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Başkan : Serdar KAHRAMAN
2. Başkan : Ömer AKÇALI
Sekreter : Alpaslan ŞENKÖYLÜ
Sayman : Çağatay ÖZTÜRK
Üyeler : Haluk BERK
Hakan CANER
Uyur ER
Esat KITER
Deniz KONYA
Halil İbrahim SEÇER
Yazışma Adresi : İ. Teoman BENLİ
Hisar Intercontinental Hospital,
Alemdağ Cad., Siteyolu Sok., No: 7
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TÜRK OMURGA CERRAHİSİ DERGİSİ

Türk Omurga Cerrahisi Dergisi, Türk Omurga Cerrahisi Derneği'nin resmi yayın organıdır. Türk Omurga Cerrahisi Derneği, Prof. Dr. Emin Alıcı önderliğinde az sayıda üye tarafından 1989 yılında İzmir (Türkiye)'de kuruldu.

Derneğin kuruluş amacı:

- Omurga cerrahisi ile uğraşan Ortopedi ve Travmatoloji uzmanları ile Nöroşirurji uzmanlarını bir araya getirerek omurga cerrahisi ile ilgili bilgi ve birikimlerini paylaşmalarını sağlamak,

- Omurga cerrahisi konusunda çalışan hekimlerin sayılarını artırmak ve ülkemizde gelişmiş bir tıp disiplini haline getirmek,

- Omurga cerrahisi konusundaki gelişmeleri takip etmek ve üyelerine aktarmak,

- Uluslararası ve ulusal kongre, sempozyum ve kurslar düzenleyerek, omurga cerrahisi eğitimi vermek,

- Omurga cerrahisi eğitiminde standardizasyonu sağlamak,

- Omurga cerrahisi konusundaki bilimsel çalışmaları

özendirmek ve bu konudaki çalışmaları içeren dergi ve kitaplar çıkarmak,

- Tüm bu çabalarla Türk omurga cerrahisini geliştirmek ve Dünya omurga cerrahisine bu yolla katkılar sağlamaktır.

Türk Omurga Cerrahisi Dergisi, Türk Omurga Derneği'nin resmi yayın organıdır. Derginin amacı, Türk omurga cerrahlarının çalışmalarını ve literatürdeki yeni gelişmeleri yayınlayarak tüm Türk tıp camiasının ve özellikle omurga cerrahisiyle uğraşanların bilgi ve görgüsünü artırmaktır. Ayrıca dergi, dernek üyeleri hakkındaki gelişmeleri, omurga cerrahisi ile ilgili bilimsel kongre ve toplantıları, yeni çıkan yayın ve kitapları dergi abonelerine duyurmak amacını gütmektedir.

Türk Omurga Cerrahisi Dergisi'nin geçmişi, Türk Omurga Cerrahisi Derneği geçmişi kadar eskidir.

Derneğin ilk kez İzmir Çeşme' de düzenlediği kongre ile eş zamanlı olarak ilk 4 sayı yayınlanmıştır. İki yılda bir düzenlenen uluslararası kongrelerde sunulan çalışmalar, derneğin özendirmesiyle yazarları tarafından orijinal makale haline getirilmiş ve dergide yayınlanmıştır.

Dergi, klinik ve temel araştırma, davetli derlemeler ve olgu sunumları şeklindeki Yayın Kurulunun onayladığı orijinal makaleleri İngilizce veya Türkçe olarak yayınlar. Çalışmalar, en az iki hakem tarafından değerlendirildikten sonra yayınlanabilir. Yayın Kurulu, yayını kabul etme, düzeltilmesini isteme ve yayınlamama hakkına sahiptir. Dergi, her üç ayda bir çıkar ve dört sayıda bir cilt tamamlanır.

Türk Omurga Cerrahisi Dergisi'nde yayınlanan çalışmalardaki bilimsel veri, bilgi ve çıkarımlar ile ilgili bilimsel etik ve mediko-legal sorunlar yazının yazarlarının sorumluluğundadır, konuyla ilgili editörün ve yayın kurulunun hiçbir sorumluluğu yoktur.

Son yıllarda artan bilimsel etik ve mediko-legal sorumluluk bilinci dergimiz için temel esasları oluşturur.

Bilimsel çevrelerin ve toplumun da beklentisi bu yöndedir. Dergimizde yayınlanan makalelerde, alıntıların mutlaka kaynak belirtilerek kullanılması zorunluluğu vardır. Dergimiz, hasta haklarına saygılı olup, dergide yayınlanan çalışmalarda hasta onay formlarının olmasına özen gösterir ve hastaların kimliklerini deşifre edecek şekilde isimlerinin kullanılmasına, fotoğrafların göz bandı olmaksızın basılmasına izin vermez. Çalışmalara ait etik kurul onaylarının olmasını zorunlu tutar. Yazarlar, ticari kuruluşlardan maddi destek almışlarsa bu durumun açıkça belirtilmesini şart koşar. Dergimiz yazarlardan destek alınan kuruluşun makalenin içeriğine karışmadığına, yayınlanmasına müdahale etmeyeceğine ve izinsiz başka bir yerde kısmen veya tamamen yayınlanmayacağına dair taahhüt ister.

Türk Omurga Cerrahisi Dergisi, dernek üyelerine ve abonelere ücretsiz olarak dağıtılmaktadır.

Derginin yayın ve dağıtım giderleri, dernek üye aidatlarından, kongre gelirlerinden ve dergiye alınan reklâm bedellerinden sağlamaktadır. Reklâm bedelleri aktüel fiyatlara göre belirlenir. Dergi ya-

yın kurulu, bir veya birden çok ticari kuruluşla sponsorluk anlaşması yapmaya yetkilidir. Ancak ilgili kuruluşlar, asla derginin bilimsel içeriğine, tasarımına, yayınların yayınlanma sırasına ve sürecine müdahale edemezler.

Türk Omurga Cerrahisi Dergisi, Birleşmiş Milletler, "Global Compact" sözleşmesine uyacağını taahhüt etmiş ve bunu bir bildiri ile Birleşmiş Milletlere bildirmiştir. Bu meyanda, dergimiz genelde insan haklarına, özelde hasta haklarına ve deneysel çalışmalarda hayvan haklarına saygılı olunması gerektiği inancında olup, yayınlanan çalışmalarda bu prensiplere uyma zorunluluğu getirmiştir.

Son yıllarda klinik olarak ilgili bilimsel gelişmeler, çağdaş ölçüler, daha sofistike istatistiksel yaklaşımlar ve iyi formüle edilmiş araştırma planlarının artan kullanımını ve üst düzey raporlamayı içermektedir. Bilimsel yazılar, diğer yazılar gibi, yaratıcı bir süreci yansıtır, sadece bir eylemi değil. Bir raporun kalitesi tasarıdaki fikrin ve araştırmanın yönetilmesinin kalitesine bağlıdır. İyi hazırlanmış sorular veya hipotezler, tasarı ile ilişkilidir. İyi hazırlanmış hipotezler tasarıyı gösterir ve tasarı da hipotezi gösterir. Bir raporun etkililiği kısalık ve odak ile ilgilidir. Az noktaya dikkat çekmek yazarların kritik konulara odaklanmasını sağlar. Kısalık ve özlük tekrardan kaçınma (birkaç istisna hariç), sade stil ve düzgün gramer ile elde edilir. Pek az orijinal makalenin 3000 kelimeden fazla olmaya ihtiyacı vardır. Daha uzun makaleler temel yeni metotlar raporlanıyorsa veya bir literatür araştırması yansıtıyorsa kabul edilebilir. Yazarların ağdalı ifadeden kaçınması gerekmesine rağmen, etkili iletişim sağlayan kritik bilgi çoğu kez soruların (veya hipotezler veya anahtar konular) tekrarlanması anlamına gelir. Sorular Özet, Giriş ve Tartışma bölümlerinde belirtilmeli, ve yanıtlar Özet, Sonuçlar ve Tartışma bölümlerinde yer almalıdır.

Pek çok derginin makaleleri formatlamak için yönergeler yayınlamasına rağmen, yazı stilleri yazarların az veya çok kurulu ve alışkanlık edindikleri bir yazma stiline sahip oldukları için çeşitlidir.

Türk Omurga Cerrahisi Dergisi, geleneksel olarak genel yönerge olarak AMA stilini kullanmaktadır. Ancak pek az bilimsel ve tıbbi yazarın bu stilleri öğrenmek için zamanı vardır. Bu nedenle dergimiz düzgün dilbilgisi ve sade etkili iletişim sınırları içinde bireysel stillere hoşgörü ile yaklaşmaktadır.

THE TURKISH JOURNAL OF SPINAL SURGERY

The Turkish Journal of Spinal Surgery is the official publication of the Turkish Spinal Surgery Society. The Turkish Spinal Surgery Society was established in 1989 in Izmir (Turkey) by the pioneering efforts of Prof. Dr. Emin Alıcı and other a few members. The objectives of the society were to:

- establish a platform for exchange of information/ experience between Orthopedics and Traumatology Specialists and Neurosurgeons who deal with spinal surgery

- increase the number of physicians involved in spinal surgery and to establish spinal surgery as a sophisticated medical discipline in Turkey

- follow the advances in the field of spinal surgery and to communicate this information to members

- organise international and national congresses, symposia and workshops to improve education in the field

- establish standardization in training on spinal surgery

- encourage scientific research on spinal surgery and publish journals and books on this field

- improve the standards of spinal surgery nationally, and therefore make contributions to spinal surgery internationally.

The Turkish Journal of Spinal Surgery is the official publication of the Turkish Spinal Surgery Society. The main objective of the Journal is to improve the level of knowledge and experience

among Turkish medical society in general and among those involved with spinal surgery in particular. Also, the Journal aims at communicating the advances in the field, scientific congresses and meetings, new journals and books to its subscribers. The Turkish Journal of Spinal Surgery is as old as the Turkish Spinal Surgery Society. The first congress organized by the Society took place in Çeşme, Izmir, coincident with the publication of the first four issues. Authors were encouraged by the

Society to prepare original articles from the studies presented in international congresses organized by the Society every two years, and these articles were published in the Journal.

The Journal publishes clinical or basic research, invited reviews, and case presentations in English or Turkish after approval by the Editorial Board. Articles are published after they are reviewed by at least two reviewers. Editorial Board has the right to accept, to ask for revision, or to refuse manuscripts. The Journal is issued every three months, and one volume is completed with every four issue. Responsibility for the problems associated with research ethics or medico-legal issues regarding the content, information and conclusions of the articles lies with the authors, and the editor or the editorial board bears no responsibility.

In line with the increasing expectations of scientific communities and the society, improved awareness about research ethics and medico-legal responsibilities forms the basis of our publication policy.

Citations must always be referenced in articles published in our journal. Our journal fully respects to the patient rights, and therefore care is exercised in completion of patient consent forms; no information about the identity of the patient is disclosed; and photographs are published with eyebands. Ethics committee approval is a prerequisite. Any financial support must clearly be disclosed. Also, our Journal requests from the authors that sponsors do not interfere in the evaluation, selection, or editing of individual articles, and that part or whole of the article cannot be published elsewhere without written permission.

The Turkish Journal of Spinal Surgery is available to the members of the society and subscribers free of charge. The publication and distribution costs are met by membership fees, congresses, and the advertisements appearing in the journal. The advertisement fees are based on actual pricing.

The Editorial Board has the right for signing contracts with one or more financial organizations for sponsorship. However, sponsors cannot interfere in the scientific content and design of the journal,

and in selection, publication order, or editing of individual articles.

The Turkish Journal of Spinal Surgery agrees to comply with the "Global Compact" initiative of the UN, and this has been notified to the UN. Therefore, our journal has a full respect to human rights in general, and patient rights in particular, in addition to animal rights in experiments; and these principles are an integral part of our publication policy.

Recent advances in clinical research necessitate more sophisticated statistical methods, welldesigned research plans, and more refined reporting. Scientific articles, as in other types of articles, represent not only an accomplishment, but also a creative process. The quality of a report depends on the quality of the design and management of the research.

Well-designed questions or hypotheses are associated with the design. Well-designed hypotheses reflect the design, and the design reflects the hypothesis. Two factors that determine the efficiency of a report are focus and shortness. Drawing the attention to limited number of subjects allows the author to focus on critical issues. Avoidance from repetitions (apart from a few exceptions), a simple language, and correct grammar are a key to preparing a concise text. Only few articles need to exceed 3000 words, and longer articles may be accepted when new methods are being reported or literature is being reviewed. Although authors should avoid complexity, the critical information for effective communication usually means the repetition of questions (or hypotheses or key subjects). Questions must be stated in Summary, Introduction and Discussion sections, and the answers should be mentioned in Summary, Results, and Discussion sections.

Although many journals issue written instructions for the formatting of articles, the style of the authors shows some variance, mainly due to their writing habits. The Turkish Journal of Spinal Surgery adopts the AMA style as a general instruction for formatting. However, not many authors have adequate time for learning this style. Thus, our journal is tolerant to personal style within the limitations of correct grammar and plain and efficient communication.

YAZARLARA BİLGİLER

Türk Omurga Cerrahisi Dergisi (www.jtss.org),

Omurga Cerrahisi Derneği'nin yayın organıdır. Omurga hastalıkları ile ilgilenen hekim grubuna doğrudan hitap eden multidisipliner, hakemli bir dergidir ve spinal bilginin gelişimine önemli katkıda bulunacak orijinal çalışmaların yayınlanması amacıyla düzenlenmiştir. Dergi, klinik ve temel araştırma, davetli derlemeler ve olgu sunumları şeklindeki Yayın Kurulunun onayladığı orijinal makaleleri İngilizce veya Türkçe olarak yayınlar. Çalışmalar, en az iki hakem tarafından değerlendirildikten sonra yayınlanabilir. Yayın Kurulu, yayını kabul etme, düzeltilmesini isteme ve yayınlamama hakkına sahiptir. Dergi, her üç ayda bir çıkar ve dört sayıda bir cilt tamamlanır.

- Türk omurga cerrahisi dergisi, yıl içinde 4 kez yayınlanır: Mart, Haziran, Eylül ve Aralık.

- Türk omurga cerrahisi dergisine İngilizce özet (Summary) ve İngilizce anahtar kelimeler (Key Words) bölümlerine sahip, "Omurga Cerrahisi" ile ilgili:

I- Orijinal klinik ve laboratuar araştırma yazıları,

II- Vaka takdimleri,

III- Derleme yazılar kabul edilir.

Dergiye ulaşan çalışmanın, başka bir yerde daha önce yayınlanmamış (özet veya ön rapor dışında) veya yayın için değerlendirme aşamasında olmaması gerekir. Yayında adı geçen her çalışmacının, çalışmaya katılmış olduğu düşünülür. Tüm yazarlar, çalışmayı okuduklarını ve içeriği ile Türk Omurga Cerrahisi Dergisi'ne gönderilmesini onayladıklarını ekteki "Başvuru Mektubu"nda olduğu gibi ayrı bir yazı ile bildirmelidirler. Çalışmanın doğruluğu ile ilgili son sorumluluk, dergi, editörler veya yayıncıya değil, yazarlara aittir. Başvuru mektubunda ayrıca herhangi bir ticari kuruluştan destek alıp almadıklarını da açıkça belirmelidirler.

Hastanın isminin ve bilgilerinin saklanması esastır. Hastanın kimliğinin dikkatli bir şekilde korunacağının garanti edilmesi ve çalışmada insanlar üzerinde yapıldığı belirtilen herhangi bir deneysel çalışmanın, hasta bilgilendirilerek ve insan denekler üzerinde yapılan deneysel araştırmalarda öngörülen ve tüm yazarların görüş birliğine vardığı yasalar çerçevesinde uygulanması, yazarların sorumluluğudur.

Hastalardan yazılı izin alınıp ve bu belge çalışmayla birlikte dergiye yollanmadıkça hastaların tanınmaması için gözleri kapatılmalı ve fotoğraflardan isimleri çıkartmalıdır.

- İzinler: Yazarlar, ekte yer alan örnekteki gibi (Yayın Hakkı Devri Mektubu) ayrı bir yazı halinde, çalışmanın daha önce başka bir dergide yayınlanmadığını ve değerlendirmede olmadığını bildirmeleri gerekir. Yazarlar aynı zamanda çalışmalarının tüm yayın haklarını dergimize devrettiklerini bu yazı ile bildirmelidirler. Yazarların, başka bir yerde yayınlanmış olan alıntı, tablo ve resimlerin kullanılabilmesi için telif hakkı sahibinden (genellikle yayıncı) yazılı izin almaları ve göndermeleri gerekir.

Derlemelerin formatı, orijinal verileri bildirenlerinkinden farklı olacaktır. Fakat ortak prensiplerin çoğu uygulanır. Bir İncelemenin bir "Özet", bir "Giriş" ve bir "Tartışma" bölümüne ihtiyacı vardır. Giriş bölümünün odaklanmış konulara ve bu konular için bir gerekçeye ihtiyacı vardır. Yazarlar çalışmalarını diğer mevcut materyalden (monografi, kitap bölümleri) ayırtan benzersiz yaklaşımları okuyucuya sunmalıdır. Konular "Giriş" bölümünün son paragrafında verilmelidir. Bir incelemenin "Giriş" bölümü, orijinal materyali veren belgelere dayanan bir makale ile birlikte dört paragraftan uzun olması gerekmez. Daha uzun "Giriş" ler odağı kaybetmeye yatkındır, bu nedenle okuyucu hangi yeni bilginin sunulacağından emin olamaz.

"Giriş"ten sonraki bölümler nerdeyse her zaman belirli incelemeye özgüdür, fakat tutarlı bir şekilde düzenlenmelidir. Başlıklar (ve uygunsa alt başlıklar) paralel yapı izlemeli ve benzer konular yansıtmalıdır (örneğin tanısal kategoriler, metot seçimi, cerrahi müdahale seçimi gibi). Okuyucu sadece başlıkları göz önüne aldığında, incelemenin mantığını anlayacak şekilde açık olmalıdır. "Tartışma", gözden geçirilmiş literatürle uyumlu bir bütün olarak ve "Giriş"te belirtilen yeni konuların kapsamında birleştirir. Sınırlamalar, verilmiş bir çalışmadakinden ziyade literatürdekileri yansıtmalıdır. Bu sınırlamalar, teşhisin veya tedavi seçiminin az veya çok belirli değerlendirilmesine engel olan literatürdeki boşluklarla ilgili olacaktır. Literatürdeki çelişmeler kısaca araştırılmalıdır. Okuyucu sadece sınırlamaları araştırarak literatürü perspektife oturtur. Yazarlar "Tartışma" bölümünü, "Özet" bölümünün sonunda kısa haliyle verilecek olmasına benzer şekilde özet ifadeler ile bitirmelidir.

Genel olarak bir inceleme, konuya göre değişiklik göstermekle birlikte, belgelere dayalı bir makale ile karşılaştırıldığında daha geniş bir literatür incelemesine ihtiyaç duyar. Bazı konulara tüm bir monografide bile, (örneğin osteoporoz) kapsamlı şekilde atıfta bulunulamaz. Bununla beraber yazarların bir incelemenin tüm literatürü temsil ettiğini, ve bunun büyük olması durumunda çok sayıda referansa ihtiyaç duyulduğu unutulmamalıdır.

- Orjinal makaleler: "Başlık sayfası", "Özet", "Anahtar Kelimeler", "Abstract", "Key Words", "Giriş", "Materyal-Metot", "Sonuçlar", "Tartışma", "Çıkarımlar" "Kaynaklar" bölümlerini içermelidir. İngilizce olan orijinal makalelere Türkçe "Özet" ve Türkçe "Anahtar Kelimeler" bölümü eklenmelidir.

- Başlık (80 karakter, boşluklar dahil): Özet bölümünün okuyucunun dikkatini çekmesinde önemli olduğu gibi, başlık da aynı önemi taşımaktadır. Az sayıda kısa kelime ile soru ortaya atan veya soru cevaplayan başlıklar, sadece konuyu belirten başlıklardan daha başarılı olacaklardır. Ay-

rıca "Bisfosfonatlar kemik kaybını azaltır" gibi başlıklar ana mesajı etkili şekilde taşır ve okuyucuların daha çok aklında kalır.

- Başlık Sayfası: a) Çalışmanın açıklayıcı bir başlığını, b) Tüm yazarların tam isimleri ve akademik unvanlarını, c) Sorumlu yazarın adını, adresini, faks ve telefon numarasını, e-posta adresini, d) Sorumlu yazardan farklı ise "ayrı basımların" gönderilme adresini içermelidir. Başlık sayfası ayrıca hastalardan gerekli izinlerin alındığına ve etik kurul onayının olduğuna dair bilgiyi de içermelidir. Başlık sayfasında mutlaka "Kanıt Düzeyi" belirtilmelidir. Bunun için ekte yer alan Tablo-1'e bakılabilir. Ayrıca çalışmanın Tablo-2'de listesi yer alan konulardan hangisine girdiği (en fazla 3 konu) belirtilmelidir.

- Özet: İkinci sayfada, İngilizce yazılar için Türkçe, Türkçe yazılar için İngilizce, 150-250 sözcüklük bir özet yer almalıdır. Özet başlıca; geçmiş bilgiler, çalışmanın amacı, materyal-metot, sonuçlar ve çıkarımlar (Background Data, Purpose, Material- Methods, Results and Conclusion) bölümlerini içermelidir. İngilizce ve Türkçe özet birebir aynı olmalıdır.

Genel olarak bir Özet bölümü makalenin tamamı tamamlandıktan sonra yazılmalıdır. Bunun sebebi, yazma sürecinin düşünceyi ve hatta belki de amacı nasıl değiştirdiği ile ilişkilidir. Yazar(lar) ancak verilerin dikkatli gözden geçirilmesi ve literatür ile sentezinden sonra etkili bir özet yazabilir.

Günümüzde pek çok okuyucu basılı materyallerde aramaktansa, internet bazlı veritabanları aracılığıyla tıbbi ve bilimsel bilgiye erişiyor. Erişimin dışında okuyucunun girişi başlıklar ve özetlerden geçtiği için sağlam başlıklar ve özetler okuyucun dikkatini daha etkili şekilde çeker. Bir okuyucunun tüm makaleyi inceleyip incelemeyeceği çoğunlukla zorlayıcı bilgi içeren bir özete bağlıdır. Zorlayıcı bir Özet soruları veya amaçları, metotları, sonuçları (çoğunlukla nicel veriler) ve neticeleri içerir. Bunların her biri bir veya iki ifadeyle verilebilir. "Bu raporun açıkladığı konu …" gibi ifadeler çok az faydalı bilgi verir.

- Anahtar Kelimeler : Bilimsel indekslerde ve arama motorlarında standart kullanılan kelimeler seçilmelidir. Anahtar kelime sayısı en az 3 en fazla 5 adet olmalıdır.

- Giriş (250 – 750 kelime): Makale konusuyla ilgili tarihsel literatür bilgisini içermeli, problem ortaya konulmalı, çalışmanın amacı ve problemin çözümü için yapılanlar anlatılmalıdır.

Giriş kısmı en kısa bölüm olduğu halde belki de en kritik bölümdür. Giriş bölümü konuları etkili bir biçimde belirtmeli, bu konular ve sorular için gerekçeleri formüle etmelidir. Bununla beraber çalışmaların çoğu şunlar için yayınlanır: (1) tamamen yeni buluşları bildirmek için (nadiren vaka raporlar, fakat bazen temel veya klinik çalışmalar); (2) daha önceden raporlanan çalışmaları teyit etmek için (örneğin vaka raporları, küçük ilk seriler); (3) veriler ve/veya sonuçlar çelişkili ise literatürdeki çelişkileri takdim etmek veya belirtmek için. Araştırmalar ve diğer özel makalelerin dışında bu üç amaçtan bir tanesi genelde Giriş bölümünde belirtilmelidir.

İlk paragraf genel konuyu veya problemi sunmalı ve önemini belirtmelidir, ikinci ve belki üçüncü bir paragraf gerekçeleri sunmalı, ve bir son paragraf soruları, hipotezleri ve amaçları belirtmelidir. Bazıları gerekçeleri ve hipotezleri formüle etmeyi Aristo mantığı (tasımsal model) olarak düşünebilir ve şu formu ele alabilir: A, B ve C ise, D, E ve F'dir. A, B ve C öncülleri kabul edilmiş olguları yansıtırken, D, E veya F mantıklı çıkarımlar veya tahminleri yansıtır. Öncüller en iyi yayınlanmış yayınlardan çıkar, fakat mevcut veri yoksa yayınlanmış gözlemler (tipik niteleyici), mantıklı iddialar veya fikir birliği kullanılabilir. Bu öncüllerin gücü aşağı yukarı veriler ile gözlemlerin azalan sırasında veya fikre karşı olan iddiadır. D, E veya F mantıklı sonuçları yansıtır. Gözlem sıralarını açıklamalar (D, E veya F) mantıklı şekilde takip eder. Bu nedenle hipotezleri formüle ederken, deneyleri tasarlayan ve sonuçları raporlayan araştırmacılar tek bir açıklamaya bağlı kalmamalıdır.

Gerçekten yeni materyallerin olduğu ender istisnalarla birlikte, yazarlar gerekçeler öne sürerken temsili literatüre referans vermelidir. Bu gerekçeler yenilik ve soruların geçerliliğini kurar ve literatüre yerleştirir. Yazarlar öncülleri ilgili aktarmalar ile sade bir şekilde belirtmeli ve alıntılar ile yazarlarının isimlerini tanımlamaktan kaçınmalıdır. Bu yaklaşımdaki istisnalar yeni bir metot için gerekçe geliştirmekte gerekli olduğunda geçmiş metotların tanımını, veya geçmiş örnek oluştururken önemli olduğunda yazarların isimlerine ithafı içerir. Alıntıların açıklamaları uygun görülürse Tartışma bölümünde takip edebilir. Bir gerekçe hazırlarken, her türlü yeni müdahale belli sorunları çözmek içindir. Örneğin, yeni implantlar (konsept olarak yeni değilse) daha önceki implantlar ile yaşanan sorunları bertaraf etmek için belirli kriterlere göre tasarlanır. Amaç yeni bir tedavinin raporlanması ise çalışmanın öncülleri, açıklanan sorunları (mümkünse nicel sıklıklarla) içermelidir ve onlara atıfta bulunmalıdır.

Son paragrafta mantıklı olarak öncekilerden başlar ve çalışmanın değişkenlerine (bağımlı, bağımsız) göre belirtilecek sorular veya hipotezleri açıklamalıdır. Çalışma değişkenlerine göre dayandırılmayan konular anlamlı şekilde belirtilemez. Raporun odağı bu sorulara odaklanmayla ilgilidir ve rapor literatürde iyi şekilde açıklanmış cevapları olan sorulardan kaçınmalıdır (örneğin idiopatik skolyozda en fazla rotasyon olan omur apikal omur mudur?). Sadece yeni ve açıklanmamış bilgi varsa veriler, belirtilmiş soruları cevaplama gereği dışında bildirilmelidir.

- Materyal-Metot (1000-1500 kelime): Hastaların epidemiyolojik, demografik bilgileri, klinik ve radyolojik çalışmaları, cerrahi teknik, sonuçların değerlendirme metodu ve istatistik çalışmalar bu bölümde ayrıntılı olarak belirtilmelidir.

Prensip olarak "Materyal ve Metot"lar çalışmayı tekrarlamak için başka araştırmacı için yeterli detayları içermelidir. Uygulamada ise, bu tür detaylar ne pratiktir ne de istenir çünkü pek çok metot daha önce daha detaylı olarak yayınlanmıştır ve ayrıca uzun tanımlar okumayı zorlaştırır. Bununla beraber, Materyaller ve Metotlar bölümü tipik olarak en uzun bölümdür.

Klinik çalışmaları raporlarken yazarların ülkelerinin kanunlarına ve düzenlemelerine göre etik komitelerinin veya kurumsal inceleme kurulunun onayını belirtmek zorundadırlar. Uygun yerde bilgisi verilen onay belirtilmelidir. Bu onay "Materyal ve Metot" bölümünün ilk paragrafında belirtilmelidir.

Başlangıçta okur temel çalışma tasarısını görmelidir. Yazarlar daha önce raporlanmış metotları sadece kısa bir şekilde tarif etmeli ve atıfta bulunmalıdır. Yazarlar bu metotları değiştirdiğinde bu değişiklikler ilave açıklama gerektirir. Klinik çalışmalarda hasta sayısı ve demografisi başta belirtilmelidir. Klinik çalışmalar dahil olan ve hariç olan kriterleri, serilerin ardıl mı veya seçilmiş mi olduğunu; seçilmişse seçimde rol oynayan kriterleri belirtmelidir. Okuyucu bu tanımdan yargının tüm potansiyel kaynaklarını, teşhisi, istisnayı, tekrarı veya tedavi fikrini anlamalıdır. Temel olarak gelecek çalışmalar için harcanan çaba ve masraf ile, çoğu yayınlanmış klinik çalışmanın geçmişe dayalı olması şaşırtıcı değildir. Bu tür çalışmalar çok kez geçmişe dayalı olduğu için haksız yere eleştirilir, fakat bu çalışmanın geçerliliğini ve değerini ortadan kaldıramaz. Dikkatli bir şekilde hazırlanmış geçmişe dayalı çalışmalar mevcut olan bilgilerin çoğunu sunar. Bununla beraber yazarlar takipte kayıp, zorluklar, eksik veri ve geçmişe dayalı çalışmalarda yaygın olan çeşitli fikir formları gibi potansiyel problemleri tanımlamalıdır.

Yazarlar istatistiksel analiz kullanırsa, Materyaller ve Metotlar bölümünün sonunda kullanılan tüm istatistiksel testleri belirten bir paragraf yer almalıdır. Birden fazla test kullanıldıysa yazarlar hangi testlerin hangi veri seti için kullanıldığını belirtmelidir. Tüm istatistiksel testler varsayımlar ile ilişkilidir, verilerin bu varsayımları karşılayacağı açıkça görülmezse yazarlar ya destekleyici verileri sunmalıdır yada alternatif testler kullanmalıdır. Önem seviyesi seçimi kanıtlanmalıdır. 0,05'lik alfa ve 0,80'lik beta seviyesi seçilmesi yaygın olmasına rağmen bu seviyeler bir şekilde isteğe bağlıdır ve her zaman uygun değildir. Bir hata çıkarımının ciddi olduğu durumda, klinik veya biyolojik önemi değerlendirmek için çalışma tasarısında farklı alfa ve beta seviyeleri seçilebilir.

- Sonuçlar (250-750 kelime): "Sonuçlar" mümkün olduğunca anlaşılır ve özet belirtilmeli, ayrıntılı sonuçlar tablolarda verilmelidir. Okuyucunun daha iyi anlayabilmesi için sonuçlar bölümü alt başlıklarla bölünebilir.

Sorular veya konulara "Giriş" bölümünde yeterli şekilde odaklanıldıysa, "Sonuçlar" bölümünün uzun olması gerekmez. Genelde okuyucuyu metotların geçerliliğine ikna etmek için bir veya iki paragrafa ihtiyaç duyulur, açıkçaortaya konan her soru veya hipotezi anlatan bir paragrafve son olarak yeni ve beklenmeyen bulguları raporlayan paragraflar. Her paragrafın ilk (konu) cümlesi konuyu belirtmeli veya soruyu yanıtlamalıdır. Okuyucu "Sonuçlar" bölümündeki her paragrafın sadece ilk cümlesini göz önüne aldığında, yazarın çıkarımlarının mantığı açık olmalıdır. Tüm rakam ve tablolara yapılan parantez içi ithaflar, yazarı verilerin yorumunu yazılı olarak yapmaya zorlar; önemli olan materyal veriler değil yazarın verileri yorumlamasıdır.

Verilerin istatistiksel raporlanması özel dikkat gerektirir. Bazı sonuçları vurgulamak için artar veya azalır (veya daha fazladır veya daha azdır) ifadeleri ile birlikte ve karşılaştırmalı kısımlardan hemen sonra p (veya başka istatistik) değerini parantez içinde belirtmek daha etkilidir. Buna ilave olarak, istatistiksel olarak farklı veya önemli ölçüde farklı olan koşullardan kaçınmak okuyucunun istatistiksel önemden bağımsız olarak istatistiksel değeri biyolojik veya klinik açıdan önemli olarak kabul edip etmeyeceklerine karar verme imkanı verir. Felsefe ve stil konusu olmasına rağmen, asıl p değeri, önceden konmuş seviyelerden daha düşük bir değer belirtmekten daha fazla bilgi taşır. Ayrıca Motulsky'nin dikkat çektiği üzere, "Bir sonucun çarpıcı olmadığını okuduysanız, düşünmeye devam edin … Önce, güven aralığına bakın … İkinci olarak eğer orada olsaydı bir çarpıcı farkı bulmak için çalışma nın gücünü sorgulayın." Bu yaklaşım okuyucuya biyolojik veya klinik etkililik konusunda daha iyi fikir verecektir.

- Tartışma (750-1250 kelime) : Tartışma bölümü spesifik unsurlar içermelidir: bunun için problem veya sorunun tekrar belirtilmesi, sınırlamalar ve varsayımların araştırılması, literatürdeki bilgiler ile bir karşılaştırma, karşılaştırmanın bir sentezi ile sonuca ulaşmak gereklidir. Problem veya sorunun yeniden belirtilmesinin vurgu amacıyla kısa olması gerekmektedir. Bunun sonrasında varsayımların ve sınırlamaların verilmelidir. Sınırlamaları araştırmadaki başarısızlık, yazarın bilmemesi veya göz ardı ettiğini seçmesini gösterir, bu da okuru yanlış yönlendirir. Bu sınırlamaları araştırma sadece kısa olmalıdır, fakat tüm eleştirel konular tartışılmalıdır ve okuyucunun sonuçları kafasında şüpheye düşürmemesi sağlanmalıdır.

Sonrasında yazarlar verilerini literatürde belirtilen veriler ile karşılaştırmalı ve/veya karşıtlıklarını bulmalıdır. Genel olarak bu raporların çoğu Giriş bölümünde bahsedilen ge-

rekçeleri içerecektir. Verilen bir çalışmanın özellikleri nedeniyle, veriler ve gözlemler literatürdekiler ile karşılaştırılabilir olmayabilir, en az eğilimleri içermemesi yaygın değildir. Nicel karşılaştırmalar, çalışmadaki verilerin yaklaşık değer olduğu konusunda okuyucuyu en etkili şekilde ikna eder, ve tablolar veya rakamlar bilgiyi etkili şekilde verir. Mümkün olduğunda çelişkiler belirtilmeli ve açıklanmalıdır; bir çelişkinin açıklaması açık olmadığı zaman bu da belirtilmelidir. Sadece makaledeki verilere dayalı olan sonuçlar nadiren kesindir çünkü literatür neredeyse her zaman önceki bilgileri içerir. Herhangi bir raporun kalitesi bu karşılaştırmaların bağımsız doğasına bağlı olacaktır. Son olarak, yazar(lar) verilerini literatürdekiler ile sentezlemelidir. Hiçbir eleştirel veri gözden kaçmamalıdır, çünkü karşıt veri bir görüşü etkili şekilde çürütebilir. Yani nihai sonuçlar sadece sundukları yeni veriler ile değil ayrıca literatürdekiler ile de uyumlu olmalıdır.

- Çıkarımlar : Çalışma sonucunda yazarların vardığı yargılar ve öneriler kısaca belirtilmelidir. Bu bölümde çalışmada elde edilen bilimsel verilere dayanmayan tahmin ve kişisel fikirleri içeren cümlelere yer verilmemelidir.

- Kaynaklar : Kaynakların bilimsel indekslerde bulunabilir olmasına dikkat edilmelidir. Kişisel görüşme bilgilerine kaynaklarda yer verilemez. **Kaynaklar alfabetik sıra ile dizilmeli ve yazı içinde mutlaka site edilmeli, site edilmeyen kaynaklar listede yer almamalıdır.** Sempozyum ve Kongre bildiri sunumlarının özetleri makale ile birlikte yollanmalıdır. Aşağıdaki listeleme yöntemi kullanılmalıdır.

Referanslar (ithaflar) öncelikle emsal taranmış dergiler, standart ders kitapları veya monografi, veya kabul görmüş ve sabit elektronik kaynaklardan elde edilmelidir. Yazarlar verilerin yorumuna bağlı alıntılar için genellikle sadece yüksek kalitede emsal taranmış kaynaklar kullanmalıdır. Özetler ve sunulan makaleler kullanılmamalıdır çünkü bu kategorilerdekilerin çoğu emsal taramadan geçirilmemiştir.

Gerek görülürse, yazarlardan herhangi bir kaynağın tam metni istenebilir. Veriler, yayınlanmamış bir kaynaktan alınmışsa, çalışmanın adı ve yeri gibi bilgiler verilmelidir. Gönderilen fakat henüz basım için kabul edilmemiş olan yazılar ve kişisel görüşmeler, metinde site edilmelidir. Dergi isimlerinin kısaltmaları için Index Medicus içeriğindeki "list of journals" bölümüne başvurulabilir veya http://www.nlm.nih.gov/tsd/serials/lji.html adresinden liste elde edilebilir. Kaynaklar, şu şekilde düzenlenmelidir:

Dergiden Makale:

1. Berk H, Akçalı Ö, Kıter E, Alıcı E. Does anterior spinal instrument rotation cause rethrolisthesis of the lower instrumented vertebra? J Turk Spinal Surg 1997; 8 (1):5-9.

Kitaptan Bölüm:

2. Wedge JH, Kirkaldy-Willis WH, Kinnard P. Lumbar spinal stenosis. Chapter 5. In: Disorders of the lumbar spine. Eds.: Helfet AJ, Grubel DM, JB Llippincott, Philadelphia 1978, pp: 61-68.

Kitap:

3. Paul LW, Juhl JH. The essentials of Roentgen interpretation. Second Edition. Harper and Row, New York 1965, pp: 294-311.

Kitap ve Cilt No:

4. Stauffer ES, Kaufer H, Kling THF. Fractures and dislocations of the spine. In: Fractures in adults. Vol 2. Eds.: Rockwood CA, Gren DP, JB Lippincott, Philadelphia1984, pp: 987-1092.

Yayında Olan Makale:

5. Arslantaş A, Durmaz R, Coşan E, Tel E. Aneurysmal bone cysts of the cervical spine. J Turk Spin Surg (In press).

Yayında Olan Kitap:

6. Condon RH. Modalities in the treatment of acute and chronic low back pain. Low back pain. Ed.: Finnison BE, JB Lippincott, Philadelphia (In press).

Sempozyum:

7. Raycroft IF, Curtis BH: Spinal curvature in myelomeningocele: Natural history and etiology. Proceedings of the American Academy of Orthopaedic Surgeons Symposium on Myelomeningocele, Hartford, Connecticut, November 1970. St. Louis, CV Mosby, 1972, pp : 186-201.

Toplantılarda Sunulan Bildiriler:

8. Rhoton AL: Microsurgery of the Arnold-Chiari malformation with and without hydromyelia in adults. Presented at the annual meeting of the American Association of Neurological Surgeons, Miami, Florida, April 7, 1975.

- Tablolar: "Tablolar", Arap rakamlarıyla metin içinde geçiş sıralarına göre numaralandırılmalıdır. Her bir tablo, ayrı bir sayfada verilerek tablo başlığı ve açıklamalı yazısı eklenmelidir. "Tablolar", yazının içine Sıkıştırılmamalı, çalışmanın tekrarından çok eki olmalıdır. "Tablolar"daki bilgiler yazıdan bağımsız incelense bile kolaylıkla fikir verecek nitelikte açık ve anlaşılır olmalıdır. "Tablolar"da verilen bilgiler yazı içinde tekrarlanmamalıdır. "Tablolar"da mümkünse istatistiksel ortalamalar, standart sapma, t ve p olasılık değerlerine yer verilmelidir. Tabloda yapılan kısaltmalar tablo altında açıklanmalıdır.

