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EFFECTS OF IMPLANT REMOVAL AND REMOVAL TIME ON CLINICAL OUTCOMES IN LENKE TYPE-I IDIOPATHIC SCOLIOSIS PATIENTS WHO TREATED WITH 3RD GENERATION INSTRUMENTATION SYSTEM

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ÖZET

Son bir kaç dekattır, 3. jenerasyon enstrümantasyon sistemlerinin idiopatik skolyoz cerrahi tedavisinde kullanıma başlamasıyla, frontal ve sagittal plandaki deformite daha yüksek oranlarda düzeltilmeye başlamıştır. Deformitenin düzeltilmesindeki yüksek başarıya rağmen, hastaların sırt ağrısı yakınmaları önemli bir sorun olarak karşımıza çıkmaktadır. Son yıllarda bunun başlıca, özellikle çapraz bağlantılardan kaynaklanan bir metal hastalığı sonucu oluştuğu ileri sürülmektedir. İmplantların çıkartılması füzyon olana kadar, ki bu süre yaklaşık 9 - 12 aydır, implant yezmetliği ve benzeri bir sorun da gelişmemişse ve hasta da ısrarla istemiyorsa, cerrahlar tarafından yeni morbidite riski nedeniyle tercih edilmemektedir. Literatürde implant çıkartılmasının klinik sonuçlara etkisi üzerine bir çalışma da yoktur. Bu amaçla bu çalışmada, yaşları 12-16 arasında yer alan (ortalama 13.9 ± 1.4), cerrahi tedavileri için 3. jenerasyon entrümantasyon sistemi kullanılan ve takiplerinde belirgin sırt ağrısı yakınması olan ve bu nedenle implantları sadece hastaların kendi istekleri nedeniyle çıkartılan ve Lenke tip 1 eğriliğe sahip 30 hasta bu çalışmaya dahil edilmiştir. Bu hastalar implant çıkartılmasından itibaren minimum iki yıl (ortalama 42.3 ± 8.2 ay) süre ile takip edilmişlerdir. 15'er hastadan oluşan, implantları 2 veya 3. yıl içinde çıkartılan (1. Grup) ve 4. yıl içinde veya daha geç çıkartılan (2. Grup) iki grup teşkil edilmiştir. Bu iki grubun yaş ortalaması (13.8 ± 1.4 ve 14.1 ± 1.3, t: 0.61, p > 0.01), kadın / erkek oranı (7/8 ve 7/8), preoperatif (51.6° ± 10.6° ve 52.6° ± 7.7°, t: 0.29, p > 0.01) ve postoperatif frontal plandaki eğriliğin Cobb açıları (9.4° ± 6.3° ve 9.8° ± 7.0°, t: 0.16, p > 0.01), korreksiyon oranları (% 82.8 ± 8.7 ve % 82.5 ± 10.4, t: 0.09, p > 0.01) ve korreksiyon kayıplarının (3.5º ± 3.2° ve 2.5° ± 3.3°, t: 0.84, p > 0.01) ve preoperatif (18.7° ± 24.3° ve 21.1° ± 17.1°, t: 0.31, p > 0.01) ve postoperatif torakal kifoz açıları (37.2° ± 5.9° ve 34.5° ± 8.3°, t: 1.22, p > 0.01) istatistiki olarak benzer olduğu belirlenmiştir. Her iki grupta da hastalarda postoperatif enfeksiyon, implant yetmezliği, nörolojik defisit gibi bir komplikasyona rastlanmamıştır. Her iki grubun postoperatif ve son kontroldeki ağrı, fonksiyon, mental durum ve sel-image ve tedaviden tatmin olma domainleri ve bu skorların toplamından oluşan toplam SRS-22 anket sonuçları mukayese edilmiştir. Postoperatif ve son kontrolde, sırasıyla toplam SRS-22 skorlarının, 1. grupta 19.89 ± 1.24 ve 21.03 ± 1.22, 2. grupta 20.28 ± 1.38 ve 20.65 ± 1.37 olduğu saptanmıştır (p: 0.0). Her iki grupta da self

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image, mental status domainlerinde istatistiki olarak anlamlı bir değişme görülmemiş, ağrı, fonksiyon ve tedaviden tatmin domainlerinde iyileşme olduğu, bu iyileşmenin ise implantları daha erken çıkartılan 1. grrupta daha fazla olduğu belirlenmiştir. Ayrıca, SRS-22 anket sonuçları ile implmant çıkartılma zamanı arasında istatistiki olarak anlamlı bir korelasyon olduğu da tespit edilmiştir. Bu görüşlerin ışığı altında, Lenke Tip I idiopatik skolyoz hastalarında, füzyon kitlesi geliştikten sonra, hasta da istiyorsa implantların 4. yıldan önce çıkartılması, hastanın özellikle ağrı yakınmalarının azaltılması ve fonksiyonlarının artırılması yönünden klinik sonuçları olumlu etkilediği fikri elde edilmiştir.

Anahtar Kelimeler: *Skolyoz, cerrahi tedavi, SRS-22 anketi, enstrümantasyon.*

ABSTRACT

Due to new morbidity risk, implant removal is not preferred by surgeons until the development of fusion, which takes about 9 to 12 months, unless implant fails, a similar complication develops or the patient requests. The effect of implant removal on clinical outcomes has not been previously investigated. For this purpose, 30 patients with Lenke type I adolescent idiopathic scoliosis (age range: 12-14 at the time of corrective surgery) treated with a third generation instrumentation system, experiencing apparent back pain at follow-up examinations and had their implants removed upon their request were included in this study. These patients were followed-up for a minimum of two years (mean 42.3 ± 8.2 months) after implant removal. Patients were assigned into two groups based on the timing of implant removal: at the second or third year (Group 1, n=15), and at the fourth year or later (Group 2, n=15). Groups were similar in terms of all preoperative and postoperative parameters (p>0.05). None of the patients had complications like post-operative infections, implant failure, and neurological deficits. Results of early post-operative and final follow-up visits SRS-22 questionnaires are compared between groups. Total SRS-22 scores were 19.89±1.24 and 21.03±1.22 in Group 1 and 20.28±1.38 and 20.65±1.37 in Group 2, respectively (p:0.0). No statistically significant change was observed in terms of self image and mental status domains in either of the groups, however, improvements was detected in terms of pain, function and treatment satisfaction domains. Our findings suggest that in patients with Lenke Type I idiopathic scoliosis, removal of implants before the forth year upon the request of the patient reduces pain and increases functions, provided the fusion has been developed.

Key Words: *Scoliosis, surgical treatment, SRS-22 questionnaire, instrumentation.*

INTRODUCTION

During the last decade, the three-plane deformity concept of idiopathic scoliosis has led to the evolution of spinal instrumentations correcting the deformity in all three planes. Multiple level fixation with wires or hooks at strategic vertebrae, double rods and transverse connecting devices have become the state-of-the-art technology in addressing this complex problem [3,14-18]. Multiple hook applications to the strategic vertebrae, 'claw' applications to the proximal and distal part of the curve, new locking mechanisms and improved transverse connectors made these systems biomechanically safer and led higher correction rates to be achieved [26].

The most significant late complications of adolescent idiopathic scoliosis include implant failure, correction losses, deep infection and pseudoarthrosis [26]. The removal of implant is not suggested unless these complications have occurred. Bago et al. reviewed the survival for Cotrel–Dubousset instrumentation performed to 133 idiopathic scoliosis cases operated between 1987 and 1995. After a 10 year period, the implant was removed due to implant failure only in 23.5 % of the patients. Authors also suggested a strong correlation between implant failure and preoperative planning [11].

Another major reason for implant removal is the presence of postoperative infection. Debridement and antibiotics are usually successful for the treatment of early postoperative infection and implant removal is often not required [14,26]. Benli et al. reported that they found early superficial infection following posterior corrective surgery with Texas Scottish Rite instrumentation in 5 patients and they removed the implants due to deep infection in 3 patients in their idiopathic scoliosis series of 217 patients [12]. Muschik et al. reported easy wound healing in late infections following implant removal at the expense of a decreased chance of surgical corrective revision [18]. Hahn and Zbinden reported deep infection caused by propionibacterium acnes in 6.9% of their 101 operated adolescent idiopathic scoliosis patients. They successfully eradicated infections by removing implants and use of antibiotics [23].

Regarding the long term results of the idiopathic scoliosis, it seems that idiopathic back pain is one of the most important problems [14,26]. The most significant cause of pain at early phases seems to be the injury of paravertebral muscles, in these patients undergoing aggressive surgery [22]. The second possible mechanism may be related to the metal disease seen in total hip replacements, which may lead to late back pain. In their study published in 2001, Gaine et al. clinically and histopathologically demonstrated that the most important cause of the late back pain was the metal accumulation around the cross links used to construct a rigid frame [19].

In the literature, there is no study on implant removal due to back pain and subsequent clinical findings. In the present study, we prospectively followed 30 patients operated for idiopathic scoliosis with posterior third generation instrumentation who developed severe idiopathic back pain during the postoperative period. The present study is the first study on this particular subject. Furthermore, the effect of the timing of implant removal was also assessed by categorizing the patients into two groups based on the timing of removal: at the second or third year vs. forth year or later.

The public surveys on preoperative and postoperative self-image, pain, function and the mental status of the patients with idiopathic scoliosis point out the subjective satisfaction of them and their families. These studies also help us to find out the effect of the treatment on the overall life quality of the patient. The questionnaires like SRS-22, SRS-24 and Short Form-36 are mostly

used ones in recent years[6-10,22,33-36]. In the present study, Turkish version of SRS-22 questionnaire adapted and validated by Alanay et al. was used to evaluate the effect of implant removal on back pain, function and patient satisfaction level [1].

PATIENTS AND METHODS:

Thirty adolescent idiopathic scoliosis patients operated by Dr. Benli in SSK Ankara Diskapi Training Hospital between 1994 and 2001 for the correction of Lenke Type I (Flexible right thoracic scoliosis) deformity were included in the present study. Texas Scottish Rite Hospital system was used for all patients. These patients had admitted to the hospital for severe back pain after at least one year following surgery. The average time to hospital admission for back pain after corrective surgery was 33.1 ± 16.1 months (14-58 months). Implant failure, pseudoarthrosis and infection were excluded by clinical, laboratory, electrophysiological and radiological examinations. After elimination of any possibilities of organic causes, idiopathic back pain was attributed to the implant, as also claimed by the patients. Implant removal was planned following necessary routine laboratory examinations and consultations.

In prone position, entering from the previous incision scar, muscles were exposed gently and implants were achieved. Implants were removed and fusion area was examined carefully, and also the presence of any pseudoarthrosis area was searched thoroughly. Intraoperatively, combined SEP and MEP monitoring and cell saver autotransfusion device were used. Antibiotic prophylaxis was initiated with 1 gram of a first generation parenteral cephalosporin one hour before the operation and maintained with 0.5 gram BID for two days. Approximately 1.8 ± 1.2 unit of blood was transfused to the patients. Culture specimen was obtained from the operation area and biopsy was taken from the fusion area. Thereafter, the layers were closed in order. Postoperatively on the first day the patients were mobilized. On the fifth day postoperatively, patients were discharged from the hospital. Their sutures were taken at Day 12 and they were called back for follow up visits at 3rd, 6th and 12th months. The final follow-up visits were done in June 2005. At these visits patients were evaluated clinically and radiologically.

Preoperatively and at the end of follow up, SRS-22 questionnaire was administered. It had pain, function, mental state, self-image and treatment satisfaction domains. Each of the first four domains had 5 questions whereas treatment satisfaction domain had 2 questions. Each question was scored over 5 points and total score was divided to 5 for each domain to obtain domain score; and total score for questionnaire was evaluated over 22 points.

In addition, in this study patients were categorized into two groups on the basis of time to postoperative implant removal in order to assess the effect of timing on clinical outcomes. Group 1 and 2, each included 15 patients, had implant removal at the 2nd/3rd year and 4th year or later, respectively. Groups were compared with respect to age, gender, preoperative and postoperative Cobb angle of the curve at frontal plane, correction rates, correction losses and preoperative SRS-22 questionnaire score. Then the effect of implant removal timing on the clinical outcomes was assessed by comparing the questionnaire scores at the end of follow up.

SPSS for Windows 9.0 software was used for the statistical analyses. "Significancy test of the difference between two pairs" and "student t-test" were applied. A p value <0.01 was considered significant.

RESULTS:

The mean age of patients at the time of corrective surgery and at the time of implant removal was 13.9 ± 1.4 years (range 12 - 16 y) and 15.9 ± 2.4 y (range 14-18 y), respectively. Female to male ratio was 14:16. The mean time from corrective surgery to implant removal was 33.1 ± 16.1 months, and the mean follow up period was 42.3 ± 8.2 months (minimum 2 years of follow-up).

- Frontal and Sagittal Plane analysis before and after corrective surgery:

When all patients were included in the analysis before corrective surgery, the mean Cobb angle for the curves at the frontal plane was 52.1° ± 9.1° and they were reduced to 9.6° ± 6.6° postoperatively, resulting in a statistically highly significant mean improvement of 82.7% ± 9.4% (t: -3.6, p= 0.001) (Table -1). At the last follow-up visit before implant removal, when all patients were included in the analysis, a correction loss of 3.0° ± 3.2° was seen in the scoliotic curve and a statistically significant improvement of the mean Cobb angles (13.1° ± 6.8°) was obtained compared to preoperative values (t: 32.1, p < 0.001).

When all patients were included in the analysis for sagittal plane, mean thoracal kyphosis angle, which was 19.9° ± 20.7° before corrective surgery significantly improved to 36.1° ± 7.3° postoperatively (t: -3.6, p= 0.01). At the last visit before implant removal, there was a minimal loss and mean thoracal kyphosis angles were maintained as 35.8° ± 8.5° (Table-1).

— The assessment of patients before and after implant removal:

All patients were suffering from severe back pain before implant removal surgery and there were no findings suggesting infection, implant failure or pseudoarthrosis in the preoperative clinical, radiological and laboratory evaluations. Patients described their pains as localized on the paravertebral region, unresponsive to medical treatment, partially relieved by rest, usually blunt and occasionally penetrating.

No signs of infection or pseudoarthrosis were found during the implant removal operation. There was no growth in the cultures obtained from painful area and no pathology was found in biopsies taken from fusion area. The only notable finding was the relatively thickened fibrous tissue particularly around the rods and cross link plates, and the darkening of this tissue with the appearance of metal residue. Histopathological examination of this fibrous tissue revealed phagocytic metal inclusions.

No early or late complications occurred during and after implant removal and in the follow up period. No infection or neurological deficit was observed.

— End of follow-up evaluation:

In the end of follow-up evaluation following the removal of implants, frontal X-rays revealed a 2.1° ± 2.0° correction loss after a mean duration of 42.3 ± 8.2 months, and the final improvement rates (81.8% ± 8.6%) were statistically similar to the improvement rates obtained after corrective surgery (p > 0.05). Also, similar improvement rates were obtained for sagittal plane (mean 34.9° ± 8.6°).

The mean scores for pain, function, self image, mental status, treatment satisfaction domains of SRS-22 questionnaire before implant removal operation were 3.97 ± 0.28, 3.97 ± 0.28, 4.03 ± 0.29, 4.05 ± 0.27 and 4.17 ± 0.24 respectively, and total score was 20.18 ± 1.24 (Table-2). When all patients were included, statistically significant improvements were found in pain (4.06 ±

TABLE-1. The results of the patients.