Rakamlar ve tablolar metinde materyali tekrar etmemeli, tamamlamalıdır. "Tablolar", yazılı şekilde tanımlaması zor olacak olan bilgiyi yoğun şekilde sunarlar. Metinde kısa ve öz olarak tarif edilen materyal tablo ve rakamlar ile anla-

tılmamalıdır. Örneğin klinik çalışmalar çoğu kez sonuçları yorumlamada önemli olmalarına rağmen makalede ortaya konan sorular için kritik olmayan demografik veriler için tamamlayıcı tablolar içerir. İyi odaklanmış çalışmalar "Giriş" bölümünde belirtilen her soru ve hipotez için sadece bir veya iki tablo veya rakamlar içerir. İlave materyaller beklenmeyen sonuçlar için kullanılabilir.

İyi yapılandırılmış "Tablolar", kendiliğinden açıklayıcıdır ve sadece bir başlığa ihtiyaç duyar. Her sütun birimlerle birlikte bir başlık içerir. Fakat rakamların sembollerin anlamlarını da içerecek şekilde bazı açıklamalara ihtiyacı olabilir. Gerekli veri açıklamalarına ek olarak rakam göstergeleri ortaya konan sorular çerçevesinde ana noktaları içermelidir; açıklamalar tam cümleler olarak yazılmalıdır. Okuyucu "Giriş" bölümünün son paragrafında soruları okuyabilmelidir, sonra "Sonuçlar" bölümünün her paragrafının ilk cümlesinde ve rakam açıklamalarında yanıtları bulabilmelidir.

- Resim ve Şekiller: Tüm figürler, metin içinde sırasıyla numaralandırılmalıdır. Her resim/şekil in arkasında, üzerinde numarasını, üst kenarını gösteren ok işaretini ve ilk yazarın adını içeren bir etiket bulunmalıdır. Siyah-beyaz baskılar, parlak kağıt üzerinde olmalıdır (9x13 cm). Resim/şekil üzerindeki yazının harf karakteri, figür küçülünce okunaklı olacak şekilde büyük olmalıdır. Profesyonel olmayan, daktilo karakterleri kabul edilmez. Resim/şekil açıklamaları, referanslardan sonra, ayrı bir kağıda yazılmalıdır. Dergi, yazının değerini arttıracak olan renkli baskıları da kabul eder. Ancak, bu baskılar, yazarlar ödeme yapmadan yayınlanamaz. Yazarlar, renkli baskılar için ödeme yapmazlarsa, siyah-beyaz basılmasını isteyebilirler. Elektronik yolla yollanan çalışmalar için resimler jpeg ve tiff formatında olmalı, 300 dpi üstünde rezolüsyona sahip olmalıdır. Resimler numaralandırılmalı, mutlaka yazı içinde site edilmelidir.

- Stil: Yazı şablonu, "American Medical Association Manual of Style (9th edition)" verilerine göre biçimlendirilir. Stedman's Medical Dictionary (27th edition) ve Merriam Webster's Collegiate Dictionary (10th edition), standart referanslar olarak kullanılmalıdır. İlaç ve terapötik ajanlar, kabul edilen jenerik ve kimyasal isimlerine göre yazılmalı ve kısaltma kullanılmamalıdır. Kod numaraları, ancak jenerik ismi bulunamıyorsa, kullanılmalıdır. Bu durumda, ilacın kimyasal yapısını veren kimyasal maddenin ismi ve şekli elde edilmelidir. ilaçların ticari isimleri, jenerik isminden sonra parantez içinde verilmelidir. Marka kanununa uymak için yazıda adı geçen her ilaç veya cihazın imalatçısının isim ve yeri belirtilmelidir. Ölçüm birimleri için metrik sistem, ısı ölçümü için Celsius kullanılmalıdır. Geleneksel birimlerden çok Standart birimlerin kullanılmasına dikkat edilmelidir.

Kısaltmalar, yazıda ilk kullanıldığı yerde, her tablo ve her figürde tanımlanmalıdır. Bir firma ismi bildirilecekse, imalatçının isim ve adresi (şehir ve ülke) verilmelidir.

Standart kısaltma listesi için, "Council of Biology Editors St yle Guide" (Council of Science Editors, 9650 Rockville Pike, Bethesda, MD 20814 adresinden ulaşılabilir) veya diğer standart kaynaklara başvurulabilir.

- Teşekkür : Mali olmayan tüm teşekkürleri bu bölümde belirtiniz. Şu cümleyle başlayabilirsiniz: "Yazarlar …'e teşekkür etmek ister". Teşekkür bölümünde, farmasötik endüstri dahil, tüm destekler bildirilmelidir.

- Pratik İpuçları :

1- Bu ifadelerin tüm kritik materyali içerip içermediğini ve mantıksal akışın açık olup olmadığını doğrulamak için metin içinde her paragrafın sadece ilk cümlesini okuyunuz.

2- "…bu raporun açıkladığı konu…" gibi Özet ifadelerden kaçınınız. Bu tür ifadeler okuyucu için temel bilgi vermez.

3- Özet bölümünde referans ve istatistiksel değerlerden kaçınınız.

4- Geçmişe dayalı örnek kurma haricinde alıntı yapılan yazarların isimlerini kullanmaktan kaçınınız. konuyu belirtiniz ve altyazıyla alıntı veriniz.

5- Giriş bölümünün son paragrafında "…verilerimizin raporunuz sunuyoruz…" gibi cümlelerden kaçınınız. Bu tür ifadeler okuyucunun (ve yazarın!) dikkatini kritik konulara odaklamasını engeller.

6- Tablo ve rakamlara parantez içinde atıfta bulunun ve tablonun bir cümlenin öznesi veya nesnesi olduğu ifadelerden kaçınınız. Parantez içindeki atıflar tablo ve rakamın değil, tablo ve rakamlardaki bilginin yorumunu vurgular.

7- Giriş bölümünden Tartışma bölümüne kadar düzenli olarak kelimeleri sayınız.

- En fazla sayıda revizyona neden olan konuları şunlardır:

1- Açık sorular ve cevaplar verilmemiştir. Hastaları dahil eden tüm metinler için Türk Spinal Cerrahi Dergisi, açık bir birincil araştırma sorusu gerektiren Delil Düzeyi yayınlar. Bu soru açık bir şekilde cevaplanmalıdır.

2- Başlık sayfasında bir Delil Düzeyi belirtiniz. Düzey ne kadar yüksek olursa o kadar iyi olur.

3- Hasta popülasyonları, okuyucunun çeşitli eğilim formlarını araştırması için yeterli şekilde tanımlanmamıştır.

4- Çalışma sınırlamaları Tartışma bölümünde bulunmamıştır.

5- Aktarılmamış veya eksik referanslar; uygun formatında olmayan referanslar.

6- Eksik telif hakkı transfer formları.

7- Daha önce yayınlanmış materyal için eksik izinler

(tablolar, şekiller)

Başvuru Mektubu Örneği:

Türk Omurga Cerrahisi Dergisi

Sayın Editör,

Ekte Türk Omurga Cerrahisi Dergisi'nde incelenmek üzere "……" başlıklı bir metin gönderiyoruz.

Adı geçen yazarlar çalışmayı tasarladılar (parantez içinde uygun yazarların isimlerini yazınız), verileri topladılar (parantez içinde uygun isimlerini baş harflerini yazınız), verileri analiz ettiler (parantez içinde uygun yazarların isimlerini yazınız), ilk taslakları yazdılar (parantez içinde uygun yazarların isimlerini yazınız) ve veri ile analizin tutarlılığını sağladılar (parantez içinde uygun yazarların baş isimlerini yazınız).

Tüm yazarların bu metnin içeriklerini ve son halini gördüğünü ve onayladığını ve çalışmanın başka bir yerde tamamen veya kısmen yayınlanmadığını kabul ettiklerini teyit ederim.

Bu yazışmayı sağlayan yazar olarak ben (ve diğer yazarlar) Türk Omurga Cerrahisi Dergisi'nin tüm yazarların çalışmanın herhangi bir kısmını destekleyen ticari kurum ile bir sözleşme veya anlaşma imzalamış olabileceğini belirtmesini istediğini anlıyoruz. Ayrıca bu bilginin, çalışma incelenirken gizli tutulacağını ve yazımsal kararı etkilemeyeceğini, fakat çalışma yayınlanmak üzere kabul edilirse çalışmada bir ifşaat açıklaması yer alacağını kabul ediyoruz. Aşağıdaki açıklamaları, benim ve diğer yazarların çalışmayla ilgili olarak ticari ilgisi olmadığını belirtmek amacıyla seçtik.

1) Tüm yazarlar çalışma için toplanmış tüm veya bir kısım verilerin yayımını sınırlayacak veya her hangi bir sebepten yayımı geciktirecek şekilde, bu çalışmayla ilgili olarak ticari bir anlaşma imzalamadığını beyan ederler.

2) Yazarlardan biri veya birkaçı (isimleri) bu çalışmayla ilgili ticari bir anlaşma imzaladığını, ancak bu anlaşmaların ticari kurumun verilere sahip olma veya kontrol etme ve gözden geçirme ve değiştirmesine müsaade etmeyeceğini ve yayımlanmasını geciktirmeyeceğini veya önleyemeyeceğini taahhüt ederiz.

3) Yazarlardan biri veya birkaçı (parantez içinde uygun yazarların isimlerini yazınız) bu çalışmayla ilgili ticari bir anlaşma imzaladığını ve bu anlaşmaların ticari kurumun verilere sahip olma veya kontrol etme ve gözden geçirme ve değiştirme hakkına sahip olduğunu bildiririz ve fakat yayımlanmasını geciktirmeyeceğini ve önleyeceğini taahhüt ederiz

Saygılarımla,

Yazışmadan sorumlu yazar

Yazarlık Sorumluluğu, Finanssal İfşa, ve Telif Hakkı Transferi

METİN BAŞLIĞI:

YAZIŞMAYI YÜRÜTEN YAZAR:

YAZIŞMA ADRESİ:

TELEFON / FAKS NUMARALARI:

Her yazar aşağıdaki açıklamayı okumalı ve imzalamalıdır; eğer gerekliyse bu belgeyi fotokopi ile çoğaltmalı ve orijinal imzaları için diğer yazarlara vermelidir. Doldurulmuş formlar yazı kuruluna gönderilmelidir:

SUNUM KOŞULLARI

SAKLI HAKLAR: Telif hakkının dışında, çalışmayla ilgili diğer özel haklar yazarlar tarafından elde tutulmalıdır.

ORJİNALİTE: Her yazar çalışmaya katkısının orijinal olduğunu ve bu anlaşmaya girmek için tam yetkisinin olduğunu garanti eder. Ne bu çalışma ne de benzer bir çalışma yayınlanmıştır. Ayrıca bu yayının değerlendirmesi altındayken başka bir yerde yayınlanmak üzere de gönderilmemiştir ve gönderilmeyecektir.

YAZAR SORUMLULUĞU: Her yazar, çalışmanın yayın sorumluluğunu almak üzere, düşünsel içeriğe, verilerin analizi ve çalışmanın yazılmasında yeterli ölçüde yer aldığını doğrular. Her biri çalışmanın son versiyonunu incelemiştir, geçerli çalışmayı temsil ettiğine inanmaktadır, ve yayınını onaylamaktadır. Ayrıca yayının editörleri çalışmanın dayandığı verileri talep ederlerse, hazırlamaları gerekir.

TEKZİP: Her yazar bu çalışmanın hakaret veya kanunsuz ifadeler içermediğini ve başkalarının haklarını ihlal etmediğini garanti eder. Telif hakkına tabi çalışmalardan alıntılar (metin, rakamlar, tablolar veya şekiller) dahilse, sunumdan önce yazarlar tarafından yazılı bir yayın verilir, ve orijinal yayına kredi uygun şekilde alındılanır. Her yazar çalışmayı takdim etmeden önce, isimleri veya fotoğrafları çalışmanın bir parçası olarak kullanılan hastalardan yazılı ibralarını aldığını garanti eder. Yayın Kurulu bu yazılı ibraların kopyalarını isterse yazarlar bunları sunmalıdır.

TELİF HAKKININ TRANSFERİ

YAZARLARIN KENDİ ÇALIŞMALARI: Türk Omurga Cerrahisi Dergisi çalışmayı yayınlaması halinde, yazarlar burada tüm dünyada, tüm dillerde ve CD-ROM, internet ve intranet gibi elektronik medya dahil tüm medya formlarında tüm telif hakkını Türk Omurga Cerrahisi Dergisi'ne transfer eder, devreder ve nakleder. Eğer Türk Omurga Cerrahisi Dergisi herhangi bir sebepten dolayı, bir yazarın çalışmaya takdimini yayınlamamaya karar verirse, yazışmayı yürüten yazara kararını bildiren notu hemen gönderir, bu anlaşma feshedilir, ne yazar ne de Türk Omurga Cerrahisi Dergisi başka sorumluluk veya yükümlülük altında olmaz. Yazarlar Türk Omurga Cerrahisi Dergisi'ne çalışmada ve çalışmanın veya yayının promosyonunda isimlerini ve biyografik verileri (profesyonel bağlantı dahil) kullanma haklarını verirler.

KİRA İÇİN YAPILMIŞ ÇALIŞMALAR: Eğer bu çalışma bir başka kişi veya kurum tarafından komisyonlandırılmışsa, veya bir çalışanın görevinin parçası olarak yazıldıysa, komisyon kurumunun yetkili bir temsilcisi veya çalışan kişi de kurumdaki unvanını belirterek bu formu imzalamalıdır.

FİNANSAL İFŞA: Her yazar, ayrı bir ek olarak ifşa edilmesi haricinde, takdim edilen makale ile ilişkili olarak bir çıkar çatışması olarak görülebilecek ticari bir ilişkisi (örneğin danışmanlık, hisse senedi sahipliği, sermaye ortaklığı, patent/lisans düzenlemeleri, vs) olmadığını doğrular. Çalışmayı destekleyen tüm fon temin kaynakları ve yazarların tüm kurumsal veya tüzel bağlar çalışmada bir dipnotta verilir.

KURUMSAL İNCELEME KURULU / HAYVAN

GÖZETİM KOMİTESİ ONAYI: Her yazar kendi kurumunun, hayvan veya insan içeren her türlü inceleme için protokolü kabul ettiğini ve tüm deneylerin etik ve insani araştırma ilkelerine uygun olarak yürütüldüğünü doğrular.

İmza	Basılı İsim	Tarih
İmza	Basılı İsim	Tarih
İmza	Basılı İsim	Tarih

TABLO-1. KANIT DÜZEYLERİ

DÜZEY- I .

1) İstatistiksel önemlilik testleri yapılan, vakaların randomize seçildiği, çift kör kontrol gruplarının yer aldığı deneysel çalışmalar

2) Vakaların % 80'den fazlasının kontrollere riayet ettiği tanı, tedavi ve prognostik kriterleri karşılaştıran vakaların randomize seçildiği, istatistiksel önemlilik testleri yapılan ileriye dönük planlanan (prospektif) klinik çalışmalar

3) Ardıl olgular için önceden seçilmiş kriterlerle istatistiksel önemlilik testleri yapılan, evrensel (altın standart) referanslarla mukayese edilen ileriye dönük klinik çalışmalar

4) Düzey – I çalışmaların iki veya daha fazlasının verilerini, önceden belirlenen yöntemlerle ve istatistikî olarak önemlilik testleri yapılarak karşılaştırılan sistematik inceleme (meta analiz) çalışmaları

5) Çok merkezli, randomize prospektif çalışmalar

DÜZEY –II.

1) Vakaların % 80'den azının çalışmaya alındığı randomize prospektif çalışmalar

2) Randomizasyon yapılmayan tüm Düzey-I çalışmalar

3) Randomize retrospektif klinik çalışmalar

4) Düzey-II çalışmaların meta- analizi

DÜZEY– III.

1) Randomizasyon yapılmayan düzey-II çalışmalar (prospektif klinik araştırmalar vb.)

2) Ardıl olmayan vakaların karşılaştırıldığı (tutarlı referans aralığı olmaksızın) klinik çalışmalar

3) Düzey III çalışmaların meta – analizi

DÜZEY- IV.

1) Olgu sunumları

2) Zayıf referans aralığı olan istatistiksel önemlilik verileri yapılmayan vaka serileri

DÜZEY – V.

1) Uzman görüşü

2) Bir çalışma hakkında kişisel deneyimlerin aktarıldığı bilimsel dayanağı olmaksızın bildiren görüş yazıları

TABLO-2. KLİNİK ALANLAR

- Makale
- Anatomi
- Temel Bilimler
- Biyomekanik
- Deformite
  - Skolyoz
  - Adölesan idiopatik
    - Kifoz
  - Konjenital
  - Dejeneratif
- Tanısal yöntemler
- Epidemioloji
- Fizik Tedavi
- Fonksiyon
  - Halk sağlığı
- Literatür gözden geçirme
- Meta-Analiz
- İş sağlığı
- Sonuçlar
- Tedavi
  - Konservatif tedavi
  - Primer tedavi
  - Yaşam kalitesi
  - Tedavi etkinliği
  - Pediatrik
  - Rehabilitasyon
  - Cerrahi
- Klinik cerrahi
  - Disk cerrahisi
  - Nöroşirurji
    - Rekonstriksiyon cerrahisi görüntüleme rehberliğinde cerrahi endoskopi
  - Başarısız omurga cerrahisi
  - Mikrocerrahi
  - BT yardımıyla
  - Minimal invazif
- Görüntüleme
  - Radyoloji
  - MRI
  - BT
- Füzyon
  - Füzyon kafesleri
  - Enstrümantasyon
  - Pedikül vidası
  - Fiksasyon
- Ağrı
  - Kronik ağrı
  - Bel ağrısı
  - Postoperatif ağrı
  - Ağrı ölçülü
  - Boyun ağrısı
  - Diskojenik ağrı
- Nöroloji
  - Nörofizyoloji
  - Nörolojik muayene
  - Nörokimya
  - Nöropatoloji
  - Kognitif nöroloji
  - Nöromusküler omurga hastalıkları
- Servikal omurga
  - Servikal miyolopati
  - Servikal rekonstrüksiyon
  - Servikal disk hastalığı
  - whiplash
  - Kraniyoservikal bileşke
  - Atlantoaksiyel
- Torasik omurga
  - Torakolomber omurga
- Lomber omurga
  - Lumbosakral bileşke
- Psikoloji
- Sinir
  - Sinir kökü
  - Siyatik
- Enjeksiyon
  - Epidural
- Diğer Hastalık
  - Metabolik kemik hastalıkları
  - Epilepsi
  - Lupus
  - Kanser
  - Parkinson
  - Tüberküloz
  - Romatoloji
  - Artrit
  - Osteoporoz
- Kemik
  - Kemik dansitesi
  - Kemik biyomekaniği
  - Kemik rejenerasyonu
  - Kemik grefti
  - Greft ürünleri
  - Kırık
- Disk
  - Disk dejenerasyonu
  - Herniye disk
  - Disk patolojisi
  - Disk replasmanı
  - Artifisial disk
  - IDET
- Travma
- Spinal kord
  - Spinal kord yaralanması
  - Klinik eğilimler
- Randomize çalışmalar
- Biyoloji
  - Biyokimya
  - Moleküler biyoloji
  - Tümör
  - Genetik
  - Stenoz
  - Enfeksiyon
  - Non-Operatif Tedavi
  - Hareket Analizi
  - Fizik Tedavi
  - Manüplasyon
  - Anestezi

INSTRUCTIONS TO AUTHORS

The Journal of Turkish Spinal Surgery (www.jtss.org), is the official publication of the Turkish Spinal Surgery Society. It is a peer-reviewed multidisiplinary journal for the physicians who deal with spinal diseases and publishes original studies which offer significant contributions to the development of the spinal knowledge. The journal publishes original scientific research articles, invited reviews and case reports that are accepted by the Editorial Board, in English or Turkish. The articles can only be published after being reviewed by at least two referees and Editorial Board has the right to accept, revise or reject a manuscript. The journal is published once in every three months and a volume consists of four issues.

The Journal of Turkish Spinal Surgery is published four times a year: on March, June, September, and December.

- Following types of manuscripts related to the field of "Spinal Surgery" with English Summary and Keywords are accepted for publication:

I- Original clinical and experimental research studies;

II- Case presentations; and

III- Reviews.

The manuscript submitted to the journal should not be previously published (except as an abstract or a preliminary report) or should not be under consideration for publication elsewhere. Every person listed as an author is expected to have been participated in the study to a significant extent. All authors should confirm that they have read the study and agreed to the submission to the Journal of Turkish Spinal Surgery for publication. This should be notified with a separate document as shown in the "Cover Letter" in the appendix. Although the editors and referees make every effort to ensure the validity of published manuscripts,

the final responsibility rests with the authors,

not with the Journal, its editors, or the publisher. The source of any financial support for the study should be clearly indicated in the Cover Letter.

It is the author's responsibility to ensure that a patient's anonymity be carefully protected and to verify that any experimental investigation with human subjects reported in the manuscript was performed upon the informed consent of the patients and in accordance with all guidelines for experimental investigation on human subjects applicable at the institution(s) of all authors. Authors should mask patients' eyes and remove patients' names from figures unless they obtain written consent to do so from the patients; and this consent should be submitted along with the manuscript.

Clinically relevant scientific advances during recent years include use of contemporary outcome measures, more sophisticated statistical approaches, and increasing use and reporting of well-formulated research plans (particularly in clinical research).

Scientific writing, no less than any other form of writing, reflects a demanding creative process, not merely an act: the process of writing changes thought. The quality of a report depends on the quality of thought in the design and the rigor of conduct of the research. Well-posed questions or hypotheses interrelate with the design. Well-posed hypotheses imply design and design implies the hypotheses. The effectiveness of a report relates to brevity and focus. Drawing the attention to a few points will allow authors to focus on critical issues. Brevity is achieved in part by avoiding repetition (with a few exceptions to be noted), clear style, and proper grammar. Few original scientific articles need to be longer than 3000 words. Longer articles may be accepted if substantially novel methods are reported, or if the article reflects a comprehensive review of the literature. Although authors should avoid redundancy, effectively communicating critical information often requires repetition of the questions (or hypotheses/key issues) and answers. The questions should appear in the Abstract, Introduction, and Discussion, and the answers should appear in the Abstract, Results, and Discussion sections.

Although most journals publish guidelines for formatting a manuscript and many have more or less established writing styles (e.g., the American Medical Association Manual of Style), styles of writing are as numerous as authors. The Journal of Turkish Spinal Surgery traditionally has used the AMA style as a general guideline. However, few scientific and medical authors have the time to learn these styles. Therefore, within the limits of proper grammar and clear, effective communication, we will allow individual styles.

- Permissions: As shown in the example in the appendix (Letter of Copyright Transfer) the authors should declare in a separate statement that the study has not been previously published and is not under consideration for publication elsewhere. Also, the authors should state in the same statement that they transfer copyrights of their manuscript to our Journal. Quoted material and borrowed illustrations: if the authors have used any material that had appeared in a copyrighted publication, they are expected to obtain written permission letter and it should be submitted along with the manuscript.

- Review articles: The format for reviews substantially differs from those reporting original data. However, many of the principles noted above apply. A review still requires an Abstract, an Introduction, and a Discussion. The Introduction still requires focused issues and a rationale for the

study. Authors should convey to readers the unique aspects of their reviews which distinguish them from other available material (e.g., monographs, book chapters). The main subject should be emphasized in the final paragraph of the Introduction. As for an original research article, the Introduction section of a review typically need not to be longer than four paragraphs. Longer Introductions tend to lose focus, so that the reader may not be sure what novel information will be presented. The sections after the Introduction are almost always unique to the particular review, but need to be organized in a coherent fashion. Headings (and subheadings when appropriate) should follow parallel construction and reflect analogous topics (e.g., diagnostic categories, alternative methods, alternative surgical interventions). If the reader considers only the headings, the logic of the review (as reflected in the Introduction) should be clear. Discussion synthesizes the reviewed literature as a whole coherently and within the context of the novel issues stated in the Introduction.

The limitations should reflect those of the literature, however, rather than a given study. Those limitations will relate to gaps in the literature which preclude more or less definitive assessment of diagnosis or selection of treatment, for example. Controversies in the literature should be briefly explored. Only by exploring limitations will the reader appropriately place the literature in perspective. Authors should end the Discussion by summary statements similar to those which will appear at the end of the Abstract in abbreviated form.

In general, a review requires a more extensive literature review than an original research article, although this will depend on the topic. Some topics (e.g., osteoporosis) could not be comprehensively referenced, even in an entire monograph. However, authors need to ensure that a review is representative of the entire body of literature, and when that body is large, many references are required.

- Original articles should contain the following sections: "Title Page", "Summary", "Keywords", "Introduction", "Materials and Methods", "Results", "Discussion", "Conclusions", and "References". Turkish "Summary" and "Keywords" sections should also be added if the original article is in English.

- Title (80 characters, including spaces): Just as the Abstract is important in capturing a reader's attention, so is the title. Titles rising or answering questions in a few brief words will far more likely do this than titles merely pointing to the topic. Furthermore, such titles as "Bisphosponates reduce bone loss" effectively convey the main message and readers will more likely remember them. Manuscripts that do not follow the protocol described here will be returned to the corresponding author for technical revision before undergoing peer review. All manuscripts, either in English or Turkish, should be typed double- spaced on one side of a standard typewriter paper, leaving at least 2.5 cm. margin on all sides. All pages should be numbered beginning from the title page.

- Title page should include: a) informative title of the paper, b) complete names of each author with their institutional affiliations, c) name, address, fax and telephone number, e-mail of the corresponding author, d) address for the reprints if different from that of the corresponding author. It should also be stated in the title page that informed consent was obtained from patients and that the study was approved by the ethics committee. The "Level of Evidence" should certainly be indicated in the title page (see Table 1 in the appendix). Also, the field of study should be pointed out as outlined in Table 2 (maximum three fields).

- Summary: A150 to 250 word summary should be included at the second page. The summary should be in Turkish for articles written in English and in Turkish for English articles. The main topics to be included in Summary section are as follows: Background Data, Purpose, Materials-Methods, Results and Conclusion. The English and Turkish versions of the Summary should be identical in meaning. Generally, an Abstract should be written after the entire manuscript is completed. The reason relates to how the process of writing changes thought and perhaps even purpose. Only after careful consideration of the data and a synthesis of the literature can author(s) write an effective abstract. Many readers now access medical and scientific information via Web-based databases rather than browsing hard copy material. Since the reader's introduction occurs through titles and abstracts, substantive titles and abstracts more effectively capture a reader's attention regardless of the method of access. Whether reader will examine an entire article often will depend on an abstract with compelling information. A compelling Abstract contains the questions or purposes, the methods, the results (most often quantitative data), and the conclusions. Each of these may be conveyed in one or two statements.Comments such as "this report describes..." convey little useful information.

-Key Words : Standard wording used in seientific indexes and search engines should be preferred. The minimum number for keywords is three and the maximum is five.

- Introduction (250 – 750 words): It should contain information on historical literature data on the relevant issue; the problem should be defined; and the objective of the study along with the problem solving methods should be mentioned.

The Introduction, although typically is the shortest ofsections, perhaps the most critical. The Introduction must effectively state the issues and formulate the rationale for tho-

se issues or questions. Its organization might differ some what for a clinical report, a study of new scientific data, or a description of a new method. Most studies, however, are published to: (1) report entirely novel findings (frequently case reports, but sometimes substantive basic or clinical studies); (2) confirm previously reported work (eg, case reports, small preliminary series) when such confirmation remains questionable; and (3) introduce or address controversies in the literature when data and/or conclusions conflict. Apart from reviews and other special articles, one of these three purposes generally should be apparent (and often explicit) in the Introduction.

The first paragraph should introduce the general topic or problem and emphasizet its importance, a second and perhaps a third paragraph should provide the rationale of the study, and a final paragraph should state the questions, hypotheses, or purposes.

One may think of formulating rationale and hypotheses as Aristotelian logic (a modal syllogism) taking the form: If A, B, and C, then D, E, or F. The premises A, B, and C, reflect accepted facts whereas D, E, or F reflect logical outcomes or predictions. The premises best come from published data, but when data are not available, published observations (typically qualitative), logical arguments or consensus of opinion can be used. The strength of these premises is roughly in descending order from data to observations or argument to opinion. D, E, or F reflects logical consequences. For any set of observations, any number of explanations (D, E, or F) logically follows. Therefore, when formulating hypotheses (explanations), researchers designing experiments and reporting results should not rely on a single explanation.

With the rare exception of truly novel material, when establishing rationale authors should generously reference representative (although not necessarily exhaustive) literature. This rationale establishes novelty and validity of the questions and places it within the body of literature. Writers should merely state the premises with relevant citations (superscripted) and avoid describing cited works and authors` names. The exceptions to this approach include a description of past methods when essential to developing rationale for a new method, or a mention of authors` names when important to establish historic precedent. Amplification of the citations may follow in the Discussion when appropriate. In establishing a rationale, new interventions of any sort are intended to solve certain problems. For example, new implants (unless conceptually novel) typically will be designed according to certain criteria to eliminate problems with previous implants. If the purpose is to report a new treatment, the premises of the study should include those explicitly stated problems (with quantitative frequencies when possible) and they should be referenced generously.

The final paragraph logically flows from the earlier ones, and should explicitly state the questions or hypotheses to be addressed in terms of the study (independent, dependent) variables. Any issue not posed in terms of study variables cannot be addressed meaningfully. Focus of the report relates to focus of these questions, and the report should avoid questions for which answers are well described in the literature (e.g., dislocation rates for an implant designed to minimize stress shielding). Only if there are new and unexpected information should data reported apart from that essential to answer the stated questions.

- Materials - Methods (1000-1500 words): Epidemiological/ demographic data regarding the study subjects; clinical and radiological investigations; surgical techniqueapplied; evaluation methods; and statistical analyses should be described in detail.

In principle, the Materials and Methods should contain adequate detail for another investigator to replicate the study. In practice, such detail is neither practical nor desirable because many methods will have been published previously (and in greater detail), and because long descriptions make reading difficult. Nonetheless, the Materials and Methods section typically will be the longest section. When reporting clinical studies authors must state approval of the institutional review board or ethics committees according to the laws and regulations of their countries. Informed consent must be stated where appropriate.Such approval should be stated in the first paragraph of Materials and Methods. At the outset the reader shouldgrasp the basic study design. Authors should only brieflyd escribe and reference previously reported methods. When authors modify those methods, the modificationsrequire additional description.

In clinical studies, the patient population and demographics should be outlined at the outset. Clinical reports must state inclusion and exclusion criteria and whether the series is consecutive or selected; if selected, criteria for selection should be stated. The reader should understandrom this description all potential sources of bias such as referral, diagnosis, exclusion, recall, or treatment bias. Given the expense and effort for substantial prospective studies, it is not surprising that most published clinical studies are retrospective.

Such studies often are criticized unfairly for being retrospective, but that does not negate the validity or value of a study. Carefully designed retrospective studies provide most of the information available to clinicians. However,authors should describe potential problems such as loss to follow-up, difficulty in matching, missing data,

and the various forms of bias more common with retrospective studies.

If authors use statistical analysis, a paragraph should appear at the end of Materials and Methods stating all statistical tests used. When multiple tests are used, authors should state which tests are used for which sets of data. All statistical tests are associated with assumptions, and when it is not obvious the data would meet those assumptions, the authors either should provide the supporting data (e.g., data are normally distributed, variances in groups are similar) or use alternative tests. Choice of level of significance should be justified. Although it is common to choose a level of alpha of 0.05 and a beta of 0.80, these levels are somewhat arbitrary and not always appropriate. In the case where the implications of an error are very serious (e.g., missing the diagnosis of a cancer), different alpha and beta levels might be chosen in the study design to assess clinical or biological significance.

- Results (250-750 words): "Results" section should be written in an explicit manner, and the details should be described in the tables. The results section can be divided into sub-sections for a more clear understanding.

If the questions or issues are adequately focused in the Introduction section, the Results section needs not to be long. Generally, one may need a paragraph or two to persuade the reader of the validity of the methods, one paragraph addressing each explicitly raised question or hypothesis, and finally, any paragraphs to report new and unexpected findings. The first (topic) sentence of each paragraph should state the point or answer the question. When the reader considers only the first sentence in each paragraph in Results, the logic of the authors` interpretations should be clear. Parenthetic reference to all figures and tables forces the author to textually state the interpretation of the data; the important material is the authors` interpretation of the data, not the data.

Statistical reporting of data deserves special consideration. Stating some outcome is increased or decreased(or greater or lesser) and parenthetically stating the p (or other statistical) value immediately after the comparative terms more effectively conveys information than stating something is or is not statistically significantly different from something else (different in what way? the readermay ask). Additionally, avoiding the terms 'statistically different' or 'sgnificantly different' lets the reader determine whether they will consider the statistical value biologically or clinically significant, regardless of statistical significance.

Although a matter of philosophy and style, actual p values convey more information than stating a value less than some preset level. Furthermore, as Motulsky notes,

"When you read that a result is not significant, don't stop thinking... First, look at the confidence interval... Second, ask about the power of the study to find a significant difference if it were there." This approach will give the reader a much greater sense of biological or clinical significance.

- Discussion (750 - 1250 words): The Discussion section should contain specific elements: a restatement of the problem or question, an exploration of limitations and assumptions, a comparison and/or contrast with information (data, opinion) in the literature, and a synthesis of the comparison and the author's new data to arrive atconclusions. The restatement of the problem or questions should only be a brief emphasis. Exploration of assumptions and limitations are preferred to be next rather than at the end of the manuscript, because interpretation of what will follow depends on these limitations. Failure to explore limitations suggests the author(s) either do not know or choose to ignore them, potentially misleading the reader. Exploration of these limitations should be brief, but all critical issues must be discussed, and the reader should be persuaded they do not jeopardize the conclusions.

Next the authors should compare and/or contrast their data with data reported in the literature. Generally, many of these reports will include those cited as rationale in the Introduction. Because of the peculiarities of a given study the data or observations might not be strictly comparable to that in the literature, it is unusual that the literature (including that cited in the Introduction as rationale) would not contain at least trends. Quantitative comparisons most effectively persuade the reader that the data in the study are "in the ballpark," and tables or figures efficiently convey that information. Discrepancies should be stated and explained when possible; when anexplanation of a discrepancy is not clear that also should be stated. Conclusions based solely on data in the paper seldom are warranted because the literature almost alwayscontains previous information. The quality of any re parisons.

Finally, the author(s) should interpret their data in the light of the literature. No critical data should be overlooked, because contrary data might effectively refute anargument. That is, the final conclusions must be consistent not only with the new data presented, but also that in the literature.

- Conclusion: The conclusions and recommendations by the authors should be described briefly. Sentences containing personal opinions or hypotheses that arenot based on the scientific data obtained from the study should be avoided.

- References: Care must be exercised to include references that are available in indexes. Data based on personal communication should not be included in the reference list. References should be arranged in alphabetical order and

be cited within the text; references that are not cited should not be included in the reference list. The summary of the presentations made at Symposia or Congresses should be submitted together with the manuscript. The following listing method should be used.

References should derive primarily from peer-reviewed journals, standard textbooks or monographs, or well-accepted and stable electronic sources. For citations dependent on interpretation of data, authors generally should use only high quality peer-reviewed sources. Abstracts and submitted articles should not be used because many in both categories ultimately do not pass peer review.

They should be listed at the end of the paper in alphabetical order under the first author's last name and numbered accordingly. If needed, the authors may be asked to provide and send full text of any reference. If the authors refer to an unpublished data, they should state the name and institution of the study, Unpublished papers and personal communications must be cited in the text. For the abbreviations of the journal names, the authors can apply to "list of Journals" in Index Medicus or to the address "http://www.nlm.nih.gov/tsd/serials/lji.html".

Please note the following examples of journal, bookand other reference styles:

Journal article:

1. Berk H, Akçalı Ö, Kıter E, Alıcı E. Does anterior spinal instrument rotation cause rethrolisthesis of the lower instrumented vertebra? J Turk Spin Surg 1997; 8 (1): 5-9.

Book chapter:

2. Wedge IH, Kirkaldy-Willis WH, Kinnard P. Lumbar spinal stenosis. Chapter 5. In: Disorders of the lumbar spine. Eds.: Helfet A, Grubel DM. JB Lippincott, Philadelphia 1978, pp: 61-68.

Entire book:

3. Paul LW, Juhl IH. The essentials of Roentgen interpretation. Second Edition, Harper and Row, New York 1965, pp: 294-311.

Book with volume number:

4. Stauffer ES, Kaufer H, Kling THF. Fractures and dislocations of the spine. In: Fractures in Adults. Vol 2. Eds.: Rockwood CA, Green DP, JB Lippincott, Philadelphia 1984, pp: 987-1092.

Journal article in press:

5. Arslantaş A, Durmaz R, Coşan E, Tel E. Aneurysmal bone cysts of the cervical spine. J Turk Spin Surg (In press).

Book in press:

6. Condon RH. Modalities in the treatment of acute and chronic low back pain. Low back pain. Ed.: Finnison BE, JB Lippincott (In press).

Symposium:

7. Raycroft IF, Curtis BH. Spinal curvature in myelomeningocele: Natural history and etiology. Proceedings of the American Academy of Orthopaedic Surgeons Symposium on Myelomeningocele, Hartford, Connecticut, November 1970, CV Mosby, St. Louis 1972, pp: 186- 201.

Papers presented at the meeting:

8. Rhoton AL. Microsurgery of the Arnold-Chiari malformation with and without hydromyelia in adults. Presented at the annual meeting of the American Association of Neurological Surgeons, Miami, Florida, April 7, 1975.

- Tables: They should be numbered consecutively in the text with Arabic numbers. Each table with its number and title should be typed on a separate sheet of paper.Each table must be able to stand alone; all necessary information must be contained in the caption and the table itself so that it can be understood independent from the text. Information should be presented explicitly in "Tables" so that the reader can obtain a clear idea about its content. Information presented in "Tables" should not be repeated within the text. If possible, information in "Tables" should contain statistical means, standard deviations, and t and p values for possibility. Abbreviations used in the table should be explained as a footnote.

Tables should complement not duplicate material in the text. They compactly present information, which would be difficult to describe in text form. (Material which may be succinctly described in text should rarely be placed in tables or figures.) Clinical studies for example, of ten contain complementary tables of demographic data, which although important for interpreting the results, are not critical for the questions raised in the paper. Well focused papers contain only one or two tables or figures for every question or hypothesis explicitly posed in the Introduction section. Additional material may be used for unexpected results. Well constructed tables are self-explanatory and require only a title. Every column contains a header with units when appropriate.

- Figures: All figures should be numbered consecutively throughout the text. Each figure should have a label pasted on its back indicating the number of the figure, an arrow to show the top edge of the figure and the name f

the first author. Black-and-white illustrations should be in the form of glossy prints (9x13 cm). The letter size on the figure should be large enough to be readable after the figure is reduced to its actual printing size. Unprofessional typewritten characters are not accepted. Legends to figures should be written on a separate sheet of paper after the references.

The journal accepts color figures for publication if they enhance the article. Authors who submit color figures will receive an estimate of the cost for color reproduction. If they decide not to pay for color reproduction, they can request that the figures be converted to black and white at no charge. For studies submitted by electronic means, the figures should be in jpeg and tiff formats with a resolution greater than 300 dpi. Figures should be numbered and must be cited in the text.

- Style: For manuscript style, American Medical Association Manual of Style (9th edition). Stedman's Medical Dictionary (27th edition) and Merriam Webster's Collegiate Dictionary (10th edition) should be used as standard references. The drugs and therapeutic agents must be referred by their accepted generic or chemical names, without abbreviations. Code numbers must be used only when a generic name is not yet available. In that case, the chemical name and a figure giving the chemical structure of the drug should be given. The trade names of drugs should be capitalized and placed in parentheses after the generic names. To comply with trademark law, the name and location (city and state/country) of the manufacturer of any drug, supply, or equipment mentioned in the manuscript should be included. The metric system must be used to express the units of measure and degrees Celsius to express temperatures, and SI units rather than conventional units should be preferred.