	Follow-up	Age	Preop. Cobb	Postop. Cobb	t	p	Postop. Correction Rate (%)	Follow-up Cobb	t	p	Loss of Correction	Preop. Thoracic Kyphosis	Postop. Thoracic Kyphosis	t	p	Follow-up Thoracic Kyphosis	t	p
2.-4. year	42.7 ± 7.4	13.8 ± 1.4	51.6° ± 10.6°	9.4° ± 6.3°	24.20	0.0	82.8 ± 8.7	13.3° ± 5.3°	18.90	0.0	3.5° ± 3.2°	18.7° ± 24.3°	37.2° ± 5.9°	-0.69	0.018	37.7° ± 8.8°	-2.59	0.021
Over 4-y.	42.0 ± 9.1	14.1 ± 1.3	52.6° ± 7.7°	9.8° ± 7.0°	41.9	0.0	82.5 ± 10.4	12.9° ± 8.2°	28.40	0.0	2.5° ± 3.3°	21.1° ± 17.1°	34.5° ± 8.3°	-2.37	0.032	34.0° ± 8.1°	-2.28	0.039
t	0.23	0.61	0.29	0.16	-	-	0.09	0.16	-	-	0.84	0.31	1.22	-	-	1.19	-	-
p	> 0.01	> 0.01	> 0.01	> 0.01	-	-	> 0.01	> 0.01	-	-	> 0.01	> 0.01	> 0.01	-	-	> 0.01	-	-
Total	42.3 ± 8.2	13.9 ± 1.4	52.1° ± 9.1°	9.6° ± 6.6°	42.8	0.0	82.7 ± 9.4	13.1° ± 6.8°	32.1	0.0	3.0° ± 3.2°	19.9° ± 20.7°	36.1° ± 7.3°	-3.6	0.001	35.8° ± 8.5°	-3.5	0.002

TABLE-2. The results of SRS-22 questionnaire

	PAIN				FUNCTION				SELF IMAGE				MENTAL STATUS				SATISFACTION				TOTAL SCORE			
	Preop.	Postop.	t	p	Preop.	Postop.	t	p	Preop.	Postop.	t	p	Preop.	Postop.	t	p	Preop.	Postop.	t	p	Preop.	Postop.	t	p
2.-4. y.	3.86 ± 0.28	4.17 ± 0.32	(-8,06)	0.0	3.91 ± 0.27	4.19 ± 0.32	(-6,38)	0.0	3.99 ± 0.33	4.04 ± 0.29	(-0.41)	0.69	3.99 ±0.26	4.07 ± 0.23	(-2.16)	0.48	4.15 ± 0.22	4.45 ± 0.29	4.53	0.0	19.89 ± 1.24	21.03 ± 1.22	(-7.15)	0.0
Over 4 y.	4.01 ± 032	4.09 ± 0.29	(-3,21)	0.006	3.97 ± 0.33	4.06 ± 0.29	(-3,76)	0.0	4.03 ± 0.29	4.07 ± 0.27	(-2.10)	0.54	4.07 ± 0.29	4.11 ± 029	(-1.78)	0.96	4.19 ± 0.27	4.32 ± 0.33	(-3.19)	0.006	20.28 ± 1.38	20.65 ± 1.37	(-5.82)	0.0
t	1.38	0.54	-	-	0.55	1.16	-	-	0.36	0.29	-	-	0.8	0.42	-	-	0.5	1.73	-	-	0.81	0.8	-	-
p	> 0.01	> 0.01	-	-	> 0.01	> 0.01	-	-	> 0.01	> 0.01	-	-	> 0.01	> 0.01	-	-	> 0.01	> 0.01	-	-	> 0.01	> 0.01	-	-
Total	3.97 ± 0.28	9.6° ± 6.6°	(-5,11)	0.0	3.97 ± 0.28	4.12 ± 0.31	4.12 ± 0.31	0.0	4.03 ± 0.29	4.06 ± 0.27	(-1.44)	0.16	4.05 ± 0.27	4.09 ± 0.26	(-2.85)	0.8	4.17 ± 0.24	4.38 ± 0.31	(-5.18)	0.0	20.18 ± 1.24	20.84 ± 1.29	(-6.37)	0.0

0.66), function (4.12 ± 0.31) and treatment satisfaction scores (4.38 ± 0.31), whereas no change was obtained for self image and mental status domains. Hence, a statistically significant improvement was found in total score (20.84 ± 1.29) ($p< 0.001$).

- The effect of timing of implant removal on clinical outcomes :

Of 30 patients included in this study, in 15 patients implants were removed at the second and 3rd year following corrective surgery, and in 15 they were removed at the fourth year or later. These two groups were statistically similar with respect to follow up duration (t: 0.23, $p > 0.01$), mean age at the time of primary operation (t: 0.61, $p > 0.01$), female to male ratios, Cobb angles before (t: 0.29, $p > 0.01$) and after (t: 0.16, $p > 0.01$) corrective surgery, postoperative correction rates (t: 0.09, $p > 0.01$), mean Cobb angles before implant removal (t: 0.16, $p > 0.01$), correction losses (t: 0.84, $p > 0.01$), mean thoracal kyphosis angles before corrective surgery (t: 0.31, $p > 0.01$), mean thoracal kyphosis angles postoperatively (t: 1.22, $p > 0.01$) and before implant removal (t: 1.19, $p > 0.01$) (Table-1).

Regarding preoperative SRS-22 domains before implant removal operation, both groups had statistically similar scores with respect to pain (3.86 ± 0.28 vs. 4.01 ± 0.32), function (3.91 ± 0.27 vs. 3.97 ± 0.33), self image (3.99 ± 0.33 vs. 4.03 ± 0.29), mental status (3.99 ± 0.26 vs. 4.07 ± 0.29), treatment satisfaction level (4.15 ± 0.22 vs. 4.19 ± 0.27) and total score (19.89 ± 1.24 vs. 20.28 ± 1.38) ($p> 0.05$) (Table-2).

These two groups with similar clinical and radiological characteristics and same number of patients were clinically compared at the end of follow-up visit after implant removal operation. Their SRS-22 scores were also compared (Table-2). Thus, it was shown that statistically similar results were obtained in all domains. Although there were favorable increases in most individual scores and in total scores at the last visit compared to the assessments before implant removal in both groups, improvement in group 1 was greater in terms of pain scores (Table - 2).

DISCUSSION :

Instrumentation systems, first introduced with Harrington Rod system in 1960s, are commonly used in the surgical treatment of adolescent idiopathic scoliosis, basically in order to protect the fusion field until solid fusion formation, to eliminate need for external immobilization (such as a plaster body cast) and the possible related problems, and to enable early movement and rehabilitation[14,26]. As yet, metallurgic and biomechanical instrumentation systems have highly developed. These implant systems have been evaluated in terms of rigidity and biomechanical endurance. Many papers related to high three-dimensional correction and increased fusion rates were reported upon introduction of the third generation instrumentation systems [3,14-18,22,26].

During recent two decades, several methods have been applied for better correction, especially for scoliosis, which is accepted as a cosmetic deformity. Combined surgical procedures, such as posterior instrumentation following anterior releasing of rigid curves, are among these [14,26]. Fixation of each level of the curve by transpedicular screws and augmentation through sublaminar wiring are the other methods used for the same purpose [13,24].

In recent years, long-term results of these surgical techniques applied in scoliotic patients demonstrated that, despite high patient satisfaction rate, there are still problems about these techni-

ques, especially with regard to pain and function[22,25,27]. Subjective patient response questionnaires, such as SRS-22, are commonly and increasingly used for the evaluation of clinical results. These studies appear to support surgical success in the long-term [2,4-10].

Asher et al. reported in their studies that in idiopathic scoliosis patients treated with Isola instrumentation, the self-imaging scores raised at 3rd and 24th months while the function scores lowered at the 3rd month, returned to the baseline at the 6th month and raised again at the 24th month. They also found a reverse correlation between postoperative curve magnitude and the scores[7,8]. White et al. reported the effect of fusion rates on pain scores, and Peres Gruesco et al. demonstrated in their CD instrumented 10 year follow-up study that the changes causing pain was not different than the normal population[35-36]. Takahashi et al reported 23 % degenerative change rate at the un-instrumented lumbar site during five to nine years follow-up[34]. White et al. reported an improvement in functional scores with surgery [36].

As the follow-up period got longer and the patients' ages got older, the satisfaction from the treatment increased in the study of Rinella et al., however, the final curve status did not correlate with the satisfaction level [33]. Asher et al. could not find a relation between the trunk deformity at the last follow-up visit and the treatment satisfaction level [4]. Haher et al. also reported that the radiological status did not correlate with the satisfaction level [22].

Review of the studies with long term results demonstrates that pain complaints of the patients are mainly caused by infection, pseudoarthrosis and implant failure [26].

One of the main causes of aseptic loosening and pain in total hip replacement procedures is defined as a metal disorder resulting from metal deposits. Gaine et al. suggested that, especially due to axial plan compulsions and rotational forces, metal accumulation takes place around crosswise connections and this is the main cause of pain with unknown origin [19]. In this study, the cause of pain in these 30 idiopathic scoliosis patients with severe idiopathic back pain without any clinically, biochemically, or radiologically identified cause such as implant failure, infection, or pseudoarthrosis, may be metal dust deposits, as also suggested by Gaine et al. Our previous observations also support this explanation. In order to ensure patient homogeneity, only Lenke Type I-A cases were enrolled into this study. After removal of the implants, initially metal deposits are seen macroscopically, then this finding was confirmed histopathologically. Based on our results, a firm conclusion may not be drawn regarding the mechanism how metal deposition leads to pain formation. However, inflammation, phagocytic activity and subsequent release of pain mediators appear to be the most reasonable explanation.

Removing an implant is often considered when there is an implant failure or infection. 10-year survey studies have demonstrated that only one fifth of the implants used in surgical scoliosis therapy are removed. Our literature search failed to identify any study investigating the effect of removing implants on clinical results. Implants were removed in these patients with severe idiopathic back pain, considering this procedure would eliminate the possibility of a permanent metal disorder. Implants were removed average 33.1 months after corrective surgery and clinical results were evaluated after a mean duration of 42.3 months. At the end of this period, a minimal - and less than when implants were in place - correction loss (2.1° ± 2.0°) was observed; and corrections were maintained at both frontal and sagittal planes, due to the development of solid fusion mass.

Statistically significant improvement was detected in SRS-22 query scores, including pain, function, mental status, self-image, and satisfaction domains, at the last follow-up visit compared to the preoperative period. Total score was increased from 20.18 ± 1.24 to 20.84 ± 1.29. These data appear to support the hypothesis that removing implants is favorably affecting clinical outcomes.

In addition, the possible effect of implant removal timing on clinical outcomes was also investigated. We could not also find any previous study investigating this subject. Two groups each with 15 patients were formed on the basis of the timing of implant removal, either in the second and 3rd postoperative year or at the fourth year and later. All clinical and radiological features of these two groups were statistically similar before and after corrective surgery and at the visit just before the removal of the implants. SRS-22 query results were also similar for these two groups for all domains at the final visit after the removal of implants. Although these results suggest that the timing of implant removal is not important in terms of clinical outcomes, patients in group 1 (earlier removal) had higher scores for pain, function and satisfaction domains compared to group 2 (later removal).

These findings suggest that, removal of implants before the 4th year, even upon the request of the patient, favorably affects the outcome in Lenke Type I idiopathic scoliosis patients, particularly in terms of pain complaints and function, provided that fusion has been developed.

REFERENCES

1- Alanay A, Cil A, Berk H, Acaroğlu RA, Yazıcı M, Akcalı O, Kosay C, Genc Y, Surat. Reliability and validity of adapted Turkish version of Scoliosis Research Society-22 (SRS-22) questionnaire. Spine 2005; 30 (21): 2464-2468.

2- Antuno SA, Mendez JG, Lopez - Fanjul JC, Paz - Jimenez J. Cotrel-Dubousset instrumentation in idiopathic scoliosis at 5 - year follow - up. Acta Orthop Belg 1997; 63:74-81.

3- Ashman RB, Herring JA, Johnston CE. Texas Scottish Rite Hospital (TSRH) Instrumentation System. In: Bridwell KH, DeWald R (Eds) The Textbook of Spinal Surgery, JB Lippincott Company, Philadelphia, 1992; pp: 219-248.

4- Asher M, Min Lai S, Burton D, Manna B. Spine deformity corraletes beter than trunk deformity with idiopathic scoliosis patients' quality of life questionnaire responses. Stud Health Technol Inform 2002; 91: 462-464.

5- Asher M, Min Lai S, Burton D, Manna B. The reliability and concurrent of the scoliosis research society – 22 patient questionnaire for idiopathic scoliosis. Spine 2003; 28 (1) : 36-69.

6- Asher M, Min Lai S, Burton D, Manna B. Scoliosis research society – 22 patient questionnaire : responsiveness to change associated with surgical treatment. Spine 2003; 28 (1): 70-73.

7- Asher M, Min Lai S, Burton D, Manna B. Discrimination validity of the scoliosis research society – 22 patient questionnaire : relationship to idiopathic scoliosis curve pattern and curve size. Spine 2003; 28 (1): 74-78.

8- Asher M, Min Lai S, Burton D, Manna B. The influence of spine and trunk deformity on preoperative idiopathic scoliosis patients' health-related quality of life questionnaire responses. Spine 2004; 29 (8) : 861-868.

9- Asher M, Lai SM, Burton D, Manna B, Cooper A. Safety and efficacy of Isola instrumentation and arthrodesis for adolescent idiopathic scoliosis: two- to 12-year follow-up. Spine 2004; 29 (18): 2013-2023.

10- Bago J, Climent JM, Ey A, Perez-Grueso FJ, Izquierdo E . The spanish version of the SRS-22 patient questionnaire for idiopatic scoliosis: transcultural adaptation and reliability analysis. Spine 2004; 29 (15): 1676-1680.

11- Bago J, Ramirez M, Pellise F, Villanueva C. Survivoship analysis of Cotrel – Dubousset instrumentation in idiopathic scoliosis. Eur Spine J 2003; 12(4) : 435-439.

12- Benli IT, Akalın S, Kıs M, Cıtak M, Aydın E, Duman E. Frontal and sagittal balance analysis of late onset idiopathic scoliosis treated with third generation instrumentation. Kobe J Med Sci 2001; 47: 231-253.

13. Benli IT, Büyükgüllü O, Altug T, Akalın S, Ateş B, Kurtuluş B. Augmentation of third generation instrumentation with sublaminar titanium wiring in late onset idiopathic scoliosis. The Surgical Results and Analysis of Trunk Balance. Kobe J Med Sci, 2004; 50 (3-4): 83-100.

14- Bridwell KH. Spine update. Surgical treatment of adolescent idiopathic scoliosis: the basics and the controversies. Spine 1994; 19:1095-1100.

15- Bridwell KH. Spinal instrumentation in management of adolescent idiopathic scoliosis. Clin Orthop Rel Res 1997; 335: 64-72.

16- Bridwell KH, Hanson DS, Rhee JM, Lenke LG, Baldus C, Blanke K. Correction of thoracic adolescent idiopathic scoliosis with segmental hooks, rods, and Wisconsin wires posteriorly: it's bad and obsolete, correct? Spine 2002; 27 (18): 2059-2066.

17- Chopin D, Morin C. Cotrel-Dubousset instrumentation (CDI) for adolescent and pediatric scoliosis. In: Bridwell KH, DeWald RL (Eds) The Textbook of Spinal Surgery. JB Lippincott Company, Philadelphia, 1992; pp: 183-217.

18- Dubousset J, Cotrel Y. Application technique of Cotrel-Dubousset Instrumentation for scoliosis deformities. Clin Orthop Rel Res 1991; 264: 103-110.

19- Gaine WJ, Andrew SM, Chadwick P, Cooke E, Williamsson JB. Late operative site pain with isola posterior instrumentation, implant removal : infection or metal reaction? Spine 2001; 26 (5): 583-587.

20- Gotze C, Liljenqvist UR, Slomka A, Gotze HG, Steinbeck J. Quality of life and back pain : outcome 16.7 years after Harrington instrumentation. Spine 2002; 27 (13): 1456-1463.

21- Haher TR, Merola A, Zipnick RI, Gorup J, Mannor D, Orchowski J. Meta-analysis of surgical outcome in adolescent idiopathic scoliosis. A 35-year English literature review of 11,000 patients. Spine 1995; 20 (14): 1575-1584.

22- Haher TR, Gourup JM, Shin TM, Homel P, Merola AA, Grogan DP, Pugh L, Lowe TG, Murray M. Results of the Scoliosis Research Society instrument for evaluation of surgical outcome in adolescent idiopathic scoliosis. A multicenter study of 244 patients. Spine 1999; 24 (14): 1435-1440.

23- Hahn F, Zbinden R, Min K. Late implant infection caused by propionibacterium acne ich scoliosis surgery. Eur Spine J 2005; 14 (8): 783 – 788.

24- Halm H, Niemeyer T, Link T, Liljenqvist U. Segmental pedicle screw instrumentation in idiopathicthoracic and lumbar scoliosis. Eur Spine J 2000; 9 (3): 191-197.

25- Helenius I, Remes V, Yrjonen T, Ylikoski M, Schlenka D, Helenius M, Poussa M. Comparison of long-term functional and radiologic outcomes after Harrington instrumentation and spondylodesis in adolescent idiopathic scoliosis: a review of 78 patients. Spine 2002; 27 (2): 176-180.

26- Herring JA.Tachdjian's Pediatric Orthopaedics. 3rd Ed. WB Saunders Company, Philadelphia, 2002; pp: 326.

27- Merola AA, Haher TR, Brkariç M, Panagopoulos G, Mothur S, Kohani U, Lowe TG, Lenke LG, Wenger DR, Newton PO, Clements DH, Betz RR. A multicenter study of the outcomes of the surgical treatment of adolescent idiopathic scoliosis using the Scoliosis Research Society (SRS) outcome instrument. Spine 2002; 27 (18): 2046-2051.

28- Muschik M, Lück W, Schlenzka D. Implant removal for late – developing infection after instrumentation and posterior spinal fusion ffor scoliosis : reinstrumentation reduction and correction. A retrospective analysis of 45 cases. Eur Spine J 2004; 13 (7): 645-651.

29- Perez-Grueso FS, Fernandez-Baillo N, Arauz de Robles S, Garcia Fernandez A. The low lumbar spine below Cotrel-Dubousset instrumentation: long term findings. Spine 2000; 25 (18): 2333-2341.

30- Remes V, Helenius I, Schlenzka D,Yrjonen T, Ylikoski M, Poussa M. Cotrel–Dubousset (CD) or Universal Spine System (USS) instrumentation in adolescent idiopathic scoliosis (AIS): comparison of midterm clinical, functional, and radiologic outcomes. Spine 2004; 29 (18) : 2024-2030.

31- Richards BS, Birch JG, Herring JA, Johnston CE, Roach JW. Frontal plane and sagittal plane balance following Cotrel-Dubousset instrumentation for idiopathic scoliosis. Spine 1989; 14:733-737.