The abbreviations should be defined when they first appear in the text and in each table and figure. If a brand name is cited, the manufacturer's name and address (city and state/country) must be supplied.

The address, "Council of Biology Editors Style Guide" (Council of Science Editors, 9650 Rockville Pike, Bethesda, MD 20814) can be consulted for the standard list of abbreviations.

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Begin with, "The Authors wish to thank…" All forms of support, including pharmaceutical industry support should also be stated in Acknowledgments section.

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- Practical Tips:

1. Read only the first sentence in each paragraph throughout the text to ascertain whether those statements contain all critical material and the logical flow is clear.

2. Avoid in the Abstract comments such as, "... this report describes..." Such statements convey no substantive information for the reader.

3. Avoid references and statistical values in the Abstract.

4. Avoid using the names of cited authors except to establish historical precedent. Instead, indicate the point in the manuscript by providing citation by superscripting.

5. Avoid in the final paragraph of the Introduction purposes such as, "... we report our data..." Such statements fail to focus the reader's (and author's!) attention on the critical issues (and do not mention study variables).

6. Parenthetically refer to tables and figures and avoid statements in which a table of figure is either subject or object of a sentence. Parenthetic reference places emphasison interpretation of the information in the table or figure, and not the table or figure.

7. Regularly count words from the Introduction through Discussion.

Application Letter Example:

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The Journal of Turkish Spinal Surgery

Dear Editor:

We enclose the manuscript titled '…..' for consideration to publish in The Journal of Turkish Spinal Surgery.

The following authors have designed the study (AU: Parenthetically insert names of the appropriate authors), gathered the data (AU: Parenthetically insert names of the appropriate authors), analyzed the data (AU: Parenthetically insert names of the appropriate authors), wrote the initial drafts (AU: Parenthetically insert initials of the appropriate authors), and ensure the accuracy of the data and analysis (AU: Parenthetically insert names of the appropriate authors).

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TABLE-1. LEVELS OF EVIDENCE

LEVEL- I .

1) Randomized, double-blind, controlled trials for which tests of statistical significance have been performed

2) Prospective clinical trials comparing criteria for diagnosis, treatment and prognosis with tests of statistical significance where compliance rate to study exceeds 80%

3) Prospective clinical trials where tests of statistical ignificance for consecutive subjects are based on predefined criteria and a comparison with universal (gold standard) reference is performed

4) Systematic meta-analyses which compare two or more studies with Level I evidence using pre-defined methods and statistical comparisons.

5) Multi-center, randomized, prospective studies

LEVEL –II.

1) Randomized, prospective studies where compliance rate is less than 80%

2) All Level-I studies with no randomization

3) Randomized retrospective clinical studies

4) Meta-analysis of Level-II studies

LEVEL– III.

1) Level-II studies with no randomization (prospective clinical studies etc.)

2) Clinical studies comparing non-consecutive cases (without a consistent reference range)

3) Meta-analysis of Level III studies

LEVEL- IV.

1) Case presentations

2) Case series with weak reference range and with no statistical tests of significance

LEVEL – V.

1) Expert opinion

2) Anecdotal reports of personal experience regarding a study, with no scientific basis

TABLE-2. CLINICAL AREAS

Article
Anatomy
Basic Science
Biomechanics
Deformity
- Scoliosis
- Adolescent idiopathic
  - Kyphosis
- Congenital spine
- Degenerative spine conditions

Diagnostics
Epidemiology
Exercise Physiology and Physical Exam
Functional Restoration
Health Services Research
Literature Review
Meta-Analysis
Occupational Health
Outcomes
Patient Care
- Conservative care
- primary care
- quality of life research
- treatment efficacy
- pediatric
- rehabilitation

Surgery
- clinical surgery
- intradiscal surgery
- neurosurgery
- reconstructive surgery
- image guided surgery
- endoscopy
- failed spine surgery
- microsurgery
- computer-assisted
- minimally-invasive

Imaging
- radiology

- MRI
- CT scan

Fusion
- fusion cages
- instrumentation
- pedicle screws
- fixation

Pain
- chronic pain
- low back pain
- postoperative pain
- pain measurement
- neck pain
- discogenic pain

Neurology
- neurophysiology
- neurological examination
- neurochemistry
- neuropathology
- cognitive neuroscience
- neuromuscular spine

Cervical Spine
- cervical myelopathy
- cervical reconstruction
- cervical disc disease
- whiplash
- craniocervical junction
- atlantoaxial

Thoracic Spine
- thoracolumbar spine

Lumbar Spine
- lumbosacral spine

Psychology

Nerve
- nerve root
- sciatica

Injection
- epidural

Disease/Disorder
- metabolic bone disease
- epilepsy
- lupus
- cancer
- Parkinson's
- tuberculosis

Rheumatology
- arthritis
- osteoporosis

Bone
- bone density
- bone mechanics
- bone regeneration
- bone graft
- bone graft sustitutes
- fracture

Disc
- disc degeneration
- herniated disc
- disc pathology
- disc replacement
- artificial disc
- IDET

Trauma

Spinal cord
- spinal cord injury

Clinical trials

Randomized trials

Biology
- biochemistry
- biomaterials
- molecular biology

Tumor

Genetics

Stenosis

Infection

Non-Operative Treatment

Motion Analysis

Physical Therapy

Manipulation

Anethesiology

İÇİNDEKİLER

The Journal of Turkish Spinal Surgery

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pp. 1-2

EDITORIAL */ EDİTÖRDEN*

Dear Colleagues,

We sincerely wish the year 2015 brings peace, happiness and health to all my colleagues and their families. We are happy to accomplish the first issue of 2015.

There are 7 research articles in this issue. The first one is a morphometric study, analyzing the appropriate odontoid screw sizes for Turkish population whose odontoid sizes were determined with MR measurements. The second one analyzes the curvature severity and growth hormone level in patients with Scheuerman kyphosis. The third study compares the effectiveness of the kyphoplasty and vertebroplasty for providing the vertebra body height in osteoporotic spinal fractures. The other three studies are related to spinal trauma, the first analyzing the effectiveness of the short segment instrumentation for placing the pedicular screw in spinal fracture, the second one compares the spinal classification for 234 cases and the third one evaluates the pelvic fractures and spinal fractures. The last one is a study analyzing the survival of the sacral screw in patients administered lumbar degenerative spinal stenosis by posterior instrumentation. We believe that all those studies will quietly interest the readers.

There are also four case studies in this issue: the first one is the osteoid osteoma of the atlas case, which is seen quiet rarely, and it was sent by our Iranian colleagues from Tehran University. The second case study is a sacral giant-cell tumor and sent by our Indian colleagues from Kashmiri region of India. The third case study presents the migration of an intraspinal bullet into medusa and sent by our Indian colleagues from Rohtek region of India. In the last case study, a case who fell down from height and who had "Clay-shoveler's fracture" was presented.

There are two reviews in this issue. The first one is a review presenting the studies about the tuberculosis, and the second one presents the genetic basis of degenerative disc disease and both of those are quiet comprehensive and informative reviews.

In this issue, in the "Frontiers of the Spinal Surgery" section, Prof. Dr. Tarık Yazar, who had great contributions to Turkish spinal surgery and to training of a number of spinal surgeons in Ankara University, and who is one of the 3 giant plane-trees of "Ankara Medicine" école, is presented. We wish him a healthy and peaceful long life and we present our love and respects to him.

The "Marmara Spinal Group Meetings", which includes İstanbul and neighboring cities and which is conducted to increase the interests of especially assistants and new specialist on

spinal surgery and to contribute to their trainings and to transfer the experiences of experienced colleagues and will be organized each month regularly by the regulatory board, and which Prof. Dr. Cüneyt Şar will perform the headship this year and Surgeon Yunus Atıcı performs the secretariat, will be continued. In October, the subject of "*Treatment choices, techniques and problems in adult scoliosis*" was discussed with the hosting of old TOD president Prof. Dr. Azmi Hamzaoğlu and with his own presentation. In November, with my hosting, the question "*Did the Lenke classification change the adolescent idiopathic scoliosis?*" was tried to be answered in Hisar Intercontinental Hospital. In this meeting, the previous TOD president, my dear friend Prof. Dr. Emre Acaroğlu asserted the answer "*Yes, it changed*" while Prof. Dr. Ufuk Talu asserted the answer "*No, it did not change*". After the great presentations of both speakers, an interactive discussion was performed about the issue. 60 colleagues attended to each of first two meetings of 2014-2015 training term from İstanbul and neighboring cities. You can find the other meeting contents from the announcements section.

We respond to answer the STE questions that we publish in accordance with the request from TOTBİD TOTEK for recertification in this issue. The answers of the questions included in this issue should be sent to cutku@ada.net.tr or admin@jtss.org.tr addresses as also indicated in the page including the questions. The sent answers will be sent to the secretariat working relevantly in TOTBİD TOTEK by us.

We wish healthy, successful and peaceful days to Turkish Spinal Surgery family and we present our deepest respects.

Prof. Dr. İ. Teoman BENLİ
JTSS Editor

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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

LENGTH OF THE TRAJECTORY OF ANTERIOR ODONTOID SCREW IN ADULT TURKISH POPULATION: MORPHOMETRIC STUDY

ERİŞKİN TÜRK TOPLUMUNDA ODONTOİD VİDA UZUNLUĞU: MORFOMETRİK BİR ÇALIŞMA

Uygur ER[1], İ.Teoman BENLI[2]

SUMMARY

Anterior placement of a screw for fixation of an odontoid fracture is performed to maintain axial rotation at the C1, C2 level. This morphometric study was performed to determine the length of anterior odontoid screw trajectory in adult Turkish population. Measurement of the trajectory length was performed on midsagittal T1-W sequence of MRI. Overall average length is 3.52±0.81 cm. Commonly used 35 mm screws are suitable for approximately half of the population.

Key words: Anterior odontoid screw fixation, Odontoid fractures, Surgery

Level of evidence: Retrospective clinical study, Level III

ÖZET

C1, C2 düzeyinde yapılacak sabitlemede aksiyal rotasyonu korumak için anterior odontoid vidası kullanılmaktadır. Bu morfometrik çalışma erişkin Türk toplumunda uygun anterior odontoid vidası boyunu belirlemektir. Vida yolu ölçümleri T1-A midsagittal MRG üzerinde yapılmıştır. Vida yolunun ortalama uzunluğu 3.52±0.81 cm. dir. Sıklıkla kullanılan 35 mm. vidalar toplumun yarısı ıçın uygun olduğu belirlenmiştir.

Anahtar sözcükler: Anterior odontoid vidası ile sabitleme, Cerrahi, Odontoid kırığı

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III

INTRODUCTION:

Fractures of the odontoid process at its junction with the corpus are the commonest odontoid fractures (8). Anterior placement of a screw for fixation of a type II or narrow type III odontoid fracture is performed to maintain axial rotation at the C1, C2 level (12). It may also be done in cases of posterior element deficiency in fractures in the upper cervical region. The effective application of these screws requires a preoperative transaxial computed tomography (CT) scan to detect the diameter of odontoid waist, thus determining the number of screws that may be placed safely within it. The favored screws for this intervention are two 3,5 mm cancellous lag screws requiring a minimum of an 8 mm wide odontoid waist (12). Some studies in the literature have shown that a single screw, with less associated risk may be just as effective as two screws in obtaining a fusion (3). To facilitate the choice of screws, one should know the length of the trajectory of the screw and prepare appropriate size screw preoperatively. This morphometric study was performed to determine the length of anterior odontoid screw trajectory in adult Turkish population.

MATERIALS AND METHODS:

This study is a retrospectively designed morphometric MRI study.

Patient population

Two hundreds adult patients aged between 18 and 65, consisting 100 women and 100 men were included in the study. Average age of women is 47.5 age, and men is 44.9 age. Overall average age of the population is 46.2 age.

Including criteria

i. Adult male and female patients.

ii. Patients with normal craniovertebral junction (CVJ) by measurement of routine radiograms.

Excluding criteria

[1] MD, Professor of Neurosurgery, Depatment of Neurosurgery Medical School of Düzce University, Düzce.
[2] MD, Professor of Orthopedics and Traumatology, Director of the Department of the Orthopedics and Traumatology, Hisar Intercontinental Hospital, İstanbul.

i. Patients with abnormal CVJ measurement, platybasia or basilar invagination.

ii. Patients had an upper cervical trauma.

iii. Patients underwent an operation at the CVJ.

iv. Patients with systemic metabolic diseases.

v. Patients with a disseminated bone disease.

Measurement:

Cervical spinal magnetic resonance imaging (MRI) in 200 consecutive adult patients, who were undergoing MRI for an unrelated complaint were analyzed. Measurement of the trajectory length was performed on midsagittal T1-Weighted sequence of MRI (Hitachi Echelon 1.5 T, Hitachi medical Systems America, Inc., USA). The length assessed from anterior odontoid basis to the posterior corner of the odontoid tip (Figure 1) (SarusPACS, DICOM viewer, EES, Ankara, Türkiye).

Sample size representative of a large population was calculated at 95% confidence interval and with a margin of error <0.1.

Figure-1. Midsagittal T1-W MRI shows suggested measurement of odontoid screw trajectory.

RESULTS:

Mean age of the population is 46.2 age with a range between 18 and 65 years. Mean ages of males is 44.9 years, range 20 and 65 years and mean age of females is 47.5 years, range 18 and 65 years. The distribution of age in the two sexes was comparable. Mean trajectory length of odontoid is 3.48±0.79 cm for females, 3.56±0.83 cm for males (Table-1). The range of the length is from 2.69 cm to 4.00 cm for females, and from 2.71 cm to 4.02 cm for males. Overall average length is 3.52±0.81 cm.

DISCUSSION:

Odontoid fractures account for 9-15 % of cervical fractures (6,9). The commonest fractures of odontoid process are Anderson and D'Alonzo type II fractures (1). Without compromising C1- C2 motion was considered since the first use of screws for internal fixation of odontoid fractures. Bohler et al (2) and Nakanishi et al (10) have shown comparable union rates between anterior screw fixation and C1- C2 fusion without compromising C1- C2 motion. Two screws fixation was evolved single screw fixation since some authors have shown that there is no significant difference in the strength of fixation between one and two screws (11). Subsequent clinical studies also showed comparable union rates between two and one screw fixation (4,5,7). However, screw breakage is occurred in approximately10% cases, if single screw was performed (7).

Commonly used 3.5 mm lag screws are as long as the mean length of odontoid. In other words they are not suitable for approximately half of the population. A preoperative midsagittal T1-W MRI can help determine the appropriate screw size. A larger sample size and prospectively designed multiparameter studies may help surgeons to use tailored instruments for odontoid fixation to achieve a better union rates.

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Corresponding Address: Uygur ER MD, Professor of Neurosurgery Neurosurgery Dept., Medical School, Duzce University, 81100, Duzce **Tel:** 0 505 589 23 55 **Fax:** 0 380 542 13 87
E-mail: uygurer@gmail.com
Arrival time: 12th October, 2014.
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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

THE CORRELATION OF THE GROWTH HORMONE AND SEVERITY OF THE KYPHOSIS IN THE PATIENTS WITH SCHUERMANN KYPHOSIS

SCHUERMANN KİFOZUNDA BÜYÜME HORMONU İLE KİFOTİK DEFORMİTE CİDDİYETİNİN KORELASYONU

Doğaç KARAGÜVEN[1], İ. Teoman BENLİ[2], Ahmet ÜN[3], Burhan KURTULUŞ[4], Uygur ER[5]

SUMMARY

Backround data: Scheuermann's structural kyphosis is the most common cause of kyphotic deformity in adolescents. The etiology of Scheuermann's kyphosis remains unclear. Histologic studies have revealed abnormal vertebral endplate cartilage, irregular mineralization, disorders in vertebral ossification, and alterations in collagen aggregation with abnormal collagen-proteoglycan ratios. Growth hormone hypersecretion also has been related to the pathogenesis of Scheuermann's kyphosis. Patients with the disease were found to be taller than the percentile mean height for their age. However, no studies exist to define causative relation between growth hormone secretion and Scheuermann's disease and its role remains unclear.

Purpose: The aim of the that study was to research the effecting of the growth hormone on the occurrence of the Scheuermann disease and also to evaluate of the correlation between the severity of the kyphotic curve of the Scheuermann Kyphosis and Growth Hormone.

Patients and methods: 16 female and 15 male patients with an average age of 14.4 ± 3.2 and having thoracic kyphosis angle >60° due to wedging in at least 3 levels, totally 31 patients were included in the study. Deformities of the patients were divided into 3 groups as 60° - 70° (12 patients), 71° - 80° (10 patients) and over 81° (9 patients). For all the patients' antero-posterior and lateral x-rays and thoracic magnetic resonance imaging (MRI) were performed. Morning growth hormone levels were measured. All the patients were new cases and before conservative or surgical treatment serum growth hormone levels were obtained.

Results: When all the patients are included global kyphosis angle average was 75.23° ± 9.65°. Averages were found to be, in 60° - 70° (12 patients) kyphosis angle group 65.92° ± 3.58°, in 71° - 80° (10 patients) group 75.30° ± 2.63° and in over 81° (9 patients) 87.56° ± 4.79°. 28 of the 31 patients (90.3%) growth hormone levels were in the normal range of the laboratory for 5-16 years in male 0-11 ng/ml and female 0-17 ng/ml. Only 3 male patients (9.7%) growth hormone levels were above 11 ng/ml. All the patients were over 8 ng/ml, 67.7% of the patients were over 10 ng/ml. When all the patients are included average morning fasting growth hormone concentration was 10.46 ± 1.48 ng/ml.

Conclusion: In conclusion, according to the results of this study, growth hormone levels and severity of the kyphotic deformity are not statistically correlated. In other words, there was no correlation between Scheuermann kyphosis and level of growth hormone being close to the upper limit or higher than normal.

Key words: Scheuerman kyphosis, etiology, growth hormone

Level of evidence: Retrospective clinical study, Level III

ÖZET

Geçmiş bilgiler: Scheuermann kifozu adölesanda görülen en sık görülen yapısal kifozdur. Etiyolojisi hali hazırda bilinmemektedir. Histolojik çalışmalar, anormal son plak kartilaj oluşumu, düzensiz ossifikasyon (Shmorl nodülleri), anormal kollajen / proteoglikan oranlarıyla giden çeşitli oranlarda kollajen agregasyonu göstermektedir. Büyüme hormonunun aşırı salınması, Scheuermann kifozunun etiyopatogenezinde rol oynadığı düşünülmüştür. Hastaların yaşlarına uygun normal persentillerden yüksek kilo ve boylarda olması bu düşünceyi desteklemektedir. Ancak, hiç bir çalışmada kesin olarak büyüme hormonu ile hastalık arasındaki ilişki gösterilememiştir.

Amaç: Bu çalışmanın amacı, büyüme hormonunun, Scheuermann kifozu etiyolojisinde rol oynayıp oynamadığının ve hormon düzeyleri ile kifotik deformitenin şiddeti arasında korelasyon olup olmadığının araştırılmasıdır.

Hastalar ve Metot: Ortalama yaşları 14.4 ± 3.2, torakal kifozu 60° üzeri ve en az 3 komşu omurda 5°'den fazla lokal kifozu olan 16 kız ve 15 erkek toplam 31 hasta bu çalışmaya dahil edilmiştir. Kifotik deformiteye sahip hastalar 60° - 70° (12 hasta), 71° - 80° (10 hasta) 81° ve üzeri (9 hasta) olmak üzere 3 gruba ayrılmıştır. Tüm hastaların direk PA ve lateral grafileri ile MR'ları çekilmiştir. Hastalara konservatif veya cerrahi bir tedaviye başlamadan önce sabah büyüme hormon düzeylerine bakılmıştır.

Sonuçlar: Tüm hastalar dahil edildiğinde ortalama global kifoz açısının 75.23° ± 9.65° olduğu belirlenmiştir. 60° - 70° (12 hasta) kifoza sahip hastalarda bu açının ortalama 65.92° ± 3.58°, 71° - 80° (10 hasta) kifoza sahip hastalarda ortalama 75.30° ± 2.63° ve torakal kifozu 81° üzeri olan hastalarda (9 hasta) ortalama 87.56° ± 4.79° olduğu saptanmıştır. Bu çalışmada yer alan 31 hastanın 28 (% 90,3)'inde büyüme hormon düzeyleri 5-16 yaş için normal sayılan erkekler için 0-11 ng/ml ve kızlar için 0-17 ng/ml aralıklarında olduğu belirlenmiştir. Sadece 3 erkek hastada (% 9.7) büyüme hormon düzeyi 11 ng/ml üzerinde bulunmuştur. Tüm hastaların büyüme hormon düzeyleri 8 ng/ml üzerinde olup hastaların % 67.7'sinde ise bu düzey 10 ng/ml üzerinde olduğu saptanmıştır. Tüm hastalar dahil edildiğinde büyüme hormon düzeyleri ortalama 10.46 ± 1.48 ng/ml olduğu belirlenmiştir.

Sonuç: Hastaların kifotik deformitelerine göre yapılan gruplardaki ortalama büyüme hormon düzeylerinin istatistikî olarak benzer olduğu görülmüştür ($p > 0,05$). Başka bir deyişle Scheuerman kifozundaki sagittal deformitenin şiddeti ile büyüme hormon düzeyleri arasında bir korelasyon bulunamamıştır.

Key words: Scheuerman kyphosis, etiology, growth hormone

Level of evidence: Retrospective clinical study, Level III

[1] M.D., Surgeon of the Orthopaedics and Traumatology, Department of Orthopaedics and Traumatology, Ufuk University Medical School, Ankara.
[2] Prof., Surgeon of the Orthopaedics and Traumatology, Department of Orthopaedics and Traumatology, Hisar Intercontinental Hospital, Spine Center, İstanbul.
[3] M.D., Surgeon of the Orthopaedics and Traumatology, Department of Orthopaedics and Traumatology, OSM Ortadoğu Özel Hastanesi, Urfa.
[4] M.D., Surgeon of the Orthopaedics and Traumatology, Department of Orthopaedics and Traumatology, S.B. Yıldırım Beyazıt Dışkapı E. A. Hastanesi, Ankara.
[5] MD, Professor of Neurosurgery, Depatment of Neurosurgery Medical School of Düzce University, Düzce.

INTRODUCTION:

In 1920, Holger Scheuermann[11] described a clinical entity of juvenile "round back" deformity that could be distinguished clinical and radiographical from postural and normal kyphosis. Scheuermann's structural kyphosis is the most common cause of kyphotic deformity in adolescents. After idiopathic scoliosis, it is the second most common disorder in patients who present to spine deformity clinics.[1,4,6,9]

Scheuermann's disease is most frequently diagnosed between ages 13 and 17 years. The overall incidence is 0.4 % to 10 %. The typical patient is between the late juvenile to age 16 years, commonly between 12 and 15 years. There is no specific gender prevalence. [1,4,6,9]

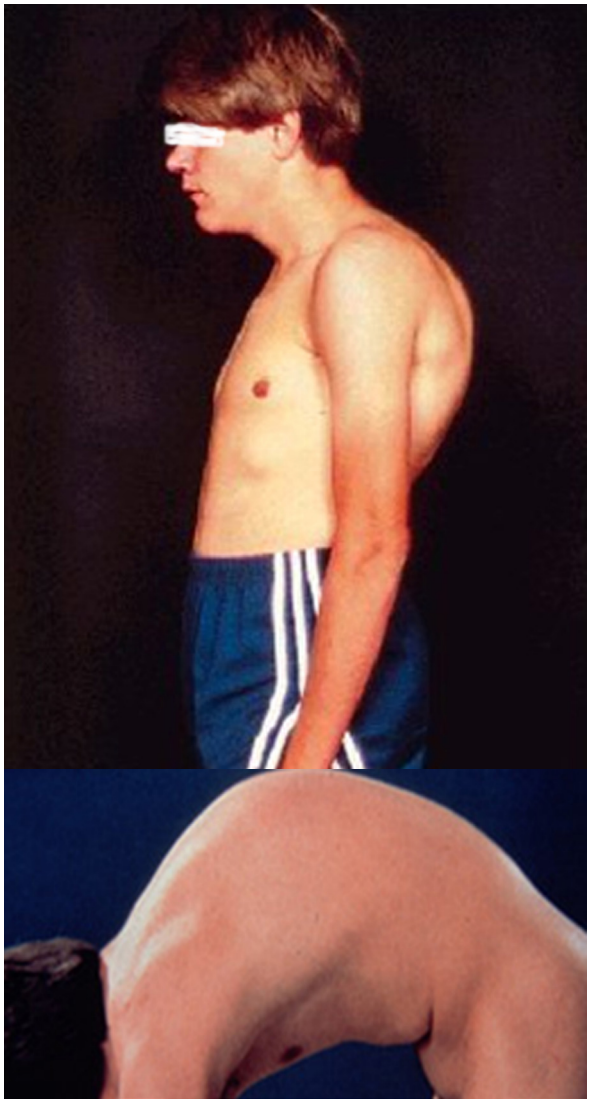

Figure-1. **a.** Lateral view of the patient and **b.** Adams test

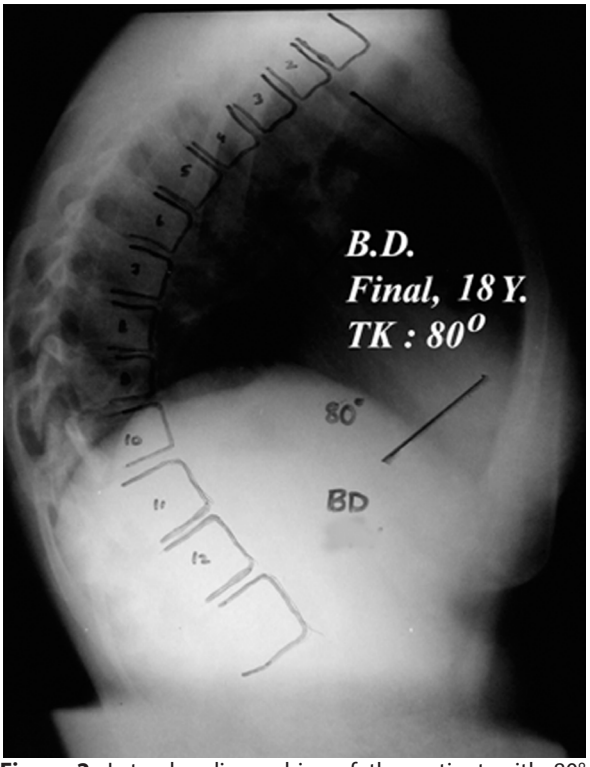

Figure-2. Lateral radiographies of the patient with 80° Scheuermann's kyphosis.

The etiology of Scheuermann's kyphosis remains unclear. Scheuermann first explained it as a result of aseptic necrosis of the ring vertebral apophyses.[11] Histological studies have revealed abnormal vertebral endplate cartilage, irregular mineralization, disorders in vertebral ossification, and alterations in collagen aggregation with abnormal collagen-proteoglycan ratios.[4] Other studies have reported the causative association of Scheuermann's kyphosis with dural cysts, Legg-Calvé-Perthes and Beckhterew's diseases, infections, spinal dysraphism, and other pathologic conditions such as hypotonia or hypertonia, poliomyelitis, rickets, endocrine disorders, osteoporosis, and constitutional kyphosis.[2-6,9]

Scheuermann's disease is considered hereditary, although the hereditary pattern has not been clearly defined. Reports suggest heritability of identical radiological changes in monozygotic twins, sib recurrence, and transmission through generations.[5]

Growth hormone hypersecretion also has been related to the pathogenesis of Scheuermann's kyphosis. Patients with the disease were found to be taller than the percentile mean height for their age. However, no studies exist to define causative relation

between growth hormone secretion and Scheuermann's disease and its role remains unclear.[2]

The aim of the that study was to research the effecting of the growth hormone on the occurrence of the Scheuermann disease and also to evaluate of the correlation between the severity of the kyphotic curve of the Scheuermann Kyphosis and Growth Hormone.

PATIENTS AND METHODS:

16 female and 15 male patients with an average age of 14.4 ± 3.2 and having thoracic kyphosis angle >60° due to wedging in at least 3 levels, totally 31 patients were included in the study. Deformities of the patients were divided into 3 groups as 60° - 70° (12 patients), 71° - 80° (10 patients) and over 81° (9 patients). For all the patients' antero-posterior and lateral x-rays and thoracic magnetic resonance imaging (MRI) were performed. Morning growth hormone levels were measured. All the patients were new cases and before conservative or surgical treatment serum growth hormone levels were obtained.

All patients' growth hormone levels average and standard deviation were calculated and correlation to thoracic kyphosis angles was statistically evaluated. For statistical evaluation SPSS 16.0 program was used and student t-test and Pearson's correlation regression tests were performed with probability 0.05.

RESULTS:

When all the patients are included global kyphosis angle average was 75.23° ± 9.65°. Averages were found to be, in 60° - 70° (12 patients) kyphosis angle group 65.92° ± 3.58°, in 71° - 80° (10 patients) group 75.30° ± 2.63° and in over 81° (9 patients) 87.56° ± 4.79° (Table 1). 28 of the 31 patients (90.3%) growth hormone levels were in the normal range of the laboratory for 5-16 years in male 0-11 ng/ml and female 0-17 ng/ml. Only 3 male patients (9.7%) growth hormone levels were above 11 ng/ml. All the patients were over 8 ng/ml, 67.7% of the patients were over 10 ng/ml. When all the patients are included average morning fasting growth hormone concentration was 10.46 ± 1.48 ng/ml.

Hormone levels according to the deformity groups can be seen in Table-1. When patients in 60° - 70° (1st group), 71° - 80° (2nd group) and over 81° (3rd group) groups were compared, average of growth hormones levels were statistically similar (p>0.05) (Table-1).

Table-1. The mean level of growth hormone (GW) in the patients groups according to the kyphosis angle (KA**)**

GROUP	Mean Kyphosis (range)	Mean GW (ng/ ml) (range)
GROUP-1 (12 patients)	65,9° ± 3,6° (60°-70°)	9,92 ± 1,38 (8,0 – 12,0)
GROUP-1 (10 patients)	75,3° ± 2,6° (71°-80°)	11,09 ± 1,53 (8.96 – 14,40)
GROUP-1 >81° (9 patients)	87,6° ± 4,8° (82°-95°)	10,46 ± 1,42 (8.00 – 12,53)
TOTAL (31 patients)	75,2° ± 9,7° (60°-95°)	10,45 ± 1,48 (8,00- 14,40)

On the other hand, when all patients are included average of growth hormone levels were not statistically significant than individual groups (p>0.05) (Table-2).

Table-2. The comparison mean level of growth hormone (GW) between in the patients groups according to the kyphosis angle (KA) with student-t test.

GROUPS	t	p	Results
1 and 2	-0,54	0,81	> 0,05
2 and 3	-0,87	0,41	> 0,05
1 and 3	-1,21	0,26	> 0,05
1 and Total	-0,01	0,39	> 0,05
2 and Total	0,56	0,71	> 0,05
2 and Total	0,89	0,44	> 0,05

Averages of 2nd and 3rd groups were more similar and 1st groups growth hormone average was lower.

According to the results of this study, growth hormone levels and severity of the kyphotic deformity are not statistically correlated in the all groups and all the patients (r=0.25, p>0,05) (Table-3).

Table-3. The correlation between level of growth hormone (GW) and the kyphosis angle (KA) of the patients with Pearson's correlation test.

GROUPS	r	p	Results
Group-1	-0,246	0,49	> 0,05
Group-2	-0,133	0,73	> 0,05
Group-3	0,063	0,44	> 0,05
Total	0,125	0,25	> 0,05

DISCUSSION:

Scheuermann's structural kyphosis is the most common cause of kyphotic deformity in adolescents. The etiology of Scheuermann's kyphosis remains unclear. Avascular necrosis, osteoporosis, biomechanical factors, imbalance of the paravertebral muscles, genetic inheritance had been blamed of the etiology of the Scheuermann's kyphosis.[1-6,9-12]

Growth hormone hypersecretion also has been related to the pathogenesis of Scheuermann's kyphosis. Patients with the disease were found to be taller than the percentile mean height for their age. However, no studies exist to define causative relation between growth hormone secretion and Scheuermann's disease and its role remains unclear.[2,6,9]

The aim of the that study was to research the effecting of the growth hormone on the occurrence of the Scheuermann disease and also to evaluate of the correlation between the severity of the kyphotic curve of the Scheuermann Kyphosis and Growth Hormone. In the English literature, the study like our study has not been found.

28 of the 31 patients (90.3%) growth hormone levels were in the normal range of the laboratory for 5-16 years in male 0-11 ng/ml and female 0-17 ng/ml. Only 3 male patients (9.7%) growth hormone levels were above 11 ng/ml. All the patients were over 8 ng/ml, 67.7% of the patients were over 10 ng/ml. When all the patients are included average morning fasting growth hormone concentration was 10.46 ± 1.48 ng/ml. When patients in 60° - 70° (1st group), 71° - 80° (2nd group) and over 81° (3rd group) groups were compared, average of growth hormones levels were statistically similar ($p>0.05$). On the other hand, when all patients are included average of growth hormone levels were not statistically significant than individual groups ($p>0.05$). In all 3 groups designated according to the kyphotic deformity, hormone levels were not found to be different, averages of the growth hormone levels in those groups were not different that all patients average. Although averages of 2nd and 3rd groups were more similar but 1st groups growth hormone average was lower. It is significant that 1st group is similar to normal kyphosis angle and does not require treatment.

There are some limitations to this study. First of all, only 31 patients were included in the study. According to the parametric criteria in each group assigned according to the severity of the kyphosis angle at least 10 patients should be included for sound statistical analysis, but for better results this number should be increased. Second limitation is the retrospective nature of the study. As the kyphosis angle progresses, during the whole adolescence period, growth hormone levels must be prospectively followed up and pointing the correlation between growth hormone levels and kyphosis angle values might have more reliable results. On the other hand kyphosis in the children is overlooked in many families until the deformity becomes severe. This makes the design of such a prospective study hard.

In conclusion, according to the results of this study, growth hormone levels and severity of the kyphotic deformity are not statistically correlated. In other words, there was no correlation between Scheuermann kyphosis and level of growth hormone being close to the upper limit or higher than normal. But results of this study suggest that, order to clarify effects of growth hormone level at the beginning of the kyphosis deformity and whether this hormone created deformity through other mediators, studies on this subject is needed.

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Address: Prof. Dr. İ. Teoman Benli, Surgeon of the Orthopaedics and Traumatology, Department of Orthopaedics and Traumatology, Hisar Intercontinental Hospital, Spine Center, Siteyolu Sok. No.:7, Ümraniye, İstanbul. **Tel.:** +90 532 205 85 62
E-Mail: cutku@ada.net.tr
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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

EFFECTIVENESS OF VERTEBROPLASTY AND KYPHOPLASTY IN OSTEOPOROTIC VERTEBRAL BODY COMPRESSION FRACTURES: A COMPERATIVE STUDY

OSTEOPOROTİK OMURGA CİSİM KIRIKLARINDA VERTEBROPLASTİ VE KİFOPLASTİNİN ETKİNLİĞİ: KARŞILAŞTIRMALI BİR ÇALIŞMA

Evren YÜVRÜK[1], Tarkan ÇALIŞANELLER[1], Mehmet Reşid ÖNEN[1], Sait NADERİ[2]

SUMMARY

Purpose: It is the comparison of effectiveness of vertebroplasty and kyphoplasty for pain management and reduction of vertebral height loss in osteoporotic vertebral body fractures.
Material and Methods: In our clinic since 2008, 75 vertebral fortification surgeries were performed for OVBF. 38 patients whose pre-operative and post-operative data and patients themselves were accessible included in the study.
Results : Preoperative VAS scores of vertebroplasty (VP) patients were 7.61 ± 0.49 and postoperatively it was 3.33 ± 0.57 ($p<0.005$). Kyphoplasty (KP) patients preoperative score was 7.23±0.56 and 24 h postoperative was 3.41 ± 1.06 ($p < 0.005$). VP patients preoperative vertebral body (a) anterior, (b) midline and (c) posterior heights were 17.54 ± 5.35 mm, 13.07±3.99 mm, 20.35 ± 4.12 mm respectively and postoperative 18.69 ± 5.35 mm, 14.39 ± 3.90 mm, 21.35 ± 4.40 mm respectively ($p<0.05$). KP patients preoperative vertebral body (a) anterior, (b) midline and (c) posterior heights were 16.46 ± 6.97 mm, 11.78 ± 5.15 mm, 18.91 ± 3.99 mm respectively and postoperative 17.99 ± 6.29 mm, 13.38 ± 5.09 mm, 20.32 ± 3.71 respectively ($p<0.05$).
Conclusion: For treatment of pain and maintenance of vertebral height in osteoporotic vertebral fractures efficiency of VP and KP were found to be similar.

Keywords: Kyphoplasty, osteoporotic vertebral body fracture, vertebroplasty

Level of evidence: Retrospective clinical study, Level III

ÖZET

Amaç: Osteoporotik omurga cisim kırığına bağlı ağrı ve omurga yüksekliği kaybının giderilmesinde vertebroplasti ve kifoplastinin etkinliğinin karşılaştırılmasıdır.
Materyal ve Metot: Kliniğimizde 2008'den bu yana 75 olguda VKOF nedeniyle omurga güçlendirme uygulaması yapılmıştır. Preop ve postoperatif tüm verilerine ve hastanın kendisine ulaşılabilen 38 hasta çalışmaya dahil edilmiştir.
Sonuçlar: VP uygulanan hastaların preoperatif VAS skoru 7.61 ± 0.49 ve postoperatif - 24 saat VAS skoru 3.33 ± 0.57 ($p<0.005$) olarak, KP uygulanan hastaların preoperatif VAS skoru 7.23±0.56 ve postoperatif - 24 saat VAS skoru 3.41 ± 1.06 ($p < 0.005$) olarak bulundu.
VP uygulanan hastaların omurga cisminin preoperatif orta hat ön (a), orta (b) ve arka (c) yükseklikleri sırası ile 17.54 ± 5.35 mm, 13.07±3.99 mm, 20.35 ± 4.12 mm; postoperatif orta hat ön (a), orta (b) ve arka (c) yükseklikleri sırası ile 18.69 ± 5.35 mm, 14.39 ± 3.90 mm, 21.35 ± 4.40 mm olarak ölçüldü ($p<0.05$). KP uygulanan hastaların omurga cisminin preoperatif orta hat ön (a), orta (b) ve arka (c) yükseklikleri sırası ile 16.46 ± 6.97 mm, 11.78 ± 5.15 mm, 18.91 ± 3.99 mm; postoperatif orta hat ön (a), orta (b) ve arka (c) yükseklikleri sırası ile 17.99 ± 6.29 mm, 13.38 ± 5.09 mm, 20.32 ± 3.71 olarak ölçüldü ($p<0.05$).
Sonuç: Osteoporotik omurga cisim kırığına bağlı ağrının giderilmesi ve omurga yüksekliğinin sağlanmasında VP ve KP benzer etkinlikte bulunmuştur.

Anahtar Sözcükler: Kifoplasti, osteoporotik omurga cismi kırığı, Vertebroplasti,

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III

INTRODUCTION:

Osteoporotic vertebral body fractures (OVBF) may lead to pain in the fracture area, loss in vertebral height, kyphosis deformity and instability. Since Ross *et al*. (15) published the risk of another fracture in a patient with osteoporotic fracture is increased 5 times, physicians specialized on spinal surgery has developed many treatments and methods for OVBF.

In last quarter of the century, with the minimally invasive surgery paradigm, in this group of disease where the pain is the major finding, vertebroplasty (VP) and kyphoplasty (KP) became more popular. Vertebral fortification for osteolytic vertebral body tumors is another indication of VP and KP (3,12). There are many studies comparing VP and KP on pain. In those studies many parameters like pain management, restoration of the vertebral body height, cement leakage and new fracture at the adjacent level were studied (5,7,9,11,16). Unlike VP, in KP application, it was reported that additional to the treatment of the fractured bone, kyphosis angle is straightened parallel to the increase in the body height (1), and less amount of cement was used (5).

[1] Surgeon of the Neurosurgery, Department of Neurosurgery, Umraniye Teaching and Research Hospital, İstanbul.
[2] Prof. Dr., Surgeon of the Neurosurgery, Department of Neurosurgery, Umraniye Teaching and Research Hospital, İstanbul.

Aim of this study is to compare effectiveness of VP and KP for pain and vertebral body height loss removal in osteoporotic vertebral fractures.

MATERIALS AND METHODS:

In our clinic since 2008, 75 vertebral fortification surgeries were performed for OVBF. 38 patients whose pre-operative and post-operative data and patients themselves were accessible included in the study. Patients gone through vertebral fortification surgery for osteolytic vertebral body tumors were not included in this study.

For VP, for every level total of 4 cc polymethylmetacrylate (PMMA) injection bi-pedicular and for KP following balloon expansion to 1.5 cc, total of 5 cc PMMA injection bi-pedicular performed.

For all patients preoperative and postoperative 24 h VAS scores and improvement in the pain were studied. Pain improvement was grouped into three as full recovery (>90), partial recovery (70-90%) and minimal recovery (<70%).

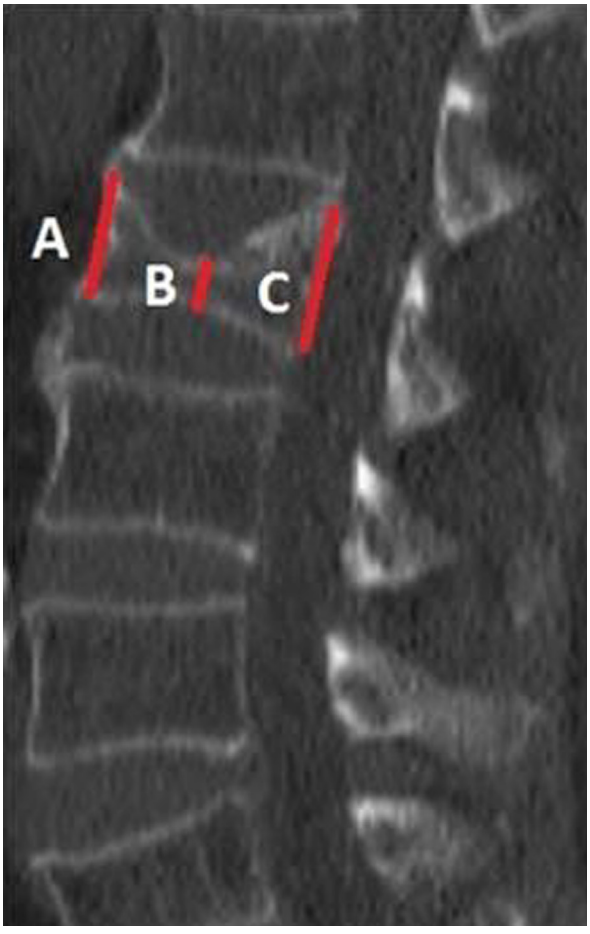

Figure-1. Exemplary case images (Preoperative (a) anterior, (b) midline and (c) posterior heights, sagittal CT)

Also operated vertebral body (a) anterior, (b) midline and (c) posterior heights of the patients preoperatively and postoperatively were compared from sagittal CT scans (Figure-1).

Cement leakage, neurological complications and late fracture at the adjacent level were also studied.

RESULTS:

38 patients treated in our clinic for OVKB (25 female, 13 male) were included in this study. In 21 patients, total of 25 levels were treated with VP and in 17 patients, total of 23 levels were treated with KP. Average age of the VP patients were 66.9 ± 8.4 (45-84 years) and KP patients were 63.5 ± 13.02 (32-81 years) ($p > 0.05$).

Preoperative VAS scores of vertebroplasty (VP) patients were 7.61 ± 0.49 and postoperatively it was 3.33 ± 0.57 ($p<0.005$). Kyphoplasty (KP) patients preoperative score was 7.23±0.56 and 24 h postoperative was 3.41 ± 1.06 ($p < 0.005$) (Table-1). When VP and KP patients' preoperative and postoperative VAS scores were compared no significant difference was found ($p > 0.05$).

Table-1. Preoperative and postoperative VAS scores before and after VP and KP

Procedure	Preoperative	Postoperative P
VP	7.61±0.49	3.33±0.57 0.000
KP	7.23±0.56	3.41±1.06 0,000

61.9% of the VP patients and 52.9% of the KP patients pain was totally resolved (>90%). Similarly, 38.1% of the VP patients and 47.1% of the KP patients pain was totally resolved (>90%). For both procedures none of the patients had unchanging pain (Table-2).

VP patients preoperative vertebral body (a) anterior, (b) midline and (c) posterior heights were 17.54 ± 5.35 mm, 13.07±3.99 mm, 20.35 ± 4.12 mm respectively and postoperative 18.69 ± 5.35 mm, 14.39 ± 3.90 mm, 21.35 ± 4.40 mm respectively (Table-2).

Tablo-2. Rates of pain relief succeeding kyphoplasty and vertebroplasty application.

Pain relief rate	Vertebroplasty	Kyphoplasty
Complete (>90%)	13 (61,9%)	9 (52,9%) (9)
Incomplete (70-90%)	8 (38,1%)	8 (47,1%)
No pain relief (<70%)	0 (0)	0 (0)

When preoperative and postoperative measurements were compared, in all measurements statistically significant differences were found (Figure-2) ($p<0.05$).

Figure-2. Sagittal lumbar CT images before (a) and after (b) VP procedure.

KP patients preoperative vertebral body (a) anterior, (b) midline and (c) posterior heights were 16.46 ± 6.97 mm, 11.78 ± 5.15 mm, 18.91 ± 3.99 mm respectively and postoperative 17.99 ± 6.29 mm, 13.38 ± 5.09 mm, 20.32 ± 3.71 respectively (Table-3 and 4).

Table-3. CT and VAS values before and after vertebroplasty.

Vertebroplasty	Anterior (mm)	Midline(mm)	Posterior (mm)
Preoperative measurement	17.54±5.35	13.07±3.99	20.35±4.12
Postoperative measurement	18.69±5.35	14.39±3.90	21.35±4.40
p	0,028	0,007	0,019

Table-4. CT scan and VAS values before and after kyphoplasty procedure.

Kyphoplasty	Anterior (mm)	Midline (mm)	Posterior (mm)
Preoperative measurement	16.46±6.97	11.78±5.15	18.91±3.99
Postoperative measurement	17.99±6.29	13.38±5.09	20.32±3.71
p	0,000	0,000	0,000

When preoperative and postoperative measurements of KP patients were compared, in all measurements statistically significant differences were found ($p < 0.05$).

In KP patients no cement related complication was observed, and only one of the VP patients cement leakage to the adjacent disc was observed.

When adjacent segment fractures are taken into consideration, only in one VP patient at the postoperative 3rd month level above the procedure a fracture was located. Fracture in the neighboring segment was also treated with vertebroplasty. In Figure-2 preoperative and postoperative sagittal CT images of a vertebroplasty patient, in Figure-3 preoperative sagittal CT and T1 weighed MRI image and postoperative sagittal and axial CT images of a KP patient are given.

DISCUSSION:

Galiert reported the first application of Vertebroplasty in 1987 (6), and Reiley reported the first application of Kyphoplasty in 1993 (9). In the last 30 years minimally invasive surgery concept is trending. These two methods of minimally invasive surgery, has some difference in application and utilization. Different aspects of these two percutaneous interventions are given in Table-5.

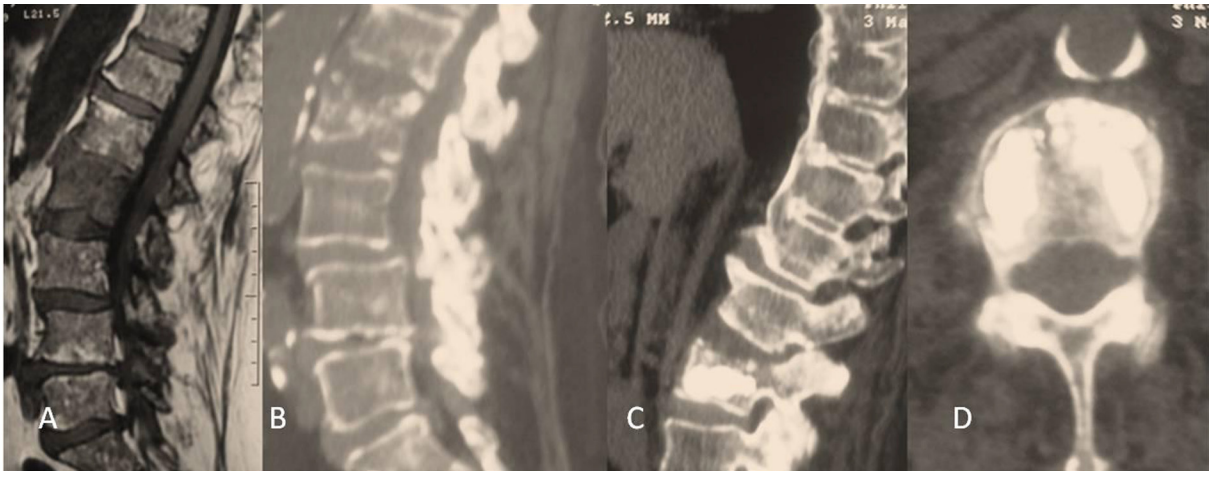

Figure-3. T1 weighed 227 MRI images of a case before KP procedure (a) and sagittal CT image (B) and same case's postoperative sagittal (c) and axial (d) CT images.

Table-5. Specifications of KP and VP applications.

	Kyphoplasty	Vertebroplasty
Procedure	Cavity formation with a balloon And filling with PMMA	Filling present cavities with PMMA
PMMA amount	3- 8 ml	1-3 ml
Process time	relatively longer	Shorter
Cost	Expensive	Cheap
Complication (5)	Less risk for cement leakage (0,3%)	Relatively higher risk for cement leakage (1,6%)
	Less risk for new Compression fracture (14,1%)	Relatively higher risk for new compression fracture (17,9%)
	Relatively higher risk For infection (0,3%)	Relatively lower risk for infection (0,1%)

American National Osteoporosis Society reports more than 50% of the >50 years of age Americans have either osteopenia or osteoporosis. This shows that osteoporosis is not just a disease that causes pain but a public health issue (13). In the same study in this group of diseases 80% is observed in female population. Our study supports this data. Primary complaints of the OVBF patients are lumbar and back pain resulting from a low energy trauma or a provocative move (14). Magnetic resonance imaging (MRI) scans following this clinical picture supports the diagnosis when heterogeneous bone marrow signal and hyper-intense (defining edema) images at STIR sequences were observed.

IN X-ray images and CT scans observation of the loss of vertebral height is diagnostic. In OVBF minimally invasive VP and KP procedures aim to minimize pain in early stage and sustain vertebral height.

In Gill *et al*. study it was shown that VP and KP decrease pain distinctly (7). Taylor significant decrease in pain scores of osteoporotic cases after percutaneous intervention (17). In our study it was shown that both VP and KP procedures are similarly sufficient for pain removal. When literature is taken into consideration, more than 90% of the osteoporotic fracture patients had reduced pain but reduction in the pathological fractures this rate decreases (2,4).

Second most important problem in OVBF after pain is kyphosis deformities that develop later on due to loss of body height. These deformities are not only important for morphological deformities but also for increased risk of fracture in the adjacent levels (8). Adjacent level fractures are important problems and require a new vertebral reinforcement surgery. Major cause of this problem is that extensively reinforced vertebral body compresses and stresses the adjacent osteoporotic vertebrae. In order to avoid this outcome, excessive cement application must be avoided. Due to this reason in this study maximum of 4 cc cement was applied.

In our series in only one case adjacent vertebra fracture was observed. It was reported that VP has less effect on body restoration than KP (10,18). In our study, it was shown that both KP and VP has rectification according to the preoperative values similarly. When complications are taken into consideration, none of the methods were superior to one another. Theoretically KP is superior to VP for restoration of vertebral height and avoiding cement leakage but in our study both methods resulted in similar clinical outcomes. Main reason of this is viscous application of the cement in VP and targeting to midline and anterior portions of the vertebral body.

In conclusion, VP and KP have similar efficiency for pain removal and height restoration resulting from osteoporotic vertebral fractures. But randomized control experiments comparing two procedures are required for further evaluation.

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Address: Evren YÜVRÜK, Surgeon of the Neurosurgery, Department of Neurosurgery, Umraniye Teaching and Research Hospital, İstanbul.
Tel.: 0216 6321818 **GSM:** 05057153247
E-mail: evreny82@gmail.com
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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

SHORT-SEGMENT PEDICLE SCREW FIXATION INCLUDING PEDICLE SCREW AT THE FRACTURED LEVEL FOR TREATMENT OF UNSTABLE THORACOLUMBAR FRACTURES

STABIL OLMAYAN TORAKOLOMBER VERTEBRA KIRIKLARINDA KIRIK SEVİYEYE PEDİKÜLER VİDA FİKSASYONU İLE KISA SEGMENT FİKSASYON SONUÇLARI

Murat KORKMAZ[1], Turgut AKGÜL[2], Okan OZKUNT[3], Kerim SARIYILMAZ[3], Natig VALIYEV[4], Fatih DIKICI[3]

SUMMARY

Background Data: Short segment pedicle screw fixation with additional pedicle screws at the fractured level improves stability and provides better correction of deformity. This surgical technique allows anterior column support through indirect reduction.
Purpose: The aim of this study was to evaluate the effect of short-segment posterior fixation including pedicle screw at the fractured vertebra.
Materials-Methods: Between 1997 and 2013, 25 patients who had treated for unstable thoracolumbar vertebra fracture with using pedicle screw at the fractured level were reviewed retrospectively. All patients evaluated by radiographs, computed tomography and magnetic resonance. Local kyphosis, anterior and posterior wall height were studied on lateral X-ray preoperatively and postoperatively. Functional outcome and pain were assessed by Oswestry Disability Index (ODI) and visual analog scale (VAS) scores. The unpaired Student's t-test and Mann Whitney U test and also, SPSS v.20.0 (SPSS Inc., Chicago, IL, USA) were used for statistical analyses.
Results: In this study, the mean age was 52 (20-84). The most common injured area was thoracolumbar spine (%75) and L1 was the most commonly affected vertebra (%43). Preoperative mean anterior wall height was 19 mm (12-27 mm) and posterior wall height was 29 mm (17-38 mm). Postoperative anterior wall height was 27 mm (16-36mm) and posterior wall height was 31 mm (19-38 mm). The mean local kyphosis angle was decreased from 17 degree (8-26 degree) to 2.7 degree (-7,9 degree). Statistically, increase of anterior corpus height and decreasing of the local kyphosis angle have a significant difference ($p<0.05$). Laminectomy and posterior wall height did not have a significant difference between pre- or postoperatively ($p> 0.05$). The mean VAS score was 2.2 (0-7) and the mean Oswestry score was 9.8 (3-24).
Conclusion: Short-segment pedicle screw fixation with pedicle screw at the fractured level is a safe and effective surgical method for unstable thoracolumbar fractures through improves stability and provides anterior column support.

Key words: short-segment pedicle fixation, intermediate screw, thoracolumbar fracture

Level of Evidence: Retrospective clinical study, Level III

ÖZET

Giriş: Kırık vertebranın pedikül vidası ile enstrümante edildiği kısa seviyeli posterior tespit, stabiliteyi arttırıcı etki gösterir ve deformitede daha belirgin düzelme sağlar. Son yıllarda ön plana çıkan bu teknik omurganın ön kolonunun indirek olarak destekleme prensibine dayanır.
Amaç: Bu çalışmamızda kısa segment posterior tespiti ile birlikte yapılan kırık vida enstrümentasyonunun etkinliğini değerlendirmeyi amaçladık.
Materyal-Metod: 1997-2013 yılları arasında stabil olmayan torakolomber omurga kırığı nedeniyle kırık segment enstrümentasyonun da dahil edildiği kısa segment posterior tespit yapılan 25 hasta retrospektif olarak çalışmaya dahil edildi. Hastalar radyolojik olarak direk grafi, bilgisayarlı tomografi ve MR ile değerlendirildi. Ameliyat öncesi ve sonrası lateral grafilerle bölgesel kifoz, omurga cisminin ön ve arka duvar yükseklikleri ölçüldü. Hastalar fonksiyonellik ve ağrı açısından Oswestry Disability Index (ODI) ve visual analog scale (VAS) ile değerlendirildi. Elde edilen değerler Student T-testi (unpaired T-testi) ve Mann Whitney U ile analiz edildi ve istatistiksel anlamlılık değeri % 95 güven aralığı için $p<0.05$ olarak kabul edildi.
Sonuçlar: Çalışmamızda ortalama yaş 52 (20-84) idi. En sık yaralanan bölge torakolomber bölge (% 75) ve en sık yaralanan vertebra ise L1 vertebra idi (% 43). Ameliyat öncesi ortalama omurga ön duvar yüksekliği 19 mm (12-27 mm) ve arka duvar yüksekliği 29 mm (17-38 mm) iken ameliyat sonrası ön duvar yüksekliği 27 mm (16-36 mm) ve arka duvar yüksekliği 31 mm (19-38 mm) idi. Ameliyat öncesi 17 derece (8-26 derece) olan ortalama bölgesel kifoz açısı, ameliyat sonrası 2.7 dereceye (-7-9 derece) geriledi. Ameliyat sonrasında vertebra ön duvar yüksekliğindeki artış ve bölgesel kifoz açısındaki azalma istatistiksel olarak anlamlıydı ($p<0.05$). Bununla birlikte, laminektomi ve arka duvar yüksekliğindeki değişiklikler istatistiksel olarak anlamlı değildi ($p>0.05$). Hastaların ortalama VAS skoru 2.2 (0-7) ve ortalama ODI skoru 9.8 (3-24) idi.
Çıkarımlar: Kırık vertebra enstrümentasyonunun da dâhil edildiği kısa seviye posterior tespit indirek ön kolon desteği sağlaması ve stabiliteyi arttırması nedeniyle instabil torakolomber omurga kırıklarında etkili ve güvenilir bir cerrahi yöntemdir.

Anahtar Kelimeler: Kısa segment enstrümantasyon, intermediet vida, torakolomber kırıklar

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III

[1] MD, Surgeon of the Orthopaedics and Traumatology, Department of Orthopedics and Traumatology, Ministry of Health Şişli Etfal Hamidiye Training and Research Hospital, İstanbul.
[2] MD, Surgeon of the Orthopaedics and Traumatology, Istanbul University İstanbul Faculty of Medicine Department of Orthopedics and Traumatology
[3] Ass. Prof., Surgeon of the Orthopaedics and Traumatology Department of Orthopedics and Traumatology, Acıbadem, Atakent University Hospital, Istanbul, Turkey
[4] MD, Surgeon of the Orthopaedics and Traumatology Department of Orthopedics and Traumatology, Acıbadem Maslak Hospital, Istanbul, Turkey.

INTRODUCTION:

Spine fractures are serious injuries and usually associated with other major organ system injuries such as bone fractures, head trauma, pulmoner and abdominal injuries. (19). Also % 4,5 of patients have noncontiguous vertebral injuries (5). These fractures are usually caused by high-energy trauma such as fall from height or car crash. Approximately 75 % of fractures are seen in the thoracic and lumbar regions, also thoracolumbar junction is the most common injury site (8, 15). Complet neurological injury occurs in 20 % of patients and incomplete neurological injury occur in 15 % of patients (25).

The goal of the treatment in vertebral fractures are to maintain spinal stability and alignment with preserving neurological function, However, the management of the treatment is still under debate, such as surgical versus conservative treatment, timing of surgery, preference of surgical technique (13, 24). Several surgical techniques had been introduced in the literature. There is no consensus on surgical treatment modalities as anterior, posterior, or combined approach (9, 30).

Short segment spinal instrumentation became a popular surgical procedure with using posterior pedicle screw fixation. That is provided better correction of deformity, greater stability that allowed early mobilization (1, 16). Despite these advantages of this surgical technique, it has been associated with loss of reduction and implant failure in some cases (1, 18). Recently, some authors have suggested that inserting pedicle screw at the level of fractured vertebra in a short-segment construct may prevent too early failure and help to improve biomechanical stability (3, 17).

This study evaluates the hypothesis that short segment fusion using pedicle screw combined with additional screw at the level of the fracture vertebra via posterior approach is enough to reduction of vertebral height safely.

MATERIAL AND METHODS:

We retrospectively evaluated 25 patients (7 females and 18 males) who had undergone short-segment posterior construct with pedicle screws adding index level instrumentation between 1997 and 2013. Patients who have vertebra fracture below T12 were included to study. Patients with vertebra height compression lower than 25% were excluded from the study because of given false results to asses' reduction value. Also patients operated via anterior or combined surgery or used hook were excluded from the study.

Neurological status were classified according to ASIA (American Spinal Injury Association) scale 20 patients were neurologically intact (ASIA E), 3 had incomplete deficit (ASIA B, C, D) and 2 had complete neurologic deficit (ASIA A) Standart prophylactic methylprednisolone treatment were applied for the patients with neurologic deficit.

All patients were preoperatively evaluated by radiographs, computed tomography and magnetic resonance, local kyphosis angle by the Cobb method, anterior and posterior wall height were studied on lateral X-ray that taken at preoperatively and control. Patients with neurologic deficit and unstable fractures including injury to posterior ligament complex, >50% loss of vertebral body height, spinal canal compromise great than 40% and >25%kyphosis were treated through this surgical method. (20). The patients' functional outcome and pain were assessed by Oswestry Disability Index (ODI) and visual analog scale (VAS) scores.

The unpaired Student's *t*-test was used for comparison of quantitative results with normal distribution, Mann Whitney U test for results where a normal distribution was rejected. P values of less than 0.05 were considered significant. SPSS v.20.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses.

SURGICAL PROCEDURE:

All of the patients were operated using a standart posterior midline approach in prone position under general anesthesia. After confirming the fractured vertebra with fluoroscopy following by subperiostal dissection were applied without damage interspinous or supraspinous ligaments. Proximal facet were protected to prevent proximal junctional kyphosis. Pedicle screws were inserted upper and lower vertebra and also fractured vertebra using freehand technique. All screw replacement confirmed radiologically. The intermediate screws were inserted bilaterally if the pedicle walls were intact that evaluated with CT. We used 6,5 mm diameter titanium poli-axial pedicle screws for lumbar region and T12 vertebra and 5,5 mm diameter titanium poli-axial pedicle screws for upper segments. Spongiosus allograft were used for posterolateral fusion.

RESULTS:

In this study, 25 patients with mean age was 52 (20-84) was reviewed. 3 patients underwent short posterior pedicle screw fixation including fractured level through one level above and one level below pedicle screw instrumentation and also, other patients treated through 2 level above and one level below. The most common injured area was thoracolumbar spine (75%) and L1 was the most commonly affected vertebra (43%). 6 T-12 fractures, 12 L-1 fractures, 2 L-2 fractures, 3 L-3 fractures and 2 L-4 fractures.

Preoperative radiological parameter that was measured on the lateral X-ray, the mean anterior wall height was 19 mm (12-27 mm) and posterior wall height was 29 mm (17-38 mm). Postoperative radiological value anterior wall height was 27 mm (16-36mm) and posterior wall height was 31 mm (19-38 mm). The mean local kyphosis angle was decreased from 17 degree (8-26 degree) to 2.7 degree (-7,9 degree) (Figure-1 and 2). According to the statistical analysis, increase of anterior corpus height and decreasing of the local kyphosis angle have a significant difference ($p<0.05$). Laminectomy and posterior wall height did not have a significant difference between pre- or post-operatively ($p> 0.05$) (Figure-3).

The mean VAS score was 2.2 (0-7) and the mean Oswestry score was 9.8 (3-24). All patients with incomplete neurological deficit (n: 3) improved to ASIA E. However patients (n: 2) with complete neurologic deficit (ASIA A) did not show any neurologic recovery (Figure-4).

During the final follow-up, all the patients were observed to union at fractured vertebra. Also there was any implant related complication during follow-up. There were 2 superficial wound infection which healed by antibiotics treatment. However, any deep wound infection was not seen (Figure-5).

DISCUSSION:

Several treatment options have been described for thoracolumbar vertebra fractures include anterior, posterior, or combined fixation techniques (4,26,28,31). Also, short segment posterior stabilization is a preferable method for stabilizing the unstable thoracolumbar fractures through less surgical dissection, decreased blood loss and surgical time

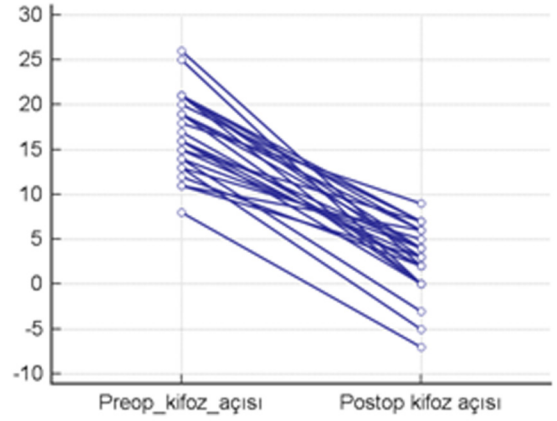

Figure-1. Preoperative and postoperative kyphosis angle

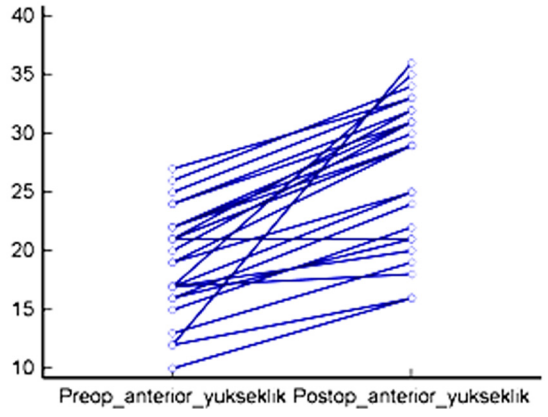

Figure-2. Preoperative and postoperative anterior wall height

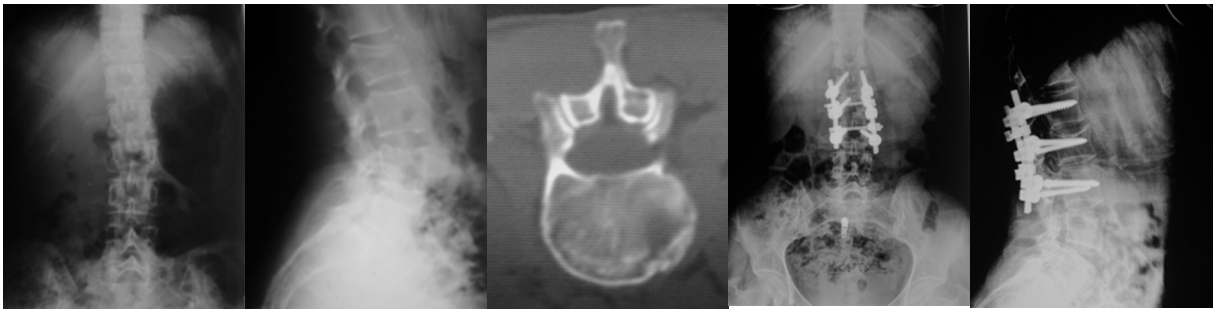

Figure-3. 53 years old patient with L2 vertebra fracture treated with one level above and level below instrumentation using pedicle screw at fractured vertebra

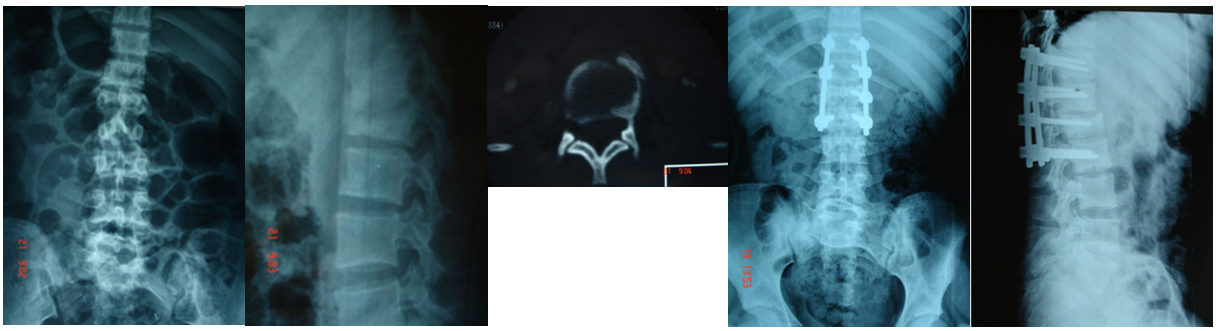

Figure-4. 27 years old patient with L1 vertebra fracture treated with two level above and one level below instrumentation using pedicle screw at the fractured level

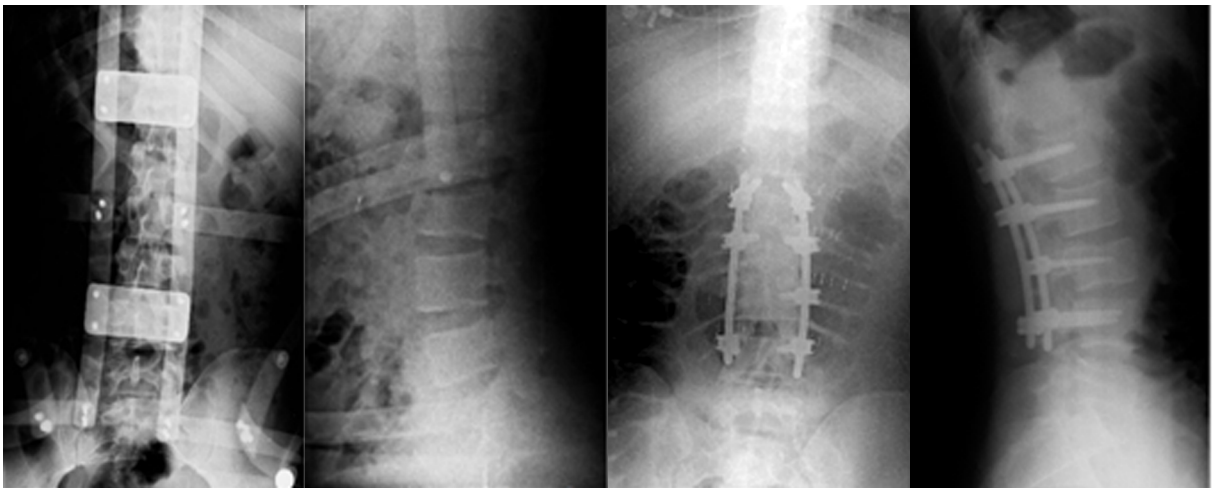

Figure-5. 23 years old patient with L3 vertebra fracture treated with two level above and one level below instrumentation using pedicle screw at the fractured level

(11,32). Even though this technique is popular, several authors have suggested that this procedure associated with unacceptable results including loss of reduction and implant failure depends on inadequate anterior column support and increasing anterior vertebral stress on each pedicle screws (27,30). To support anterior part of the vertebra several technique was described as transpedicular grafting or vertebroplasty (1,7). An alternative method is to use longer segmental instrumentation to reduce the stress on each pedicle screws. Nevertheless, this procedure have some disadvantages such as longer operation time, more bleeding, remaining less motion segments (21,23).

In a cadaveric biomechanical study, Norton et al compared long versus short segment instrumentation by using pedicle screws for unstable thoracolumbar fractures and they suggested that long segment instrumentation is more rigid than short segment instrumentation (22). Similarly, Tezeren et al demonstrated that long segment instrumentation is more effective than short segment instrumentation for management of thoracolumbar fractures in their retrospective clinical study. They suggested that short segment instrumentation would have been more successful when two above and two below pedicle screw were used (29). However, Baaj et al suggested that even though long segment instrumentation provides more stability than short segment constructs, insertion pedicle screw at the level of fracture to short segment construct improves stability (2). Also, Dick et al reported that additional insertion of pedicle screws at the fractured level improve biomechanical stability through supporting anterior column and diminishing stress on each pedicle screws as a popular method of stabilization for unstable thoracolumbar fractures (10). However, Mahar et al found that short segment pedicle screw fixation with screw at the level of fracture improves biomechanical stability during axial rotation but not during flexion, extension or lateral bending in a cadaveric biomechanical study. The advantages of this procedure include easier operation, short surgery time, less soft tissue dissection and blood loss and finally less morbidity (17).

In the literature, kyphosis correction after surgery with short-posterior fixation without pedicle screw at the level of fractured vertebra was from 6 degree to 15 degrees. Also, kyphosis correction degree was decreased at follow-up (6,7,17). Author reported that kyphosis correction loss was related amount of bony communication, fracture displacement and amount of correction of kyphotic deformity (14). Loss of correction degree on kyphosis angle was better in patients operated with posterior short fixation addition of pedicle screws at the level of fracture (12). In our study, the mean initial kyphosis correction was 15 degrees after surgery additional insertion of pedicle screw at the fractured vertebra.

In conclusion, short posterior fixation with pedicle screws at the fractured level is one of the effective method for treatment of unstable thoracolumbar fractures, which can improve the stability, maintain the reduction through provide anterior column support and indirect reduction and also achieve better outcomes. This method has advantages such as short operation time, less soft tissue dissection and blood loss, and also less morbidity. In our opinion, this surgical technique can be used for treatment of unstable thoracolumbar fractures to prevent complications including loss of reduction and implant failure.

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Correspondin Address: Op. Dr. Murat Korkmaz, Sisli Etfal Hamidiye Training and Research Hospital, Halaskargazi St. Sisli/Istanbul
Phone: (+90) 536 430 52 66
E-mail: mrtmkz@gmail.com
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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

SPINAL TRAUMA CLASSIFICATION AND PRINCIPLES OF TREATMENT: A RETROSPECTIVE STUDY OF 234 CASES

SPİNAL TRAVMALARDA SINIFLAMA VE TEDAVİ PRENSİPLERİ: 234 OLGULU BİR RETROSPEKTİF ÇALIŞMA

Serhat YILDIZHAN[1], Mehmet Gazi BOYACI[1], Ergün KARAVELİOĞLU[1], Adem ASLAN[1], Hamit Selim KARABEKİR[2], Olcay ESER[3]

SUMMARY

Objective: To determine the age, gender, reason of injury, neurological status, level of fracture, type of fracture of the cases that are hospitalized in our clinic due to spinal trauma and that are practiced medical or surgical treatment in a retrospective way and to compare the results with the literature and to discuss them.
Material and Method: This research has been conducted in between January 2004 – December 2011 by evaluating 234 patients who were exposed to spinal trauma. They were exposed to cervical, thoracic and lumbar area. Trauma has been included to this research. A classification for each patient has been made separately according to the results of X-ray, computerized tomography and magnetic resonance imaging of patients, performed just after the patients consulted to the hospital. The patients have been classified in 5 groups according to upper cervical, lower cervical, thoracic, thoracolumbar and lumbar area traumas and each group has been evaluated in itself.
Conclusion: In our research, the most frequent reason of spinal traumas has been determined to be motor vehicle accidents and the most affected area has been determined to be thoracolumbar area (T11-L1). Using a general classification system has turned to be compulsory in determining the treatment that is to be applied to the patient.

Key words: Spinal trauma classification, TLICS, AO classification

Level of evidence: retrospective clinical study, Level III.

ÖZET

Amaç: tedavi uygulanan olguların retrospektif olarak yaş, cinsiyet, yaralanma nedeni, nörolojik durumu, kırık seviyesi, kırık tipi belirlemek, sonuçlarımızı literatürle karşılaştırmak ve tartışmaktır.
Materyal Metod: Bu çalışma Ocak 2004-Aralık 2011 tarihleri arasında Spinal travmaya maruz kalan 234 hasta değerlendirilerek yapılmıştır. Servikal, Torakal ve Lomber bölge travmasına maruz kalan 234 hastanın hastaneye başvurduklarında çekilen Direkt Grafi, Bilgisayarlı Tomografi (BT) ve Magnetik Rezonans Görüntüleme (MRG) sonucunda her bir hastaya ayrı ayrı sınıflandırma yapılmıştır. Hastalar Üst Servikal, Alt Servikal, Torakal, Torakolomber ve Lomber bölge travmalarına göre 5 ayrı gruba ayrılmış, her bir grup kendi içinde değerlendirilmiştir.
Sonuçlar: Çalışmamızda spinal travmaların en sık nedeni olarak motorlu taşıt kazaları ve en sık etkilenen bölgede torakolomber bölge (T11-L1) bulunmuştur.
Sonuç: Hastalara uygulanacak tedavinin belirlenmesinde genel bir sınıflama sisteminin kullanılması artık zorunlu hale gelmiştir.

Anahtar kelimeler: Spinal travma sınıflaması, TLICS, AO sınıflaması

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III.

INTRODUCTION:

Traumatic spine and spinal cord injuries are serious problems causing significant work force and economical loss currently, by resulting in paraplegia, paraparesis and psychosocial problems (6,18). Although it shows regional differences in global data, the prevalence of the spinal cord injuries are 236-1009 per million (median value is approximately 853 per million in USA) (9,21). Its incidence, on the other hand, ranges between 10.4 and 83 (median value is approximately 39 per million in USA) (21,34). Although there are no reliable statistical data in our country, if it is calculated with the USA data, approximately 2800 new cases emerge in a year and 63.000 people continue their lives as disabled as a result of the spinal cord injuries (21,34). Even though it shows regional differences and it is seen 4 times more in males, the frequent reasons are motor-vehicle accidents, falling down from height, occupational accidents, violence including accidents, sports accidents and other trauma reasons in order (6, 9,21).

[1] Afyon Kocatepe University Medical Faculty, Department of the Neurosurgery, Afyonkarahisar.
[2] Dokuz Eylül University Medical Faculty, Department of the Neurosurgery, İzmir.
[3] Balıkesir University Medical Faculty, Department of the Neurosurgery, Balıkesir.

Most of the spinal injuries consist of lower cervical region and thoracolumbar joint. Those regions are highly mobile. Cervical vertebras are examined as upper cervical region (C0-C1-C2) and lower cervical region (C3-C7) as anatomically and biomechanically. The vertebra in the lower cervical region resemble to each other anatomically and biomechanically (10,22). They are generally formed by high energetic traumas. With the increasing technology, traffic accidents, injuries with gun, falling down from height and occupational accidents happen in an increasing rate. The cases with cervical vertebra trauma are mostly cases with multiple injuries. It becomes the situation more dramatic to see the current traumas in young population (10,14).

The most frequently encountered pathological problem is fractures. The injuries in the thoracolumbar region (T11-L1) which is the transition region between thoracic kyphosis and lumbar lordosis are frequent. While some of this injury is stable mechanically and the neurological injury risk is too low, there is instability in most of them and it causes acute or delayed neurological deficit.

There are still discussions in the treatment of potentially life-threatening injuries. New techniques and instrumentation systems allows a more aggressive surgical approach in the treatment of those injuries. There is a need for the use of a classification system in the spinal trauma cases. The used classification system helps the direction of follow-up and treatment when it not only indicates the bone lesion but also showing the accompanying soft tissue and ligament injury.

Any classification system should provide competence in gaining and storage of the data and the access of the data. The system not only should present a way for the documentation of the fractures, but also should provide the understanding them biologically and biomechanically (22).

The aim of this study is to compare the surgical decision as a result of the determination of the fracture type with the age, gender, neurological condition, fracture level and the classifications in the spinal traumas retrospectively in cases who were administered medicine or surgery as a result of the application to our clinics due to spinal trauma, and to discuss the results. In this study, also, we aimed to compare reflections of similarities, consistencies and contradictions of the spinal trauma classifications in general practices and all those results and to obtain the data which will help to reach to the suitable classification system.