32- Richards BS, Herring JA, Johnston CE et al. Treatment of adolescent idiopathic scoliosis using Texas Scottish Rite Hospital Instrumentation. Spine 1994; 19:1598-1605.

33- Rinella A, Lenke L, Peelle M, Edwards C, Bridwell KH, Sides B. Comparison of SRS questionnaire results submitted by both parents and patients in the operative treatment of idiopathic scoliosis. Spine 2004; 29 (3): 303-310.

34- Takahashi S, Delecrin J, Passuti N. Changes in the unfused lumbar spine in patients with idiopathic scoliosis. A 5- to 9-year assessment after Cotrel-Dubousset instrumentation. Spine 1997; 22 (5): 517-523.

35- White SF, Asher MA, Lai SM, Burton DC. Patients' perceptions of overall function, pain, and appearanca after primary posterior instrumentation and fusion for idiopathic scoliosis. Spine 1999; 24 (16): 1693-1699.

36- White SF, Asher MA, Lai SM, Burton DC. Patients' perception of overall function, pain, and appearance after primary posterior instrumentation and fusion for idiopathic scoliosis. Discussion. Spine 1999; 24 (16): 1699-1700.

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DERLEME / REVIEW ARTICLE

HIV POZİTİF VE BAĞIŞIKLIĞI BASKILANMIŞ HASTALARDA OMURGA ENFEKSİYONLARI

Alper KAYA[1]

SUMMARY

Spinal infections are relatively uncommon but have potentially poor consequences if not diagnosed and treated correctly. Compromised immunologic responsiveness, either transient or permanent, predisposes patients to more frequent and more severe infections. Infection treatment must include treatment of immun compromising underlying condition. The pandemic of human immunodeficiency virus (HIV) has caused a rise in tuberculosis and extremely rare spinal infections caused by fungus, virus and atypical bacteria that usually are nonpathogenic. Immun system and altered immun status investigated and management of spinal infections discussed in this review.

Key words: *AIDS, immunity, spondylitis.*

ÖZET

Omurga enfeksiyonları göreceli olarak nadir, ancak doğru tanı ve tedavi uygulanmadığında kötü sonuçları olan enfeksiyonlardır. Geçici veya kalıcı olarak baskılanmış bağışıklık yanıt hastaları daha sık ve ciddi enfeksiyonlara yatkın hale getirir. Enfeksiyonun tedavisiyle birlikte risk faktörlerinin ve altta yatan bağışıklığı etkileyen hastalığın da tedavisi gereklidir. Özellikle human immunodeficiency virus (HIV) enfeksiyon pandemileri, bu hastalarda tüberküloz, çok nadir görülen mantar, virüs ve genellikle patojenik olmayan atipik bakterilerle enfeksiyonlarının sayısında artışa neden olmaktadır. Bu derlemede bağışıklık sistemi ve bu sistemi baskılayan durumlar gözden geçirilerek, omurga enfeksiyonlarına karşı yaklaşım tartışılmıştır.

Anahtar kelimeler: *AIDS, immünite, spondilit.*

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GİRİŞ

Omurga enfeksiyonları göreceli olarak nadir olmalarına karşın doğru tanı ve tedavi yapılmadığında çok kötü sonuçları olan enfeksiyonlardır. Bağışık yanıtın geçici veya kalıcı baskılanması, hastaları daha sık ve ciddi enfeksiyonlara yatkın hale getirir. Bağışıklık sisteminin baskılanmasına yol açan başlıca hastalıklar ve durumlar tablo 1'de belirtilmiştir. Tüm bu durumlar konak bağışıklığının humoral veya hücresel komponentlerini bozar veya düzensizleştirir[8].

Omurga infeksiyonları özellikle nöral yapıların zarar görmeden tanı konarak tedavi edilmesi gereken enfeksiyonlardır. Spontan omurga enfeksiyonları antibiyotik, istirahat ve immobilizasyonla konservatif tedavi edilebilirken, dirençli olgularda kesin tanı için açık biyopsi yapılabilir veya ilerleyici nörolojik tutulumu olanlarda cerrahi tedavi uygulanabilir. Bağışıklık sistemi baskılanmış hastalarda konservatif tedaviler daha başarısız olur ve cerrahi tedavi sıklıkla gerektirir[16]. Omurga enfeksiyonu gelişen hastaların yaklaşık %40'ında değişik derecelerde bağışıklık yetmezliği tespit edilmiştir[4,11,13].

HIV ve ona bağlı AIDS (acquired immunodeficiency syndrome) Güneydoğu Asya ve Afrika'da pandemik düzeylere ulaşmıştır. 2004 yılının sonunda Afrika'da HIV pozitif 25.4 milyon insanın yaşadığı ve 3.1 milyon enfeksiyonun oluştuğu bildirilmiştir[22]. Amerika Birleşik Devletleri'nde 2000 yılında HIV pozitif insan sayısı 950.000'e ulaşmıştır ve 2004 yılında 1 milyonu aştığı tahmin edilmektedir[20]. Periferik kas iskelet sistemi enfeksiyonları ve spinal enfeksiyonlar HIV enfeksiyonlu hastalarda hastanede yatış süresi ve maliyeti yükseltmektedir. Omurga tüberkülozu gelişmiş ülkelerde tamama yakın eradike edilmişken, HIV'li hastalarda ortaya çıkmaktadır[6]. Ancak HIV pozitif hastalarda karşılaşılan enfeksiyonların tamamı düşünülürse kemik-kıkırdak enfeksiyonları intravenöz ilaç kullanan hastalara göre daha nadir görülmektedir. Genel popülasyona göre ise HIV veya AIDS'li hastalarda omurga enfeksiyonları görülme sıklığı 2-10 kat fazladır[52]. 40 ve daha fazla olgu içeren değişik serilerde intravenöz ilaç kullanan hastalarda omurga enfeksiyonu sıklığı %11-35 bildirilmiştir[27]. Alkolik hastalarda 2 farklı seride omurga enfeksiyonu sıklığı %13-18 arasında bildirmiştir[47,53].

Senthikumar ve ark. hastanede yatan HIV pozitif hastalarda negatiflere göre staf. aureus bakteriyemisi riskinin 16.5 kat olduğunu bildirmiştir[44]. En sık predispozan faktör uzun süreli kateterizasyonlardır. Omurgaya özgü enfeksiyonlar olmasa da O'Brien ve Denton açık tibia kırıklarından sonra HIV negatif hastalarda %10 sıklıkta staf. aureus enfeksiyonu görülürken HIV pozitiflerde %100 sıklıkta görüldüğünü rapor etmişlerdir[39]. Literatürde Jellis, Heary ve Letao'nun yayınlarında da HIV pozitif hastalarda omurga enfeksiyonlarının normal popülas-

Tablo 1: Bağışıklık sistemini baskılayan durumlar

Human Immunodeficiency Virus(HIV) enfeksiyonu	Beslenme bozuklukları
İntravenöz ilaç kullanımı	Kanser
Alkolizm	Kemoterapi alan hastalar
Siroz	Organ transplantasyonu
Diabetes mellitus	Otoimmün hastalıklar

yona göre çok sık olduğu ve en sık staf. aureusun meydana getirdiği pyojenik enfeksiyonların ve ikinci sıklıkta omurga tüberkülozunun görüldüğünü bildirmişlerdir[25,28,36].

Omurga enfeksiyonlu HIV pozitif hastaların toplam sayısı fazla olmamasına karşın, Weinstein ve ark.nın yayınında kliniklerinde tedavi edilen omurga enfeksiyonlu hastaların %8 kadarının HIV pozitif olduğu bildirilmiştir[52]. HIV pozitifli hastalarda omurga enfeksiyonu için temel risk faktörü intravenöz ilaç kullanımıdır. Bir çalışmada 482 intravenöz ilaç kullanan HIV pozitif hastada 25 (%5), 85 intravenöz ilaç kullanan HIV negatif hastada 6 (%7) omurga enfeksiyonu bildirilmiştir[52].

Omurga tüberkülozu bağışık yetmezlikli hastalarda özellikle de HIV pozitiflerde normal popülasyona göre daha sık görülmektedir[52]. Ancak literatürde hastalığın prognozu tartışmalıdır. Bazı yazarlar normal popülasyona göre daha kötü seyrettiğini, bazıları ise fark olmadığını savunmuşlardır[26,54].

Mantar enfeksiyonları nadir olmakla beraber bağışık yetmezlikli hastalarda görülebilmektedir. En sık etkenler candida albicans, cryptokokkus, ve pseudallescheria boydii'dir[52].

Postoperatif omurga enfeksiyonları da bağışık yetmezlikli hastalarda daha sık görülmektedir. Her türlü omurga cerrahisinde bağışıklık sistemi iyi değerlendirilmeli ve önlemler alınmalıdır.

PATOFİZYOLOJİ

Bağışıklık sistemi humoral ve hücresel sistem üzerinden çalışır[1]. Humoral bağışıklık antijen sunan hücreler ve kompleman proteinleri ve immunglobulinler tarafından yönetilir[1]. Humoral bağışıklıkta problem varsa hasta h.influenza, streptokok ve stafilokoklara karşı daha savunmasız hale gelir. Hücresel bağışıklık ise B ve T lenfositlerinin ve makrofajlar gibi antijen fagositlerinin fonksiyonu ile oluşur. Hücresel bağışıklığın baskılanması hastaları viral, fungal ve protozoal enfeksiyonlara yatkınlaştırır. Bağışıklık sistemi bu iki mekanizmanın optimal birlikteliğinden meydana gelir. T lenfositleri ve immünglobulinlerin gibi iki mekanizmanın da etkilendiği durumlarda bakteriyel enfeksiyonlara karşı yatkınlık oluşur. Bağışık yetmezliği olan hastalarda fırsatçı enfeksiyonlara karşı yatkınlığın bilinen en önemli sebebi CD4 lenfositlerinin azalmasıdır[7,37]. Bu hastalarda en sık bakteriyel etken stafilokokkus aureus'tur. HIV pozitif hastalarda CD4 T lenfositlerinin sayısı orta derecede azalmışsa (≥200 hücre/mm^3) diskit ve/veya osteomyelit gelişebilir ancak genellikle antibiyotiklere yanıt verir. CD4 T lenfositlerinin sayısı daha da azalmışsa (50-200 hücre/mm^3) omurga tüberkülozu gelişebilir. Sayı çok azalmışsa (≤50 hücre/mm^3) epidural abse meydana gelebilir[52]. CD4 seviyelerindeki ciddi azalmalarda en sık pneumocystis carini pnömonisi, sitomegalovirus enfeksiyonları, mikobakterium avium ve mantar enfeksiyonları gelişebilir[52].

İntravenöz ilaç kullanımı da endokardit, hepatit, dissemine gonokok enfeksiyonu ve HIV enfeksiyonuna neden olabileceği için immünsupresyona zemin hazırlar. İntravenöz ilaç kullananlarda gerçek bağışık yetmezlik sadece eroin kullananlarda tespit edilmiştir[27]. Bunun lenfosit opiat reseptörlerine bağlı T-killer lenfosit inaktivasyonuna sekonder olduğu düşünülmektedir[23]. İntravenöz ilaç kullananlarda omurga enfeksiyonlarının en sık etkenleri stafilokok ve streptokoklardır. Ancak anaeroblar, gram negatif mikroorganizmalar ve mantarlar da oldukça sık etken olabilirler.

Alkolizm ve alkole bağlı hepatitte hücresel bağışıklık sisteminde kemik iliği depresyonunun da eşlik ettiği bir bozulma, fagosit ve gra-

nülositlerin sayı ve fonksiyonlarında ve sitokin yanıtında azalma söz konusudur[34]. Bağışıklık sistemindeki bu bozulmalar hastaları tüberküloz, fırsatçı enfeksiyonlar, mantar enfeksiyonları ve dirençli veya düşük virülanslı organizmalara karşı yatkın hale getirir.

Diabetes mellitus kompleks bir mekanizmayla hem humoral hem de hücresel bağışıklığı baskılar. Humoral bağışıklıkta C3 ve C4 kompleman proteinleri etkilenmiştir[5]. Hücresel bağışıklıkta TNF (tumor necrosing factor), interlökin (IL)-1 beta, IL-2, IL-6, IL-8, IGF-2 (insulin like growth factor) üzerinden sitokin yanıtında bir bozukluk oluşur[2]. 29 ve daha fazla hastayı içeren serilerde omurga enfeksiyonları olan olguların %19-38'inde diyabet bulunduğu rapor edilmiştir[3,24,45]. Diyabetle birlikte görülen bağışık yetmezliği nadir görülen mikroorganizmalarla enfeksiyonlara yatkınlığa neden olur[16].

Malnutrisyon omurga enfeksiyonlarına zemin hazırlayan bir başka faktördür. Klein ve ark. omurga cerrahisi yapılan hastalarda 26 komplikasyonun 24'ünün beslenme bozukluğu olan hastalarda görüldüğünü bildirmiştir[32]. İmmün yetmezlik humoral ve hücresel bağışıklıkta görülür ve kemotaksi ve fagositozda bozulmaya neden olur. Azalmış serum albumin düzeyi (<3.5 g/dL) ve total lenfosit sayısı (<1500-2000 hücre/µL) beslenme yetersizliğinin göstergeleridir. Ancak malnutrisyon geri dönüşümlü ve omurga cerrahisi öncesi düzeltilebilir bir durumdur.

Artmış enfeksiyon sıklıkları kanser kemoterapisinde, inflamatuar hastalıkların tedavisinde ve transplantasyonda görülmektedir. Tedavide uygulanan ilaçların humoral ve hücresel bağışıklık sistemini baskılaması ve kemik iliği depresyonu nedeniyle hastalar düşük virulanslı, fırsatçı ve zaman zaman da ciddi enfeksiyonlarla karşılaşmaktadır[16].

KLİNİK

Omurga enfeksiyonunun sırt ağrısı, ateş ve lökositoz gibi klasik klinik bulguları hastaların yarısından azında mevcuttur[11,49]. Weinstein ve Eismont'un çalışmalarında omurga enfeksiyonlarının klinik bulguları bağışık yetmezlikli hastalarda normal popülasyona göre daha az sıklıkta görülmektedir. Omurga osteomyeliti genellikle 50-70 yaşlarında görülürken HIV veya AIDS'li hastalarda ortalama 45 yaşlarında görülür[52]. Nörolojik defisit ise normal populasyonda hastaların % 16-34'ünde görülürken HIV veya AIDS'li hastaların % 45'inde görülmektedir[11,30]. Enfeksiyonun bölgesel yerleşimi ise normal populasyonda olduğu gibi en sık lomber, ikinci sıklıkta torakal ve en nadir de servikal omurgada görülmektedir.

Enfeksiyonun primer kaynağı genellikle üriner sistem, ciltaltı abseler, akciğer enfeksiyonu, enfekte cerrahi yara ve endokarditttir[33]. Omurga enfeksiyonu gelişen hastaların önemli bir kısmında değişik derecelerde bağışık yetmezliği olabildiğinden HIV, AIDS, intravenöz ilaç kullanımı, alkolizm, siroz, diyabet, malnutrisyon, kanser ve immunsupresif tedavi açısından iyi bir anamnez alınmalıdır[4,13].

Sırt ağrısı, ateş, pozitif serolojik testler ve radyolojik bulgular tanıda önemlidir. Ancak kesin tanı enfeksiyon bölgesinden örnek alınarak mikroorganizmanın gösterilmesi veya kan kültürlerinde üretilmesiyle konabilir. Beronius ve ark. vertebral osteomyelit için tanı kriterleri belirlemişlerdir: Pozitif biyopsi veya biyopsinin pozitif kültürü, pozitif kan kültürü, lokalize nörolojik semptomlar, pozitif serolojik testler ve radyolojik bulgular[4]. Bu kriterlerle klinik bulgular birleştirilerek tanı kesinleştirilebilir. Bilgisayarlı tomografi, manyetik rezonans, sintigrafi ile yumuşak dokudaki enfeksiyon bulguları, skip lezyonlar, kemik kaybının miktarı ve cerrahi planlama için stabilite değerlendirilebilir[9].

LABORATUVAR BULGULARI

Omurga enfeksiyonlarında serolojik bulgular değişkenlik gösterir. Yüksek lökosit değerleri enfeksiyon tanısını destekler ancak düşük değerler bağışık yetmezlikli hastalarda tanıyı ekarte ettirmez[11,52]. Eritrosit sedimentasyon hızının yükselmesi omurga enfeksiyonlarında normal populasyonda % 90-100 iken, bağışık yetmezlikli hastalarda % 89'dur[52]. Aynı şekilde tedaviye yanıtın değerlendirilmesinde de benzer oranlarda ilişki mevcuttur. Ancak sedimentasyon hızı diğer inflamatuar durumlarda da yükseldiği için spesifik değildir. İnflamasyonun bir başka göstergesi olan C-reaktif protein ise omurga enfeksiyonlarında % 82-100 oranında duyarlıdır ve enfeksiyon tamamen temizlendiğinde normal değerlerine hızla iner[4,13].

Etken mikroorganizmalar kan kültürleri veya biyopsi kültürleriyle izole edilmeye çalışılmalıdır. Biyopsi radyoloji kontrollü veya açık olarak yapılabilir. Enfeksiyonun en sık etkeni stafilokokkus aureus, mikobakteri, brusella ve gram negatif basillerdir[9,13,30]. Carragee bağışık yetmezlikli hastaların % 55'inin düşük virulanslı mikroorganizmalarla enfekte olduğunu bildirmiştir[11]. Ayrıca bu hastalarda aspergillus, kandida, petriellidium, cocciodioides gibi mantarlarca oluşan fırsatçı enfeksiyonlar görülebilir[15,21,50]. Kan kültürleri % 39-72, açık biyopsi % 44-73, radyoloji eşliğinde iğne biyopsisi % 52-74 doğruluk oranlarına sahiptir[4,13,38,40,49].

Ayrıca hastanın bağışık yetmezliğine neden olan patolojilere ait laboratuar bulguları da kaydedilmelidir. Kan şekeri ve HbA1C düzeyleri, hepatit ve HIV belirteçleri, karaciğer fonksiyon testleri, otoimmün hastalıklara ait laboratuar çalışmaları ve beslenme durumunu değerlendirmek amacıyla serum albumin seviyesi, lökosit sayımı ve serum çinko düzeylerine bakılmalıdır. Serum albumin seviyesinin 3.5 g/dL'nin, lökosit sayımının 1500 hücre/ml'nin çinko düzeyinin de 670 mg/dL'nin altında olması malnutrisyonun göstergeleridir. CD4 lenfosit düzeyleri HIV pozitif hastalarda düşük düzeylerdedir. 200/mm^3'ün altındaki değerler enfeksiyoz komplikasyon riskinin çok artacağını ve prognozun kötülüğünü gösterir[41].

RADYOLOJİK BULGULAR

Direkt radyografilerde disk yükseklik kaybı, kemik veya disk destrüksiyonu enfeksiyondan yaklaşık 2 hafta sonra hastaların % 56-89'unda tespit edilebilir[4,38]. Bilgisayarlı tomografi ilk seçenek değildir ancak üç boyutlu kemik yapısını, kemik destrüksiyonunu ve enfeksiyonun diğer bulgularını direkt radyografilerden önce gösterebilir.

Kemik sintigrafisi diğer bölgelerdeki kemik tutulumunun değerlendirilmesinde değerlidir. Omurga enfeksiyonlarında % 77-95 hastada pozitif sintigrafik bulgular bildirilmiştir[4,38].

Manyetik rezonans görüntüleme disk mesafesi, vertebral osteomyelit ve komşu yumuşak dokuların enfeksiyonunu görüntülemede altın standarttır[42,50]. Kemik iliği ödemi, disk ve disk mesafesinde T2-hiperintensite, endplate kenarlarında düzensizlik, abse formasyonu ve yumuşak doku kitlesi hastaların % 77-100'ünde görüntülenmektedir[4,38].

TEDAVİ

Omurga enfeksiyonlarının tedavisinde amaç omurga stabilitesini koruyarak mikroorganizmanın eradike edilmesi ve iyileşme için beslenmenin sağlanmasıdır. Bağışık yetmezlikli hastaların iyi değerlendirilmesi ve tıbbi olarak müdahale edilebilecek durumların öncelikle düzeltilmesine çalışılmalıdır. Diyabetik hastaların kan şekeri düzeyleri normale yakın hale getirilmeli, en azından 200 mg/dL'nin altında tutulmalıdır. Bunun için endokrin hastalıkları

uzmanının desteği alınmalıdır. Malnutrisyonlu hastalarda beslenme uzmanının önerileri ile nutrisyonel destek arttırılarak gerekirse parenteral beslenmeye geçilmelidir. Organ transplantasyonlu hastalar transplantasyon bölümünce mutlaka değerlendirilmeli, immun supresif tedavileri için mümkünse doz azaltılması planlanmalıdır. Bağışık yetmezliğin nedeni ne olursa olsun omurga enfeksiyonu tanısı konan bir hastanın tedavisine başlanmadan önce enfeksiyon hastalıkları konsültasyonu istenmeli ve tedavinin aşamalarında destek istenmelidir. CD4 sayısı çok düşük olan HIV pozitifli hastalara antiretroviraller ve proteaz inhibitörleri verilerek sayı arttırılabilir.

Standart konservatif tedavi 2-6 hafta parenteral antibiyotik tedavisini takiben oral antibiyotikler, stabiliteyi korumak amacıyla korse ile immobilizasyon ve erken harekettir[31,46,47]. Tedavinin başarısı klinik düzelme ile birlikte eritrosit sedimentasyon hızı ve C-reaktif protein değerlerinin normale dönmesi ile değerlendirilebilir. İmmun yetmezlikli hastalarda konservatif tedavi ile sedimentasyon düşüşünün gecikmesi kötü prognoza işaret eder ki bu durumda başarısızlık oranı % 87'dir[12]. HIV veya AIDS'li hastalarda omurga tüberkülozunun 4'lü antitüberküloz tedavisiyle (izoniazid, rifampisin, pirazinamid ve etambutol) başarılı sonuç % 92 bildirilmiştir[35]. Ancak genel populasyonla karşılaştırıldığında immun yetmezlikli hastalarda enfeksiyonun tedavisine başlandıktan sonra ilk 6 ayda ölüm oranının (% 14'e % 6) ve nörolojik komplikasyonların (% 45'e % 19) daha fazla görüldüğü bilinmektedir[11].

Cerrahi tedavi endikasyonları 2-6 hafta parenteral antibiyotik tedavisine yanıt alınamaması, omurga stabilizasyonun bozulması, nörolojik defisit ve abse varlığıdır[46,47]. Cerrahi tedavi postoperatif enfeksiyonlarda irrigasyon ve debridman sonrası 6 hafta parenteral, 6 hafta da oral antibiyotik verilmesi en uygun yöntemdir[14]. Thalgott ve ark. yaradan izole edilen mikroorganizmaların sayısına, enfeksiyonun derinliğine ve hastanın immun sistemine göre bir derecelendirme ve tedavi algoritması önermişlerdir[48]. Buna göre tek bir mikroorganizmaya bağlı bir yüzeyel enfeksiyonda hastanın immun yetmezliği de yoksa bir kez debridman yeterlidir. Bağışık yetmezlikli hastalarda, derin enfeksiyonu olanlarda ya da birden fazla mikroorganizmanın izole edildiği hastalarda tekrarlayan debridmanlar gerektiği görüşünü savunmuşlardır[48].

Omurga cismi osteomyeliti veya toraks veya karın boşluğuna açılan enfeksiyonlarda anterior cerrahi gerekir[16]. Posterior elemanların enfeksiyonu veya epidural abse genellikle posterior yaklaşımla tedavi edilebilir. Anterior, posterior veya anterior ve posterior yaklaşımlarla çok başarılı sonuçlar bildirilmiştir, ancak immun yetmezlikli hastalarda cerrahi tedavinin sonuçları ve teknikle ilgili çok az yayın vardır[18,19,29,43]. Carragee anterior debridman ve parenteral antibiyotikle tedavi edilen immun yetmezlikli 10 hasta bildirmiştir[10]. Bu hastaların 6'sına ayrıca posterior enstrumentasyon ve füzyon uygulanmış ve 5 hasta tekrar ameliyat edilmiştir. Enfeksiyon rekürrensinin olmadığı ancak 1 hastanın hepatorenal sendromdan ex olduğu ve 3 ciddi komplikasyon görüldüğünü bildirmiştir. Carragee bağışık yetmezlikli hastalarda ilk 6 ayda mortalite sıklığının ve nörolojik tutulumunun diğer hastalara göre arttığını bildirmiştir[11].

Omurga enfeksiyonlu hastalarda instrumentasyon ve greftleme çok dikkatli yapılmalıdır. Stabilizasyon gerekiyorsa posteriorda rijit pedikül vidalarıyla enstrumentasyon, anteriorda titanyum "mesh" kafesler kullanılmalıdır. Otogreftler hızlı inkorperasyonları ve yarada yabancı cisim etkisi oluşturmamaları için allog-

reftlere tercih edilmelidir[16]. Kemik çimentosu ve polimerler ise enfekte yarada mümkün olduğunca kullanılmaması gereken materyallerdir[17].

Omurga enfeksiyonlu HIV pozitif hastalara yaklaşım öncelikle ayrıntılı laboratuar çalışmalarını içermelidir. CD4 sayısı, lökosit, eritroit sedimentasyon hızı ve C-reaktif protein düzeyleri incelenir. Tüm hastalardan kan kültürleri alınmalıdır. Eğer kan kültürleri negatifse, bilgisayarlı tomografi eşliğinde biyopsi yapılmalıdır. Mikroorganizmanın izolasyonu sonrası antibiyotikler başlanır. Antibiyotik tedavisi başarısızsa veya spinal stabilite veya nörolojik fonksiyonlarda bozulma varsa stabilizasyonlu veya stabilizasyonsuz cerrahi debridman gerekir. Hastanın genel tıbbi durumu iyi değerlendirilmeli ve eğer cerrahi girişimleri tolere edemeyecek kadar "düşkün" veya risk-yarar oranı fazlaysa yapılmamalıdır.

SONUÇ

Bağışıklık sistemi baskılanmış veya değişik derecelerde bağışık yetmezliği olan hastalarda omurga enfeksiyonları daha sıklıkla görülmektedir. Yapılan çalışmalar HIV pozitif hastaların negatif olanlara göre pyojenik diskit ve/veya osteomyelit, tüberküloz veya epidural abse gibi omurga enfeksiyonlarına daha yatkın olduğunu göstermiştir. Bu hastalara yaklaşım enfeksiyonun tedavisiyle birlikte bağışıklığın da kontrol altına alınmaya çalışılmasını içermelidir. Bu hastaların daha dikkatli değerlendirilerek risk faktörlerinin azaltılmaya çalışılması, erken tanı ve agresif tedavinin planlanması mortalite ve morbiditenin azaltılması için gereklidir.

KAYNAKLAR:

1. Abbas AK, Lichtman AH, Pober JS. Cellular and molecular Immunology. Philadelphia:WB Saunders Co; 1991.
2. Al-Kassab AS, Raziuddin S. Immune activation and T cell subset abnormalities in circulation of patients with recently diagnosed type I diabetes mellitus. Clin Exp Immunol 1990; 81:267–271.
3. Bendo JA, Spivak J, Moskovich R, Neuwirth M. Instrumented posterior arthrodesis of the lumbar spine in patients with diabetes mellitus. Am J Orthop 2000; 29: 617–620.
4. Beronius M, Bergman B, Andersson R. Vertebral osteomyelitis in Goteborg, Sweden: a retrospective study of patients during 1990-95. Scand J Infect Dis 2001; 33: 527–532.
5. Blackwell CC, Weir DM, Patrick AW, Collier A, Clarke BF. Secretor state and complement levels (C3 and C4) in insulin dependent diabetes mellitus. Diabetes Res 1988; 9: 117–119.
6. Bono CM. Spectrum of Spine Infections in Patients with HIV. A case report and review of the literature. Clin Orthop Relat Res 2006; 444: 83-91.
7. Brennan PJ, DeGirolamo MP. Musculoskeletal infections in immunocompromised host. Orthop Clin North Am 1991; 22: 389-399.
8. Broner FA, Garland DE, Zigler JE. Spinal infections in the immuncompromise host. Orthop Clin North Am 1996; 27: 37-46.
9. Camacho M, Guis S, Mattei JP, Costello R, Roudier J. Three-year outcome in a patient with Staphylococcus lugdunensis discitis. Joint Bone Spine 2002; 69: 85–87.
10. Carragee EJ, Billys J, Sonu C. Pyogenic Vertebral Osteomyelitis in Immunocompromised Adults. Orthop Trans 1993; 17: 1185–1186.
11. Carragee EJ. Pyogenic vertebral osteomyelitis. J Bone Joint Surg 1997; 79: 874–880.
12. Carragee EJ, Kim D, van der Vlugt T, Vittum D. The clinical use of erythrocyte sedimentation rate in pyogenic vertebral osteomyelitis. Spine 1997; 22: 2089–2093.

13. Chelsom J, Solberg CO. Vertebral osteomyelitis at a university hospital 1987-97: clinical features, laboratory findingsand outcome. Scand J Infect Dis 1998; 30: 147–151.
14. Christodoulou AG, Givissis P, Symeonidis PD, Karataglis D, Pournaras J. Reduction of postoperative spinal infections based on an etiologic protocol. Clin Orthop Relat Res 2006; 444: 107-113.
15. Cortet B, Richard R, Deprez X, Lucet L, Flipo RM, Le Loet X, Duquesnoy B, Delcambre B. Aspergillus spondylodiscitis: successful conservative treatment in 9 cases. J Rheumatol 1994; 21: 1287–1291.
16. Cunningham ME, Girardi F, Papadopoulos EC, Cammisa FP. Spinal infections in patients with compromised immun systems. Clin Orthop Relat Res 2006; 444: 73-82.
17. Dietze DD Jr, Fessler RG, Jacob RP. Primary reconstruction for spinal infections. J Neurosurg 1997; 86: 981–989.
18. Dimar JR, Carreon LY, Glassman SD, Campbell MJ, Hartman MJ, Johnson JR. Treatment of pyogenic vertebral osteomyelitis with anterior debridement and fusion followed by delayed posterior spinal fusion. Spine 2004; 29: 326-332.
19. Fayazi AH, Ludwig SC, Dabbah M, Bryan Butler R, Gelb DE. Preliminary results of staged anterior debridement and reconstruction using titanium mesh cages in the treatment of thoracolumbar vertebral osteomyelitis. Spine J 2004; 4: 388–395.
20. Fleming PL, Byers RH, Sweeney PA, et al. HIV prevelance in the United States, 2000. In conference on retroviruses and oppurtunistic infections. Seattle, WA, 2002.
21. Frazier DD, Campbell DR, Garvey TA, Wiesel S, Bohlman HH, Eismont FJ. Fungal infections of the spine. Report of eleven patients with long-term follow-up. J Bone Joint Surg Am 2001; 83: 560–565.
22. Fredriksson J, Kanabus A. HIV and AIDS in Africa. Available at http://www.avert.org/aafrica.htm. Accessed 2004.
23. Freier DO, Fuchs BA. A mechanism of action for morphineinduced immunosuppression: corticosterone mediates morphineinduced suppression of natural killer cell activity. J Pharmacol Exp Ther 1994; 270: 1127–1133.
24. Friedman JA, Maher CO, Quast LM, McClelland RL, Ebersold MJ. Spontaneous disc space infections in adults. Surg Neurol 2002; 57: 81–86.
25. Heary RF, Hunt CD, Krieger AJ, Vaid C. HIV status does not affect microbiologic spectrum or neurologic outcome in spinal infections. Surg Neurol 1994; 42: 417–423.
26. Henn L, Nagel F, Dal Pizzol F. Comparison between human immunodeficiency virus positive and negative patients with tuberculosis in Southern Brazil. Mem Inst Oswaldo Cruz 1999; 94: 377–381.
27. Horsburgh CR, Anderson JR, Boyko EJ. Increased incidence of infections in intravenous drug users. Infect Control Hosp Epidemiol 1989; 10: 211-215.
28. Jellis JE. Bacterial infections: bone and joint tuberculosis. Baillieres Clin Rheumatol 1995; 9: 151–159.
29. Jin D, Qu D, Chen J, Zhang H. One-stage anterior interbody autografting and instrumentation in primary surgical management of thoracolumbar spinal tuberculosis. Eur Spine J 2004; 13: 114–121.
30. Joughin E, McDougall C, Parfitt C, Yong-Hing K, Kirkaldy-Willis WH. Causes and clinical management of vertebral osteomyelitis in Saskatchewan. Spine 1991; 16: 261–264.
31. Khan IA, Vaccaro AR, Zlotolow DA. Management of vertebral diskitis and osteomyelitis. Orthopedics 1999; 22: 758–765.
32. Klein JD, Hey LA, Yu CS, Klein BB, Coufal FJ, Young EP, Marshall LF, Garfin SR. Perioperative nutrition and postoperative complications in patients undergoing spinal surgery. Spine 1996; 21: 2676–2682.
33. Krogsgaard MR, Wagn P, Bengtsson J. Epidemiology of acute vertebral osteomyelitis in Denmark: 137 cases in Denmark 1978-1982, compared to cases reported to the National Patient Register 1991-1993. Acta Orthop Scand 1998; 69: 513–517.