MATERIAL VE METHODS:

234 patients, who were exposed to cervical, thoracic and lumbar region trauma and who were treated in hospital between 2004 and 2011, were included in this study. Each patient were classified as a result of the Direct Graphy, Computerized Tomography (CT) and Magnetic Resonance Imaging (MRI) taken when they first applied to hospital. The patients were classified into 5 different groups according to upper cervical, lower cervical, thoracic, thoracolumbar and lumbar region traumas and each group was evaluated in itself.

For the Atlantoaxial Rotatory Dislocation (AARD), which is an upper cervical vertebra injury, Fielding and Hawkins classification was used (10). The Subaxial Cervical Spine Injury (SLIC), which is a lower cervical vertebra (C3-C7) injury, were evaluated according to Magerl-AO and ASIA classification (1,5,26,33).

The same classification was used in thoracic, thoracolumbar and lumbar traumas. The patients were evaluated according to Dennis (11), McAfee (27), Mc Cormak (28), Vaccaro (31), Magerl-AO (25) and ASIA (1) classifications. In the Dennis classification, the patients were classified according to compression, blow-out, safety belt and fracture dislocation. In the Mc Afee classification, the patients were grouped as compression, blow-out, chance, flexion-distraction and translation. In Vaccaro classification, the morphological features, the integrity of posterior ligamentous structures and neurological condition was considered, each was graded, the severity of the injury was determined according to the grade and the suitability of the administered treatment was compared with the literature. The grades were determined according to the disintegration of vertebra corpus, detachment of the corpus fracture and correction of the traumatic kyphosis and compared with the administered treatment.

The radiological and patho-morphological features of the injury were used as the base in Magerl-AO classification. Classification was performed according to the neurological examination in ASIA classification.

RESULTS:

The 130 of the cases (56 %) were males and 104 of them (44 %) were female, 32 % of them were diagnosed with upper and lower cervical trauma, 30 % with thoracolumbar joint trauma, 24 % with lumbar trauma and 11 % with thoracic trauma. The upper cervical constituted the 9 % of all cases and lower cervical constituted 23 % (Figure-1). The cases who had surgical operation were 154 patients in total (66 %) with 7 cases in upper cervical, 33 cases in lower cervical, 22 cases in thoracic, 60 cases in thoracolumbar and 42 cases in lumbar.

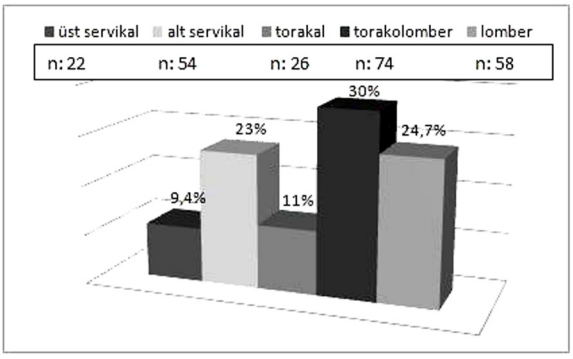

Figure-1. The distribution of all cases with spine trauma.

When the reasons of the injuries were examined, 59 % were vehicle or motorcycle accidents, 26 % were falling down from height, 6 % were direct trauma on head and neck, 4 % were falling while walking and 5 % were the others in cervical region, and 61.5 % were 16 cases with traffic accidents, 23.2 % were 6 cases with falling down from height, 7.6 % were 2 cases with occupational accidents and 7.6 % were 2 cases with other reasons resulting in fractures in thoracic region.

There were fractures in the thoracolumbar region in 42 cases due to traffic accident as 56.7 %, 20 cases due to falling down from height as 20 %, 8 cases due to occupational accident as 10.8 %, and 4 cases due to other reasons as 5.4 %.

There were fractures in the lumbar region in 32 cases due to traffic accident as 55.1 %, 18 cases due to falling from height as 31 %, 6 cases due to occupational accident as 10.3 % and 2 cases due to other reasons as 3.4 %.

There were accompanying injuries in our cases at a rate of 22 % and 22 % of those were extremity injuries, which was the most frequent, and 1 % was cranial injury.

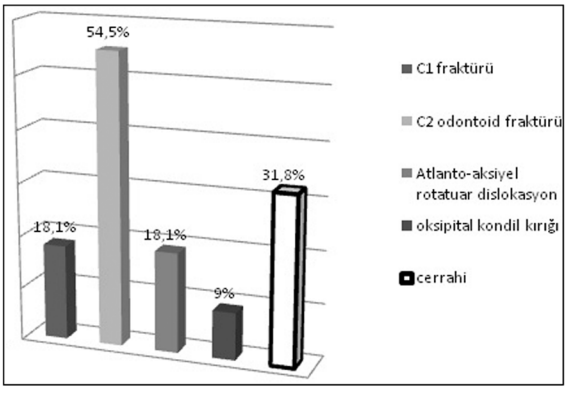

Figure-2. The distribution of the cases with upper cervical vertebra injury.

The 14 of (63 %) the 22 patients, whose upper cervical region trauma was followed, were females and 8 of them (37 %) were males, and this was mostly seen in ages 20-29 with 36 %. 4 of those cases (18 %) were detected as C1 fracture, 12 of them (55 %) as C2 odontoid fracture, 4 of them (19 %) as Atlantoaxial rotator dislocation and 2 of them (9 %) as occipital condyle fracture (Figure-2).

3 of the patients (25 %) with C2 odontoid fractures were classified as type 1, 8 of them were (67 %) type 2 and 1 of them (32 %) was type 3.

While the mostly affected region in our study was C4-C5 with 35 %, it is followed by C5-C6 with 31 %, C6-C7 with 15 % and C3-C4 with 11 %. The most frequent lesion in terms of the affected vertebra fracture was encountered in C5 vertebra with 19 %. 32 (59 %) of the 54 cases were male and 22 (41 %) of them were females. Most of the cases were in 20-29 age range with 24 % and 40-49 age range with 20 %. There was neurological deficit in 37 % of the cases and 36 of them (67 %) were in ASIA E group. When evaluated with Subaxial Cervical Spine Injury Classification (SLIC), 13 of them (24 %) got 2 points, 20 of them (37 %) got 3 points, 15 of them (28 %) got 4 points and 5 of them (9 %) got 5 points.

When the cases were analyzed according to Magerl-AO classification, mostly Group B1 was encountered in 12 patients (22.2 %). 33 of all patients (61 %) who has lower cervical region injury were treated with surgery.

16 of 26 patients (61.5 %) with thoracic vertebra trauma were males and 10 of them (38.5 %) were females. Among the cases, there was 20-29 age group with 7 patients (26.9 %) at most. In their first examination, 13 of them (50 %) were ASIA E group. According to Dennis classification, 14 of them (54 %) were classified as compression fracture, 8 of them (31 %) as blow-out fracture, 3 of them (12 %) were safety belt fracture and 1 of them (4 %) was fracture dislocation. According to McAfee classification, 13 patients (50 %) were classified as wedge compression fracture, 8 of them (31 %) as blow-out fracture, 3 of them (12 %) as chance fracture, 1 of them (4 %) as translational type.

When Mc-Cormak classification is used, 7 of the patients (27 %) got 4 points, 12 of them (46.1 %) got 5 points, 5 of them (19.2 %) got 6 points and 2 of them (8 %) got 7 points.

When evaluated according to Vaccaro classification, 7 of them (26.9 %) were evaluated as 3 points, 10 of them (38 %) were evaluated as 4 points, 8 of them (31 %) were evaluated as 5 points and 1 of them (4 %) was evaluated as 6 points. The mostly seen group was

Group B1 with 6 cases (23 %) according to Magerl-AO classification. 22 of all patients (85 %) having thoracic vertebra injury were treated with surgery.

44 of the cases (59 %) with thoracolumbar vertebra trauma were males and 30 of them (41 %) were females. Among the cases, there was 20-29 age group with 20 patients (27 %) at most. According to Dennis classification, 32 of them (43 %) were classified as compression fracture, 26 of them (35 %) as blow-out fracture, 10 of them (14 %) were safety belt fracture and 6 of them (8 %) was fracture dislocation.

According to McAfee classification, 28 patients (38 %) were classified as wedge compression fracture, 30 of them (41 %) as blow-out fracture, 8 of them (11 %) as chance fracture, 4 of them (5 %) as flexion-destruction, 4 of them (5 %) as translational type.

According to Mc-Cormak classification, 10 of the patients (14 %) got 3 points, 16 of them (22 %) got 4 points, 26 of them (35 %) got 5 points and 12 of them (16 %) got 6 points and 10 of them (14 %) got 7 points.

According to Vaccaro classification, 10 of them (14 %) were evaluated as 3 points, 16 of them (22 %) were evaluated as 4 points, 40 of them (54 %) were evaluated as 5 points and 18 of them (24 %) were evaluated as 6 points.

In the ASIA classification of the cases, 40 cases (54 %) were in ASIA E group at most.

According to Magerl-AO classification, Group A1, Group B2 and Group C2 were equal to each other with 10 cases (14 %). 60 of all the patients (81 %) having thoracolumbar vertebra injury were treated with surgery.

30 of the cases (52 %) with lumbar vertebra trauma were males and 28 of them (48 %) were females, there were patients in 50-59 age range with 20 patients at most (34 %). According to Dennis classification, 24 of them (41 %) were classified as compression fracture, 20 of them (34 %) as blow-out fracture, 10 of them (17 %) were safety belt fracture and 4 of them (7 %) was fracture dislocation.

According to McAfee classification, 22 patients (34 %) were classified as wedge compression fracture, 20 of them (34 %) as blow-out fracture, 8 of them (14 %) as chance fracture, 6 of them (10 %) as flexion-destruction, 2 of them (3 %) as translational type.

According to Vaccaro classification, 15 of them (26 %) were evaluated as 3 points, 13 of them (22 %) were evaluated as 4 points, 18 of them (31 %) were evaluated as 5 points and 12 of them (21 %) were evaluated as 6 points.

According to Mc-Cormak classification, 9 of the patients (16 %) got 3 points, 12 of them (21 %) got 4 points, 20 of them (34 %) got 5 points and 8 of them (14 %) got 6 points and 9 of them (16 %) got 7 points.

In the classification made according to the first examination, 33 cases (57 %) were evaluated as ASIA E.

12 cases at most (21 %) were detected as Group B1 according to Magerl-AO classification.

42 of all the patients (72 %) having lumbar vertebra injury were treated with surgery.

DISCUSSION:

Spinal fractures are generally formed as a result of the severe and high energetic trauma (13), and the worst result, which is feared from beginning of the recorded date, the treatment seems impossible and which will not meet the expectations of both the physician and the patient, is the spinal cord injury (33). In our study, 234 cases, who applied to our department due to spinal trauma, were analyzed retrospectively and the classifications affecting the treatment choices and the neurological conditions together with the related classification results, etiology of the pathology, the type, physical examination features, surgical or conservative approach and the obtained results were analyzed in company with the literature.

Goldberg *et al*. performed a prospective study including 21 centers with 34.069 patients to determine the exact prevalence, spectrum and distribution of the cervical vertebra injuries formed after blunt traumas. They detected 1496 different cervical spinal injuries in total in 24 % of those patients. They also found that the second cervical spine is the level where the injuries most frequently form (24 %) and the one third of those injuries was odontoid injuries (10, 15). 32 % of the cases in our study was cervical region trauma. The cases who had upper cervical region trauma consisted of 29 % of the patients with acute cervical trauma. It was observed that there was C2 fracture in 16 % of the cases with acute cervical trauma and 55 % of the cases with upper cervical region trauma.

When the patients with odontoid fractures were analyzed according to Anderson and D'Alonzo classification system (2), 25 % of them was classified in Type 1, 67 % was in Type 2 and 8 % was in 8 %. Greene *et al*. reported that they have achieved nearly total success in fusion rates in Type I and Type II fractures with the halo vest immobilization as a result of their studies reviewing 199 patients with odontoid fractures among 340 patients. Non-union was detected in 28 % of the Type II fractures who were administered external immobilization for 13 weeks. It was shown that this high non-union rate (86 %), the replacement of dens 6 mm or more is independent from the age of the patient, direction of replacement or existence of neurological

deficit (16). Julien *et al*. found that the nonunion rates were 0 %, 35 % and 16 % for Type I, II and III, respectively, in patients treated with halo/minerva fixation for 8-12 weeks in their review studies including 269 odontoid fractured patients (17).

In the review conducted by Longo *et al*. in 2010 and including 1078 cases by analyzing 43 publications, they found C1 fracture in 2-15 % and C2 fracture in 17-25 % of the patients with acute cervical trauma and they compared the halo transaction instability and they asserted that the Halo vest administration is safe and effective in indication (24). In our series, 32 % of the cases were followed surgically, 18 % were followed with Halo Vest and 50 % were followed with conservative treatment choices such as SOMI, and when the cases who were administered conservative treatment were ignored, the common inconsistency between Halo Vest and surgery in the literature was in favor of surgery in our clinics, but 1/3 of the cases with upper cervical vertebra trauma were treated with surgery. In the Type 2 fractures, the risk factors negatively affecting the union of the fractures were 6 mm and more dissociation, posterior subluxation and the age over 65 (4, 16). Halo Vest is a quite significant treatment method besides the surgery requirement in risky groups and it should not be abandoned. Although the posterior or anterior methods are controversial in surgical techniques, nowadays it is changing in favor of the anterior approach (4).

Most of the cervical spine injuries occurs in the lower cervical region and the C3-C7 vertebra known as the subaxial cervical region (26). Kocis *et al*. examined 363 patients with subaxial cervical injuries and they showed that 50 % was traffic accident, 18 % was falling down from the height and the most frequently seen age is 20-29. They classified the neurological findings of cases in their study according to Frankel grading system and 54 % were evaluated as Frankel E and 30 % were evaluated as Frankel A as having complete sensory and motor deficit. In their study, they showed that the mostly seen was C5 and C6-C7 vertebra fracture according to vertebra injury and the least one was C7-T1 segment (20).

Platzer *et al*. reported that the most frequent injury cause was vehicle or motorcycle accident with 44 % in 367 cases, 212 of whom were subaxial, they examined and there was 38 % neurological deficit (30). Argenson *et al*., on the other hand, showed that the mostly seen trauma reason as the traffic accident with 60 % in 255 cases with subaxial cervical vertebra injuries, and found that 28 % was falling down from height and 63 % of the cases had neurological lesion (3). In SLIC classification that we used in our study the patients are graded by evaluating the morphology, discoligamentous complex and neurological condition and while the scores which are 4 and more necessitates surgery, conservative treatment is administered to patients having scores lower than 4. When 54 patients are evaluated with SLIC, 24 % of them got 2 points, 37 % of them got 3 points, 28 % of them got 4 points and 9 % of them got 5 points. 61 % of the cases in our series were administered surgery and 39 % of them were administered conservative treatment, and 37 % surgical indication forms according to SLIC classification (Figure-3). Due to the high rate of the cases getting 3 points, which is the lowest limit for the surgery in SLIC classification, although the complete spine injury was graded with 2 points in the classification system, since it is accepted as instable in our general perspective, most of the patients having 3 points and complete spine injury were operated. The distribution of cases getting 3 points according to SLIC classification in the population should be analyzed and we think that in the cases especially with neurodeficit, the surgical operation would be administered in other clinics in practice and this classification required modification.

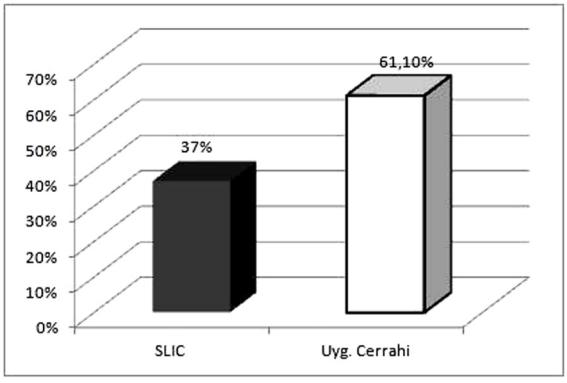

Figure-3. Our SLIC surgery and application in cases with lower cervical spine injury

SLIC: 4 points and more in SLIC classification (The percent of the patients who were suggested with surgery). %PS*: The percent of the patients who were administered surgery by us.*

In Magerl-AO classification, the injury pattern is essentially consisted of 3 main types. It shows A (compression fractures), B (anterior and posterior element injury with destruction), C (anterior and posterior element injury together with rotation). In general, the most commonly seen group in cervical vertebra injuries is Type B. In this classification, instability potential increases through Type C. While group A1 and group A2 have the least complication, neurological deficit is seen in more than 60 % of the patients in Group B1 and Group C2 (7). In our study, when we an-

alyzed according to Magerl-AO, 12 patients (22.2 %) at most were encountered in Group B1. Surgical operation was administered to 33 patients (61 %) who are accepted as instable. The patients having minimal damage on the vertebra and the patients having complete spinal cord involvement with neurodeficit according to SLIC and Magerl AO classification are accepted as clinically instable and the surgical operation showed differences due to the requirement of decompression. The neurodeficit rates are high in injuries of those regions and we think that the classifications should be modified for SLIC and the neurological condition should be considered in cervical trauma in Magerl AO.

In a study conducted by Platzer *et al*. and including 367 cases, it was reported that there were 212 subaxial vertebra injury and the unnoticed or delayed diagnosis were analyzed and the 18 patients (5 %) in the first level trauma center were exposed to unnoticed diagnosis (30). In our study, on the other hand, it was seen that 4 cases (7 %) of the 54 cases with subaxial cervical vertebra injury were evaluated in other trauma centers and they did not receive a diagnosis about cervical vertebra. Those cases applied to our clinics due to their ongoing neck pain and they were diagnosed with vertebra injuries after radiographic examination. The reasons of the delay in this diagnosis are thought as radiologically incorrect interpretation, not completing the radiography series and insufficient quality of radiography. Besides, insufficient clinical and neurological evaluation of the cases or lack of experience can be thought as the reason.

The aim of the surgical intervention in the vertebra fractures is basically to reform the stability. In this case, to define the stability gains importance. There is no discussion about this issue in cases having neuron damage; instability is certain. The blow-out fractures when the posterior structures such as facets, pedicles or lamina are injured should be accepted as instable according to Panjabi (29). Marotti, on the other hand, accepts that progressive neuron damage, accompanying posterior structure damage, increasing kyphosis more than 20°, loss in the vertebra height more than 50 % and presence of free bone pieces narrowing the spinal canal in CT cross section as the instability criteria (26).

After the report of Denis indicating that the delayed neurological worsening at a rate of 17 % following the conservative treatment in the thoracolumbar spine fractures, those fractures were started to be treated by surgery frequently (12). Surgical treatment has advantages such as providing early stabilization of the spine and thus decreasing the risk of neurological worsening, better correction of the kyphosis, which occurs after the fracture, and early mobilization (8, 12).

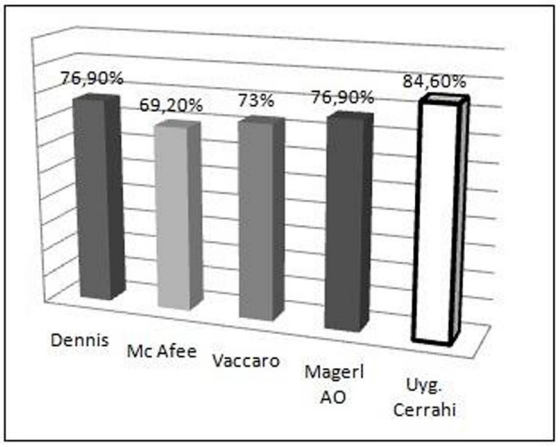

Figure-4. The comparison of the classifications in thoracic cases, surgical administration. *The percentages of the surgical indications of classification systems, %PS: The percentage of the patients who were administered surgery by us.*

While surgery is administered to 22 of the patients (85 %) exposed to thoracic region trauma, conservative approach was preferred for 4 patients (16 %). When the results were compared, surgical indication was decided to 20 patients (70 %) as 6 stable compression fracture, 8 instable compression fractures, 8 blow-out fractures and 1 fracture dislocation in Dennis classification (Figure-4). In Mc Afee classification, 7 patients were classified as stable wedge compression, 1 patient as stable blow-out, 7 patients as instable blow-out, 3 patients as chance, 1 patient as flexion-destruction and 1 patient as translational type and 18 patients (69 %) were in groups suggested for surgery (Figure-4).

In Vaccaro classification, while 7 of 26 patients got 3 and lower points, 19 patients (73 %) having surgical indication got 4 and higher points (Figure-4).

In Magerl AO classification, 4 patients were evaluated as Group A1 and 2 patients were evaluated as Group A2. According to this classification, 20 patients (77 %) were found instable and surgical indication was formed (Figure-4).

While surgery was administered to 60 of 74 patients (81 %) exposed to thoracolumbar region trauma, conservative approach was preferred in 14 patients (19 %). When the results were compared, 10 stable compression fractures, 22 instable compression fractures, 26 blow-out fractures, 10 safety belt fractures and 6 fracture dislocation were found in Dennis classification, 64 patients (86 %) requires surgery according to this classification (Figure-5). The

number of the patients who were administered surgery by us shows similarity with the suggested one in the literature.

According to Mc Afee classification, 12 patients were classified as stable wedge compression, 16 patients as instable wedge compression, 4 patients as stable blow-out, 26 patients as instable blow-out, 8 patients as chance, 4 patients as flexion-destruction and 4 patients as translational type, and 58 patients (78 %) necessitated surgery (Figure-5). The number of the patients who were administered surgery by us shows similarity with the suggested one in the literature.

In Vaccaro classification, while 10 of 74 patients got 3 and lower points, 64 patients (86 %) having surgical indication got 4 and higher points (Figure-5).

In Magerl AO classification, 10 patients were evaluated as Group A1 and 8 patients were evaluated as Group A2 and accepted as instable. According to this classification, 56 patients (76 %) were found instable and surgery was suggested (Figure-5).

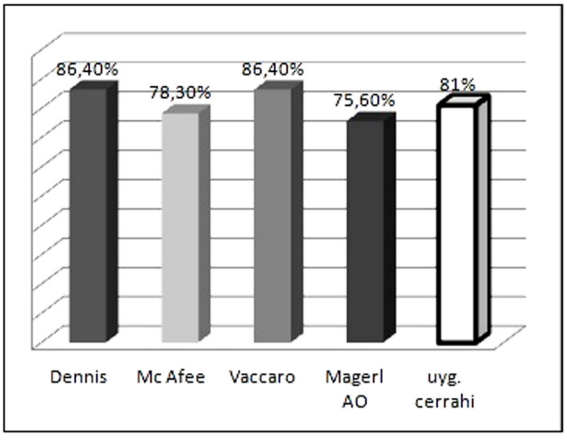

Figure-5. The comparison of the classifications in thoracolumbar cases, surgical administration. *The percentages of the surgical indications of classification systems, %PS: The percentage of the patients who were administered surgery by us.*

While surgery was administered to 42 of 58 patients (72 %) exposed to lumbar region trauma, conservative approach was preferred in 16 patients (28 %). When the results were compared, 10 stable compression fractures, 14 instable compression fractures, 20 blow-out fractures, 10 safety belt fractures and 4 fracture dislocation were found in Dennis classification, 48 patients (83 %) requires surgery according to Dennis classification (Figure-6).

The number of patients who were administered surgery shows similarity with the one suggested in the literature.

According to Mc Afee classification, 12 patients were classified as stable wedge compression, 10 patients as instable wedge compression, 4 patients as stable blow-out, 16 patients as instable blow-out, 8 patients as chance, 6 patients as flexion-destruction and 2 patients as translational type, and 42 patients (72 %) necessitated surgery (Figure-6).

In Vaccaro classification, while 15 of 58 patients got 3 and lower points, 43 patients (74 %) having surgical indication got 4 and higher points (Figure-6)

In Magerl AO classification, 10 patients were evaluated as Group A1 and 8 patients were evaluated as Group A2 and accepted as instable. According to this classification, 40 patients (70 %) were found instable (Figure-6).

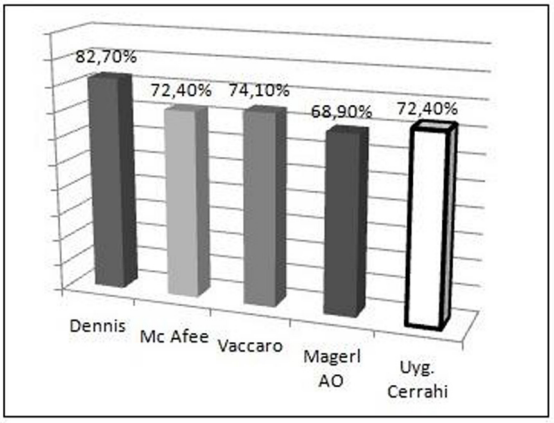

Figure-6. The comparison of the classifications in lumbar cases, surgical administration. *The percentages of the surgical indications of classification systems, %PS: The percentage of the patients who were administered surgery by us.*

Li *et al*. reported that approximately 70 % of all blow-out fractures are in thoracolumbar region (23). In our study, thoracolumbar joint was found as the mostly affected region with 48 %.

Basically, as in the treatment of all fractures, there are two choices in the treatment of thoracolumbar region fractures; conservative and surgical treatment. The increasing biological lifetime nowadays increases the expectation of return to the active life after the injury; issues such as hospitalization period, rehabilitation need and cost-benefit ratio gain the currency. In this context, the choice of conservative or surgical treatment in thoracolumbar fractures gains high significance.

The main problem in spinal injuries formed generally due to high energetic trauma is the lack of a classification system which will help the surgeon for the optimum diagnosis and detection of the treatment, which is standardized, which is easy and which is extensively accepted. A number of studies show the

absence of a classification system whose absence is felt until today, which is accepted by large masses, and which is the leader in prognosis estimation. It is true that the classification system has a number of purposes. Those purposes can be sorted as helping the surgeon during decision, helping in detection of the treatment choices, helping to guess the existing problems before, directing the treatment, predicting the results, to be able to compare with the analysis and similar cases, helping documentation and facilitating the communication.

According to data of this study, the classifications used in different regions of the spine, the number of patients in each group shows differences and they include same rate of patients in terms of the determination of surgery. As a result, when all the classifications are analyzed, the opinion which states that currently there is no ideal classification which achieves all the purposes we mentioned above and which guides directing the treatment and determining the prognosis.

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Corresponding Address: Mehmet Gazi Boyacı, Afyon Kocatepe Üniversitesi Hastanesi, Beyin ve Sinir Cerrahisi, Ali Çetinkaya Kampusü, İzmir Karayolu 7. Km, Afyonkarahisar, Türkiye.
Phone: +90 505 629 04 35
E-mail: mgazibyc@hotmail.com
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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

SPINE FRACTURES CONCOMITTANT WITH PELVIC REGION FRACTURES

PELVİK BÖLGE KIRIKLARINA EŞLİK EDEN OMURGA KIRIKLARI

Cem ÇOPUROĞLU[1], Murat KAYA[2], Mert ÇİFTDEMİR[3], Elif ÇOPUROĞLU[4], Mert ÖZCAN[1]

SUMMARY

Aim: To analyze the frequency and treatment modality of spine fractures in concomitant pelvic region fracture diagnosed and followed-up patients

Patients and Methods: The files of the patients, who were treated for pelvis and acetabulum fractures between March 2009 – December 2014, were evaluated retrospectively. Spine injuries and treatment modalities of the 26 patients having spine and pelvis injuries concomitantly were evaluated. Treatment modalities and timing of the surgery for both area injuries due to high energy fractures were analyzed.

Results: Spine injuries were diagnosed in 26 of the 182 patients, who were treated for pelvic region fractures between March 2009 and December 2014. In spine injured 6 patients, 8 burst fractures, in 6 patients 8 compression fractures, in 2 patients 2 spinous process fractures and in 12 patients 25 transvers process fractures were diagnosed. Eight patients were operated for burst fractures and 1 patient was operated for compression fracture. The other patients with other diagnosis were treated conservatively.

Conclusion: Pelvic injuries concomitant with spine injuries is frequent. In the treatment decision, priority is to stabilize vital functions.

Key Words: Pelvis, Spine, fracture

Level of evidence: Retrospective clinical study, Level III

ÖZET

Amaç: Pelvis bölgesinde kırık tanısı ile takip edilen hastalarda eşlik eden omurga yaralanmalarının sıklığını ve tedavi şeklini analiz etmek.

Hastalar ve Yöntem: Mart 2009 ile Aralık 2014 tarihleri arasında kliniğimizde tedavi edilen 182 pelvis ve asetabulum kırıklı hastaların dosyaları geriye dönük olarak incelendi. Aynı zamanda omurga kırığı mevcut olan 26 hastanın omurga yaralanmaları ve uygulanan tedavi yöntemleri incelendi. Yüksek enerjili yaralanmalar sonucunda oluşan her iki bölge kırıklarında tedavi zamanlaması ve tedavi yöntemleri analiz edildi.

Bulgular: Kliniğimizde pelvis bölgesi yaralanması nedeni ile tedavi edilen 182 hastadan 26 tanesinde omurga yaralanması olduğu tespit edildi. Omurga yaralanmalı 6 hastada 8 patlama kırığı, 6 hastada 8 kompresyon kırığı, 2 hastada 2 spinöz çıkıntı kırığı ve 12 hastada 25 transvers çıkıntı kırığı tespit edildi. Opere edilen 8 hasta patlama kırığı nedeni ile 1 hasta ise torakolomber bölgede kompresyon kırığı nedeni ile opere edildi. Diğer omurga yaralanması tanıları olan hastalar konservatif yöntemlerle tedavi edildiler.

Sonuç: Pelvis yaralanmaları ile omurga yaralanmaları birlikteliği sıktır. Tedavi kararını belirlemede yaşamsal fonksiyonları stabilize etmek önceliklidir.

Anahtar Kelimeler: Pelvis, Omurga, kırık

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III

INTRODUCTION:

Pelvic and acetabulum fractures are generally formed as a result of the high energetic traumas such as the traffic accidents, falling down from height (7, 10). A potential spinal trauma should be suspected in each patient exposed to high energetic trauma (3). In cases when the pelvic region fractures or other fractures are focused in this patient group, who has injuries frequently in more than one region, spinal fractures might not be noticed. The most commonly seen and accompanying injury besides the pelvic region fractures is the thoracic region injuries (16). No recognition of the spinal fracture might lead to spinal injury or the progress of the existing neurological damage after the spinal fracture (3).

The first aim in the poly-traumatized patient is to stabilize the patient. After observing that the vital signs are stable, treatment for the fractures is planned. While the primary aims are to limit the neurological damage and to provide the spinal stability, the correction of the deformation caused by the fracture, diminishing the movement loss and preparation of the ground for the rehabilitation are the secondary aims.

We analyzed the frequency of the accompanying spinal fractures, approach to the spinal fractures,

[1] Assoc. Prof. Dr., Trakya University Medical School, Orthopedics and Traumatology Department, Edirne
[2] Research Assistant Dr, Trakya University Medical School, Orthopedics and Traumatology Department, Edirne
[3] Assist. Prof. Dr, Trakya University Medical School, Orthopedics and Traumatology Department, Edirne
[4] Assist. Prof. Dr, Trakya University Medical School, Anesthesiology and Reanimation Department, Edirne

treatment aims, treatment time and priorities in our patient group we treated due to pelvic and acetabulum fractures retrospectively and we aimed to obtain implications from our own experience.

PATIENTS AND METHOD:

The records of the patients who were treated with pelvic and acetabulum region fractures between March 2009 and December 2014 were analyzed retrospectively. As a result of the conducted analysis, the patients having spinal fractures accompanying the pelvic region fractures (n: 27) formed our study group. The pelvic region of the patients and the spinal injury types, administered treatment methods, the time of the administered treatment and the demographic data of the patients were evaluated.

The hospitalization time of the patients, trauma type, pelvic and spinal injury diagnosis, the level of the spinal injury, existence of accompanying additional injury, treatment method and surgery times were analyzed. Pelvic external fixator and open reduction internal fixation methods were administered in patients with pelvic fractures. The administered method in patients with spinal fractures was posterior instrumentation. 6-8 weeks bed rest as a conservative treatment and prophylaxis for the additional complications such as decubitus ulcers and deep vein thrombosis were administered in patients with pelvic fractures.

RESULTS:

27 of the 182 patients, whose records were reached in the retrospective analysis, having pelvic region injuries were detected with the accompanying spinal fractures. 18 of the patients were male and 9 of them were females. The mean age was 35.1 (16-73). The trauma formation mechanisms were traffic accident outside of any vehicle in 8 patients, traffic accident in the vehicle in 10 patients, motorcycle accident in 1 patients and falling down from height in 7 patients. The mean hospitalization period was 16 days (3-68 days) (Table-1).

Table-1. Demographical Data (Gender: 1-female, 2-male, Trauma: 1-Traffic Accident Outside of Vehicle (1M: motorcycle), 2-falling down from height (2E: electric shock), 3- Traffic Accident Inside the Vehicle)

gender	age	hospitalization period	trauma
1	16	3	1
2	59	45	2
2	26	6	3
2	32	10	2
2	38	8	1M
2	40	12	2E
1	27	7	3
2	36	3	3
2	23	6	1
2	28	8	3
2	56	21	2
1	25	24	2
1	19	15	3
2	43	57	3
1	24	7	2
1	33	3	3
1	48	4	1
2	73	3	1
1	26	4	3
1	61	15	1
2	23	68	2
2	62	12	3
2	44	6	1
2	22	16	3
2	39	24	1
2	25	11	3

It was pointed out that the long hospitalization period of the patients having multiple traumas was the factor increasing the mean. When the pelvic fractures were analyzed, it was seen that there were more than one injuries in the pelvic region in 17 patients and there was isolated pelvic region fracture in 9 patients. It was observed that there was pubic arm fracture in 17 patients, acetabulum fracture in 10 patients, sacrum fracture in 7 patients, pubic dissociation in 11 patients and iliac wing fracture in 3 patients.

8 blow-out fractures in 6 patients, 8 compression fractures in 6 patients, 2 spinous process fractures in 2 patients and 25 transverse process fractures in 12 patients with spinal fractures were detected. While

Table-2. Injury information (Pelvic: 1-Pubic arm, 2-Acetabulum, 3-Sacrum, 4-pubic diastase, 5-sakroiliac diastase, 6-iliac wing, Vertebra: S: spinosis process, T: transverse process, B: burst, additional injury: 1-fracture in the joint, 2-long bone fracture, Op/nonop: 0-nonop, 1-op)

pelvis	vertebra?	kaç seviye vertebra	ek yaralanma	op/nonop	post en	P.EF	P.AR+I	ek yaralanma o	açıklama	p. Enst zamanı	pelvis op zamanı
1	C4S	1	0	0	0	0	0	0	-	-	-
1+2+3	T12B-L1B	2	1+2	1	1	0	0	1	-	30	-
1+2+4+5	L4T	1	0	1	0	1	0	0	-	-	EF:3
1	L2T-L3T-L4T	3	1	0	0	0	0	1	-	-	-
1+6	L1B	1	0	1	1	0	0	0	-	4	-
1	T12K	1	2	1	1	0	0	1	-	9	-
1+3	C7S	1	2	0	0	0	0	1	-	-	-
1+2+4+5	L5K	1	0	0	0	0	0	0	kendi isteği ile taburcu	-	-
2+4+5	L5T	1	0	0	0	0	0	0	-	-	-
4+5	L5T	1	0	1	0	0	1	0	-	28	A:3
1+5+6	L1K	1	2	1	0	0	1	1	-	-	P:11
1+2+3+4	T6K- T8K-L1T-L2T-L4T	5	1+2	1	0	1	0	1	-	-	EF:12
1+3	L3B	1	1+2	1	1	1	0	1	-	13	EF:1
1+2+5	L5T	1	1	1	0	1	0	1	-	-	EF:1
1	L1T-L4T-L3K-L4K	4	1	0	0	0	0	1	-	-	-
3	L5T	1	0	0	0	0	0	0	-	-	-
1+3	L5K	1	0	1	0	0	1	0	-	-	P:1
1+5	L1T-L2T-L3T-L4T	4	0	1	0	1	0	0	-	-	EF:1
5	L2T-L3T	2	0	0	0	0	0	0	-	-	-
2	L1B	1	0	1	1	0	1	0	aynı seans opere	8	A:8
2+3+5	L4T-L5T	2	1+2	1	0	0	1	1	-	-	A:6, P14
1+2	L2B	1	0	1	1	0	1	0	-	3	A:8, P:2
1+4	L5T	1	0	1	0	0	1	0	-	-	A:1
1+4+5+6	T12B	1	0	1	1	1	1	0	vertebra dışmerkez	1	EF:3, A:3
4	L2T-L3T-L4T	3	0	1	0	1	0	0	-	-	EF:1
1+2+3+4	T12B-L1B	2	1	1	1	1	1	1	vertebra dışmerkez	12	EF:1 A6

the spinal injury was one level in 17 patients, it was 2-level in 4 patients, 3-level in 2 patients, 4-level in 2 patients and 5-level in 1 patient (Table-2). There were other extremity injuries in 10 patients besides the pelvic and spinal injuries. Pelvic external fixator was administered to 8 patients with pelvic fractures, 9 patients were fixed with open reduction internal fixation and 11 patients were operated due to other fractures.

7 patients, who were operated due to spinal injury, were operated due to the blow-out fracture and 1 patient was operated due to the compression fracture in thoracolumbar region. Surgical intervention for both of two regions due to spinal fracture and pelvic fracture was applied in 6 patients.

When the surgical operation times were examined, while the spinal surgery of 3 those three patients were performed after the pelvic surgery, in 2 of those patients first pelvic external fixator surgery, then the spinal surgery and then the pelvic open reduction and internal fixation surgeries were performed. In 1 patient who was administered the spinal surgery first in an external center, then pelvic surgery was performed. While the spinal surgeries were administered at the 4th week in 2 patients, it was performed in the first 10 days in other patients. Patients having other spinal injury diagnosis were treated with conservative methods. In 9 patients who were treated conservatively for their spines, also conservative treatment was administered for their pelvic injuries.

DISCUSSION:

Since the pelvic region fractures were formed due to high energetic traumas, there are also accompanying injuries. Not to be able to make a complete and reliable examination in cases exposed to multiple traumas, accompanying injuries might be unnoticed (17) or it might cause a delayed diagnosis (4). Especially in patients who were taken into intensive care directly from emergency service, who has mental fog due to general condition impairment and who was sedated, the repeated direct graphies and computerized tomography diagnosis are helpful for the diagnosis of the spinal fractures (17).

To be able to recognize the accompanying other fractures to the life threatening pelvic region trauma, firstly fractures should be suspected. Next, basic examination methods such as inspection and palpation, and radiological examination help. In this study, we aimed to evaluate the frequency of accompanying spinal fractures in patients, whose basic application reason was pelvic region trauma, and our treatment approach.

According to advanced trauma life support (ATLS) guidance, the primary graphies that should be taken in the emergency services are cervical collateral, thorax anterior-posterior and pelvic anterior-posterior graphies (17). In patients, who cannot be diagnosed with those graphies, additional graphies might be taken after the patient is stabilized.

Spinal fractures are most commonly seen in thoracolumbar joint among the whole spine (3). Most of the stress is accumulated between T10 and L12 since the thoracic spine is rigid and since it is the transition region in between the motile lumbar region. There was thoracolumbar joint injury in 9 of the 26 patients in our study.

A potential spinal trauma should be suspected in patients exposed to high energetic trauma (3). In the thoracolumbar region, most frequently, compression fractures, blow-out fractures, flexion destruction injuries and dislocations with fractures are seen (3). Most of the compression fractures are treated with the

methods other than surgery. It is suggested that surgical treatment should be administered in kyphosis more than twenty degrees and in compression more than 50%. The most important factor for deciding the surgical treatment in blow-out fractures is the presence of the posterior ligamentous complex fissure (1). In our cases, blow-out fracture in 7 of the 8 patients and compression fracture in one patients resulted in the formation of surgical indication.