34. Latvala J, Parkkila S, Niemela O. Excess alcohol consumption is common in patients with cytopenia: studies in blood and bone marrow cells. Alcohol Clin Exp Res. 2004; 28: 619–624.
35. Leibert E, Schluger NW, Bonk S, Rom WN. Spinal tuberculosis in patients with human immunodeficiency virus infection: clinical presentation, therapy and outcome. Tuber Lung Dis 1996; 77: 329–334.
36. Letiao J, Govender S, Parbhoo AH. Pyogenic spondylitis. S Afr J Surg 1999; 37: 79–82.
37. Luck JV Jr, Logan LR, Benson DR, Glasser DB. Human immunodeficiency virus infection: complications and outcome of orthopaedic surgery. J Am Acad Orthop Surg 1996; 4: 297-304.
38. Nolla JM, Ariza J, Gomez-Vaquero C, Fiter J, Bermejo J, Valverde J, Escofet DR, Gudiol F. Spontaneous pyogenic vertebral osteomyelitis in nondrug users. Semin Arthritis Rheum 2002; 31: 271–278.
39. O'Brien ED, Denton JR. Open tibial fracture infections in asymptomatic HIV antibody-positive patients. Orthop Rev 1994; 23: 662–664.
40. Perronne C, Saba J, Behloul Z, Salmon-Ceron D, Leport C, Vilde JL, Kahn MF. Pyogenic and tuberculous spondylodiskitis (vertebral osteomyelitis) in 80 adult patients. Clin Infect Dis 1994; 19: 746–750.
41. Ragni MV, Crosset LS, Herndon JH. Postoperative infection following orthopaedic surgery in human immunodeficiency virus infected hemophiliacs with CD4 counts < or _ 200/mm3. J Arthroplasty 1995; 10: 716–721..
42. Rothman SL. The diagnosis of infections of the spine by modern imaging techniques. Orthop Clin North Am 1996; 27: 15–31.
43. Safran O, Rand N, Kaplan L, Sagiv S, Floman Y. Sequential or simultaneous, same-day anterior decompression and posterior stabilization in the management of vertebral osteomyelitis of the lumbar spine. Spine 1998; 23: 1885–1890.
44. Senthikumar A, Kumar S, Sheagren JN. Increased incidence of Staphylococcus aureus bacteremia in hospitalized patients with acquired immunodeficiency syndrome. Clin Infect Dis 2001; 33: 1412–1416.
45. Simpson JM, Silveri CP, Balderston RA, Simeone FA, An HS. The results of operations on the lumbar spine in patients who have diabetes mellitus. J Bone Joint Surg 1993; 75: 1823–1829.
46. Slucky AV, Eismont FJ. Spinal Infections. In: Bridwell KH, De-Wald RL, eds. The Textbook of Spinal Surgery. Vol 2. Philadelphia, PA: Lippincott-Raven Publishers; 1997: 2141-2183.
47. Tay BK, Deckey J, Hu SS. Spinal infections. J Am Acad Orthop Surg 2002; 10: 188–197.
48. Thalgott JS, Cotler HB, Sasso RC, LaRocca H, Gardner V. Postoperative infections in spinal implants. Classification and analysis—a multicenter study. Spine 1991; 16: 981–984.
49. Torda AJ, Gottlieb T, Bradbury R. Pyogenic vertebral osteomyelitis:analysis of 20 cases and review. Clin Infect Dis 1995; 20: 320–328.
50. Vaccaro AR, Shah SH, Schweitzer ME, Rosenfeld JF, Cotler JM. MRI description of vertebral osteomyelitis, neoplasm, and compression fracture. Orthopedics 1999; 22: 67-73.
51. Van Ooij A, Beckers JM, Herpers MJ, Walenkamp GH. Surgical treatment of aspergillus spondylodiscitis. Eur Spine J 2000; 9: 75–79.
52. Weinstein MA, Eismont F. Infections of the spine in patients with human immunodeficiency virus. J Bone Joint Surg Am 2005; 87: 604-609.
53. Wimmer C, Gluch H, Franzreb M, Ogon M. Predisposing factors for infection in spine surgery: A survey of 850 spinal procedures. J Spinal Disord. 1998; 11: 124–128.
54. Yechoor VK, Shandera WX, Rodriguez P, Cate TR. Tuberculous meningitis among adults with and without HIV infection. Experience in an urban public hospital. Arch Intern Med 1996; 156: 1710–1716.

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DERLEME / REVIEW ARTICLE

PRİMER MALİGN OMURGA TÜMÖRLERİ

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Giriş

Omurgada görülen malign tümörler, genellikle metastatik tümörlerdir. Omurganın primer malign tümörleri, metastatik tümörlerinin kırkta biri oranında izlenir.

Omurganın primer malign tümörleri geniş bir spektrumda gözlenirler. Bu spektrumda kordoma, primer sarkomalar (osteosarkoma, kondrosarkoma, paraspinal yumuşak doku sarkomaları), yuvarlak hücreli tümörler (plazmasitoma, multiple miyeloma, Ewing sarkoma/PNET, lenfoma) yer alır. Omurgada ve sakrumda rastlanan primer tümörlerin % 10'unun malign olduğu saptanmıştır[13]. Söz konusu tümörlere yönelik tedavinin başarılı olabilmesi için önkoşul tanının doğru konulmasıdır. Kemik lezyonlarında doğru tanı koyabilmek için olgunun klinik, radyolojik ve histolojik özelliklerinin birlikte değerlendirilmesi gerekmektedir. Tedavi şekli, tümörün lokal veya sistemik yayılımına ve tipine göre belirlenir.

Omurgada gözlenen yuvarlak hücreli tümörler dışındaki tümörler, multidisipliner bir yaklaşımın benimsenmesi durumunda, başarıyla tedavi edilirler. Tedavide radikal cerrahi rezeksiyon, adjuvan ve neoadjuvan kemoterapi ile radyoterapi birlikte kullanılabilir. Bu tür olgularda radikal cerrahi girişim, ekstremite tümörlerindeki durumun aksine, yaşam süresini uzatmak bakımından yararlı olmamaktadır. Bu durumun en önemli nedenleri arasında, omurga anatomisinin kompleks yapısı, vital yapılara olan yakınlığı ve lezyonun tümünün çıkarılamaması yer almaktadır. Cerrahi tekniklerdeki yeni gelişmeler, daha başarılı sonuçları da beraberinde getirmektedir.

Klinik Bulgular

Primer malign omurga tümörlerinin en belirgin semptomu, huzursuzluk hissi ile başlayan sırt ağrısıdır. Bu ağrı, gün içindeki farklı aktivitelerden kaynaklanabileceği gibi, gece ağrısı şeklinde de kendini gösterebilir. Tümörün spinal korda ve sinir köklerine ulaştığı durumlarda ise nörolojik defisitler oluşur.

Lenfoma, miyeloma ve Ewing sarkoma/PNET gibi yuvarlak hücreli tümörler kilo kaybı, ateş, halsizlik, anoreksi ve kabızlık gibi sistemik semptomlarla ortaya çıkar.

Alt lomber bölge ve sakrum bölgesinde yerleşmiş lokalize kitlelerde (özellikle kordomada) ise kabızlık ve rektal disfonksiyon gözlenir. Mayo Klinik serisinde primer malign omurga tümörü olan olgulardan % 4'ünün disk hernisi sanılarak yanlış tanı aldığı bildirilmiştir [11].

Radyolojik Bulgular

Omurga ve sakrumdaki lezyonları görüntülemek için ilk aşamada antero-posterior ve lateral grafiler çekilir. Lezyonun osteoblastik veya osteolitik görünümü, vertebradaki lokalizasyonu, kalsifikasyon içermesi, paterni ve komşu verteb-

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ral diski de etkilemesi ayırıcı tanıda belirleyici bir önem kazanır. Tümörün oluşturduğu matriks ve invazyon şekli de ayırıcı tanıda önem kazanır. Agresif malign tümörler, tüm kemiğin yapısını yok edecek şekilde harabiyete neden olurlar. Yavaş gelişen tümörlerde ise kortikal destrüksiyon yerine "scalloping" ve ekspansiyon izlenir[31,37].

Vertebranın anterior kısmında yerleşen tümörler, daha çok malign olma eğilimindedirler. Özellikle servikal vertebrayı tutan tümörlerde bu durum oldukça belirgindir. Benign anterior kısım tümörleri eozinofilik granüloma, hemanjiyoma ve anevrizmal kemik kisti (AKK) dir. Malign anterior kısım tümörleri ise lenfoma, kordoma ve sarkomalardır. Vertebranın posterior kısmında yerleşen tümörler osteokondroma, osteoid osteoma ve osteoblastomadır. Nadiren kondrosarkoma da posterior yerleşim gösterebilir. Diğer primer tümörler her bölgede izlenebilirler [48].

Spinal bir neoplaziden şüphe duyulduğu durumlarda, uygulanabilecek diğer bir yöntem teknisyum kemik sintigrafisidir. Sintigrafide birden fazla lezyonun izlenmesi durumunda, metastatik tümörden şüphelenilmelidir. Kemikteki lezyonu sintigrafi yoluyla erken saptamak mümkün olmakla birlikte, lezyonun benign ya da malign olduğunu anlamak mümkün değildir. Ayrıca sintigrafide enfeksiyon, kırık ve inflamasyon tümör ile karışabilir. Bu yöntemde miyeloma, plazmasitoma ve bazen kordoma da hatalı negatif sonuç verebilir [31,46].

Tümörün sınırlarının belirlenmesinde, bilgisayarlı tomografi (BT) ve manyetik rezonans görüntüleme (MRG) yöntemlerinin birlikte uygulanması yararlıdır. BT ile kemik anatomisi daha iyi izlenebilir. MRG ile kalsifikasyonlar, düşük dereceli kondrosarkomalarda izlenen "scalloping" daha iyi gözlenebilir. MRG ile vertebra korpusunda kemik iliğine ait benign değişiklikler yanlışlıkla malign olarak değerlendirilebilir. MRG yöntemi sayesinde tümörün lokal yayılımı ve çevre yumuşak dokulara yayılımı hakkında daha net bilgiler elde edilir [31]. MRG ile miyelografideki riskler olmaksızın spinal kord ve sinir kökleri izlenebilir. Cerrahi planlamada kolaylık sağlayacak şekilde lezyon farklı düzlemlerde görüntülenebilir. MRG sayesinde tümör, enfeksiyon ve kırık arasında ayrım yapmak mümkündür [31].

Biyopsi Metodları

Açık biyopsi, iğne biyopsisi ve ince iğne aspirasyon biyopsisi (İİAB), farklı biyopsi yöntemleri olarak seçenek oluştururlar. Açık biyopsi kemik tümörlerinin tanısında en çok kullanılan yöntemdir. Bu yöntemle maksimum miktarda doku sağlanabilir. Kesin tanı sonrasında yapılacak operasyonda, biyopsi traktının çıkarılabilmesi için biyopsi önceden planlanmalıdır. Açık biyopsi radyolog, patolog ve ortopedist ile birlikte planlanmalıdır. Biyopsi sırasında tanı için yeterli materyal alınıp alınmadığını değerlendirmek amacıyla, intraoperatif patoji konsültasyonu yapılması yararlı olacaktır. Perkutanöz iğne biyopsisi, özellikle metastatik tümörlerde etkili ve güvenilir bir tekniktir [38,49]. Bu yöntem İİAB'ye göre daha avantajlıdır. Bunun nedeni, bu yöntemle daha fazla materyal elde edilebilmesidir. Hücre bloğu ve imprint, yapılabilecek sitolojik preparasyonlardır.

İğne biyopsisi uygulandığı durumlarda, bu konuda tecrübeli bir sitopatolog ile çalışıldığı zaman primer - metastatik tümör, benign - malign tümör ve düşük - yüksek dereceli tümör ayrımı yapmak mümkün olabilir.

Primer Malign Tümörler

KORDOMA

Kordoma, embriyonel notokord artıklarından oluşan düşük dereceli, lokal infiltratif ve destrük-

tif, yavaş büyüyen bir tümördür. Ancak bu tümör, ileri evrede metastaz yapabilir ve retroperitoneal bölgeye direkt yayılım gösterebilir. Düşük dereceli bir tümör olmasına rağmen omurgada yerleşim göstermesi nedeniyle kür sağlanması zordur.

Kordoma, tüm primer kemik tümörlerinin % 1-4'ünü oluşturur. % 50-60 oranında soliter bir tümör olarak sakrumda izlenir. Genellikle 30-70 yaş arasında görülen bu tümör, 5. ve 7. dekatta pik yapar. Kordomaların % 60'ı sakrumu, % 25'i klival (sfeno-oksipital) bölgeyi ve % 15'i vertebrayı tutar. Sakral bölge yerleşimi, daha çok erkeklerde gözlenir. Sakral bölge yerleşimli tümörde kalça, perine ve bacaklara vuran ağrı mevcuttur. Bu bölgede gelişen tümör çok büyük olabilir.

Olguların % 20'sinde barsak ve mesane fonksiyonlarında bozulma olur. Litik destrüktif lezyon oluşturarak, bazen patolojik kırık gelişimine yol açabilir.

Makroskobik olarak parlak, mukoid, şeffaf görünümdedir. Hemoraji ve nekroz alanları içerebilir. Mikroskobik olarak küçük büyütme ile bakıldığında jelatinöz lobule tümör kitlesi izlenir. Gland yapısı içermez. Büyük büyütme ile bakıldığında ise vakuoler sitoplazmaya sahip, fizaliferöz hücrelerden oluşan tümör dokusu izlenir. Eozinofilik sitoplazma içeren tümör hücreleri de görülebilir. Miksoid bir stromaya sahip olan tümörde, hafif hücresel atipi ve sinsityal gelişim paterni gözlenir. Tümör hücreleri müsikarmin ile pozitif boyanır. Adipöz doku belirteci negatiftir. İmmünhistokimyasal olarak S-100 protein ve sitokeratin ile pozitif boyanma gösterir. Ayırıcı tanı yapılırken, kondrosarkomalarda S-100 protein pozitif izlenirken, sitokeratinler negatif olması önemlidir [37]. Tümör, renal hücreli karsinomadaki gibi eozinofilik hücreler içeriyorsa, bu tümör ile ayırıcı tanısının mutlaka yapılması gerekmektedir. Ayırıcı tanıda liposarkoma, metastatik karsinoma (rektumun taşlı yüzük hücreli adenokarsinoması), tükrük bezinin mikst tümörü ve miksopapiller ependimoma akla getirilmelidir.

Kordoma yavaş gelişim gösterir, ancak yüksek rekürrens oranına sahiptir. On yıllık yaşam oranı % 70'tir. Hastalığın ileri dönemlerinde metastaz gelişebilir. Tümör, oldukça büyük boyutlara ulaştığında, retroperitona direkt yayılım göstererek barsak lümenini basıya uğratarak daraltabilir, mesaneyi etkileyebilir veya deriye invazyon gösterebilir [19].

Tanı koyarken cerrahi girişim öncesinde İİAB veya iğne biyopsisi yapılabilir [52]. Tanı sonrasında cerrahi girişim, radyoterapi veya kombine tedavi tercih edilen tedavi yöntemleridir. Cerrahi olarak tümörün çevre dokuyla beraber geniş eksizyonu ya da blok halinde vertebra çıkarımı yapılır.

OMURGANIN PRİMER SARKOMALARI

OSTEOSARKOMA

Osteosarkoma (OS), kemiğin primer yüksek dereceli intramedüller yerleşimli malign mezenkimal tümörüdür. Sıklıkla uzun kemiklerde gelişen, oldukça agresif seyirli bir tümördür. Malign tümör hücreleri, immatür kemik matriks 'osteoid' oluşturur. Miyelomadan sonra ikinci sıklıkta gözlenen primer kemik tümörüdür. Tüm kemik tümörlerinin % 15-20'sini oluşturur[28,37]. Tüm OS olgularının % 3'ü omurga ve sakrumda izlenir[22].

OS, omurgadaki tüm malign tümörlerin % 5'ini oluşturur [48]. % 85 olgu 30 yaş altında, % 75 olgu ise 20 yaş altındadır [37,48]. Omurga yerleşimli OS'lu olguların yaş ortalaması, uzun kemik tutulumu gösteren OS olgulara göre daha ileridir [37,48]. Kadın ve erkeklerde aynı oranda izlenir. Sekonder OS gelişimi bildirilen olgular sıklıkla 40 yaşın üstündedir. Klinik olarak ağrı, şişlik ve patolojik kırık görülür. Radyolojik ve mofolojik değişkenler nedeniyle tanı koyarken sorun ya-

şanabilir. İskelet dağılımı gözönüne alındığında, tümör % 54 oranında dizde yerleşim gösterir ve % 90 oranında metafizi tutar.

OS'un farklı alt tipleri tanımlanmıştır. Tümörün anatomik olarak geliştiği yere (intramedüller, intrakortikal, yüzeyel), diferansiyasyon derecesine, birden fazla odakta olup olmamasına (senkron, metakron), primer veya sekonder gelişimine, histopatolojik özelliklerine (osteoblastik, kondroblastik, fibroblastik, telenjiektatik, küçük hücreli, dev hücreli) göre çeşitli alt tipleri belirlenmiştir. OS'un en sık rastlanan tipi ise uzun kemiklerin metafizinde gelişen primer, soliter, intramedüller ve az diferansiye özellikte olanıdır. Bu tipte ağırlıklı olarak tümör hücrelerinin kemik matriks oluşturduğu izlenmektedir. Sekonder OS kemiğin benign tümörleri, Paget hastalığı ya da kemik infaktı zemininde ve radyasyon maruziyeti sonucunda gelişebilir.