While the treatment of the patient with spinal fracture is being planned, the neurological condition, spinal stability, deformation level and additional injuries should be considered. Due to the severity of the trauma, cardiovascular, pulmonary and neurological injuries might accompany with the thoracolumbar fractures (19). Canal occupation and progressive neurological injury necessitates the surgical decompression and stabilization. If the instability due to the fracture increases, the rigidity of the surgical treatment increases. The angle of the regional kyphosis might increase in the postoperative period in patients with spinal fracture (13).

As in the pelvic fractures, thoracolumbar fractures are mostly seen in actively working males between 20 and 40 of ages (15) frequently (11). The male patients were dominating in our study group and the mean age was 35.1. The stability of the fracture is significant in the patients with spinal fractures as in the case of the patients with pelvic fractures. If the fracture is instable, it might be the reason for the progressive neurological injury. Conservative treatment is suitable in fractures which are stable and which do not have neurological injury (12). The deterioration in the neurological condition necessitates urgent surgical intervention (2). Percutaneous techniques might be used as the surgical fixation method (14).

Sacrum, which has significant role in the transfer of the spinal load to the pelvic, has an important role in providing the mechanical stability of the spine. If there is sacrum fracture accompanying to the deterioration of the pelvic ring integrity, there is spinopelvic instability. Stabilization should be performed immediately (6). The caudal migration of sacrum and the cranial migration of the iliac wings lead to pelvic instability and problems in standing and walking (5). Major spinal intervention should be avoided in the early period after the injury in borderline patients having multiple traumas (8). Percutaneous techniques might be administered to provide the stability (9, 18). Similarly, the administration of the controlled orthopedics principles decreases the morbidity in patients with pelvic fractures (7). While the damage controlled orthopedics provides better results in Tile C Type fractures, early total care is suggested in Tile B Type fractures (10). In our study group, while the early stabilization was administered right after the trauma in patients with pelvic instability, the elective surgery was administered between 4-10 days, within the window period.

As a result, spinal fractures are formed as a result of the high energetic trauma as the pelvic fractures. In the patient group who has high neurological injury risk together with hemodynamic instability, the vital functions should be stabilized first while the treatment decision is being made.

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Address: Cem Çopuroğlu, Trakya University Medical School, Orthopedics and Traumatology Department, 22030, Edirne.
Mail: cemcopur@hotmail.com
Tel: +90 284 235 76 41 (4707) **GSM:** +90 532 336 19 23
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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

IMPACT OF INTERBODY FUSION IN DEGENERATIVE VERTEBRAE ON SACRAL PEDICLE SCREW SURVIVAL

DEJENERATİF OMURGA TEDAVİSİNDE İNTERBODY FÜZYONUN SAKRAL PEDİKÜL VİDASI SAĞKALIMINA ETKİSİ

Okan ÖZKUNT[1], Turgut AKGÜL[2], Kerim SARIYILMAZ[1], Murat KORKMAZ[3], Fatih DİKİCİ[4], Ufuk TALU[5], Cüneyt ŞAR[5]

SUMMARY

Purpose: Analyze the prevalence of sacral screw loosening following posterior long segment instrumentation and fusion in adult spine.
Material methods: 66 patients who were diagnosed with adult spinal deformity with L5-S1 degeneration and treated using posterior instrumentation and PL or interbody fusion in our institute between 2003-2008 were included in the study. Anterior-posterior projection and lateral lumbosacral and CT projections were used for radiologic evaluation of patients. Patients were reviewed retrospectively under two groups: interbody fusion and posterolateral (PL) fusion. Standard lumbosacral X- ray was performed to evaluate pseudo arthrosis or sacral pedicle screw loosening. Preoperative and postoperative VAS scores were measured for functional assessment.
Results: Patients age were 69.1 (37-89) and mean follow-up was 8.8 years (6-11 years). 48 patients had degenerative spinal deformity and 18 patients had degenerative spondylolisthesis. We applied posterior instrumentation with posterolateral fusion in 50 patients and posterior instrumentation with interbody fusion in 16 patients. All procedure included L5-S1 segment. Level of posterior instrumentation mean was 5.9 (4-11). In PL fusion group 12 patients had sacral screw failure (24%) but no sacral screw failure in interbody fusion group (p<0,005). VAS scores increased in both groups but in interbody fusion decrease was more prominent than PL fusion group (p < 0,05)
Conclusion: Interbody fusion of L5-S1 disc area for treatment of degenerative lumbar disease in patients with L5-S1 degeneration results positively on survival of the sacral pedicle screws.

Key words: Lumbar degenerative disease, instrumentation, sacral screws

Level of evidence: Retrospective clinical study, Level III.

ÖZET

Amaç: Çalışmamızda yetişkin yaş grubunda uzun seviye posterior enstrümantasyon yapılan hastalarda cisimler arası füzyonun sakral vida gelişimi sıklığına etkisini araştırmayı amaçladık.
Materyal-Metod: Çalışmamızda 2003-2008 arasında, L5-S1 segmentinde dejenerasyonu bulunan ve posterior enstrümantasyonla tedavi edilen dejeneratif omurga tanılı 66 hasta retrospektif olarak değerlendirildi. Sadece posterolateral füzyon yapılanlar ve posterolateral füzyona L5-S1 cisimler arası füzyon eklenenler olarak iki gruba ayrılan hastalar radyolojik olarak ön-arka ve lateral lumbosakral grafiler ve bilgisayarlı tomografiyle değerlendirildi. Standart grafiler ile psödoartroz ve sakral vidada kırık ya da gevşeme değerlendirildi. Ameliyat öncesi ve sonrası fonksiyonel değerlendirmede VAS skoru kullanıldı. İstatistiksel analizler için SPSS (Statistical Package Social Sciences for Windows 12.0) programı kullanıldı. p<0,05 sonucu istatistiksel anlamlı olarak değerlendirildi.
Sonuçlar: Hastaların ortalama yaşı 69.1 (37-89) ve ortalama takip süresi 8,8 yıl (6-11 yıl) idi. 48 hastada dar kanalın eşlik ettiği dejeneratif omurga ve 18 hastada dejeneratif spondilolistezis bulunmaktaydı. 50 hastaya uzun segment posterior enstrümantasyon ile birlikte posterolateral füzyon, 16 hastaya ise uzun segment enstrümantasyon ve L5-S1 cisimler arası füzyon uygulandı. Ortalama posterior enstrümantasyon seviyesi 5.9 (4-11) idi. Sonuçta, cisimler arası füzyon uygulanan grupta sakral vidalarda yetmezlik görünmezken, diğer grupta 12 hastada (% 24) gevşeme görülmekteydi. (p<0.05) Klinik olarak, cisimler arası füzyon yapılan grupta VAS skoru istatistiksel olarak daha iyiydi. (p<0.05)
Çıkarımlar: Lomber dejeneratif omurga hastalığının tedavisinde L5-S1 seviyesinde yapılan interbody füzyon uzun seviye enstrümantasyon yapılan hastalarda sakral pedikül vidasının gevşemesini azaltması ve daha iyi klinik sonuçlar sağlaması nedeniyle tercih edilebilir bir yöntemdir.

Anahtar Kelimeler: Lomber dejeneratif hastalığı, enstrümantasyon, sakral vida

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III.

[1] Surgeon of the Orthopedics and Traumatology, Department of Orthopedics and Traumatology, Acıbadem University Atakent Hospital, İstanbul.
[2] Surgeon of the Orthopedics and Traumatology, Department of Orthopedics and Traumatology, İstanbul University Medical Faculty, İstanbul.
[3] Surgeon of the Orthopedics and Traumatology, Department of Orthopedics and Traumatology, Şişli Etfal Training and Research Hospital, İstanbul.
[4] Assoc. Prof., Surgeon of the Orthopedics and Traumatology, Department of Orthopedics and Traumatology, Acıbadem University Atakent Hospital, İstanbul.
[5] Prof., Surgeon of the Orthopedics and Traumatology, Department of Orthopedics and Traumatology, İstanbul University Medical Faculty, İstanbul.

INTRODUCTION:

During degeneration process morphologically vertebrae goes through dysfunction, instability and immobilization. After the degeneration a series of complex pathologies like subchondral sclerosis, osteophyte formation, convergence in anterior vertebral body, and spinal stenosis could be observed (11, 17, 20) In the degenerative process L5-S1 disc is most commonly affected but addition of this level to the fusion during lumbar vertebral surgery is still debated (1) Stopping the fusion at L5 level during surgical treatment, preserve range of motion in L5-S1 level. On the other hand, degeneration progressing in this level negatively affects the functional outcomes. Adding S1 level to the fusion contains risks like pseudoarthrosis depending on the procedure. It is reported that sacral pedicle screws may fail and anterior fusion might be added to posterior fusion to prevent this situation.(11)

Aim of our study is show the effects of addition of anterior fusion to the procedure in patients with long segment fusion in which sacrum is included on survival of sacral pedicle screws.

PATIENTS AND METHODS:

66 patients who were diagnosed with adult spinal deformity with L5-S1 degeneration and treated using posterior instrumentation and PL or interbody fusion in our institute between 2003 and 2008 were assessed retrospectively.

Inclusion criteria was at least 4 levels fusion including L5-S1 segment for degenerative vertebrae, and in order to assess the survival of S1 screw at least years of follow up. Patients with revision surgery and short segment fusion were not included in the study.

Patients were evaluated in to groups: patients with posterolateral fusion, and patients with interbody fusion at L5-S1 disc space additional to posterior fusion. In patients included in the study posterolateral interbody fusion technique was employed for interbody fusion.

Patients files were retrospectively evaluated and clinical examination findings, VAS scores, surgery information, and complication were reviewed. Radiological evaluation was conducted from antero-posterior and lateral x-rays, CT and MRI. In the control x-rays fractures in the sacral pedicle screw or radiolucent area around the screw is accepted as loosening of the screw. For the final clinical evaluation patients VAS scores were considered.

For statistical analysis SPSS (Statistical Package Social Sciences) for Windows 12.0 program was employed. For comparison of quantitative data student t-test, and for qualitative data chi-square tests were used. $P<0.05$ was accepted as statistically significant.

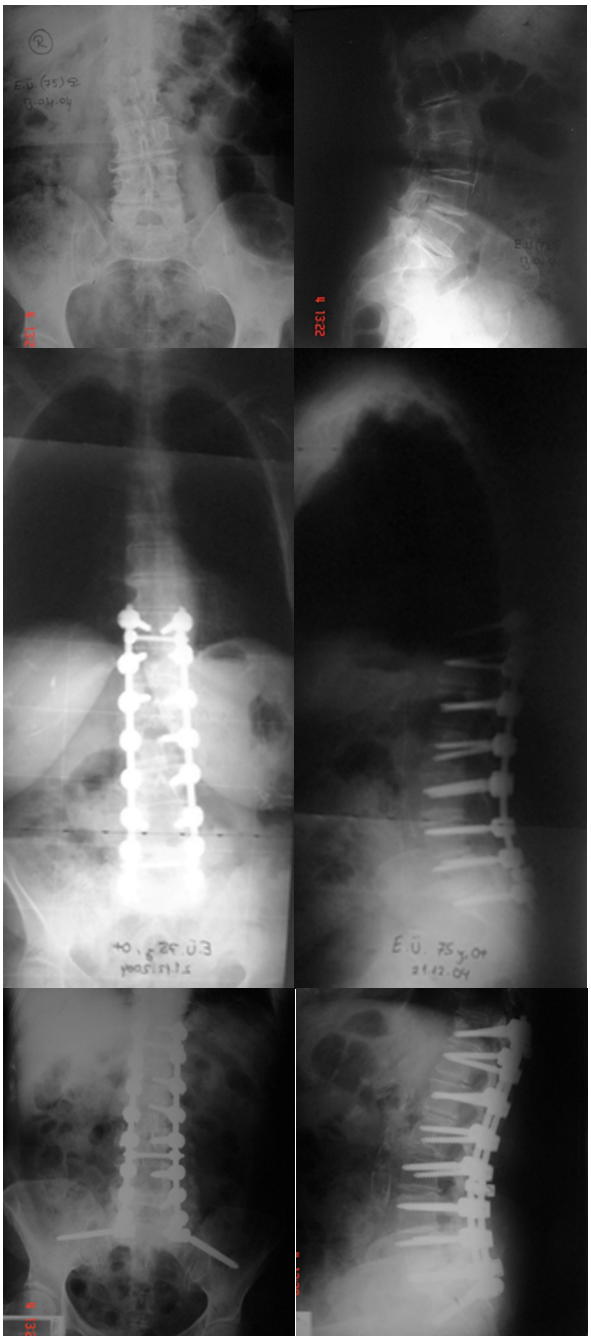


Figure-1. A 75 years old female patient with degenerative lumbar vertebrae, preoperative x-rays show (a, b) degeneration at L5-S1 level. Patient was treated with posterior instrumentation with T11-S1 posterior fusion (c, d). In the follow ups due to screw loosening and pain complaints revision surgery was performed (e, f).

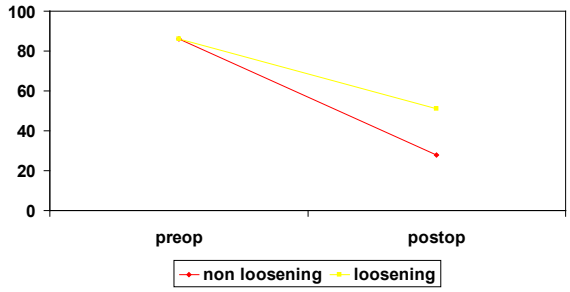
RESULTS:

Average age of the patients included in the study was 69 (37–89) years and average follow up period was 8.8 (6-11) years. Patients' diagnosis was degenerative vertebrae accompanied by spinal stenosis (48 patients) and degenerative spondylolisthesis (18 patients). Choice of surgical procedure was long segment posterior instrumentation with posterolateral fusion in 50 patients, and long segment instrumentation with L5-S1 fusion in 16 patients. Average of posterior instrumentation levels was 5.9 (4-11).

In 12 patients included in the study, sacral pedicle screw insufficiency was observed (Figure-1). Sacral pedicle screw insufficiency was observed in 12 of the 50 patients (24%) who received posterior instrumentation and fusion, but in added interbody fusion group no sacral pedicle insufficiency was observed. When both groups were compared for screw loosening results of interbody fusion group was significantly better ($p<0,05$).

Clinical evaluation of the patients using VAS scores revealed preoperative VAS scores in posterior fusion group was 8.2 and postoperatively 5.1 ($p<0,05$). In the group with added interbody fusion preoperative VAS scores were 8.3 and postoperatively 3.6 ($p<0.05$). When both groups are compared VAS scores of interbody fusion was significantly better ($p<0.05$). (Table-1)

Table-1. Diagram showing changes in VAS scores according to the S1 screw loosening condition.



In two of our cases dural injury repaired during surgery and superficial infection treated with antibiotics were observed.

DISCUSSION:

In degenerative vertebral diseases L5-S1 degeneration effects the prognosis of the disease. In the meta-analysis of Sardar et al. reported that in case the fusion is stopped at the level of L5 during fusion complication rate was 23.5% but if patient had L5-S1 degeneration and this level is included in the fusion complication rate was 53% (16) Addition of L5-S1 level to the fusion is not recommended in when deformity includes lumbar-sacral region, progressive deformity and instability conditions and how L5-S1 should be added to the treatment is still debatable.(8)

In the treatment of degenerative lumbar vertebrae, and in the patients treated with long segment fusion complication rates are significantly higher (10). Technically instrumentation of the sacrum results in longer surgery time and increased bleeding.(12) In cases which only posterior fusion was implemented when fusion level is chosen as S1 instead of L5 pseudo-arthrosis risk is significantly increased.(9) After pseudo-arthrosis development at L5-S1 level control of the movement in these segments could only be possible through sacral implants.(13, 14) If the fusion is not complete this overloading on the sacral implants will result in loosening or fracture of sacral pedicle screws. Cho et al. reported this rate in their series as 25%.(6) Again in the literature Kim et al. in their 144 case series reported screw loosening rate as 24%, Edward et al. reported as 42%.(7, 12) We in our study, in 50 patients treated with posterior instrumentation and fusion found screw loosening rate as 24%.

In the literature, in order to minimize L5-S1 movement and perform fusion it is shown that a better fastening method biomechanically is suggested, and interbody fusion techniques, lubricant proteins and iliac screws accompanying sacral screws are described in the literature with success .(2, 4, 6, 7, 16, 18, 19) In fusion only from the posterior is insufficient and requirement for an anterior support bring up the idea for a 360 degrees fusion and to regain sagittal balance interbody fusion is suggested (15). In the studies from the literature, in patients with L5-S1 interbody fusion it was shown that pseudo-arthrosis rates are significantly smaller (5,7,10,12). After the achievement of L5-S1 fusion clinical and functional results were reportedly better with less observed complications.(5) Results we obtained in our study are in conformity with the literature. In patients whom interbody fusion is added to the procedure VAS scores were significantly higher. In cases with achieved fusion no sacral screw complications were observed. Statistically significantly, in cases with added interbody fusion long term radiological and clinical outcomes are superior. But as depicted in the literature surgery times are prolonged and bleeding was increased.

In the treatment of lumbar degenerative vertebral diseases in the case of inclusion of L5-S1 level to the fusion, application of interbody fusion has significant and beneficial effects on sacral pedicle screw survival in the long term.

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CORRESPONDING ADDRESS: Op. Dr. Okan Ozkunt, Acıbadem Üniversitesi Atakent Hastanesi Ortopedi ve Travmatoloji Kliniği, Halkalı, İstanbul
Phone: 90 212 404 4048 **FAX:** 90 212 404 4445
Email: drdeto@gmail.com
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CASE REPORT / *OLGU SUNUMU*

OSTEOID OSTEOMA OF THE ATLAS: REPORT OF A NEW CASE AND REVIEW OF THE LITERATURE

ATLASIN OSTEOİD OSTEOMASI: YENİ BİR VAKA SUNUMU VE LİTERATÜRÜN GÖZDEN GEÇİRİLMESİ

Abolfazl RAHIMIZADEH[1], Touraj YAZDI[1], Shaghayegh RAHIMIZADEH[1]

SUMMARY

Osteoid osteomas of the cervical spine are uncommon causes of neck pain and painful torticollis in children, adolescents and young adults. In the cervical spine, affection of the upper cervical spine is rarely reported and in particular, atlas vertebra remains the least common location for being involved by osteoid osteomas, where only four cases have been reported previously. Osteoid osteomas of the cervical spine are uncommon causes of neck pain and painful torticollis in children, adolescents and young adults. In the cervical spine, affection of the upper cervical spine is rarely reported and in particular, atlas vertebra remains the least common location for being involved by osteoid osteomas, where only four cases have been reported previously. Imaging studies in a 30-year-old male suffering from severe neck pain for a period of one year disclosed an osteoid osteoma of the atlas arch. The tumor was removed with laminectomy of the atlas. Postoperatively, neck pain disappeared within a few days. At 2-year follow-up, the patient has remained symptom free. Review of the literature disclosed since the report of the first example of the osteoid osteoma of the atlas in 1978 by Jones only 3 more cases have been published so far. Therefore, the current case is the fifth example of atlas affection by this tumor.

Key words: Atlas, Osteoid Osteoma, Spine tumors, Upper Cervical

Level of evidence: Case report, Level IV

ÖZET

Osteoid osteoma, adölesan ve genç erişkinlerde, servikal bölgede, ağrılı torticollisin en sık sebebidir. Servikal bölgede üst servikal tutulum oldukça nadir olup, sadece 4 vaka rapor edilmiştir.
Bu olgu sunumunda 1 yıldır ağrısı olan ve görüntüme çalışmaları ile atlasın arkında yerleşmiş osteoid osteoma sunulmuştur. Tümör laminektomi ile çıkartılmıştır. Postoperatif bir kaç hafta ağrısı olan hastanın 2 yıl sonundaki kontrolünde hastanın ağrısının olmadığı belirlenmiştir.
Literatür taramasında ilki 1978 yılında Jones tarafından tanımlanan olgu dışında 3 olgu daha yayınlandığı görülmüştür. Bu olgu, literatürdeki 5. olgudur.

Anahtar Kelimeler: Atlas, osteoid osteoma, omurga tümörü, üst servikal omurga

Kanıt Düzeyi: Olgu sunumu, Düzey IV

INTRODUCTION:

Osteoid osteoma is the most common primary benign spinal tumor occurring in children and adolescents where more than 50 % of the cases are seen in the second and third decade of life. Osteoid osteoma was described for the first time by Bergstrand in 1930. Later, in 1935, Jaffe defined this tumor as a benign osteoblastic tumor of bone (3-4,10-13,15). Osteoid osteomas are self limited tumors and small ranging in size from 0.5 to 2 cm. This tumor is mostly found in the thoracolumbar spine followed by the cervical spine (3-4,10-13,15). The upper cervical spine remains the least common location (1,9). The tumor typically is located at the posterior elements of the spine.

Recently, in our practice, we were faced with a 31-year- old man suffering severe nocturnal neck and occipital pain with positive aspirin test. Cervical MRI was suspicious of a tumor at the arch of atlas, but Isotope scan clearly showed a hot spot at the lamina of C1 compatible with osteoid osteoma. Subsequent application computerized tomography confirmed the diagnosis the osteoid osteoma of atlas arch and clari-

[1] Pars Institute of Spinal Surgery and Research, Pars Hospital Tehran, Iran

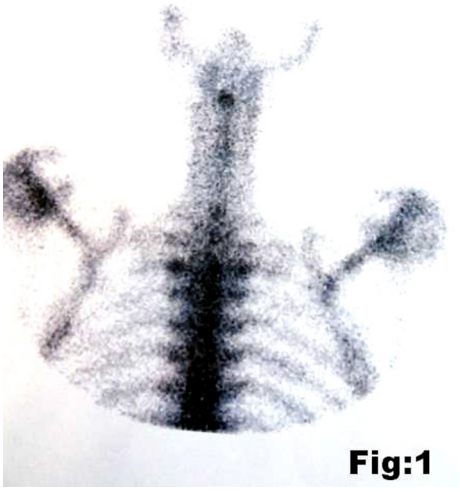

Figure-1. Isotope scan showing a hot spot in the upper cervical spine.

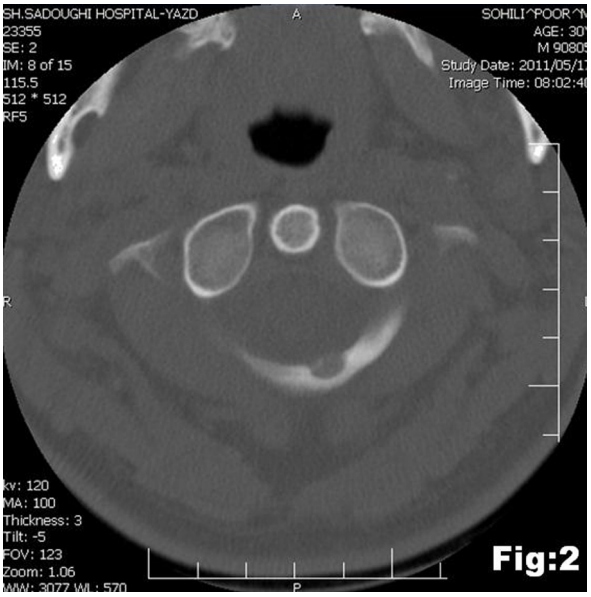

Figure-2. Axial C.T. scan through the atlas showing an osteolytic lesion in the lamina.

fied the details of it. Hemi-laminectomy of the atlas arch result in the complete relief of pain. With careful review of the literature, we could encounter only 5 cases of osteoid osteoma of atlas reported previously, 4 of which were located at lamina and one on the lateral mass (2,5,8).

CASE REPORT:

A 30- year-old man was admitted with one year history of neck as well as occipital pain and spasm of the neck muscles. Examination revealed tenderness at the posterior aspect of upper cervical spine in deep palpation where his neurological exam was normal. Plain radiographs were normal. But, MRI was suspicious for pathology at the arch of atlas.

Technetium bone scan demonstrated a hot spot in the posterior arch of atlas compatible with an osteoid osteoma. Subsequently, CT scan of the upper cervical spine, with narrow slices was performed which demonstrated a small right-sided tumor in the atlas arch with sclerotic margin and a nidus inside the details of the tumor. Treatment with aspirin relieved the pain and ameliorated nuchal spasm. The risk-benefit of NSAIDs versus surgery was described and the patient' will was undergoing surgery.

Via a mid-line incision, the paravertebral muscles were stripped off the laminas of C1. Subsequently, the tumor was removed along with lamina of atlas through an appropriate hemi-laminectomy.

Post-operatively, the patient's pain and neck spasm were completely relived. Now, at 2 years follow up, the patient is normal and free of any pain.

DISCUSSION:

Osteoid osteoma is a common primary tumor of the vertebral column. In the series of Levine et al included 41 patients treated during a 36-year period, 18 cases were osteoid osteoma where none was located at atlas (9). Furthermore, osteoid osteoma was found in 20 out of 61 primary tumors of the cervical spine reported by Abdu et al, but atlas was not affected in any (1). In current review, only 5 cases could be encountered in the literature (Table-1).

Table-1. In current review, only 5 cases could be encountered in the literature

Author	Year	Sex	Age	Location	Surgery	Outcome
Jones	1987	M	8	Lamina	Enblock resection	Good
De Praeter	1999	M	21	Lamina	Hemilaminectomy	Good
De Praeter	1999	M	22	Lamina	Hemilaminectomy	Good
Amirjamshidi	2007	M	14	Lateral mass	Drilling	Good
Our case	2014	M	31	Lamina	Hemilaminectomy	Good

This tumor is composed of an osteolytic defect and sharp sclerotic margin. The osteolytic compartment contains osteoblasts that produce soft osteoid and a nidus. The nidus consists of an irregular network of osteoid trabeculae with highly vascularized stroma and varying degree of calcification presented as woven bones. (3-4,10-13)

Osteoid osteoma usually measure from 0.5 to 2 cm in size which might be located in cancellous, sub-periosteal or cortical part of a bone. 3, 4, 10-13, 15 65 the most common and classical form is cortical type where sub-periosteal or cancellous ones remain less frequent types.

Male are more affected than females with ratio of 3 to 1. Actually, more than 50 % of the cases occur in young adults, between the ages of 15 and 25 (3-4,10-13,15). However, It rarely occurs before the age of five and after the age of 40. The predilection site of osteoid osteoma in the vertebral column is the lumbar. However, the dorsal and the cervical spine are affected in decreasing frequency and the upper cervical region remains the less frequent site of formation actually, osteoid osteomas are distributed throughout all levels except C1 and C2 (1,3-4,9-13,15).

In careful review of the literature we could find only 7 cases with axis affection and only 4 cases affecting atlas. This tumor predominantly involves the posterior elements, such as the spinous processes, transverse processes, facets, lamina, and pedicles while it rarely prefers the vertebral body. 3 out of 4 surveyed cases including the current case were in the lamina of atlas and the other two in the lateral mass (2,5,8).

The clinical picture of osteoid osteoma of the cervical spine is local neck pain being reached to maximum at nights. Dramatic relief of pain by Aspirin can be used an screening clinical test for clinical diagnosis this tumor (1,3-4,9-13,15). However in those affecting the cervical spine, varying degree of torticollis might be seen. Torticollis is a typical presenting feature in 10 to 100 % of those with cervical involvement (1,9). Torticollis was seen in 2 out of 4 cases with atlas involvement (2,5,8).

Unfortunately, despite classical noctural pain, diagnosis of this benign tumor is often delayed. Conventional radiographs usually fail to show the lesion. Actually, these small tumors are easily obscured among the overlapping shadows of the cervical spine.

Bone scintigraphy is the most sensitive screening test and can provide accurate localization of the tumor (3-4,10-13,15) actually, early diagnosis of an osteoid osteoma can be achieved only by this tool in all cases with unexplained local pain. Thin axial slices and reformatted CT images help both the accurate shape and the exact size of the tumor, but only after scintigraphy has shown the site of affection (2,5,8) However, if the cuts are at wrong level or too wide, the tumor might be missed completely.

GD enhanced MRI focusing on the suspected site might clearly show and detect the tumor but is less sensitive than CT scan where scintigraphy remains the most sensitive test (2,5,8).

Nonetheless, after establishment of the diagnosis of the osteoid osteoma of atlas and localizing the site, the treatment, in all cases has been surgical excision. In affection of the neural arch, laminectomy of the corresponding lamina will ensure the surgeon that the tumor is completely removed other modes of surgery such as en- block excision, curettage and drilling may provide similar results, although the chance of recurrence exists. Laminectomy was applied in 4 out of 5 reviewed cases including the current case. In the remaining one was managed by interlesional drilling. Regardless of the mode of surgery, tumor removal provides reliable relief of pain and the coexisting deformity disappears. Pain disappears soon after excision where torticollis resolves within a few days to a month (2,5,8).

Recently, with application of radiofrequency ablation of the osteoid osteomas located at the skeletal bones, success could be easily achieved (6-7). But careful and safe application of this setting in osteoid osteoma of the vertebral column is concerned with regard to possible thermal damage to the neural structures. This method might be useful in those tumors where the site of affection is hardly accessible by surgery, but far enough from the neural tissues (6-7).

In those with comorbidities, or in those with less -accessible location, long-term conservative treatment with Aspirin or non-steroid anti-inflammatory drugs (NSAIDs), might result in disappearance of the tumor and its ultimate solidification (7).

In summary, upper cervical region is rare location of osteoid osteoma. As imaging continued to evolve, the diagnosis of these lesions might be made easier and earlier. Affection of lamina of the upper cervical region is the simplest one which can be managed surgically either via tumor resection or through laminectomy. However, management of osteoid osteomas located at the pedicle or the body is a challenging issue which requires special consideration. Besides surgical intervention, recent evolution made by percutaneous CT guided radiofrequency has made the precise non-surgical resection of these tumors possible. Conservative treatment can be applied in those cases located at non-accessible location or in those with serious comorbidities.

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Address: Abolfazl Rahimizadeh, Pars Hospital, 83 Keshawarz Blvd15145,Tehran, Iran
Phone :+989123226149
GSM: +989123226149
e-mail: a_rahimizadeh@hotmail.com

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CASE REPORT / *OLGU SUNUMU*

GIANT CELL TUMOR OF SACRUM A REPORT OF TWO CASES

SAKRUMUN DEV HÜCRELİ TÜMÖRÜ İKİ OLGU SUNUMU

Saleem HUSSAIN[1], Rumana MAKHDOOMI[2], Nayil KHURSHEED[3]
Aiffa AIMAN[4], Nazia BHAT[1]

SUMMARY

Giant cell tumor (GCT) of bone is a rare neoplasm that accounts for approximately 5% of all primary bone tumors in adults. Sacrum is an unusual site for giant cell tumor and it is an intriguing and unpredictable entity with a high predilection for recurrences. We hereby report 2 cases of Giant cell tumor of sacrum occurring in a 42- year- old male and a 17- year- old female. The tumor recurred twice in the 42- year- old male and was treated with surgery radiotherapy and embolization, whereas the tumor did not recur in the 17- year- old female who was operated for the same.

Key words: Giant cell tumor, sacrum, surgical treatment

Level of evidence: Case report, Level IV

ÖZET

Kemiğin dev hücreli bir tümör olup primer kemik tümörlerinin % 5'ini oluşturur. Sakrum sık tutulan bir bölge değildir buna karşın tanısı zor ve nüks riski daha yüksektir. Bu çalışmada sakral dev hücreli tümörü olan biri 17 yaşında kadın, diğeri 42 yaşında erkek hasta sunulmuştur. 42 yaşındaki erkek hasta tümör eksizyonunu takiben iki kez nüks etmiş ve radyoterapi ve embolizasyon uygulanmıştır. Diğer taraftan 17 yaşındaki kadın hasta aynı zamanda opere edilmesine rağmen nüks görülmemiştir.

Anahtar Kelimeler: Dev hücreli tümör, sakrum, cerrahi tedavi

Kanıt Düzeyi: Olgu sunumu, Düzey IV

INTRODUCTION:

Giant cell tumor (GCT) of bone is a rare neoplasm that accounts for approximately 5 % of all primary bone tumors in adults (9). GCT most frequently occurs at the ends of long bones, sacrum is an uncommon site (11). In all locations the neoplasm occurs most commonly between the ages of 25-40 years and it affects males and females with equal frequency (1). Various treatment methods have been advocated including arterial embolization, curettage, surgical excision, radiation and cryotherapy (8). Treatment is very successful in long bone lesions, but the optimal treatment and medical management of GCT in spine and sacrum has not been well established (8).

We hereby describe two cases of Giant cell tumor of sacrum, one occurring in a 17 year old female and another in a 42 year old male.

CASE REPORTS:

Case No.-1

A 42 years-old-male reported to our Neurosurgical OPD in 2009 with complaints of pain and weakness of both lower limbs. On examination power in the lower limbs was 4/5 proximally and 3/5 distally. There was sensory deficit along L5 - S1 dermatomes. MRI spine showed a mass in sacral area with bilateral paravertebral extension, involvement of bilateral sacroiliac joints with extension to spinal canal. Surgery was done and intraoperatively a soft friable highly vascular tumor involving L5-S3 extending laterally to paraspinal tissue (more on left side) compressing S1 nerve roots was seen. Bilateral dural sac was displaced posteriorly. His post-operative period was uneventful. He was subjected to radiotherapy (25 cycles). He was doing well till 2011 when he again started with weakness of both limbs. MRI has done showed recurrence

[1] M.D., Resident of Pathology, Sheri-Kashmir-Institute of Medical Sciences (SKIMS), Srinagar, Kashmir, India.
[2] Ass. Prof., M.D., Department of Pathology, Sheri-Kashmir-Institute of Medical Sciences (SKIMS), Srinagar, Kashmir, India.
[3] M.S., MCh, Associate Professor of Neurosurgery, Departments of Neurosurgery, Sheri-Kashmir-Institute of Medical Sciences (SKIMS), Srinagar, Kashmir, India.
[4] M.D., Senior Resident of Pathology, Sheri-Kashmir-Institute of Medical Sciences (SKIMS), Srinagar, Kashmir, India.

of GCT. Patient was treated with embolization (bilateral ileolumbar branches) followed by re-exploration and excision of the lesion. Patient on a follow-up period of 3-yrs is doing well and is recurrence free (Figure-1).

Figure-1. MRI lumbo-sacral spine sagittal sections T1 **(a)** and T2 **(b)** weighted images and **(c)** frontal MR view show a mixed intensity lesion involving the sacrum.

Case No.-2:

A 17-years- old female came to the neurosurgical OPD with chief complaints of low backache and pain in both lower limbs for the past 1 year. There was no history suggestive of motor or sensory deficits. MRI showed an expansible destructive lesion in the sacrococcygeal area which was thought as chordoma. Surgery was performed, presacral, grayish, non suckable highly vascular tumor was removed. The sacrum was eroded and tumor was engulfing the nerve roots. Rectum was free. Her post-operative period was uneventful. On a 2-year follow-up period she is doing well.

DISCUSSION:

Giant cell tumor of bone is a distinct neoplasm with some unusual behavioral characteristics. In an analysis of 10 cases of GCT sacrum by Martin et al (8), the mean age was 31 years with an age range of 13-49 years. Our patients fell well within the age range, one being 17-years of age and the other 42-years. All his patients presented with pain for an average duration of 30-months and the pain most frequently radiated to the back and into the thighs. Both of our patients also presented with pain radiating to both lower limbs. Bladder and bowel disturbance however seen in 70 % of his patients was not seen in our patients.

Kanamori reported a patient of giant cell tumor of sacrum who presented with low back pain and numbness on the posterior aspect of left thigh (5). Liang also presented three case reports of giant cell tumor of sacrum in a 31-year-old male and two females' aged 1- yr and 31-yrs (7). In the cases analyzed by Martinet al (8), the sacral lesions were large, poorly defined lytic masses arising in the central part of the sacrum and spreading to involve both wings of the sacrum. Three patients in his series had an associated soft tissue mass. The most frequent location was the upper two segments of the sacrum, although several lesions were so large that they involved the entirety of the sacrum. We also experienced predominantly lytic lesions involving the entire sacrum in both the cases.

Kanamori in a study on a recurrent sacral GCT noted a large lytic and destructive bone lesion below the level of the first sacral segment (5). No calcifications were noted within the mass. MRI in his case demonstrated a sacral lesion which was of mixed intensity on T1 and T2 weighted sequences. Einestein also reported a large destructive lesion involving the distal half of the sacrum with extension to the sacrococcygeal joint. The superior margin of the lesion was poorly defined and there was no sclerosis at the edge of the lesion (3).

The gross appearance of a giant cell tumor is usually quite characteristic. The lesion is soft and dark brown. Microscopically, giant cell tumors consist of multinucleated giant cells and mononuclear cells. The giant cells are usually distributed uniformly throughout the lesion.

The giant cells may contain as few as 10 or as many as 50 nuclei. The mononuclear cells are round to oval, and the nuclei resemble those in the giant cells. Although mitotic activity may be brisk in the mononuclear cells, the nuclei lack atypia. Atypical mitotic figures should not be seen in a classic giant cell tumor.

Although most giant cell tumors have the classic appearance previously described, variations occur. It is not uncommon to see areas of secondary aneurysmal bone cyst in giant cell tumors. They may be focal or dominant. Collections of foam cells are quite common in giant cell tumors. The mononuclear cells tend to spindle out in these foam cell areas and may even have a storiform pattern. Occasionally, the spindling cells with the storiform pattern dominate the appearance of the giant cell tumor itself (Figure-2)(10).

Figure-2. Photomicrograph showing multinucleate giant cells in Giant cell tumor (Squash smears Haematoxylin and eosin x 40)

The differential diagnosis of giant cell tumors includes a variety of conditions associated with giant cells, including aneurysmal bone cysts, osteosarcomas, hyperparathyroidism, and chondroblastomas. Calcification or chondroid differentiation should separate chondroblastoma from a giant cell tumor. Most other giant cell-containing lesions are metaphyseal or diaphyseal, whereas giant cell tumors tend to be epiphyseal. Giant cell tumors have been shown to express p63, suggesting that this may be a useful biomarker to differentiate giant cell tumor from other giant cell-rich tumors (2).

Histological features in our case were typical of giant cell tumor of the bone. The bone showed haemorrhage, reactive bone formation, admixed with many giant cells. There was no significant pleomorphism to lead to the consideration of malignancy. Our first patient was treated with resection and he had no residual neurological deficits at follow up.

Intralesional resection of sacral GCT is associated with lower post- operative morbidity than sacrectomy (4,6). Giant cell tumor of bone remains a difficult and challenging management problem because there are no absolute clinical, radiographic or histological parameters that accurately predict the tendency of any single lesion to recur (7).

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Corresponding Address: Dr Rumana Makhdoomi, Department of Pathology, Sheri-Kashmir-Institute of Medical Sciences (SKIMS), Soura, Srinagar, Kashmir, India.
Phone: +0941 908 12 23 **Fax.:** +0194 242 69 58 **GSM:** +0941 908 12 23
E mail: rumanamak@gmail.com
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CASE REPORT / *OLGU SUNUMU*

INTRASPINAL MIGRATION OF A BULLET IN SPINAL CANAL- A CASE REPORT AND LITERATURE REVIEW

SPİNAL KANALDAKİ BİR MERMİNİN İNTRASPİNAL MİGRASYONU: OLGU SUNUMU VE LİTERATÜRÜN GÖZDEN GEÇİRİLMESİ

Roop SINGH[1], Rajesh Kumar ROHILLA[2], Kiranpreet KAUR[3]

SUMMARY

The incidence of spinal cord injury from gunshot wounds in penetrating trauma continues to increase with the violent nature of society Intraspinal migratory missiles represent a very rare subset of the gunshot wounds to the spine. The appropriate course of action in patients with migratory bullets in spinal canal remains unclear, because the number of cases described in the literature is not sufficient to provide a basis on which to make a definitive therapeutic decision. We are reporting a case of intraspinal migration of bullet from D10 region to L5-S1 disc space resulting in neurological deficit.
Plain radiography and CT-scan confirmed the intraspinal migration of the bullet. Removal of the intraspinal bullet was planned, but patient refused surgery. A thorough review of the literature about approach in such special situations is also presented.

Key words: Intraspinal bullet, migration, spine

Level of evidence: Case report, Level IV

ÖZET

Penetre travmalardan ateşli silah yaralanması insidansı, toplumun karmaşık yapısı nedeniyle artış göstermeye devam etmektedir. İntraspinal migratör mermiler, omurganın ateşli silahlarla yaralanmaları içinde nadir görülmektedir. Spinal kanal içinde migratör mermili bir hastada ne yapılacağı konusundaki seçenekler kesin değildir, çünkü literatürde tanımlanmış bir çok vakadan kesin bir tedaviye ait bilgi edinilememektedir.
Direkt radyografiler ve BT ile intraspinal migratör bir mermi tespiti edilen bu çalışmada sunulan bir hastada intra spinal yerleşimli mermi çıkartılmak istenmiş fakat aile tarafında bu öneri ret edilmiştir. Literatür bilgisi ışığı altında bu durum ve tedavi seçenekleri gözden geçirilmiştir.

Anahtar Kelimeler: İntraspinal mermi, migrasyon, omurganın ateşli silah yaralanmaları

Kanıt Düzeyi: Olgu sunumu, Düzey IV

INTRODUCTION:

The incidence of spinal cord injury from gunshot wounds in penetrating trauma continues to increase with the violent nature of society (3). However, intrathecal migration of the bullet is a rare phenomenon (4). From the smooth shiny surface of bullet the ease of migration within the spinal fluid can be appreciated (24). The appropriate course of action in patients with migratory bullets in spinal canal remains unclear, because the number of cases described in the literature is not sufficient to provide a basis on which to make a definitive therapeutic decision (4). We are reporting a case of intraspinal migration of the bullet during change of the position of the patient for radiographs and resulting in neurological deficit due to mass effect. A thorough review of the literature about therapeutic approach in such special situations is also presented.

CASE REPORT:

A twenty-five year male was admitted to our tertiary level institute after suffering a gunshot injury in the back at a very close range by 32 caliber handgun. He complained of back pain, radiating to right lower limb; and weakness & numbness of both feet. The physical examination revealed entry wound on back at D10 spinous process level, 2 cm lateral to midline on right side and decreased lumber lordosis. Neurological examination showed Frankel 2+/ 3 grade motor deficit in bilateral lower limbs. There was hypoesthesia in the L5 and S1 dermatomes to light touch. Patient also had incontinence of urine. All deep tendon reflexes of both lower limbs were absent**.** Tone of the anal sphincter was decreased. Anteroposterior radiograph of the lumbar spine showed a metallic bullet lying in the in the region of middle of L 4 vertebra (Fig.1) whereas to our surprise, the lateral radiograph of the

[1] Ph. D., Senior Professor, Department of Orthopaedic Surgery, Sharma PGIMS, Rohtak, India.
[2] M.D., Associate Professor, Paraplegia and Rehabilitation, Sharma PGIMS, Rohtak, India.
[3] Assistant Professor, Anaesthesiology and Critical Care, Sharma PGIMS, Rohtak, India.

Figure-1. Anteroposterior radiograph of the lumbar spine showing the bullet lodged within spinal canal at the L4 level.

Figure-2. Lateral radiograph of the lumbar spine showing the bullet lodged within spinal canal at the L5- S1 intervertebral disc level. Bullet lies with base upwards.

lumbar spine showed the bullet lying in spinal canal at L5-S1 disc space (Fig.2), revealing migration of the bullet during change of the position of the patient for radiographs. 40 CT-scan confirmed the metallic bullet lying in the centre of spinal canal at L5-S1 disc space (Fig.3 and Fig. 4) and fracture of the right lamina of the tenth thoracic vertebra.

Figure-3. CT-scan saggital section shows bullet lying at L5-S1 intervertebral disc level and in the spinal canal (Black arrow).

Figure-4. CT-scan axial section shows bullet lying in the spinal canal (Black arrow).

A decision to remove the bullet was made in anticipation for neurological improvement; to prevent further neurological deficit; and of the possibility of it later leading to infection or lead/ copper intoxication. But patient refused for surgery for reasons not in our hands.

DISCUSSION:

Intraspinal/ Intrathecal migratory missiles represent a very rare subset of the gunshot wounds to the spine (4,22). Intrathecal gunshot injury may or may not result in neurological deficit to the patient (2,15). Either the direct path of the bullet or the concussive effects cause injury to the spine and spinal column (18).

Avci et al reported cranial migration of the bullet caused by prone position of the patient during laminectomy (1). Singh et al also reported cranial migration along with its craniocaudal rotation during its removal (24). Caudal migration of the bullet is also reported (17,29,30). As the spinal cord expands at T10, it has been thought that migration of the bullet in spinal canal above this level does not occur (20). Oktem et al, however, reported a bullet traversing the length of the spinal canal (23). Similarly Tanguy et al reported migration of the bullet from C7 to sacral region (29).

The patient may suffer from symptoms related to mass effect of the retained bullet as reported in the present case and other reports (1,22,24). It can present even with delayed onset of symptoms (1,2,5,10,11,17,25,29). Migration of the bullet with subsequent meningitis has been reported, though the cultures of the bullet and CSF were negative (29). There is risk of acute lead intoxication or Plumbism if lead bullets are retained in areas where the pH of the tissue tends towards the acidic side (7) and lead intoxication also has been reported from retained bullet fragments within the intervertebral disc space (10,28). Chronic inflammation caused by metal breakdown products of the bullet may contribute to hyperaesthesia in the segments of spine with retained bullet fragments and formation of the syringiform cyst (8). Spinal cord necrosis around copper fragments implanted within the dura has also been reported in animal studies (31).

Treatment depends on the physician's ability to understand mechanism of injury, principles of medical management, diagnostic imaging, and surgical options (22). After the patient is stabilized, the spinal injury should be thoroughly evaluated. A complete neurological examination must be performed to document motor function, reflexes, and sensation at the time of injury and periodic examination, preferably by the same physician is needed to assess any deterioration in neurologic function (22). Anteroposterior and lateral radiographs determine the level of bullet location and/or fracture. Computed tomography is the investigation of choice, as it allows for more precise localization of the bullet fragments within the spinal canal (3,22). Missiles used for low-velocity shotguns are usually copper jacketed and do not have ferromagnetic properties (16). Therefore, MRI can be used in low-velocity shotgun injuries without any change in the neurological status or patient discomfort (16). Spine injuries without neurologic signs are not uncommon among patients with gunshot wounds. Complete radiographic spine imaging is therefore recommended to ensure that spine injuries are not missed in this population (19).

The appropriate course of action in patients with migratory bullets in spinal canal remains unclear and their treatment should be individualized (22). However, certain principles of management of intrathecal bullets have been outlined (3,22,32) and evolve around spine stability, aggressive rehabilitation, and preservation of neurologic function (18). Fractures are usually inherently stable and rarely require stabilization (3). Antibiotics should be continued for a minimum of 7 days in cases of wounds that perforate the colon and injure the spine (22). The role of steroids in gunshot injuries of the spine has been retrospectively evaluated in nonrandomized studies (12,21). No significant neurological benefits were detectable from intravenously administered steroids after a gunshot wound to the spine (12,21). Both infectious and noninfectious complication 89 rates were higher in the groups receiving steroids (12). Retained bullets rarely cause problems of delayed infection, late neurologic decline, or lead toxicity, eliminating the need for prophylactic bullet removal (33).

Decompression and removal of intracanal bullets at T12 and below may improve motor function (3,16,22,32,33). The bullet in the dural sac at the level of the cauda equina must be removed (28). 60% of the patients with cauda equina syndrome and 53% of that with lesions in the lumbar region improved their neurological status after laminectomy (9). New-onset or progressive neurologic deterioration, an intracanal copper bullet and lead intoxication are the other indications for surgical decompression and removal of the bullet (1,3,22). Role of laminectomy in spinal cord injury from gunshot wounds depends on the neurological status of patient, and the location of bullet.

In incomplete injury, role of laminectomy is controversial. Since the prognosis for recovery depended on the initial neural deficit, laminectomy had no

beneficial effect in complete or incomplete injuries in the study of Heiden et al. (13) 101 Stauffer et al. (26) reported incidence of wound infection and spinal fistulae to be 10% of such patients who had underwent laminectomies.

Spinal instability also complicated the patients who had multiple level laminectomies (26). However, laminectomy and removal of metallic foreign bodies have been performed to reduce the risk of infection in the spinal canal and to prevent toxic effects of dissolved metals on uninjured parts of the central nervous system (24,30).

The timing of laminectomy for gunshot injuries of the thoracolumbar and lumbosacral spine (early versus delayed surgery) is not essential to neurological recovery (6). However, adequate debridement of these injuries, performed as soon as the patient is stable from any associated injuries, may help to mitigate the late sequelae of arachnoiditis, infection, and pain syndromes in the lower extremities (6).

Problems during surgical removal of bullet have been reported (11). We have earlier published a case report of spontaneous migration of intradural bullet during surgery and reported practical technical tricks to remove such mobile foreign bodies (24). Patient positioning can influence bullet location which can be useful in surgical planning (2,24). The surgeon must identify the exact location of the bullet after positioning the patient and should not rely on pre-operative X-ray/ other investigations only (24). Use of intra-operative fluoroscopy is recommended to localize the migratory bullet (1,22,24,26). The surgeon may be able to bring the bullet to the desired level by changing inclination of the operative table, if migration of the bullet occurs during surgery (24). The bullet may need to be fixed while removing it, to prevent further migration (24,26). Retention of the bullet in the canal is not considered to be a significant adverse occurrence if asymptomatic (14,33), however it is not true for migratory and symptomatic bullets (22,24). In future there is a potential risk of complications of neurological deficits due to mechanical or irritative effects, infection and plumbism in the present case as bullet is lying intraspinal.

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Address for Correspondence: Dr. Roop Singh, 52 / 9-J, Medical Enclave, PGIMS, Rohtak 12400, Haryana, India.
E-mail: drroopsingh@rediffmail.com
Phone: +91-1262-213171 **Fax:** +91-1262-21308
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CASE REPORT / *OLGU SUNUMU*

CLAY-SHOVELER'S FRACTURE FOLLOWING A FALL FROM HEIGHT

YÜKSEKTEN DÜŞME SONRASI GÖRÜLEN "KUM KÜREYİCİLERİN KIRIĞI"

Gökşin ŞENGÜL[1], Mehmet Hakan ŞAHİN[1], Nuh Çağrı KARAAVCI[1], Fatih ALPER[1]

SUMMARY

Clay-shoveler's fracture represents an avulsion type of fracture of a spinous process in the lower cervical or upper thoracic region. It is an extremely rare injury at the present times but may be one aspect of a serious injury. A 36 year old male was admitted following a fall from a height. He had severe neck and thoracic back pain with radiation to the bilateral shoulder region. Radiological examination revealed spinous process fractures of the C6, C7 and Th1 vertebrae. Treatment was conservative and good clinical outcome was maintained. Clay-shoveler's fracture is generally considered stable fractures. However, it may be associated with other serious injuries. Thorough diagnostic work-up should be performed in high risk injuries.

Key words: Clay-shoveler's fracture, cervicothoracic region fractures, spinous process, treatment

Level of evidence: Case report, Level IV

ÖZET

"Kum küreyicilerin kırığı", alt servikal ve üst torakal bölgedeki spinöz çıkıntıların ayrılma kırığıdır. Günümüzde oldukça nadir görülen bu yaralanma ciddi bir yaralanmanın belirtisi olabilir. 36 yaşında erkek hasta yüksekten düşme sonrası, omuzlara yayılan şiddetli boyun ve sırt ağrısı şikâyetiyle müracaat etti. Radyolojik incelemede C6, C7, TH1 omurların spinöz çıkıntılarında kırık saptandı. Hasta konservatif olarak tedavi edildi ve klinik iyileşme sağlandı.
"Kum küreyicilerin kırığı" genellikle stabil kırık olarak değerlendirilir. Ancak, daha ciddi yaralanmalarla birlikte bulunabilir. Yüksek riskli yaralanmalarda kapsamlı tanısal çalışma yapılmalıdır.

Anahtar Sözcükler: Kum küreyicilerin kırığı, servikotorasik bölge kırıkları, spinöz çıkıntı, tedavi.

Kanıt Düzeyi: Olgu sunumu, Düzey IV

INTRODUCTION:

Isolated spinous process fracture, known as a clay-shoveler's fracture, is an avulsion type fracture of one or more spinous process of the lower cervical or upper thoracic vertebrae.

Though these fractures may occur anywhere between C6-T3, C7 or both C7 and T1 are the most commonly affected sites. They are generally considered stable injuries but may be a warning sign of more severe spinal injuries (1,5,9-10).

In this report, a case of multiple contiguous isolated spinous process fracture of the cervico-thoracic spine is presented.

CASE REPORT:

A 36-year-old male was admitted following a fall from height. He had severe neck and posterior thoracic pain. Physical examination revealed localized tenderness and limited motion over the dorsal cervical-thoracic region. Neurological examination was normal. Plain radiographs and computed tomography demonstrated fractures of the isolated spinous process of the C6, C7 and T1vertebrae (Figure-1.a,b). Sagittal T1 and T2-weighted magnetic resonance (MR) imaging also showed spinous process fractures C6, C7 and T1. STIR MR images revealed high signal areas in C3 vertebra body and paraspinal area suggestive of an acute injury (Figure-1.c,d).

The patient was treated conservatively by analgesic therapy and immobilization with cervical collar for six weeks.

[1] Atatürk Üniversitesi, Tıp Fakültesi, Araştırma Hastanesi, Beyin ve Sinir Cerrahisi, Erzurum.

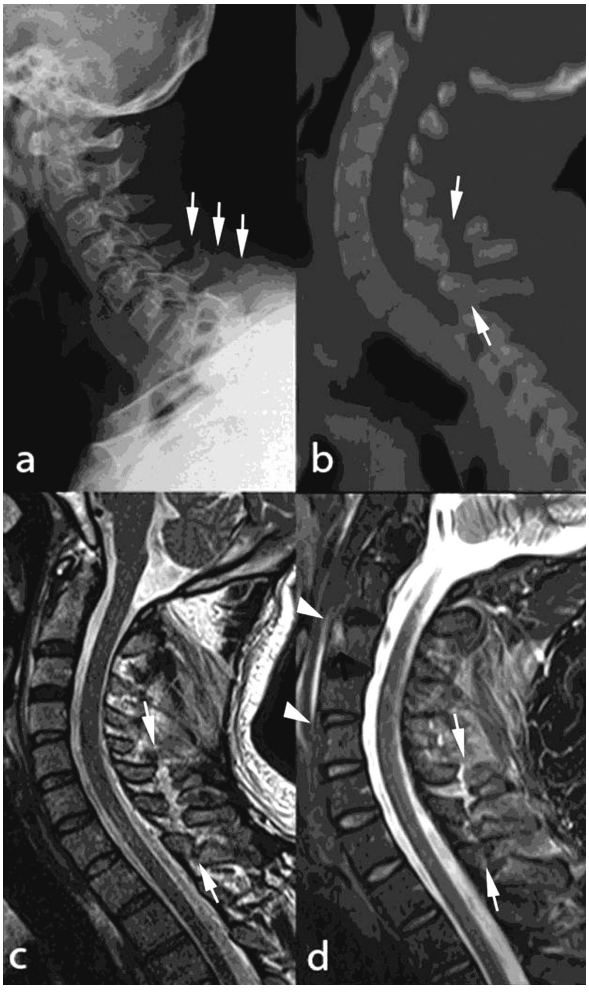

Figure-1.a. Plain radiograph and **b.** computed tomography of the cervical spine showing spinous process fractures of C6, C7 and T1 vertebrae. **c.** Sagittal T2-weighted magnetic resonance images showing C5, C6, C7 and T1 spinous process fracture without spinal cord pathology. **d.** Sagittal MRI STIR image showing high signal areas in C3 vertebra body and paraspinal area suggestive of an acute injury.

DISCUSSION:

Clay-shoveler's fracture was first described as an occupational injury in the beginning of 20th century in Western Australia, named for laborers who incurred whip like pulls along the supra-spinal ligaments while shove ling clay over their shoulders. It was most prevalent in workers who regularly engage in weight-bearing activities.

With the advent of industrialization and reduced weight bearing activities it has become relatively rare. In more recent years reported cases are only case reports. In present times, motor vehicle collisions and sports injuries are the common causes of spinous process fractures (2,4-6). Isolated spinous fracture after falling from height rarely occurs as seen in our case. It occurs when the head and upper cervical segments are forced into flexion against the opposing action of the interspinous and supraspinous ligaments. Direct blow to the posterior aspect of the neck, cervical hyperextension and hyperflexion injuries, muscle and ligament stresses, generally due to shovel heavy loads are the proposed causative mechanisms that lead to the fractures of the vertebral spinous process (2,8).

Pain at the level of the fractured spine is the main symptom of clay-shoveler'sfracture. It may increase with repeated activity that strains the muscles of upper back and gradually subsides in days to weeks. Tenderness on the skin over the posterior spine can be found in the examination of the patient (3,8).

The radiographic appearance demonstrates very classical features. On the lateral view, the fracture line is more commonly obliquely oriented, transferring midway between the tip of the spinous and the spinolaminar junction. Downward displacement of the distal spinous fragment and the "double spinous shadow" are seen on the AP view if the shoulders obscure visualization on the lateral radiographs. The possibility of segmental instability can be excluded by flexion extension studies. The lower cervical spine may be difficult to visualize due to patient obesity, muscularity, short neck or severe muscle pain. If the lower cervical spine or cervico-thoracic junction is not well visualized on cervical spine lateral radiographs, computed tomography scans should be obtained. Magnetic resonance imaging should be performed in all cases for detecting further injuries to the surrounding structures including spinal cord and ligaments (2,6-8). Nuchal bone formation and ununited secondary ossification center of the spinous tip should be considered in the differential diagnosis (2).

Clay-shoveler's fracture is stable but painful fractures. Immobilization of the neck with a cervical collar, restriction of physical activity for 4 to 6 weeks generally results in pain relief in most patients. Healing of the fracture is rare and re-attachment may only occur if there is a minimal displacement of the avulsed fragment. Non-union of the avulsed fragment is common due to the muscular pill in this region. Clay-shoveler's fractures tend to heal without residual squeal in terms of neck function and pain. If severe pain persists after conservative treatment, surgical excision of the avulsed fragment should be considered (2,5).

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Address: Atatürk Üniversitesi, Tıp Fakültesi, Araştırma Hastanesi, Beyin ve Sinir Cerrahisi,25240 Erzurum.
Telephone: +90 442 344 83 66 **Fax.:** +90 442 236 13 01 **GSM:** +90 0532 362 37 40
E-mail: goksinsengul@gmail.com
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REVIEW ARTICLE */ DERLEME*

SPINAL TUBERCULOSIS

SPİNAL TÜBERKÜLOZ

Murat KÖKEN[1], Selçuk ÖZDOĞAN[2],
Bekir Can KENDİRLİOĞLU[3], Burakhan KOCAMAN[4]

SUMMARY

Spinal tuberculosis is involved 1-3 % of all cases of tuberculosis. Spinal tuberculosis is the most dangerous type of skeletal tuberculosis. When spinal column is involved, it can result with neurological deficit, kyphosis and spinal deformity. Although the development of more accurate imaging modalities helps the early diagnoses, we can still see late diagnosed tuberculosis patients. There is not a standard surgical procedure for these patients. Surgical planning must be made carefully, complication rates must be decreased and patients living conditions must be cared.

Key Words: Spinal tuberculosis, Pott disease, Tuberculosis

Level of evidence: Review artcle, Level V

ÖZET

Spinal tüberküloz tüm tüberküloz vakalarının %1-3 ünü oluşturmaktadır. Spinal tüberküloz , iskelet sistemini tutan tüberkülozun en tehlikeli tipidir. Spinal tutulum sonrası nörolojik defisit, kifoz ve deformite oluşabilmektedir. Görüntüleme tekniklerinin giderek gelişmesi sayesinde erken teşhis konulabilmesine rağmen geç tanı almış spinal tüberküloz vakalarına halen rastlanmaktadır. Bu vakalara uygulanacak standart bir cerrahi prosedür bulunmamaktadır. Vertebra tutulumlarında cerrahi yaklaşım çok iyi planlanmalı, komplikasyon oranları en aza indirgenmeli ve hastanın yaşam kalitesine önem verilmelidir.

Anahtar Kelimeler: Spinal tüberküloz, Pott hastalığı, Tüberküloz,

Kanıt Düzeyi: Derleme, Düzey V

INTRODUCTION:

Tuberculosis is an old disease as human history that reported to be seen at B.C.8000(2). When Robert Koch had proved tuberculosis bacillus at 1882, diagnosis and treatment of this disease had been developed. Spinal tuberculosis was first described by British surgeon Percival Pott at 1779 (15).

Spinal tuberculosis is the most seen type of extrapulmonary tuberculosis. It consist 1-3% of all type of tuberculosis (9). Spinal tuberculosis could be diagnosed on multilevels at undeveloped countries, late diagnosed patients or medical therapy resistant cases. Kyphosis, instability and neurological deficit could be seen with vertebral injuries.

Spinal tuberculosis surgery has variations because there is not a standard protocol for the surgical treatment. Surgical approaches could be chosen as anterior, posterior or combined due to the spinal region, surgeons experience or medical centers protocol selection. Surgical treatment must be supported with medical therapy(1).

HISTORY:

Tuberculosis, which is as old as humanity itself, is reported to have first seen at 8000 BC when humans started living in groups and cattle were domesticated. Acid resistant bacilli were found on human skeletons which lived in Germany during this era. Similarly a girl who lived in a town called Dra' Abu el-Naga near river Nile around 3000 BC was treated using magic because her sputum contained blood. Investigation of her mummy revealed tuberculosis. Code of Hammurabi which was written around 2250 BC accepts tuberculosis as a divine punishment (2).

Symptoms of tuberculosis were first described by Hippocrates around 460-375 BC. Hippocrates used the word "Phitisie" which roughly meant decrepit. He described the clinical course of the disease, stated that it was more frequent between 18-35 years and listed food which could be used for treatment. Galenus of Pergammon who lived between 129-200 BC used the same word to describe the disease and stated that it was dangerous to be in the same room with these patients for they could transmit the disease. Av-

[1] Surgeon of the Orthopaedics and Traumatology, Department of Orthopaedics and Traumatology, Gazi State Hospital, Samsun.
[2] Surgeon of Neurosurgery, Department of Neurosurgery, Dr.Lütfi Kırdar Kartal Training and Research Hospital, İstanbul
[3] Resident of Neurosurgery, Department of Neurosurgery, Dr.Lütfi Kırdar Kartal Training and Research Hospital, İstanbul
[4] Resident of Neurosurgery, Department of Neurosurgery, Ankara Numune Training and Research Hospital, Ankara

icenna who lived between 980-1038 AD in his book "El-kanun fı't-Tıbb" , which was completed in 1025, states that this disease has human to human spread, mothers who breastfeed their children should be treated and rose essence and rose syrup could be use for treatment (21).

Definition, causes and first steps in treatment of tuberculosis were realized by Dr. Rene Laennec's studies. Laennec, who also discovered the stethoscope, described the clinical course and pathology of a total of 393 pulmonary diseases including tuberculosis. A new era was opened in 1882 when Robert Koch showed the tuberculosis bacillus in the sputum. Robert Koch later obtained a pure culture, created an experimental model in animals and reproduced the bacteria in infected animals. Robert Koch was given the Nobel prize in 1905 (2). The bacteria, which was then known as bacterium tuberculosis, was named as M. Tuberculosis by Lehamn and Neuman in 1886 due to its fungal properties such as colony morphology and slow reproduction rate (7).

Spinal tuberculosis was first described by English surgeon Percival Pott as a painful kyphotic deformity with paraplegia. Percival Pott described a patient as having "a sharp pain and numbness accompanied by a motor deficit in the back. Afterwards, the patient describes an unusual coldness and loss of sensation in the thigh. Following that, involuntary twitching is observed during the night. Urinary and fecal incontinence and erectile impotance develops. In the end the patient is rendered immobile (13).

In 1908, two French scientists named Calmette and Guerin from the Pasteur Institute located in the city of Lille, succesfully cultured the bacillus in a growth medium consisting of glycerined calf meat obtained from a cow wtih mastitis caused by Mycobacterium Bovis, bile and potato. In the following 13 years a total of 230 generations were created in order to weaken the bacteria and a vaccine against tuberculosis was made available in 1921. Scientific circles called this immunity-causing bacteria as Bacile Calmette-Guerin (BCG)(18). Since that day the easily applied intradermal vaccine has become a reliable and cheap way of stopping this disease (2).

Antibiotherapy in tuberculosis starts with Walksman's discovery of streptomycine in 1944. However, the bacteria rapidly developed resistance to single antibiotherapy. In 1946 the effect of aminosalicylic acid was shown to be effective on the bacteria and in 1952 Robizek and Selikof discovered isoniazid and thus three-antibiotherapy which lasted for 18-24 months was made available. With the discovery of pyrazinamide in 1954, ethambutol in 1962 and rifampycine in 1966, total duration of treatment was reduced to six months (21).

EPIDEMIOLOGY:

According to the data from Turkish Antituberculosis dispensary, total number of tuberculosis cases in 2015 were 20.535 and number of cases in 100.00 population were 28,5 in Turkey. Number of new cases were 18.753 and the ratio in 100.0 population was 26,0. Total number of cases in 2010 was reduced to 16.551 and its ratio in 100.0 population decreased to 22,5. Number of new cases was 15.183 and the ratio in 100.0 population was decreased to 20,6. In 238 (3,7%) of the cases there was vertebral involvement. 109 patients (45.8%) were male while 129 patients (54.2%) were females. There were no patients aged between 0-4. 3 patients were between 5-14, 20 patients were between 15-24, 35 patients were between 25-34, 20 patients were between 35-44, 40 patients were between 45-54, 51 patients were between 55-64 and 69 patients were older than 65 (20).

PATHOGENESIS:

In tuberculotic osteomyelitis, microrganisms are usually blood-borne and originate from an active visceral focus which is in the initial stage of the primary infection (Figure-1).

Figure-1. Mucobacterium tuberculosis (From Prof. İ. Teoman Benli's archive).

Direct inoculation (to the ribs or vertebra near the tracheobronchial nodes from the pulmonary focus) or lymphatic spread is also possible. Osteal infection is usually solitary, it can be the only manifestation of the disease in some cases and may go unnoticed for years. Multifocal osteal involvement is seen in patients with acquired immune deficiency (4,16).

Tuberculotic osteomyelitis is more destructive and harder to control compared to suppurative os-

teomyelitis. Histopathologic findings are the same as other sites in the body. Big macrophages with pale pink and irregular granulated cytoplasms are observed in specimens painted with hematoxylene eosine (Figure-2).

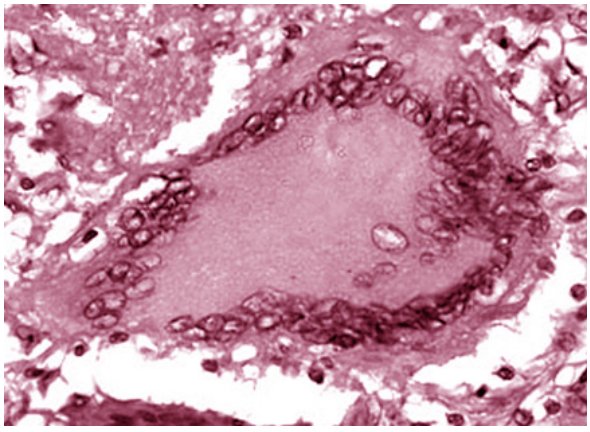

Figure-2. Histopatologic appearance of the tuberculosis (From Prof. İ. Teoman Benli's archive).

The nodule, which is formed by epitheloid histiocytes is surrounded by lymphocytes which produce the cytokines activating the macrophages. Older granulomas are surrounded by fibroblasts and connective tissue. Multinuclear giant cells are frequently found in these granulomas. These cells are formed by the fusion of 20 or more macrophages and have wide cytoplasms and multiple nuclei. In the granulomas caused by the tuberculosis bacilus or other infectious microorganisms, a central necrosis is observed due to hypoxia and free oxygen radicals. Macroscopically, these granulomas appear like cheese and thus named caseous necrosis (16) (Figure-3).

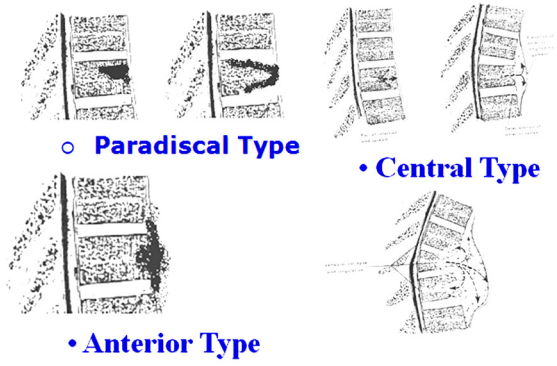

Figure-3. Spinal tuberculosis: types of affection (From Prof. İ. Teoman Benli's archive).

CLINICAL COURSE:

Osteoarticulary tuberculosis is caused by hematogenous, lymphatic or direct spread to the skeletal system from a pulmonary or non-pulmonary focus. It forms 1-2% of all tuberculosis cases. Although its incidence increases in the fourth decade, it is the same between male and female and HIV (+) and (-) patients.

Vertebra is the most common site of tuberculosis in the musculoskeletal system and frequently causes pain, deformities and neurological deficits. In the adults, tuberculotic spondilitys most frquently involves lower thoracic and upper lumbar vertebrae. There is 56% thoracic, 28% lombar, 22% thoracolumbar and 1% cervical involvement. The most effected vertabrae are the 9th tohracic and 1st lumbar vertebra. Thoracic involvement causes neurological complications in 5-25% of cases. The disease usually affects two vertebral bodies and the disc capsule between them. Progress is long and slow. The disease often attacks the anterior part of the vertebral body and reaches the neighboring vertebra via the anterior ligament. This manner of progress is usually attributed to rich arteriovenous blood supply of the region and the high oxygen need of the bacilus. Intramedullary granulomas and paraplegia can be seen in the advanced phases. Anterior narrowing of vertebrae may accompany segmental collapse or gibbus formations. Sinus formation opening to the skin may cause perispinal abscess. Paraspinal abscesses may spread to other parts of the body. As an example, psoas abscess formation with spread to the thigh and groin may result from the involvement of psoas muscle. Psoas abscess is seen in 5% of tuberculotic spondilitis. The patient may complain of back pain, muscle weakness and paralysis (6,16).

In the early stages of the disease; sharp, stabbing or drilling somatic pain is more pronounced. Daily activities increase the pain while rest alleviates it. In the advanced stages of the disease, neuropathic pain is also observed due to infiltration of the nervous tissue and compression. Neuropathic pain is characterized as burning or electrifying. It is usually worse in the night and the patient can not carry out basic tasks due to debilitating pain.

DIAGNOSIS:

Direct graphy, computerized tomography and magnetic resonance imaging can be used. Magnetic resonance imaging is the most important diagnostic tool for early stage vertebral infections. Radiologically, the lesion is first seen as an infection on the anterior part of the vertebra corpus adjacent to the subchondral bone plate and causes a subchondral destruction. It turns into a discovertebral lesion and progresses through under the anterior and posterior longitudinal ligament or by destructing the subchondral bone. This causes a decrease in the distance be-

tween two discs in direct graphy (5,6,10,23).

Radiology of tuberculosis is characteristic for one or more segments to be affected, big and calcified paravertebral masses, sclerosis, loss of new bone formation and late onset disc destruction (Figure-4).

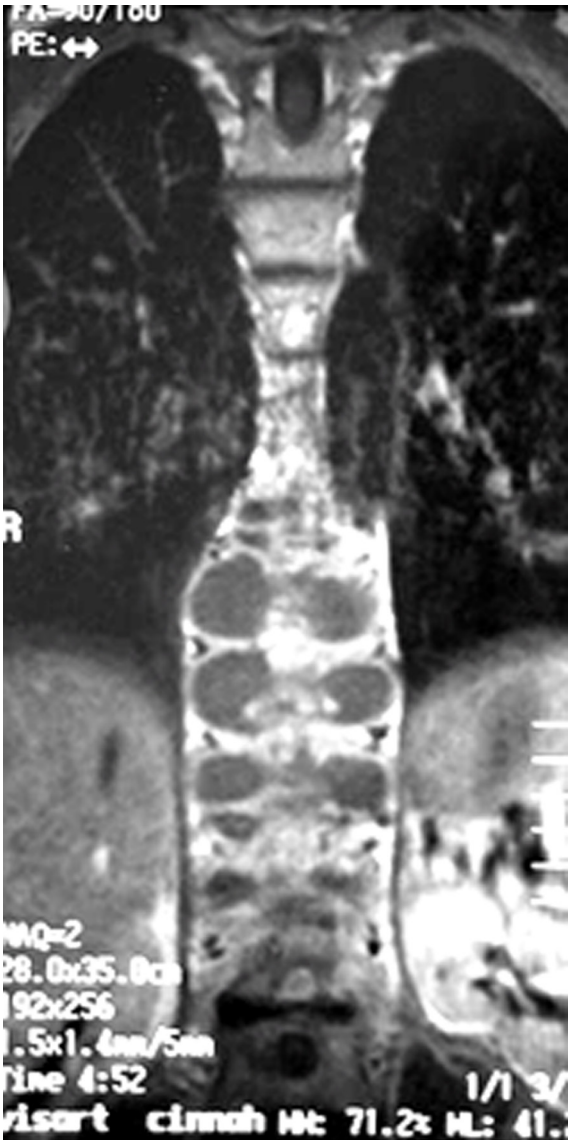

Figure-4. MR images of the patients with spinal tuberculosis in the multiple vertebrae in the thoracic region (From Prof. İ. Teoman Benli's archive).

Calcification in the abscess in histopathology is pathognomonic for tuberculosis (19). Pyogenic vertebral osteomyelitis should be considered first for differential diagnosis. Tuberculosis of the vertebra must be distinguished from brucellosis and similar infections, histiocytosis X, sarcoidosis, hemangiomas, benign or malignant tumors such as osteosarcomas, Ewing's sarcoma, multiple myeloma and metastases (Figure-5).

Figure-5. MR images of the patients with spinal tuberculosis and psoas abcess in lumbar vertebrae (From Prof. İ. Teoman Benli's archive).

TREATMENT:

Overall condition of the patient, spinal instability criteria and the experience of the surgeon are important when planning surgery (22). Advantages and disadvantages of a given surgical approach must be individualized for all cases. Possibility of kyphosis and neurologic deficit must be kept in mind before and after surgery. Mehta et al used four groups for classification while Oguz et al used three (9,12).

Direct approach to the mass, instrumentation and graft fusion are the advantages of an anterior-only approach. Benli et al have reported good outcomes using this approach (3). Shorter duration of surgery results in less blood loss. However, this approach may not produce satisfactory results when three or more segments are affected. Complication rates of instrumentations for more levels can be high. Li et al report successful outcomes for cases with involvement of two or less levels (8).

Posterior approach is the most frequently used technique. It is also the best choice for the patients with a poor clinical status. Pu et al have reported very

good results in patients with abscesses with limited spread, limited compression of the spinal canal and poor clinical status (14). Advantages of this approach are the possibility of debridement, decompression and instrumentation using one incision and ability to turn into a combined approach if necessary. Its main disadvantage is insufficient exposure of anteriorly spreading lesions (11).

The combination of anterior and posterior approach allows complete resection of the lesion and 360 degrees stabilization. This approach lets the surgeon perform the best and strongest stabilization, debridement and decompression. Longer duration of the surgery, increased blood loss, need for intraoperative change of the patient position, multiple incisions and insuitability for patients with poor clinical condition are the disadvantages of this approach (15).

Complications of surgery include failed fusion, complications of instrumentation, adjacent segment disease, insufficient decompression and stabilization (17). Surgery must be planned according to the experience of the surgeon and the condition of the patient in order to minimze the risk of complications (24).

Surgery must always be supported with antibiotherapy. Isoniazid, rifampycine, ethambutol and pyrazinamide can be used in the first place. In addition to this therapy which lasts for 3 months, isoniazide, rifampycine and pyrazinamide treatment can be prolonged up to 9 months (1).

CONCLUSION:

Tuberculosis is a source of serious complications if it is not diagnosed and treated in early stages. Planning a treatment strategy for spinal tuberculosis which is the most common extrapulmonary form of the disease determines the quality of life for a patient. Clinical condition of the patient, existence of spinal instability, spread of the disease and the experience of the surgeon must be taken into account when planning surgery and it must always be supplemented with medical treatment.

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Corresponding Adress: Dr. Selçuk Özdoğan, Dr.Lütfi Kırdar Eğitim ve Araştırma Hastanesi, E-5 yolu üzeri, Cevizli, Kartal, İstanbul.
Tel: +90 506 763 71 73
E-mail: drselcukozdogan@hotmail.com
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REVIEW ARTICLE */ DERLEME*

DEGENERATIVE DISC DISEASE AND GENETIC

DEJENERATİF DİSK HASTALIĞI VE GENETİK

Ramazan KAHVECI[1], Hüseyin ÖZEVREN[2], Ergün KARAVELIOĞLU[3]

SUMMARY

Although development of the intervertebral disc disease is a multifactorial condition, recent studies associated with genes playing a role in disc dejeneration revealed that the importance of the genetic factors in the development of disc disease. Our purpose of this study is to review current knowledge on genes associated with intervertebral disc degeneration.

Keywords: Degenerative disc disease, aggrecan, collagene, vitamin D receptor, interleukin, ADAMTS, matrixmetalloproteinase

Level of evidence: Review article, Level V

ÖZET

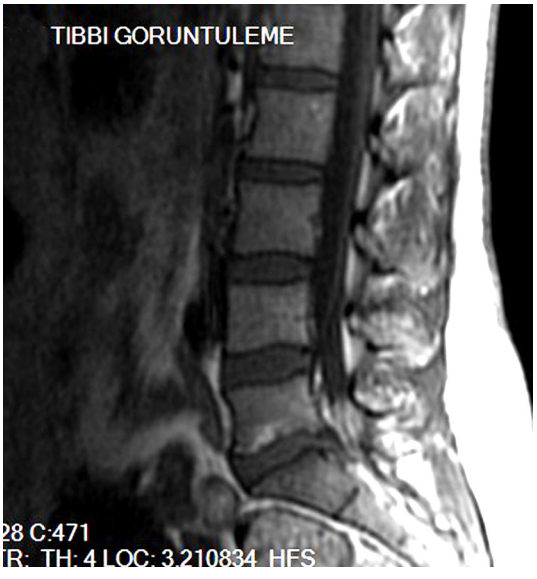
İntervertebral disk hastalığının gelişimi her ne kadar multifaktöriyel bir durum olsa da, disk dejenerasyonunda rol oynayan genlerle ilişkili son zamanda yapılan çalışmalar, genetik faktörlerin disk hastalığı gelişimindeki rollerinin önemini ortaya koymuştur. Bu çalışmadaki amacımız intervertebral disk dejenerasyonunda rol oynayan genlerle ilgili mevcut bilgilerin gözden geçirilmesidir.

Anahtar Kelimeler: Dejeneratif disk hastalığı, agrekan, kollajen, vitamin D reseptör, interlökin, ADAMTS, matriksmetalloproteinaz

Kanıt Düzeyi: Derleme, Düzey V

INTRODUCTION

Low back pain is in the first range among public health problems seen in the active living communities. Low back pain is an important health care problem especially in developed societies in terms of the treatment costs and labor loss. Annual incidence of backache differs between 15 % and 20 % in adult population in the industrialized societies. Incidence of the backache in a certain period of life again in the adult population is estimated between 50 % and 80 % (63). Inflammatory, metabolic, neoplastic, infectious and traumatic causes play a role in the etiology of low back pain. Degenerative disc disease is one of the leading degenerative causes of low back pain (Fig. 1a,b).