KONDROSARKOMA

Tümör hücrelerinin hiyalin kıkırdak oluşturduğu malign mezenkimal tümörlerdir. Kondrosarkomalar tüm kemik tümörleri arasında osteosarkomadan sonra ikinci sırada gelir. Kondrosarkomaların % 85'inin primer, % 15'inin ise daha önce var olan osteokondromaya veya enkondromaya sekonder olarak geliştiği bildirilmiştir [13]. Kondrosarkomalar % 4-8 oranında omurga tutulumu gösterirler ve omurgada farklı bölgeleri tutabilirler [13,24]. Bu tümör, erkeklerde daha sık izlenir. Erkek:Kadın oranı, 1.5-2:1 dir. Tümör her yaşta görülebilir. Ancak, 6. ve 7. dekatlarda daha sık izlenir. Şeffaf hücreli ve mezankimal tip konrdosarkoma, adelosan dönemde ve 20'li yaşlarda izlenir [13,24].

Diğer malign kemik tümörlerinde olduğu gibi kondrosarkomada da en önemli semptom ağrıdır. Ollier hastalığı veya ailesel osteokondromatoziste, yeni gelişen bir bel ağrısı veya ağrıda artış durumunda sekonder kondrosarkoma açısından araştırma yapmak gerekir.

Tümörün, intramedüller ya da jukstakortikal oluşuna ve histolojik özelliklerine göre, alt sınıflandırması yapılır. Histolojik olarak klasik, şeffaf hücreli, dediferansiye ve mezenkimal varyantları vardır.

Radyolojik olarak yavaş gelişen derece 1 tümör lobüle görünümdedir ve kalsifikasyonlar içerir. Derece 3 lezyon ise pleomorfiktir. Noktasal kalsifikasyonlar içerir ve vertebra korpusunu harabiyete uğratır. Nadiren posterior elemanlrı da tutabilir ve bu nedenle osteoblastoma ile karışır. Sintigrafi, BT ve MRG metodları kullanılarak evrelemeye gidilmelidir. Yapılan bir çalışmada olguların % 79'unun evre IB düşük dereceli ekstrakompartman yayılımlı, % 21'inin ise evre IIB yani yüksek dereceli ekstrakompartman yayılımlı olduğu belirtilmiştir [11].

Tümör, makroskobik olarak genellikle nodülasyonlar oluşturan gri-beyaz renkli, şeffaf, parlak doku şeklindedir. Mikroskobik olarak derece I lezyonlarda hafif hiperselülarite ve hafif atipi gösteren kondroblastlardan oluşan kondroid matriks içeren tümör dokusu izlenir. Tümör matriksinde enkondral ossifikasyon izlenebilir. Yüksek dereceli tümörlerde ise hiperselüler, belirgin pleomorfizm, atipi ve mitotik aktivite gösteren yer yer bizar görünümlü atipik tümör hücreleri izlenir.

Prognoz, tümörün histolojik derecesi ile ilişkilidir. Tedavide spondilektomi yapılarak lezyonun tümünün çıkartılabilmesi prognozu iyi yönde etkilemektedir. Bir seride, 65 aylık hastalıksız yaşam oranı, sakral tümörler için % 63, vertebral tümörler için ise % 71 olarak bildirilmiştir[11].

PARASPİNAL YUMUŞAK DOKU SARKOMALARI

Paraspinal kaslardan köken alan yumuşak doku sarkomaları nadir tümörlerdir[3,9,10,23]. Paras-

pinal bölge üzerindeki kitlenin boyutu büyüdükçe kemiğe, interkostal sinirlere ve spinal kanala yayılım gerçekleşir. Omurgada kemik harabiyeti ve dural kompresyon izlenir.

Bu bölgeden kaynaklanan yumuşak doku tümörleri geniş bir spektrumda izlenir: Liposarkoma, malign fibröz histiyositoma, leiomiyosarkoma, yumuşak doku kökenli kondrosarkoma, sinovyal sarkoma, anjiyosarkoma ve nörofibrosarkoma paraspinal kaslardan köken alan tümörlerdir.

Biyopsi alınmadan önce lezyonun lokal ya da sistemik yayılımını anlayabilmek için görüntüleme yöntemleri uygulanmalıdır. MRG T2 ağırlıklı görüntüleme yöntemi ile tümör sınırı tümörde yüksek, çevrede ise düşük sinyal izlenerek belirlenir. MRG ile, tedavi protokolünün belirlenmesine yardımcı olacak şekilde farklı düzlemlerde, tümörün sınırlarını takip etmek mümkündür. BT ile de komşu vertebranın olaya katılıp katılmadığı anlaşılabilir.

Bu grupta yer alan tümörler, yayılım düzeylerine göre sınıflandırılmıştır:

1. Yalnızca paraspinal yumuşak dokuda yerleşim gösterenler,

2. Paraspinal kas dokusu ile birlikte omurganın posterior elemanları ve bazen de pedinkül tutulumu gösterenler,

3. Paraspinal kas dokusu ile beraber, göğüs duvarı, omurganın posterior elemanları, vertebra korpusu ve nöroforamenler yoluyla spinal kanala yayılım gösterenler.

Bu bölgenin sarkomlarında kombine tedavi uygulanır [50]. Büyük tümörlerde operasyon öncesinde kemoterapi uygulayarak kitle küçültülmeye çalışılır. Omurganın katılımına göre tedavi şekli değişir. Spinal kanala yayıldığında durayı tutmuş olduğundan tedavisi güçleşir. Operasyon sonrasında da radyoterapi önerilir. Bu tür tümörlerde agresif cerrahi tedavi uygulanır. Ancak anatomik bölge ile ilgili zorluklar nedeniyle tedavileri sınırlıdır.

YUVARLAK HÜCRELİ TÜMÖRLER

Kemiğin yuvarlak hücreli tümörleri plazmasitoma, multipl miyeloma, lenfoma ve Ewing's sarkoma/PNET'tir. Bu tümörlerin histopatolojik incelenmesinde de ayırıcı tanıda sıkıntı yaşanmaktadır. Özellikle materyalin sınırlı olduğu ve dokuda artefaktın bulunduğu olgularda tanı koymak oldukça güçtür. Bu tümörler arasında ayırım yapmak için immümhistokimyasal boyama metodları yarar sağlamaktadır.

PLAZMASİTOMA

Malign plazma hücrelerinin oluşturduğu kemik iliği kökenli bir tümördür. Lenf nodu, dalak, gastrointestinal sistem ve respiratuvar sistemdeki lenfoid dokuda soliter lezyon şeklinde ortaya çıkabilir.

Plazmasitomada omurganın tutulumu % 25-50 oranındadır. Olguların çoğunda torasik vertebralarda tutulum gözlenir [6]. Erkekler kadınlardan çok daha fazla oranda (2:1, 3:1) etkilenirler [66]. Hastalar genellikle 50 yaş üzerindedirler. Ağrı, diğer spinal lezyonlarda olduğu gibi, burada da ilk gözlenen semptomdur. Genellikle tanı verilmesinden 6 ay önce ortaya çıkar [35,6]. Nörolojik semptomlar hastaların yarısından fazlasında izlenir. Bir seride olguların 1/3'ünde parapleji gözlenmiştir [35]. Koagulopati, hiperviskozite, amiloidoz ve renal yetmezliğe neden olan paraprotein oluşumu her zaman gözlenmez.

Radyografide vertebrada destrüktif, litik lezyon ve kollaps izlenebilir. Vertebra plana gelişebilir. Lezyon pedikülde başlayıp anterior kısıma yayılım gösterir. Posteroenterior direkt grafide pedikülün izlenmemesi tutulum olduğunu gösterir. Sakrumda lezyon varsa BT ve MRG, tümörün ve tümör sınırlarının tespiti için gereklidir. Kemik sintigrafisi normal olabilir [46].

Sistemik tutulumun olup olmadığını anlamak için kemik iliği aspirasyonu değerlendirilmelidir. Olguların % 50'sinde multipl miyeloma gelişir. Prognoz çok daha kötüdür [3].

Paraprotein varlığını tespit etmek için serum ve idrarda protein elektroforezi yapılmalıdır. Olguların % 50'sinde paraprotein saptanır. Olgularda paraprotein varlığı prognostik bir gösterge değildir [6].

Plazmositom radyosensitiftir. Bu yüzden hastalara radyoterapi uygulanır. Dekompresyon ve stabilizasyon gerektiğinde cerrahi tedaviye başvurulur. Cerrahi tedaviyi takiben iki hafta sonra radyoterapi yapılmalıdır.

Omurga yerleşimli soliter plazmasitomanın prognozu, multipl miyelomaya göre daha iyidir. Soliter plazmasitoma olgularında beş yıllık yaşam oranı yaklaşık olarak % 70'tir.

Lezyonun omurgada yerleşim göstermesi, yumuşak doku yayılımının belirgin olması, multipl plazmasitomaların varlığı, ileri yaş ve tedavi sonrasında paraprotein seviyesinin yüksekliğini koruması kötü prognostik faktörlerdir [6].

MULTİPL MİYELOMA

Kemikte en sık gözlenen primer kemik tümörüdür. Kemik iliğinin neoplastik plazma hücreleri tarafından işgal edildiği, hematopoietik olarak aktif olan kemiklerde tutulum oluşturan sistemik bir hastalıktır. Hastalığın kadın ve erkekte görülme oranı eşittir [29] ve 50-75 yaşları arasında izlenir [29,31].

Hastalarda normositik, normokromik anemi, trombositemi ve nötropeni gözlenir [29]. Kemik lezyonu nedeniyle şiddetli ağrı vardır. Sonuç olarak, patolojik kırık gelişebilir.

Multipl miyeloma sistemik bir hastalık olduğundan, patolojik kırıkla gelen hastanın tüm vücut taraması yapılmalıdır. Multipl miyelomada tanı ile ilgili en önemli aşama, kemik iliği biyopsisi yaparak tutulum olup olmadığının saptanmasıdır. Kemik iliği biyopsisi, kesin tanı için gereklidir. Paraproteinin varlığı idrar ve serum elektroforezi yapılarak saptanır.

Standart tedavide kemoterapi ve radyoterapi yer alır.

LENFOMA

Lenfoma olgularının % 13'ünde kemik tutulumu saptanmıştır. Aynı seride kemik tutulumu olan olguların % 15'inde omurga tutulumu ve bu olguların % 3'ünde ise spinal kanal kompresyonu izlendiği bildirilmiştir [2,16,25,41]. Hastalar genellikle 40-60 yaş arasındadır. Lezyon, genellikle omurganın anterior kısmında yerleşim gösterir; posterior kısmın tutulumu nadirdir. Non-Hodgkin lenfoma kemikte soliter bir lezyon olarak başlayabileceği gibi, sistemik tutulum eşliğinde de görülebilir [31,22].

Diğer yuvarlak hücreli tümörlerden ayırımda histolojik görünüm yanısıra, tümörün lenfoid kökenini gösteren CD45, CD3 ve CD20 gibi 'marker'ları içeren immünhistokimyasal (İHK) panel uygulanmalıdır. Lenfomalar radyoterapi ve kemoterapiye iyi yanıt verdikleri için, kemikte kollaps olmadığı zaman, izole lezyonlarda cerrahi girişim uygulanmayabilir. Cerrahi uygulanmaksızın radyoterapi ve kemoterapi ile tedavi edilen hastalarda, tedaviden 6 ay sonra kontrol biyopsisi yapılması önerilir. Nörolojik defisit varsa stabilizasyon için cerrahi tedavi ve onu takiben radyoterapi ve kemoterapi uygulanmalıdır.

Kemik tutulumu gösteren non-Hodgkin lenfomalarda 10 yıllık yaşam oranı % 30'dur. Bu oran, agresif cerrahi tedavi ve kemoterapi ya da radyoterapi uygulandığında iki katına çıkabilir [41]. Bir başka seride de kemik tutulumu gösteren büyük B-hücreli lenfomada 5 yıllık yaşam oranının % 30-60 arasında olduğu belirlenmiştir [31]. Lenfomalarda prognoz tümörün evresine ve hücre tipine bağlıdır.

EWİNG SARKOMA / PRİMİTİF NÖROEKTODERMAL TÜMÖR (ES/PNET)

Ewing sarkoma, çocuklarda izlenen andiferansiye kemik sarkoması olarak tanımlanırken, yumuşak dokuda izlenen primitif nöroektodermal tümör (PNET) ile ilişkili olduğu saptanmış ve bu tümör grubu Ewing sarkoma/PNET (ES/PNET) olarak adlandırılmıştır [7]. Bu patojenik birliktelik, son yıllarda yapılan genetik çalışmalarla desteklenmiştir [14,15,17,20,30,39,44].

ES/PNET, kemikte 6. sıklıkta izlenir. Bu tümör, kronik osteomiyelitten ve diğer yuvarlak hücreli tümörlerden ayrılmalıdır. Ayırıcı tanıda lenfoma, metastatik nöroblastoma, küçük hücreli osteosarkoma yer almaktadır.

ES/PNET 5-20 yaş arasında izlenir [45,53]. Tümörlerin az bir kısmı infantil ya da erişkin dönemde izlenir [18,34,51]. Bu tümör, % 7-8 oranında omurgayı tutar. Omurgada ise % 50 oranında sakrumda yerleşim gösterir [31,37]. Klinikte ağrı, ateş ve lökositoz nedeniyle osteomiyelit ile karışır. Bir olguda ağrının tanı konmasından 8 ay önce başladığı bildirilmiştir [9,10].

Radyolojik incelemede, periferinde sklerotik alanlar bulunan litik vertebral lezyon izlenir. Genellikle eşlik eden yumuşak doku kitlesi de mevcuttur. MRG spinal kanal ve çevredeki vital dokuları görüntülemek amacıyla yapılmalıdır. Toraks BT ve kemik sintigrafisi de metastaz araştırması açısından gereklidir [31].

ES/PNET'lerin makroskobik incelemesinde tümörün yumuşak, parlak, gri renkli olduğu, nekroz ve kanama alanları içerdiği gözlenir. Mikroskobik olarak, lenfositten biraz daha büyük atipik hücrelerin diffüz dağılım gösterdiği tümör dokusu izlenir. Tümör hücreleri glikojen pozitiftir. Elektron mikroskopi kullanılarak ultrastrüktürel olarak tümörün primitif görümümünü saptamak mümkündür. Ancak, diğer yuvarlak hücreli tümörler ile ayırıcı tanısında İHK yöntemler kullanılır. Tümör hücreleri, İHK olarak, düşük moleküler ağırlıklı sitokeratin, nöron spesifik enolaz ve CD99 pozitiftir. Nöroepitelyal diferansiyasyonu göstermek için kromogranin mRNA'sı, PCR yöntemi kullanılarak saptanabilir [40]. Zaman zaman kesin ayırım için genetik analizler de uygulanabilir. ES/PNET olgularının %95'inde sitogenetik olarak 11;22 (q24;q12) resiprokal translokasyonunu saptanmıştır [30].

ES/PNET'te kombine tedavi uygulanır. Yüksek dozda radyorterapiyi takiben, tümörün cerrahi olarak çıkarılması ve daha sonra kemoterapi verilmesi en etkili tedavi yöntemi olduğu bildirilmiştir [31]. Agresif tedavi uygulandığında ortalama yaşam süresi 33 ay iken, tedavi uygulanmadığında bu süre 15 aya inmektedir. 5 yıllık yaşam oranının yaklaşık % 20 olduğu bildirilmiştir[10,31,42].

KAYNAKLAR

1. Baar J, Burkes RL, Gospodarowicz M. Primary non-Hodgkin's Lymphoma of bone. Semin Oncol 1995; 26: 270-275.
2. Bacci G, Jaffe N, Emilini E. Staging therapy and prognosis of Primary Non-Hodgkin's lymphoma of bone and comperison of results with localised Ewing's sarcoma; a ten year experience at the instituto Orthopedico Rizzolli Tumori 1985; 71: 345.
3. Bacci G, Savilini R, Calderoni P. Solitary plasmasitoma of the vertebral column: a report of 15 cases. Tumori 1982; 68: 271.
4. Bacci G, Toni A, Avella M, Manfrini M, Sudanese A, Ciaroni D, Boriani S, Emiliani E, Campanacci M. Long-term results in 144 localized Ewing's sarcoma patients treated with combined therapy. Cancer 1989; 63: 1477-1486.
5. Barwick KW,Huvos AG, Smith J. Primary osteosarcoma of the vertebral column: a clinical pathologic correlation of 10 patients. Cancer 1989; 46: 595.

6. Batille R, Sany J. Solitary myeloma; clinical and prognostic features of a review of 114 cases. Cancer 1981; 48: 845.
7. Batsakis JG, El Naggar AK. Ewing's sarcoma and primitive neuroectodermal tumors; cytogenetic cynosures seeking a common histogenesis. Adv Anat Pathol 1997; 4: 207-220.
8. Bielack SS,et al Prognostic factors in high grade osteosarcoma of the extremities or trunk: an analysis of 1.702 patients treated on neoadjovant cooperative osteosarcoma study group protocols. J Clin Oncol 2002; 20: 776.
9. Bradway JK, Prichard DJ. Ewing's tumor of the spine. Ortop Trans 1988; 12: 746.
10. Bradway JK, Prichard DJ. Ewing's tumor of the spine. In Sundaresan N. Schmidek HH, Schiller Al (eds). Tumors of the spine: diagnosis and clinical management. Philadelphia: WB Saunders, 1990.
11. Camissa FP, Glaser DB, Lane JM, Chondrosarcoma of the spine Memorian Sloan-Ketering Cancer Center experience. In: Sundersan B. Schmidek HH, Schiller AL.et.al. (eds). Tumors of the spine; diagnosis and clinical manegment. Philadelfhia: WB Saunders.1990.
12. Chambers WM, Schwinn CP. Chordoma. A clinicopathologic study of metastasis Am J Clin Pathol 1979; 72: 765-772.
13. Dahlin DC, Unni KK. Bone tumors, 4th ed. Springfield, IL:Charles C Thomas, 1986.
14. de Alava E, Pardo J. Ewing tumor: tumor biology and clinical applications. Int J Surg Pathol 2001; 9: 7-17.
15. Dehner LP. Primitive neuroectodermal tumor and Ewing's sarcoma. Am J Surg Pathol 1993; 17: 1-13.
16. Dororetz D, Raymound K, murphy G. Primary lymhoma of bone; the relationship of morphologic diversity to clinical behavior. Cancer 1982; 50: 1009.
17. Editorial. Ewing's sarcoma and its congeners. An interim appraisal. Lancet, 1992; 339: 99-100.
18. Fizazi K, Dohollou N, Blay J-Y, Guerin S, Le Cesne AL, Andre F, Pouillart P, Tursz T, Bui BB. Ewing's family of tumors in adults: multivariate analysis of survival and long-term results of multimodality therapy in 182 patients. J Clin Oncol 1998; 16: 3736-3743.
19. Gagne EJ, Su WP. Chordoma involving the skin. An immunohistochemical study of 11 cases. J Cutan Pathol 1992; 19: 469-475.
20. Gerald WL. A practical approach to the differential diagnosis of small round cell tumors of infancy using recent scientific and technical advances. Int J Surg Pathol 2000; 8: 87-97.
21. Glasser DB, Lane JM Huvos AG, Marcove RC, Rosen G Survival , prognosis, and therapeutic response in osteogenic sarcoma. The memorial Hospital experience. Cancer 1992; 69: 698-708.
22. Gianelli U, Patriarca C, Moro A, Ponzoni M, Giardini R, Massimino M, Alfano RM, Armiraglio E, Nuciforo P, Bosari S, Coggi G, Parafioriti A. Lymphomas of the bone: a pathological and clinical study of 54 cases. Int J Surg Pathol 2002; 10: 257-266.
23. Guest C, Wang EHM, Davis A. Paraspinal soft tissue sarcoma: classification of 14 cases. Spine 1993; 18: 1292.
24. Henderson ED, Dahlin DC Chondrosarcoma of bone-a study of 288 cases. J Bone Joint Surg 1963; 45A: 1450.
25. Horan ST. Bone involvement in Hodgkin's disease: a survey of 201 cases. Br J Surg 1969; 56: 277.
26. Huvos AG, Butler A, Bretsky SS Osteogenic sarcoma associated with Paget's disease of bone: a clinicopathologic study of 65 patients. Cancer 1983; 52: 1489.
27. Huvos AG, Butler A, Bretsky SS Osteogenic sarcoma of bones and soft tissues in older patients. A clinicopathologic analysis of 117 patients older then 60 years. Cancer 1986; 57: 1442.
28. Kissane JM, Askin PB, Nesbit M; Vietti T, Burgert EO Jr, Cangir A, Gehan EA, Perez CA, Pritehard DI, Tefft M. Sarcomas of bone in childhood. Pathologic aspects. In Glieksmann A, Tefft M (eds): Bone and soft tissue sarcomas. J Natl Cancer Inst Monograph 1981; 56: 29-41.

29. Kyle RA. Multiple myeloma reviw of 869 cases. Mayo Clin Proc 1975; 50: 29.

30. Ladanyi M, Heinemann FS, Huvos AG, Rao PH, Chen QG, Jhanwar Sc. Neural differentiation in small round cell tumors of bone and soft tissue with the translocation t(11;22)(q24;q12). An immunohistochemical study of 11 cases. Hum Pathol 1990; 21: 1245-1251.

31. Levin AM, Crandall DG. Treatment of Primary Malign Tumors of the Spine and Sacrum. In Bridwell KH, DeWald RL (eds) The Textbook of Spinal Surgery, 2nd ed Lippincott-Raven Publishers, Philadelphia, 1997; pp: 1983-2006.

32. Lewis DR, Resnik CS, Aisner SC, Levine AM. Chondrosarcoma of the spine. Skeletal Radiol 1994; 23; 677.

33. Mankin HJ, Lange TM, Spanier S. The hazard of biopsy in patients with malignant primary bone and soft tissue tumors. J Bone Joint Surg. 1982; 64A: 1121.

34. Maygarden SJ, Askin PB, Siegal GP, Gilula LA, Sehoppe J, Foulkes M, Kissane JM, Nesbit M. Ewing sarcoma of bone in infants and toddlers. A clinicopathologic report from the Intergroup Ewing's Study. Cancer 1993; 71: 2109-2118.

35. McLane,RF, Weinstein JN. Solitary plasmacytomas of the spine. Orthop Trans 1988; 12: 528.

36. McNeil FC, Cassady JR, Feiser CF. Scintigraphy in children with osteosarcoma or Ewing'S SARCOMA. Radiology 1973; 109: 627.

37. Mirra JM. BoneTumors; Clinical, radiologic,and pathologic correlations. LEA&Febingen Philadelphia., 1989.

38. Murphy WA, Destouet JM, Gilula LA. Percutaneus skletal biopsy 1981: A procedure for radiologists.; results, review, and recommendations. Radiology 1981; 139: 545-549.

39. Navarro S, Cavazzana AO, Llombart-Boseh A, Triche TJ.Comparison of Ewing's sarcoma of bone and peripheral neuroepithelioma. An immunocytochemical and ultrastructural analysis of two primitive neuroectodermal neoplasms. Arch Pathol Lab Med 1994; 118: 608-615.

40. Pagani A, Maeri L, Rosolen A, Toffolatti L, Stella A, Bussolati G. Neuroendoerine differentiation in Ewing's sarcoma and primitive neuroectodermal tumors revealed by reverse transcriptase-polymerase chain reaction of chromogranin mRNA. Diagn Mol Pathol 1998; 7: 36-43.

41. Portlock C. Non-hodgkin's lymphomas; advances in diagnosis, staging and management Cancer 1992; 65: 718.

42. Pritchard DJ. Bone tumors. Part I; small cell tumors of bone. Instr Course Lect 1984; 33; 26.

43. Pritchhard DJ, Lunke RJ, Taylor WF,et al. Chondrosarcoma; a clinicopathologic and statistical analysis. Cancer 1980; 45: 149.

44. Rettig WJ, Garin-Chesa P, Huvos AG. Ewing's sarcoma. New approaches to histogenesis and molecular plasticity. Lab Invest 1992; 66: 133-137.

45. Rosito P, Mancini AF, Rondelli R, Abate ME, Pession A, Bedei L, Bacci G, Picci P, Mercuri M, Ruggieri P, Frezza G, Campanacci M, Paolucci G. Italian cooperative study for the treatment of children and young adults with localized Ewing sarcoma of bone: a preliminary report of 6 years of experience. Cancer 1999; 86: 421-428.

46. Rossleigh MA, Smith J, Yeh SD Sintigraphic features of primary sacral tumors. J Nucl Med 1986; 27-267.

47. Schajowicz F, Araujo ES, Berenstein N. Sarcoma complicating Paget's disease of bone. A clinico-pathologic study of 62 cases. J Bone Joint Surg 1983; 65B: 299.

48. Shives TC, Dahlin DC, Sim FH,et al. Osteosarcoma of the spine J Bone and Joint Surg 1986; 68A; 660.

49. Stoker DJ, Cobb JA, Pringle JA Needle biopsy of musculoskletal lesions. A review of 208 cases. J Bone Joint Surg Br. 1991; 73; 498-500.

50. Sunderesan N, Rosen G, Fortner JG Preoperative chemotherapy and surgical resection in the management of posterior paraspinal tumors; report of three cases. J Neurosurg 1987; 58: 446.
51. Verrill MW, Judson IR, Harmer CL, Fisher C, Thomas M, Wiltshaw E. Ewing's sarcoma and primitive neuroectodermal tumor in adults: are they different from Ewing'sarcoma and primitive neuroeetodermal tumor in children? J Clin Oncol 1997; 15: 2611-2621.
52. Walaas L, Kindblom LG. Fine-needle aspiration biopsy in the preoperatif diagnosis of chordoma; A study of 17 cases with aplication of electron microscopic, histochemical and imunocytochemical examination. Human pathol 1991; 22: 22-28.
53. Wilkins RM, Pritehard DJ, Burgert EO Jr, Unni KK. Ewing's sarcoma of bone. Experience with 140 patients. Cancer 1986; 58: 2551-2555.

SRS REGIONAL COURSE AND EUROPA-MIDDLE EAST MEETING, ISTANBUL, MAY 25-27, 2006*
POSTER PRESENTATIONS

SAFETY OF PEDICLE SCREW PLACEMENT WITH EVOKED EMG.

Prasit NIMITYONGSKUL, Clinton W. HOWARD

The complication rate associated with pedicle screw insertion in spine surgery varies from 1 to 33 %. Three main utilities are used in the placement of pedicle screw to decrease this potential: probing of the pedicle track, use of fluoroscopy, and evoked EMG.

Purpose: To demonstrate whether evoked EMG is a reliable guide for safety of pedicle screw insertion.

Study Design/Setting: A retrospective review was undertaken. Patient history, preoperative physical examination, intraoperative anesthesia, spinal cord monitoring records and the postoperative course were reviewed.

Methods: A total of 24 consecutive posterior thoracolumbar spine surgeries with transpedicular screws were reviewed. There were 24 patients (9 male and 15 female). A total of 118 pedicle screws were placed. Fifty seven percent of the patients had a principal preoperative diagnosis of idiopathic scoliosis. Other common diagnoses were neuromuscular scoliosis, kyphosis, and spondylolisthesis. All pedicle screws were placed with the assistance of fluoroscopy. After insertion of the transpedicular screws, the integrity of the pedicle cortex was tested by stimulating each screw head and recording evoked EMG.

Results: Five of 118 screws (4 %) had evoked EMG potentials of less than 7 uA. This threshold was used based on previous studies to be indicative of pedicle wall breach. There was one patient with postoperative radiculopathy and severe pain in the corresponding nerve root distinct from preoperative presentations. Consequently, this pedicle screw was revised and patient had symptom resolution. Ninety-nine percent of screws that were inserted with evoked EMG and fluoroscopy were without clinical consequence.

Conclusion: The use of evoked EMG in evaluating pedicle screw placement is safe and reproducible. A combination of fluoroscopy and EMG monitoring provides excellent intraoperative recognition of neurologic injury.

* *SRS Bölgesel Kursu ve Avrupa-Ortadoğu Toplantısı kongre özetleri, SRS başkanı ve Yönetim Kurulu'nun (Dr. Behrooz Akbarnia-Dr. Keith Bridwell) izniyle JTSS dergisinde basılmıştır. Gerekli iznin alınmasında katkısı olan Dr. Ahmet Alanay'a teşekkürü bir borç biliriz. JTSS Yayın Kurulu.*

POSTER PRESENTATION

THE BROOKS TECHNIQUE FOR ATLANTOAXIAL STABILIZATION IN CHILDREN

Prasit NIMITYONGSKUL, Matthew D. BARBER

Despite advances in screw fixation techniques for the upper cervical spine, the atlantoaxial arthrodesis method presented by Brooks in 1978 still represents a safe, reliable technique for stabilization of C1-C2 instability without the increased risks of neurological or vertebral artery injury seen with transarticular screw fixation or pedicle screw/rod fixation.

Purpose: To demonstrate the safety and efficacy of Brooks type C1-C2 fusion.

Materials & Method: Three clinical cases illustrate the effectiveness of this technique. Each patient has minimum follow up of 2 years:

(1) 20 year old female with Down's syndrome. X-rays and CT sean demonstrated anterior translation of C1 with canal compromise as well as an old odontoid fracture with malunion. A Brooks type fusion was performed using C1-C2 sublaminar wire, fibular allograft and iliac erest bone graft; (2) 10 year old female presented six months after a neek trauma with an os odontoideum likely secondary to odontoid fracture nonunion. This patient had obvious C1-C2 instability on flexion/extension films and exhibited some hyperreflexia and clonus. Stability was established using C1-C2 Brooks type fusion; (3) 2 year old male involved in a motor vehicle accident sustained a C1-C2 translation which rendered him quadriplegic with total ventilator dependence. MRI demonstrated a severe spinal cord contusionjust behind the odontoid consistent with SCIWORA injury. He underwent a Brooks type C1-C2 stabilization. Some recovery of neurologic control ofhis head, neck and shoulders was noted.

Conclusion: The authors acknowledge that the use of facet screws/pedicle screws in fusion of the upper cervical spine has earned its place in the surgeon's armamentarium with its greater biomechanical strength; however, the difficulty as well as the potential neurologic and vascular complications should be well considered. The authors' experience indicated that the Brooks method of C1-C2 fusion is safe, simple and reliable.

POSTER PRESENTATION

SINGLE-STAGE POSTERIOR TRANSPEDICULAR APPROACH VERTEBRA COLUMN RESECTION AND CIRCUMFERENTIAL RECONSTRUCTION IN THORACICOLUMBAR BURST FRACTURE: EARLY CLINICAL RESULTS IN 12 PATIENTS

Yan WANG, Xeusong ZHANG, Zheng WANG

Introduction: An burst thoracolumbar fracture with incomplete neurologic deficit requires decompression and stabilization. In a patient with an burst fracture of L1 or T12 with dorsal retropulsion of fragments into the spinal canal, 1 or 2 staged ventral plus dorsal approach for thoracolumbar arthrodesis is needed. But the ventral approach to TL junction means more injury compare to single dorsal approach. We innovated a new way to finish circumferential arthrodesis through only posterior approach.

Methods: From September 2004 to December 2005, 12 patients with thoracolumbar burst fracture underwent the single stage posterior transpedicular vertebra column resection and circumferential reconstruction. Retrospective review of all available clinical and radiographic data was used to evaluating for neurologic changes, spinal canal compromise, preoperative and postoperative segmental angulation, and arthrodesis rate.

Result: The median operative time was 4.1 hours, the median blood loss was 1650 ml, and the median hospital stay was 10 days. Nerve root injury during operation occurred in 3 patients. There were no cases of neurologic deterioration, and 10 (83.3 %) patients with incomplete neurologic deficits improved by at least one modified Frankel grade. Mean preoperative segmental kyphosis of 23.6° was improved to an early mean of 3.4°. All patients went on to apparently stable arthrodesis.

Conclusions: Single-stage posterior transpedicular vertebra column resection and circumferential reconstruction allows circumferential epidural decompression and immediate spinal stability. This technique achieved a high success rate for neurological preservation and arthrodesise, while avoiding the morbidity associated with combined approaches.

POSTER PRESENTATION

ANESTHESIA FOR SPINAL & SCOLIOSIS SURGERY: WHAT SURGEONS SHOULD KNOW?

Amr Mahmoud MONTASSER

The scope of spinal sugery is considerable, patients who would have been declined surgery 20 years ago are now offered extensive procedures. Those patients have many comorbidities. The objective of this instructional course lecture is to explain the basic concepts of safe anesthesia for spinal & scoliosis sugery, how to reduce blood loss & how to maintain spinal cord integrity. Their perioperative management is going to be reviewed.

The advent of techniques to monitor spinal cord function has reduced postoperative neurological morbidity in these patients & anesthesia plays a major role in facilitating these methods of monitoring.

Spinal surgery imposes further stresses of significant blood loss, prolonged anesthesia & problematic postoperative pain management. All of these fundamental issues are going to be explained.

This much needed interaction between surgeons & anesthesiologists is essential for the progress of spinal sugery which the ultimate goal of the SRS.

POSTER PRESENTATION

IS A SINGLE DOSE OF RHBMP-2 AN EFFICACIOUS ALTERNATIVE TO ILIAC BONE GRAFT IN ONE AND TWO LEVEL LUMBAR FUSION?

Rolando Figueroa ROBERTO, Munish Chandra GUPTA, Daniel BENSON

A retrospective review was performed investigating the efficacy of a 12 mg dose of rhBMP-2 (Infuse) as an alternative to iliac bone graft in one or two level lumbar fusion.

Inclusion criteria were one and two level posterolateral lumbar fusion with minimum radiographie follow up of 6 months. All patients received a single 12 mg dose of rhBMP-2 combined with 30 cc cancellous allograft, laminar autograft (when laminectomy was performed) and instrumentation.

Patients were excluded iliac crest graft was used in addition to rhBMP-2 or if radiographie follow-up was less than 6 months.

Twenty five patients met study inclusion criteria. The mean age was 57 years (range 18-80), there were 18 females and 7 males. The diagnoses included isthmic and degenerative spondylolisthesis (3 and 8 patients respectively), lumbar degenerative disc disease (5 pts), transition syndrome (4 pts), lumbar spinal stenosis (4pts) and pseudoarthrosis (1 pt).

There were 20 single level and 5 two level fusions. Average radiographie follow-up was 10 mos. (range 6-24). Xrays were reviewed by a single surgeon (RFR) and fusion status was graded using the seheme as devised by Bridwell, Lenke et al.

Results: All patients obtained successful fusion. There were 15 grade one fusions (solid bilateral fusion) and ten grade two fusions (thick fusion unilateral). There were no symptomatic pseudoarthroses and no complications related to the use of rhBMP-2.