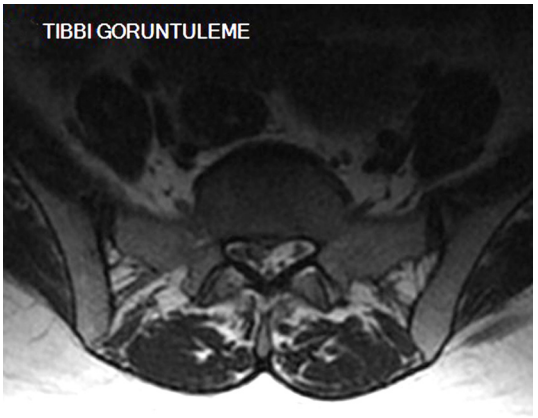


Figure-1. Sagittal **(a)** and axial (b) MR imaging of a degenerative disc disease.

[1] M.D., Department of Neurosurgery, Private Polatlı Can Hospital, Ankara, Turkey
[2] M.D., Department of Neurosurgery, Dicle University, School of Medicine, Diyarbakır, Turkey
[3] M.D., Department of Neurosurgery, Afyon Kocatepe University, School of Medicine, Afyon, Turkey

Besides environmental factors such as exposure to heavy physical load, age, smoking, trauma and infection, genetic predisposition also plays a role in development of degenerative disc disease which naturally emerges during the aging process (17). Battie et al. described hereditary factors to play a role in disc degeneration for the first time as a result of their magnetic resonance imaging (MRI) guided study in monozygotic twins (4). In both in vivo and in vitro studies that have been subsequently conducted, numeruous genes have been demonstrated to play a role in development of degenerative disc disease.

Intervertebral disc degeneration is biochemically characterized by degradation of the extracellular matrix. Extracellular matrix primarily consists of proteoglycans and collagens. Metabolism of the extracellular matrix is regulated by the balance between matrix metalloproteinases (MMPs) and aggrecanases which are degrading enzymes and tissue inhibitors of metalloproteinases that are their natural inhibitors. Degenerative disc disease develops in the case of imbalance between these enzymes (34,75). There is evidence suggesting that besides polymorphisms which code these enzymes, aggregate, collagen, vitamin D receptor and interleukin gen polymorphisms also play a role in intervertebral disc degeneration (2,50,68,71,78). With the studies conducted in the light of this information, it has been shown that a part of these enzymes which play a role in development of degenerative disc disease may also play a role in the treatment. Treatment of degenerative disc disease with the genes involved in the initial period and the enzymes coded by these genes does not seen to be impossible in the near future (Fig. 2).

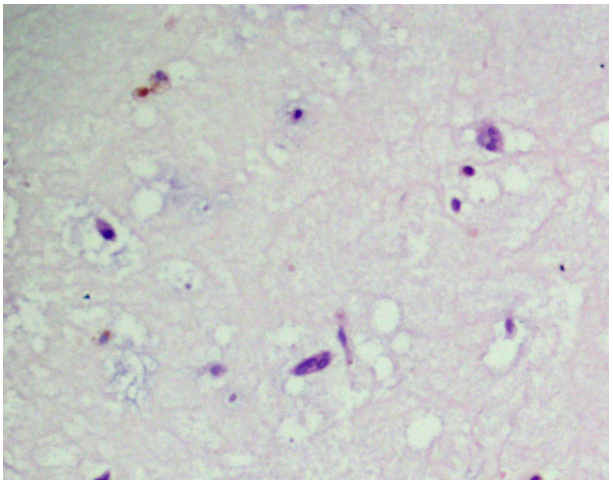


Figure-2. Photomicrograph (HEX400) of articular cartilage of degenerated disc tissue.

AGGRECAN GENE POLYMORPHISM:

One of the early indicators of intervertebral disc degeneration is loss of the proteoglycans, especially aggrecans. Disc tissue consists of the cells, water and, collagens and aggrecans which form the disc matrix. Negatively charged hydrophilic proteoglycans are the structure drawing water into the disc. Dehidration of the disc is resulted from the loss of proteoglycans and this cause deterioration in tissue continuity and reduction in durability against the loading (11,44,54).

Aggrecans are proteoglycans clusters (PG) which consist of the glycosaminoglycan (GAG) chains covalently bound to the protein nucleus and sulfated. Aggrecan is an important proteoglycan, providing resistance of the tissue against compressive loads in the intervertebral disc structure. This structural feature is related to the chondroitin sulfate chains that abundantly present especially in the nucleus protein. Chondroitin sulfate chains present in domains of the nucleus protein that are termed as CS1 and CS2. Chondroitin sulfate content of the aggrecan in intervertebral disc differs, because aggrecan gene region which codes CS1 domain in humans presents dimensional polymorphism. This situation causing to weakening of the aggrecan structure leads to intervertebral disc degeneration (62). The relationship between lumbar disc degeneration and aggrecan gene polymorphism was demonstrated first by Kawaguchi et al. They argued that individuals who have a short CS1 domain are in the risk for developing multilevel intervebral disc degeneration at an early age (39). In a study with 588 mono- and dizygotic twins, Videman et al. reported that, AGC1 gene was associated with surge in the disc, and reduction in the water content and height of the dics (79). Types and numbers of the aggrecan gene varies among the different societies. Although different results were obtained in the subsequent studies, a correlation has been shown between the short repeated allele frequency and disc degeneration in the Turkish society (13-14).

COLLAGEN GENE POLYMORPHISMS

Collagens are macromolecules which provide tensile strength of the disc. Collagens form 70 % of the annulus fibrosus % 70 and 20 % of the dry weight of nucleus pulposus. Although there are 16 types of collagens, 80 % of those in the human body are Type-1 and Type-2 collagens. Besides those types, there are also Types 3,5,6,9 and 11 collagens in structure

of the intervertebral disc. Type-1 collagen is synthesized by fibroblasts and is major callagen of the annulus fibrosus. Type-2 collagen is synthesized by the chondrocytes and mainly presents in the nucleus fibrosus. In addition, Type-3 and Type-5 collagens are synthesized in small quantities in the annulus fibrosus, Type-11 collagen in the nucleus pulposus, Type-6 and Type-9 collagens both in the annulus fibrosus and nucleus pulposus. Type-2 collagen is the major collagen of end-plate at the same time (60). Although gene polymorphisms causing alterations in the collagen structure have been demonstrated to be associated with the development of disc degeneration, their role in the disc degeneration process is yet to be fully clarified due to the differences observed among societies, even among persons (15).

In the first study regarding the gene polymorphism coding Type-1 collagen, Grant et al. described Sp1 polymorphism which affects Sp1 transcription binding area of the COL1A1 gene. COL1A1 gene codes α1 of Type 1 collagen. As a result of this polymorphism, chain rates in the collagen structure change and durability of the collagen is deteriorated (21). In another study by Pluijm et al., increase in the frequency of TT (thymine-thymine) allele in the COL1A1 gene was reported to cause increas in the interval disc degeneration (56). In their study on 24 young Greek soldiers Tilkeridis et al. demonstrated that, TT genotype was associated with the disc degeneration (73). Videman et al. reported that COL1A1 gene polymorphism led to a loss in the disc signal intensity (79).

In a study by Sahlman et al. showed that inactivation of one of the Col2A1 gene alleles forming the structure of Type 2 collagen caused ossification of the premature vertebral endplate and moderate disc degeneration in experimental mice (65).

Collagen 9 functions as a bridge between collagenous and non- collagenous proteins. Collagen 9 is a heterotrimeric protein which genetically consists of 3 different chains coded by COL9A1, COL9A2 and COL9A3 (2,51,55). In their study on the Finnish population, Karppinen et al. reported that presence of trp2 (tryptophan) allele in the COL9A2 gene was associated with degeneration of the disc and end-plate (38). In their study with Chinese volunteers, Jim et al. underlined that presence of trp2 allele was effective on development of the disc degeneration at an early age (31). In a study by Seki et al on Japanese society, presence of trp2 allele was stated to be correlated with the increase in disc degeneration in patients under 40 years of age (67). Paassilta et al. reported that presence of at least one trp3 allele in α3 chain of the collagen 9 gene increased the disc degeneration by 3 folds (52). In their study on Greek society, Kales et al. obtained contrary results (33). Videman et al. reported that, there was an association between COL9A2 and disc generation which especially occurred at the lower lumbar levels, but no such a relationship was found for different alleles of the COL9A3 gene. Again in that study, correlations were demonstrated between allelic variants of the COL1A2 gene and disc degeneration at the lower lumbar level and between allelic variants of the COL11A1 gene and disc degeneration at the upper lumbar level. In the same study, Videman et al. showed the association between COL11A and COL3A1 genes and disc bulging (79). Likewise Mio et al. demonstrated the association between allelic variants (rs1676486) of the COL11A1 gene and disc degeneration in Japanese population (48). Solovieva et al. and Noponen-Hietela et al. showed that COL11A2 polymorphism was associated with disc bulging and degenerative spinal stenosis (50,69). Boyd et al. demonstrated the association between COL9A1 gene polymorphism and disc degeneration in their study on mice (7). In their study with compressed discs, Guehring et al. demonstrated increased regulation of the COL1A2 gene in animal model (24).

VITAMIN D RECEPTOR GENE POLYMORPHISMS:

Vitamin D plays a crucial role in sulfatation of glycosaminoglycans during the proteoglycan synthesis. Sulfatation mechanism and vitamin D receptor gene (VDR) must be stable for proteoglycans can normally function. VDR bind to the active form of vitamin D and help the control of the calcium balance. Furthermore, it is also effective on differentiation, proliferation and maturation of chondrocytes. Chondrocytes play an important role in proteoglycan synthesis. As a conclusion, VDR indirectly influence the lumbar disc degeneration due to its effect on chondrocytes. However, the exact mechanism is still not fully known (6,16).

The association between VDR and disc degeneration was demonstrated for the first time by Videman et al. in 1998. In that study, two iatrogenic polymorphisms were analyzed using MRI in 85 couples male monozygotic twins. Taq 1 was one of these polymorphisms. Individuals having Taq 1 tt and Tt genotypes

were found to show predisposition to disc degeneration. Similarly, in ff and Ff genotypes of the second polymorphism Fok1, predisposition to disc degeneration was reported (77). In a study with 205 persons in the 20-29 age range in Japanese population, Kawaguchi et al. reported that Taq 1 Tt genotype caused multilevel prominent disc degeneration (37). Cheung et al. found a correlation between t allele of Taq 1 polymorphism of the VDR gene and, bulging and degeneration of the disc in persons under 40 years of age (9). Yuan et al. demonstrated the association between VDR-Apa A allele mutation and disc degeneration (82). In their study on Australian society, Jones et al. reported predisposition to disc degeneration in the persons with VDR Taq 1 tt genotype (32). In a study by Eser et al. on Taq 1 and Fok 1 polymorphisms, Ff, ff and tt genotypes were shown to be associated with heavy disc degeneration (14).

INTERLEUKIN GENE POLIMORPHISMS:

Inflammatory cytokines are produced in the body in cases of stimulation of the antigenic response such as trauma, infection etc. Their contribution to backache is well-known. In addition, inflammation is one of the factors playing an important role in catabolic process of degenerative disc disease. Solovieva et al. demonstrated the association between IL-1 polimorphism and disc degeneration using MRI in actively working Finnish population. They reported that in presence of IL-1b + 3954 T and IL-1a - 889 T alleles, disc surge increased by 2.4 and 3 folds, respectively (68). In their study, Videman et al. noted that IL1A, IL-18RAP and IL18R1 gene polymorphisms were associated with disc dehidration (79).

ADAMTS GENE POLYMORPHISMS:

ADAMTS (a metalloproteinase with disintegrin and thrombospondin motifs) is a sub family of metalloproteinase having degradation feature, affecting a part different from matrix metalloproteinases. There are 19 subtypes of ADAMTS which are divided into 4 groups in human genome (58). Aggrecanases (ADAMTS-1, -4, -5, -8, -9, -15 ve -20) have a proteoglycanolitic activity. In a recent study by Pockert et al., elevation of ADAMTS-1, -4, -5 and -15 were shown to be associated with disc degeneration and, the increase in ADAMTS-4, -5 and -15 to be correlated with increment in the degree of disc degeneration (57). In their animal model of the intervertebral disc degeneration, Furtwangler et al. reported that in that injection of ADAMTS-4 was associated with reduction in the proliferation and survival of the cells (19). Majumdar et al. and Patel et al. demonstrated the relationship between ADAMTS-4 and intervertebral disc degeneration (47,53). In their study without a control group, Hatano et al. showed the association between transligamentous disc sequestration and mRNA expression of ADAMTS-4 (28). Roberts et al. reported the association between increase of the severity of disc degeneration and aggrecanase production (61).

MATRIX METALLOPROTEINASE GENE POLYMORPHISMS:

Matrix metalloproteinases are an enzyme family capable to degrade major structural components of the intervertebral disc, having 28 types described until today. In addition, matrix metalloproteinases plays a role both in the natural production – degradation process and pathological destruction of the extracellular matrix of other several connective tissues. Main factor in intervertebral disc degeneration is impaired balance between matrix metalloproteinases and tissue metalloproteinase inhibitors that inhibit them. Of 28 types of matrix metalloproteinases, especially collagenase (MMPs 1, 8, 13), gelatinase (MMPs 2, 9), matrilysin (MMP-7) and stromelysin (MMP-3) are thought to play a prominent role in intervertebral disc degeneration. Matrix metalloproteinases are secreted as the inactive precursors and then become active. TIMPs inhibit the matrix metalloproteinases through zinc binding region of the enzyme. There are 4 types of TIMP identified with only TIMP-4 showing a high sensitivity to the cardiac tissue. TIMPs 1 and 2 among the tissue metalloproteinase inhibitors are capable to inhibit all the MMPs in intervertebral disc degeneration. Although they have ability to degrade all subtypes of the collagen such as MMP-1, MMP-8 and MMP-13, they are effective especially in degradation of the fibrillar collagen which provides mechanical strength to the tissues. MMP-1 is expressed by the activated macrophages (19,61). Weiler et al found that MMP-1, 2 and 3 were highly correlated with development of cleft and scar in the disc tissue (81). In a study by Song et al. on the adult Japanese population, an association was found between the lumbar disc degeneration and the prevalence of MMP-1 promoter polymorphism (70). In a their study conducted in order to demonstrate the associationship between lumbar intervertebral disc herniation and the gene transcription of MMP and ADAMTS, Tsarouhas et al.

did not observe mRNA expression of MMP-1 in the control or herniated disc samples (74).

MMP-2 and MMP-9 are zinc-dependent proteinases and since they use gelatin, laminin and denatured collagen as substrate they also termed as gelatinases. In a study by Bergknut et al. comparing intervertebral disc degeneration in humans and dogs, increase of the severity of intervertebral disc degeneration was reported to be correlated with the increase in MMP-2 activity in the nucleus pulposus (5). Rastogi et al. showed MMP-2 expression in annuluses of the rodents' intervertebral discs which were exposed to loading and drilling damage, and they proposed that MMP-2 played an important role in degenerative alterations in the intervertebral disc (59). In their study with the dogs which have thoracolumbar extruded disc hernia, Karli et al. demonstrated the increase of MMP-2 and MMP-9 in the affected dogs. In addition, they suggested that increased MMP-2 might contribute to degeneration of the extruded disc material in epidural region during the intervertebral disc degeneration process (36). In their study, Dong et al. showed that the frequency of MMP-2-1306CC genotype was significantly higher in the patients having lumbar disc disease than in the controls. The same authors also proposed that MMP-2-1306C/T polymorphism might be a genetic risk for development of lumbar disc disease in young adults (12). In addition, correlation between the degenerative disc lesions and increased expression in the MMP-2 activity was demonstrated in a study by Crean and Roberts (10,61). In a study by Hsieh et al., MMP-2 production was shown to increase in the disc cells exposed to an abnormal physical loading (29). In addition, in their study on mice Lotz et al. reported that MMP-2 has an important function in disc degeneration (45). Kozaci et al. reported that the levels of Pro-MMP-2 increased in the early periods of degenerative disc disease (42). In their study on rabbits, Hua et al. demonstrated that, ulinastatin which is the inhibitor of urinary trypsin decreased expression of MMP-2 and MMP-3 in IL-1β-induced disc generation (30). In a study conducted on rodents by Rostagi et al., MMP-2 was proposed to have an important function in the etiology of degenerative disc disease and might have a potential therapeutic role (59). In a research by Rugets and Kang on humans, the relationship between rough morphological changes in the annulus fibrosus and MMP-2 was demonstrated (35,64).

MMP-3 is a proteoglycan degrading enzyme which plays an important role in intervertebral disc degeneration. MMP-3 regulation is primarily adjusted at the level of transcription. MMP-3 is a key enzyme in degradation of extracellular matrix. MMP-3 activates collagenases and MMP-7 as well as other MMPs through macrophages and indirectly affects degradation of cartilage matrix (20). Takahashi et al. evaluated the relationship between disc degeneration and MMP-3 gene polymorphism in 54 young females and 49 adults in Japanese society. They found that, MMP-3-5A5A and -5A6A genotypes were more associated with degenerative findings in adults compared to -6A6A genotype (72). In their study on 720 British female patients, Valdes et al. showed the association between intervertebral disc degeneration and MMP-3 (76). In their study, Zigouris et al. demonstrated the relationship between aging and MMP-3. Again in that study, the authors argued that, MMP-1 expression was more in young population and therefore MMP-1 might play a role in degradation of matrix in the young patients (85). In a study with 174 patients and 284 control individuals in the Chinese society, Yuan et al. reported that the persons who have mutation of MMP-3 5A alleles were predisposed to disc degeneration. In addition they reported that, coupled with vibration of all the body, bending and torsional movements, -5A allele mutation increased the risk for lumbar disc degeneration (82). In their study, Nemato et al. proposed that MMP-3 was produced especially by slightly degenerated discs (49). Kanemoto et al., found that MMP-3 expression increased more compared to TIMPS-1 in degenerative intervertebral disc disease (34). Haro et al. reported that MMP-3 was required for the matrix degradation in herniated intervertebral disc resorption model (25). In a study by Roberts et al. conducted with immunohistochemical staining method on 49 disc tissue which they collected from 46 patients, MMP-3 was reported to show immunopositivity by 65% (61). In their study on the mouse intervertebral discs, Fujita et al. reported that MMP-3 induced proteoglycan loss during the aging process (18). In their study on the bovine intervertebral disc, Furtwangler et al. reported that MMP-3 provoked nor the visible matrix degradation neither major shift in the gene expression (19). In a disc degeneration model which was induced by static compression loading in rodents, Yurube et al. reported that, MMP-3 played an important role in disc degeneration and was a proper indicator of the degenera-

tion (83). In their study on rat tails which were dynamically loaded, MacLean et al. reported important mRNA alterations of MMP-3 (46). In a study by Bachmeier et al. in the degenerated and herniated discs, an important elevation was found in mRNA levels of MMP-3 and MMP-8 (3). It was reported in a study by Tsarouhas et al. that MMPs and ADAMTS-4 showed a synergistic effect in intervertebral disc herniation. Furthermore, they demonstrated that smoking descreased the expression of MMP-3 (74). In their study on 48 intervertebral disc materials collected from 42 patients, Canbay et al. found a significant correlation between the histopathological grade of intervertebral disc degeneration and MMP-3 using magnetic resonance images and, this correlation became more prominent with aging (8).

MMP-7 plays an important role in degradation of the diseased articular cartilage. MMP-7 is activated by MMP-3. Stromelysin (MMP-3, -10) and matrilysins (MMP-7, -26) are broad spectrum proteinases that have important regulatory functions in activation of the other MMPs (80). MMP-7 secreted from macrophages is important for the secretion of soluble TNF-α (26). In a study by Haro et al., MMP-7 was reported to be important for the disc resorption. In their different study, Haro et al. demonstrated that recombinant human MMP-7 (rhMMP-7) degraded the disc tissue in the surgical samples, depending on concentration. Again Haro et al. reported in their study conducted on dogs that intradiscal application of rhMMP-7 caused a decrease in the water content and proteoglycan component of the disc. Again in the study by Haro et al. MMP-7 production from macrophages was demonstrated to be required in the secretion of TNF-α which is needed for macrophage migration to the disc tissue (27).

MMP-8, known as neutrophil collagenase, is synthesized and stored in the polymorphonuclear leukocytes. MMP-8 plays a role rather in the degradation of Type 1 collagen (41). In a study by Roberts et al., MMP-8 activity was reported to increase by 4 folds in prolapsed disc hernias (61). Tsaoruhas et al. reported similar results (74).

MMP-9 is a zinc-dependent proteinase associated with matrix degradation in the disc tissue. It is also classified as gelatinase B and uses gelatin, laminin and denatured collagen as substrate. MMP-9 is synthesized in proenzyme form and stored in the neutrophil granules. In fact, MMP-9 is associated with M2-polarized macrophages and involved in wound healing and tissue remodeling (80). In their study with 43 patients, Zigouris et al. showed the association between degree of herniation and MMP-9 expression in the patients under 30 years of age. Again in that study, correlation was reported between histological degeneration score and MMP-9 expression in all age groups (85). In their study on dogs, Karli et al. reported that MMP-9 expression decreased in the acute and increased in the subacute and chronic processes of disc disease (36). In a study by Roberts and Weiler, MMP-9 expression was reported to increase in the degenerated disc tissue (61,81). Similarly, in a study by Crean et al., MMP-9 level was shown to increase in the degenerated discs (10). In tehir study conducted in order to demonstrate catabolic and anabolic gene expression in intervertebral disc degeneration using rat tail compression model, Yurube et al. found a significant increase in mRNA expression of MMP-3, 7, 9 and 13 enzymes (83). In their study on intervertebral disc samples collected from the posterior open discectomy in 63 patients, Tsarouhas et al. demonstrated that levels of MMP-9 and -13 mRNA significantly increased in the patients with chronical pain as a result of neovascularization and chronic inflammation. In addition, in that study the authors reported that mRNA levels of MMP-9 were lower in the sequestred discs than in the protruded ones (74).

MMP-13 is a member of collagenases and degrades triple helical region of the fibrillary collagen. MMP-13 degrades type 2 collagen rather which is dominant collagen in the nucleus pulposus and it is the most potent peptidolytic enzyme in this group (41,80). In a study by Klawitter et al., MMP-13 expression was reported to increase in Thompson 5 degree degenerated disc samples (40). Similar results were obtained in a study by Le Maitre and Anderson (1,43). In their study on 49 disc materials collected from 46 patients after anterior surgeries, Roberts et al. reported that MMP-13 was positively stained by 88% in the immunohistochemical staining of the degenerated disc tissue samples and this rate reached to 100% in the protruded disc materials (61). In their study on the bovine intervertebral discs, Furtwangler et al. reported that MMP-13 expression increased by ten thousand folds in the nucleus pulposus in the degenerated disc samples (19).

CONCLUSION:

Intervertebral disc degeneration is a multifactorial condition having a complex etiopathogenesis. Today disc degeneration process can not be avoided with still used clasical treatment methods and mostly semptomatic treatment for degenerative disc disease are applied with conservative and surgical approaches whic are implemented after disc degeneration. In disc degeneration course, besides the genes that are above mentioned which effects were demonstrated in numerous studies, there is evidence showing also effects of the cartilage intermediate layer protein, osteonectin gene (SPARC), polymorphisms of tissue metalloproteinases inhibitor 1 (TIMP1) and cyclooxygenase 2 (COX-2) and ADAMTS-5 polymorphisms (22,23,66,76,84,86). However, number of the studies regarding the role of genetic factors which are active in disc degeneration process for the treatment is limited. We hope that, degenerative disc disease will be transformed from a treatable process into the preventable condition as a result of better understanding of genetic factors involved in intervertebral disc degeneration and the relationship between them in the future.

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Corresponding Author: Ramazan Kahveci, MD
Address: Özel Polatlı Can Hastanesi Beyin Cerrahi Kliniği, Ankara, Türkiye
E-mail: kahveci.drramazan@gmail.com
Tel: +905052429421, **Fax:** +903126210757
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FRONTIERS OF SPINE SURGERY / *OMURGA CERRAHİSİNİN ÖNCÜLERİ*

THREE GIANT PLANE-TREES IN THE ANKARA MEDICAL FACULTY - III: PROF. TARIK YAZAR, M.D.

ANKARA TIP FAKÜLTESİNDE ÜÇ DEV ÇINAR-3: PROF. DR. TARIK YAZAR

İ.Teoman BENLİ[1]

SUMMARY

Department of Orthopaedics and Traumatology of Ankara University's school of Medicine kept and raised many academicians in terms of almost every sub branches Orthopaedics from the very first day of establishment, until today. Masters as Professor Güngör Sami Çakırgil and Professor Rıdvan Ege were played an important roles on the basis of development of spinal surgery in a certain manner which also known as "Ecole of Ankara Medical School". After these two masters, three giant plane -threes took over the mission and they were also a pioneer and contributor to develop Turkish Spinal Surgery countrywide. In these biography series, it has been told the life stories of these milestones and their endeavors' for development of Turkish Spinal Surgery in three chapters. Third chapter is including the studies of Professor Tarık Yazar. On behalf of their students, we also aimed to emphasize our appreciations and our gratitude to them.

Key Words: Tarık Yazar, scoliosis, Ibn-I Sina Instrumentation System (ISIS), spinal surgery

Level of evidence: Biography, Level V

ÖZET

Ankara Üniversitesi Tıp Fakültesi Ortopedi ve Travmatoloji Anabilim Dalı, kuruluşundan bu güne kadar aşağı yukarı Ortopedi ve Travmatolojinin her dalında çok kıymetli ve konusunda üst düzey bilgi ve deneyime sahip birçok öğretim üyesi yetiştirmiş ve bünyesinde bulundurmuştur. Ankara Üniversitesi Tıp Fakültesi Ortopedi ve Travmatoloji Anabilim Dalı'nda Güngör Sami Çakırgil ve Rıdvan Ege gibi ustalar çalışmış ve omurga cerrahisinde Ankara Tıp ekolünün gelişmesinde önemli rol oynamışlardır. Onları takip eden ve hâlihazırda çalışan Prof. Dr. Tarık Yazar, hocalarından aldığı misyonu, daha geniş bir vizyonla sürdürmüş, Türk Omurga Cerrahisi'ne önemli katkılar sağlamış, gerçek bir öncü olmuştur. Bu üç bölümden oluşan biyografi çalışmasında Türk Omurga Cerrahisine büyük katkıları olan üç dev çınarın hayat hikâyeleri ve Türk Omurga Cerrahisin gelişmesi içi çabaları anlatılmıştır. Bu çalışmanın son bölümü Prof. Dr. Tarık Yazar'a ayrılmıştır. Bu vesile ile onlara yetiştirdikleri öğrenciler adına minnet ve şükran duygularımızın ifade edilmesi amaçlanmıştır.

Anahtar Kelimeler: Tarık Yazar, skolyoz, İbn-i Sina Enstrümantasyon Sistemi, omurga cerrahisi

Kanıt Düzeyi: Biyografi, Düzey V

INTRODUCTION:

Prof. Dr. Tarık Yazar is a spinal surgeon who is closer to our generation and who is friendly. In short, he is our dear elder brother. "Downright gentleman" phrase is just suitable for him. I do not know if it is due to the fact that he is a physics engineer, his scientific curiosity, as in other fields, provided him to design a new pedicular screw. Prof. Dr. Tarık Yazar is one of the frontiers who I appreciate due to his big supports to me as well as to most of our colleagues, and who had great contributions to Turkish spinal surgery (Figure-1).

LIFE STORY OF PROF. DR. TARIK YAZAR:

Prof. Dr. Tarık Yazar was born in a small village in Artvin Şavşat in 26 May 1951. His childhood period passed in a number of cities and districts in Anatolia with his family due to his father occupational carrier from being a judge to membership to Appeals Court and Constitutional Court.

Figure-1. Prof. Dr. Tarık Yazar.

[1] **Prof. Dr. Ortopedi ve Travmatoloji Uzmanı, Ortopedi ve Travmatoloji Bölüm Başkanı, Hisar Intercontinental Hospital, İstanbul.**

He completed his high school training in Ankara Atatürk High School. While he was just 17 years old in 1968, he started to Ege University Medical School. He left the Medical School with his own decision and he became a student in Ankara University Science Faculty Physics Engineering Department. To become a scientist in nuclear physics, he tended to this field which he wanted (3).

He graduated from Ankara University Physics Department in 1973 with a degree. Since the academic members liked him so much, they insisted him on staying in the department. When he just started to the "master" program, with the "University Amnesty" provided by the government in charge in that period and by the insistence of his advisor in the university, and since this amnesty included the ones "who was enrolled into another faculty with the University Entrance Exam", he was entitled to enroll to Ege University Medical School and he started to medical school.

Prof. Dr. Uğur Büget, who he still remembers him with gratefulness and who was a "Solid State Physics" lecturer in Ankara University Science Faculty Physics Engineering, encouraged him by saying that "You graduate from the Medical School and we can make progress in those studies" since he does not have enough medical information about the neuronal and cellular communication subject in his studies about the liquid crystals. In the mind of Uğur Hoca, especially, there was the questions that what the communication between the cancer cells and how it can be prevented.

In the last years of his Medical School training, he started to spend most of his time in Orthopedics and Traumatology clinics, which he relates with especially Physics since physics was "the arithmetical condition of the justice of the matter". Since, unfortunately, there was no assistant position in Ege University in 1980, he started specialization in Orthopedics and Traumatology in Ankara University Medical School after the academicians Eroğlu, Çallı and Lök contacted directly with Prof. Dr. Rıdvan Ege (3).

The time he spent in anatomy provided him to command on surgical anatomy seriously during the surgery. While he was continuing his specialization in orthopedics, Prof. Dr. Avni Duraman, Prof. Dr. Rıdvan Ege, Prof. Dr. Güngör Sami Çakırgil, Prof. Dr. Zeki Korkusuz and Assoc. Prof. Dr. Yücel Tümer, Assoc. Prof. Dr. Ertan Mergen were the academic staff. İlker Çetin, Oğuz Polatkan and Derya Dinçer were the head assistants (3).

In 1981, he married with Prof. Dr. Zeliha Yazar, who was an Eye specialist and who is currently an academician in Kafkas University Medical School Eye Clinics and who was his classmate. He currently has 2 daughters. His daughter Elif graduated from Bilkent University Economics Department and started to work in a bank. Başak, on the other hand, graduated from Industrial Engineering Department, again, in Bilkent University and she started to work in a software company (Figure-2) (3).

Figure-2. Prof. Dr. Tarık Yazar, with his wife and daughters.

Figure-3. Prof. Dr. Tarık Yazar follows all the technological improvements probably because he is a physics engineer. While he was driving with his googles which can take a picture and video.

Figure-4. Prof. Dr. Tarık Yazar, with his dear dog "Hayat".

He became an Orthopedics and Traumatology Specialist by completing his specialization in 1985. Again, in the same year, with the encouragement of Güngör Sami Çakırgil, he tended to Spinal Surgery and he attended to a spinal surgery training programme organized by him in Zurich, Switzerland. He worked with Prof. Dr. Adam Schraber in Zurich University for 4 months. In the same year, he stayed in United States of America in Ohio University with Prof. Dr. McCulloch for a while. In following years, he attended to a number of courses and symposia about spinal surgery in a number of countries (3) (Figure-3).

He started to work in Ministry of Health Ankara Training Hospital to perform his compulsory service, which was brought into force, in 1985. He worked with Prof. Dr. Faham Sipahioğlu and Surgeon Dr. Behçet Sepici in those years. He started as a head assistant in Ankara University in 1987 after completing his compulsory service. He became an associated professor with Dr. Yener Sağlık in 1988. He was appointed to professorship in 1995. He has been working in Ankara University Medical School since then. Prof. Dr. Tarık Yazar, who was interested in cycling sports in his childhood, tended to tennis. His biggest passion

Figure-5. Prof. Dr. Tarık Yazar, during his headship in 3rd International Spinal Surgery Congress conducted in Antalya in 1994.

is "Hayat". "Hayat" is the name of the "Kangal" hybrid dog, who was adopted by his daughter Başak after a car crash and who was recovered with a surgery due to the broken legs and waist. Tarık Yazar says that his fitness is due to his walking two times a day with it (Figure-4) (3).

CONTRIBUTIONS OF PROF. DR. TARIK YAZAR TO TURKISH SPINAL SURGERY:

Prof. Dr. Tarık Yazar worked with Prof. Dr. Rıdvan Ege, Prof. Dr. Güngör Sami Çakırgil and Prof. Dr. Zeki Korkusuz, who are the doyens of the spinal surgery during his specialization in Ankara Medical School. Tarık Yazar, who was grown completely in Ankara Medical School ecole, made significant contributions to this ecole.

He became the Turkish Spine Association Administrative Board membership and also he became the head of the 3rd International Spinal Surgery Congress conducted in Antalya in 1-6 October 1994, on behalf of Turkish Spine Association (Figure-5) (1).

One of the most significant contributions of Prof. Dr. Tarık Yazar to Turkish Spinal Surgery is the cortical spongious pedicular screw, which he designed. The pull out, bending and axial loading biomechanical tests of this screw, whose upper part stays in the cortical corpus and the lower part has spongious screw threads, were performed by myself by comparing with the other modern screw systems and it was shown that it is more durable when compared to other modern screw systems especially in terms of its resistance to pull-out moment. The patent of this

pedicular screw was taken by Prof. Dr. Tarık Yazar both from TSE and "International Patent Center" in Vienna, and it was transformed to an instrumentation system by addition of the hook designs. The system was called as İbn-i Sina Instrumentation System (ISIS) and the production started in İstanbul. The introduction of the system was performed in 1993 in Turkish Orthopedics and Traumatology National Congress (5).

Prof. Dr. Tarık Yazar has large series and he is one of the people who applied the interspinous device, which is used in the kyphoplasty and degenerated disc treatment in osteoporotic vertebra fractures in Turkey (4). He is the indispensable speaker of the Bioengineering congresses about the spinal osteoporosis for years (8).

He is the person who performed the studies about the dynamic CT and MR applications in lumbar spinal stenosis and osteoporotic spine (9).

One of the most significant contributions of Prof. Dr. Tarık Yazar to Turkish Spinal Surgery is his book called "Degenerative Spinal Diseases" which he was the editor with Prof. Dr. Necdet Altun on behalf of Turkish Spine Association and which he wrote a couple of sections in and which he included the foreign authors about the subject. This book is one of two books published by Turkish Spine Association and it is a comprehensive work which gives much information from the student (7).

Prof. Dr. Yazar provided a number of young surgeons to have an experience on the cadaver by organizing Basic Spinal Surgery Cadaver courses (Figure-6).

Prof. Dr. Tarık Yazar gave conferences on "Science History" subject in a number of organizations and meetings (Figure-7).

Figure-6. Prof. Dr. Yazar provided a number of young surgeons to have an experience on the cadaver by organizing Basic Spinal Surgery Cadaver courses. From the right, the course trainers; Prof. Dr. Alpaslan Şenköylü, Prof. Dr. Emre Acaroğlu, Prof. Dr. Necdet Altun, Prof. Dr. Tarık Yazar, Prof. Dr. Mehmet Altınmakas and yours truly Prof. Dr. İ. Teoman Benli.

Figure-7. Prof. Dr. Tarık Yazar, while talking in television programme.

Figure-8. Prof. Dr. Tarık Yazar, with me and Prof. Dr. Feza Korkusuz in the gala dinner, in award ceremony in 6th International Spinal Surgery in Ankara.

CONCLUSION:

He increased his studies about minimal spinal surgery subject, he performed a number of speech on this subject and he contributed to the guidance of young people. He conducted minimal invasive surgery courses about this subject until this year and he became the founder head of Turkish Minimal Invasive Spinal Surgery Association and he conducted 1st Turkish Minimal Invasive Spinal Surgery Congress in Antalya. He was selected as the honorary president of the World Minimal Spinal Surgery congress (IV. WCMISST) in Paris in 2014 June (Figure-8) (2).

He has a number of national and international publications about the Spinal Surgery (1-10). He is still continuing to train new spinal surgeons in Ankara University Medical School Orthopedics and Traumatology Department as an Academic Member.

He overcame the unfortunate disease he had a while ago and he recovered his health again. We wish dear Prof. Dr. Tarık Yazar, who will be retired after 2 years, a long and a healthy life and happiness.

KAYNAKLAR

1- 3RD International Congress on Spine Surgery in Turkey, Antalya, 1-6 Ekim 1994.

2- http://www.spineparis2014.com. IV WCMISST, *Paris June* 11-14th, 2014.

3- Kişisel görüşme

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Address: Prof. Dr. İ. Teoman Benli, Özel Hisar Intercontinental Hastanesi, Siteyolu Sok., No:7, İstanbul.
Tel.: 0216 524 13 00
E-mail: cutku@ada.net.tr
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CME QUESTIONS / *STE SORULARI*

1- What should be the size of the most appropriate screw in mm for Turkish population according to the results of the study of Er and Benli?

a) 30
b) 32
c) 35
d) 40
e) 44

2- Which hormone levels, thought to have a role in the etiopathogenesis of Schuermann kyphosis, were reviewed in the study of Karagüven *et al*?

a) Parathyroid hormone
b) Vit- D3
c) Calcitonin
d) Growth hormone
e) Testosterone

3- Which one of the below is correct about the hormone levels asked in the 2nd question in the study of Karagüven *et al*?

a) A positive correlation was detected between the severity of kyphosis and the hormone level.

b) A negative correlation was detected between the severity of kyphosis and the hormone level.

c) If the kyphotic curvature is above the normal limits, the hormone level is also twice of the normal levels.

d) The mean hormone levels of the groups classified according to the severity of the curvature was found as statistically different.

e) The mean hormone levels of the groups classified according to the severity of the curvature was found as statistically similar.

4- Which one of the below is correct about the methods administered to achieve the vertebral body height in the study of Yüvrük *et al*?

a) Kyphoplasty is more effective
b) Vertebroplasty is more effective
c) Both of the methods are ineffective
d) Both of the methods have similar effectiveness
e) No comment can be made according to data of this study

5- How many patients were administered kyphoplasty in the study of Yüvrük *et al*?

a) 12
b) 17
c) 27
d) 32
e) 47

6- Which one of the following is correct according to the results obtained with the short segment instrumentation in which pedicular screw was also placed into the fractured vertebra in the study of Korkmaz *et al*?

a) Local kyphosis angle was clearly corrected as statistically significant.

b) Anterior body heights did not change.

c) The spinal canal diameters increased.

d) The neurological condition of all patients were recovered to normal.

e) The anterior height of the fractured vertebra was completely corrected.

7- What is the vertebral level in which most of the fractures were detected in the study of Korkmaz *et al*?

a) T-11
b) T-12
c) L-1
d) L-2
e) L-3

8- How many patients with spinal trauma did Yıldızhan *et al.* evaluated in their study?

a) 124
b) 164
c) 194
d) 234
e) 274

9- Which one of the below is <u>incorrect</u> according to the results of the study of Yıldızhan *et al*?

a) There are different classifications for each spinal region.

b) None of the classifications reached to excellence in terms of the complete description of the fracture, treatment choice and prognosis.

c) TLICS classification is only valid for the thoracolumbar region and it includes the mechanism of the fracture but the neurological condition of the patient is not mentioned.

d) When the patients were classified according to those classifications in this study, different patient groups are formed with different numbers according to type of the fracture.

e) There is a grading in AO Magerl classification according to the fracture mechanism and it is quite conmplex.

10- Which factor was detected as favorable to affect the survival of the sacral screw in patients with degenerative lumbar spinal stenosis in the study of Özkunt *et al*?

a) The age of the patient
b) The gender of the patient
c) Performing posterior decompression
d) Performing inter-body fusion
e) The technique of the screw placement

JTSS 25(3) issue CORRECT ANSWERS OF CME QUESTIONS:

1. b
2. c
3. d
4. d
5. e
6. e
7. a
8. b
9. d
10. d