Conclusion: A single 12 mg dose of rhBMP-2 can successfully induce formation of a solid posterolateral fusion mass in one level fusion.

POSTER PRESENTATION

POSTEROLATERAL DECOMPRESSION AND POSTERIOR INSTRUMENTED FUSION FOR SPINAL TUBERCULOSIS.

Hossam SALAH, Youssry EL HAWARY

Twenty-eight patients with spinal tuberculosis underwent posterolateral decompression and posterior instrumented fusion. Seventeen were males and eleven females. The mean age at the time of surgery was 28.2 years. All patients presented with local back pain, in addition 19 suffered a neurological deficit.

The mean duration of follow up was 49 months (27-59). At latest follow up, 25 patients were completely relieved from their pain, while the remaining three reported mild occasional pain. In addition, 18 out of the 19 with a neurological deficit showed improvement in their Frankel grading. No patient was down graded neurologically by the surgery. Disease control was achieved in 96 % of patients. Minimal complications were reported in this series.

In conclusion, posterolateral decompression and posterior instrumented fusion is a useful procedure in the management of selected cases of spinal tuberculosis. It allows adequate debridement and decompression of the spinal canal, correction of the kyphosis and stabilization of the motion segments that is necessary for the healing of the infection process. In addition, it avoids the added morbidity of an anterior approach, is considered of choice in cases with extensive multilevel epidural compression, multilevel contiguous or non-contiguous affection, in the upper dorsal and cervicothoracic junction affection where an anterior approach is either limited or requires an extensive approach and in those with significant respiratory compromise where a thoracotomy may be hazardous.

POSTER PRESENTATION

RELIABILITY AND CONCURRENT VALIDITY OF THE ADAPTED CHINESE VERSION OF SCOLIOSIS RESEARCH SOCIETY-22 (SRS-22) QUESTIONNAIRE

Alpaslan SENKOYLU, Y. GENE, A. ALANAY, S. LAU, S. CHAN, K. YEUNG, K. LUK, K. CHEUNG

Introduction: SRS-22 questionnaire was proven to be a way of evaluating scoliotic patients in terms of health-related quality of life. It is important to use this outcome instrument in not only in English speaking countries but also all other countries for globalization of knowledge. Aim of this study is assessment of the concurrent validity and reliability of translated Chinese version of SRS-22 outcome instrument.

Methods: The adapted SRS-22 questionnaire was administered to 48 patients. 36 (75 %) percent of patients responded second set of questionnaire. Mean age of 36 (4 male, 32 female) patients as 16.5. Later, adapted SRS-22 questionnaire and previously validated Short Form-36 were administered to a different group of patients (n=51). One patient discarded because of incorrect input. Mean age of second group of patients (4 male, 46 female) was 21. Internal consistency, reproducibility and concurrent validity were determined with Cronbach's α coefficient, interclass correlation coefficient and Pearson correlation coefficient, respectively.

Results: Cronbach's a coefficient for the four domains (function, activity, pain, self-image/appearance and mental health) were high. However, Cronbach's a coefficient of satisfaction with management domain was 0.53 which was considerably lower then the previous udies. Intraclass correlation was found excellent for all domains of SRS-22 questionnaire. In terms of concurrent validity, excellent (one domain), good (12 domains), moderate (three domains) and poor (one domain) correlations can be observed within the 17 relevant domains. Poor and moderate correlations were related with satisfaction with management domain.

Conclusions: Both cultural adaptation and linguistic translation are essential in any attempt to use a HRQL questionnaire across cultures. The Chinese version of SRS-22 outcome instrument is satisfactory internal consistency and excellent reproducibility. It is ready to use for clinical studies about idiopathic scoliosis in Chinese population.

Table 1. Descriptive Statistics on Individual Domain Scores (n=50)

Questionnaire/Domain(No. Questions)		Domain Means (SD)	Floor Score Minimum+	% With Floor Effect	% With Ceiling Effect
SRS-22*					
	Function/activity (5)	4.5 (0.69)	1.8	2.0	44.0
	Pain (5)	4.4 (0.73)	1.6	2.0	30.0
	Self-image/appearance (5)	3.8 (0.64)	2.2	4.0	2.0
	Mental health (5)	4.1 (0.80)	1.8	4.0	18.0
	Satisfaction with management (2)	3.9 (0.75)	1.0	2.0	10.0
SF-36**					
	Physical functioning (10)	81.7 (20.5)	35	6.0	32.0
	Role-physical (4)	70.5 (38.4)	0	16.0	54.0
	Pain index (2)	77.3 (25.3)	22.5	2.0	40.0
	General health perceptions (5)	64.3 (22.1)	5	2.0	4.0
	Vitality (4)	61.4 (18.5)	5	2.0	2.0
	Social functioning (2)	76.5 (23.4)	12.5	2.0	42.0
	Role-emotional (3)	72.0 (36.5)	0	14.0	54.0
	Mental health index (5)	71.4 (17.6)	12	2.0	2.0

*SRS-22 scale 5=best; 1 =worst.

**SF-36 scale 100=best; 0 =worst.

+In each domain a ceiling score, 100 for SF-36 and 5 for SRS-22 except Self-image/appearance domain (4.8).

Table 2. Distribution of the SRS-22 and SF -36 Domain Scores by Quantiles

Quantiles	Pain	Self-Image	Function/ Activity	Mental Health	Satisfaction with Management
SRS-22 Domains					
100%	100	96	100	100	100
75%	100	85	100	96	90
50%	88	78	96	86	80
25%	84	68	87	76	70
0%	32	44	36	36	20

Quantiles	Physical Function	Role Physical	Pain	General Health	Vitality	Social Function	Role Emotional	Mental Health
SF-36 Domains								
100%	100	100	100	100	100	100	100	100
75%	100	100	100	80	71.25	100	100	84
50%	85	100	90	65	62.5	75	100	72
25%	73.8	50	57.5	53.8	50	50	58.33	59
0%	35	0	22.5	5	5	12.5	0	12

Table 3. Internal Consistency Reliability (Cronbach's a)

SRS-22 Domain	μ	SF-36 Domain	μ
Function/activity	0.86	Physical functioning	0.90
Pain	0.87	Role-physical	0.85
Self-image/appearance	0.78	Pain index	0.87
Mental health	0.87	General health perceptions	0.85
Satisfaction with management	0.53	Vitality	0.75
		Social functioning	0.64
		Role-emotional	0.74
		Mental health index	0.83

Table 4. Test/Retest Reproducibility as Determined by the Intraclass Correlation Coefficien (n=36)

SRS-22 Domain	ICC
Function/activity	0.83
Pain	0.76
Self-image/appearance	0.79
Mental health	0.84
Satisfaction with management	0.82

Table 5. Concurrent Validity of SRS-22 Domains with Relevant SF-36 Domains as Determined by Pearson Correlation Coefficients (n=50)

SRS-22 Domain	SF -36 Domain	Pearson r
Function/activitv	Role-Physical	0.77
	Physical functioning	0.73
	Pain index	0.62
	General health perceptions	0.59
Pain	Pain index	0.72
	Role-physical	0.54
	Physical functioning	0.68
Self-image/appearance	General health perceptions	0.62
	Social functioning	0.59
	Physical functioning	0.50
Mental health	Mental health index	0.67
	Social functioning	0.57
	Vitality	0.66
Satisfaction with management	Physical functioning	0.25*
	Role-physical	0.24*
	Pain index	0.18*
	General health perceptions	0.49

*Not Significant (p>0.05)

POSTER PRESENTATION

SPONTENAOUSE ROTATIONAL CORRECTION SECONDARY TO CORONAL CURVE CORRECTION IN IDIOPATBIC SCOLIOSIS

Alpaslan SENKOYLU, K. LUK, YW. WONG, K. CHEUNG

Study Design: Retrospective cross-sectional study.

Objective: To demonstrate spontaneous correction of rotation when curves were corrected in the coronal plane.

Summary of Background Data: Scoliosis is a three-dimensional deformity, therefore curve correction in one plane likely to have a coupled effect in another plane. Ideal correction of scoliotic deformity must be addressed not only coronal and sagittal planes but also horizontal plane.

Methods: Fulcrum bending was used, as a pure side bending maneuver. In 39 surgically treated patients with lumbar or thoracolumbar idiopathic scoliosis fulerum bending was compared with apical rotation pre and postoperatively. Student t-test was used for statistical analysis.

Results: Fulcrum bending shows spontaneous rotational correction (p<O.05).

Conclusions: Rotational correction can be due to two reasons (1) coupled effect (2) surgical technique. This study demonstrates there was a definite coupled effect comparing apical rotation measured in preoperative A-P standing x-ray and fulerum bending x-ray. However there may be also a surgical effect. May be with flexible curves, where you can get excellent coronal correction, excellent apical derotation will also occur and no apical derotation is necessary.

Table 1. Cumulative data of the patients.

Patient No.	Age	Gender	Curve Tyne	Cobb (A-P)	Cobb (FB*)	Cobb (Poston)	Ap. Rot.** (A-P)	Ap. Rot. (FB)	Ap. Rot. (Postop)
1.	11	F	5CN	80	30	5	30	20	0
2.	11	F	5CN	48	17	0	30	30	10
3.	14	F	5CN	64	20	10	25	15	5
4.	13	F	5CN	46	20	20	10	10	0
5.	13	F	5CN	47	14	4	15	10	5
6.	14	F	5CN	49	17	15	15	15	5
7.	14	F	5CN	56	24	28	25	10	20
8.	23	F	5CN	70	40	8	25	25	10
9.	15	M	5C+	64	30	14	20	25	10
10.	13	F	5C-	55	18	3	40	40	20
11.	14	F	5CN	61	2	4	15	15	5
12.	20	F	5C+	45	2	7	25	0	15
13.	14	F	5CN	45	10	12	20	20	10
14.	21	F	5CN	47	14	21	30	20	15
15.	15	F	5CN	48	5	2	10	10	0
16.	17	F	5CN	44	10	21	15	5	10
17.	23	F	5CN	56	10	18	25	15	15
18.	15	F	5C-	55	21	2	20	15	5
19.	11	F	5CN	57	23	4	25	15	5
20.	24	F	5AN	56	8	0	35	45	10
21.	12	F	5CN	49	15	10	15	5	5
22.	15	F	5CN	60	20	10	35	30	20
23.	12	F	5C-	44	10	15	15	5	10
24.	19	F	5CN	62	8	14	25	10	15
25.	15	M	5CN	50	22	18	15	15	10
26.	16	F	5CN	50	16	0	20	15	10
27.	14	F	5CN	47	18	16	20	20	10
28.	11	F	5CN	45	16	2	25	20	5
29.	16	M	5CN	50	13	1	20	5	10
30.	13	F	5CN	43	2	11	20	20	20
31.	20	M	5CN	52	23	9	35	20	20
32.	15	F	5CN	48	9	6	20	5	0
33.	20	F	5CN	43	5	5	15	10	10
34.	13	F	5CN	48	5	12	20	20	12
35.	20	F	5C-	52	11	2	20	5	10
36.	16	F	5CN	44	7	2	30	25	20
37.	33	F	5CN	46	4	2	30	25	20
38.	16	F	5CN	53	9	10	20	15	15
39.	11	F	5AN	70	34	23	20	15	10

***FB**=Fulcrum Bending, ** **Ap.Rot**=Apical Rotation measured with Perdriolle's Method

POSTER PRESENTATION

COMPARISON OF RESULTS OF MULTIHOOK AND SUBLAMINAR WIRING METHODS FOR TREATMENT OF ADOLESCENT IDIOPATHIC SCOLIOSIS:MINIMUM 5 YEARS FOLLOW-UP

Alpaslan SENKOYLU, U. KANATLI, A. SIMSEK, M.A. DEVECI, N. ALTUN

At least 5 - year follow up results of adolescent idiopathic scoliosis, those were treated using multihook instrumentation (MI) and sublaminar wiring (SW) methods were reviewed retrospectively.

29 patients were included in the study. Fourteen of patients were treated using MI and fifteen were treated with SW method. Preoperatively primary curves were measured using Cobb method, revealing a mean of 50 degrees for MI group and 56 degrees for SW group. At the end of follow up, mean Cobb value was 15 for CDI group and 19 for sublaminar group.

Statistical analysis revealed that there is no difference between these two methods ($p>0.05$). Two patients in MI group pull-out of proximal hook were encountered. In one of these patients revision was performed.

From aspects of correction of deformity and its maintenance, comparison of MI and SW method showed that there is no significant difference at the end of follow up period.

POSTER PRESENTATION

TWO STAGED CORRECTION OF AMBULANT POLIOMYELITIC PATIENTS WITHOUT PELVIC INSTRUMENTATION

H.B. ELSEBAIE, Y.H. ELMILIGUI, W.M.T. KOPTAN

Study Design: A retrospective clinical and radiographic review.

Objectives: To study the results and complications of patients who had spinal fusion for poliomyelitis patients with scoliosis.

Summary of Background Data: The reported literature on poliomyelitis patients with scoliosis is very little. Nevertheless, the reported complication rate in the management of neuromuscular scoliosis ranges from 44 % to 62 %.

Methods: A retrospective review of 34 ambulant patients with poliomyelitic spinal deformities. The average age at surgery was 15 years and 8 months, with an average follow-up of 32 months (minimum, 24 months). All patients had a two staged procedure; the first of which was an anterior release and grafting. The second stage was posterior instrumentation, correction and fusion and was performed on an average of 6 days latter.

Results: Preoperatively, the mean major curve measured 81 degrees, which was corrected on side bending views to an average of 43 degrees. At the last follow-up, the curve had an average of 32 degrees with an average correction of 61 %. There were no neurologic complications.

Conclusions: The results for spinal fusion for neuromuscular scoliosis are better with this protocol of management and the complications were acceptable.

POSTER PRESENTATION

MULTIPLE LEVEL FUSION MASS OSTEOTOMIES IN FAILED UNORTHODOX SCOLIOSIS SURGERY

Y. ELMILIGUI, W. M. T. KOPTAN, H. B. ELSEBAIE

Summary of Background Data: Surgical treatment of spinal deformities requires proper understanding, preoperative planning and precise execution. Failure to abide to these guidelines results in catastrophic outcomes, solid fusion in these patients adds a great difficulty in rectifying these problems.

Objectives: To study the technique of multiple level fusion mass osteotomies in fifteen patients referred to our centre, who had previous procedures to correct their spinal deformities. It is important to emphasize that their primary surgeries were not beyond criticism.

Methods: The age at surgery had an average of 19 years. The dorsal curves ranged from 36° to 98° with an average of 58.4°. The lumbar curves ranged from 24° to 70° with an average of 38.5°. All patients had a double staged procedure. The first stage was an anterior release. Posteriorly, the old implants were removed and correction was achieved by performing multiple level osteotomies (4 in average) in the fusion mass. The patients were re-instrumented and fusion was performed.

Results: Post-operatively, the curves were corrected to an average of 29.4° and 26.3° respectively. Patients were followed up for an average of 2.5 years. Overall, there was no postoperative neurological deficit and the complications were acceptable.

Conclusions: Spinal osteotomies appear to be both safe and efficient in obtaining a good correction of these deformities.

POSTER PRESENTATION

EFFICACY OF PARS REPAIR WITH A CABLE-SCREW CONSTRUCT IN GRADE I OR LESS SPONDYLOLISTHESIS FOR ADOLESCENTS AND YOUNG ADULTS

W. M. T. KOPTAN, H. B. ELSEBAIE, Y. H. ELMILIGUI

Study Design: To evaluate the results of pars interarticularis repair with a cable-screw construct.

Objectives: To assess the results of a recently described technique for direct osteosynthesis of the pars interarticularis and to evaluate its efficacy in grade one slips.

Summary of Background Data: The management of symptomatic spondylolysis or spondylolisthesis with minimal displacement is controversial. Several procedures have been proposed; Buck (1970), Morscher (1984) and Nicole and Scott (1986).

Methods: The study included ten patients with Grade I or less spondylolisthesis. The average age was 18.5 years (range, 13-32 years). All patients complained of low back pain unresponsive to conservative treatment and the average duration of symptoms was 18 months. Preoperative MRI was mandatory to confirm the absence of any signs of degeneration. The surgical technique involved thorough debridement of the pseudarthrosis; impacting a tricortical iliac crest graft and rigid fixation by a special pedicle screw-cable construct.

Results: The minimum follow-up was 26 months. The results in seven were rated as excellent two as good and one as fair and all of the defects except one went to solid union. There were no implant failures.

Conclusion; The results of this technique are encouraging and above all offers the treatment of choice to Grade I lytic slips meeting the selection criteria for motion segment preservation in such a young age group.

POSTER PRESENTATION

TWO STAGED RESECTION WITH POSTERIOR INSTRUMENTATION FOR CORRECTION OF ANGULAR CONGENITAL SPINAL DEFORMITIES

Y.H. ELMILIGUI, W.M.T. KOPTAN, H. B. ELSEBAIE

Objectives: To study the results of 22 patients of with congenital spinal deformities who underwent surgical correction.

Summary of Background Data: The management of neglected angular congenital spinal deformities has been one of the most challenging procedures in this field. Spinal osteotomies have been the cornerstone of surgical treatment. Several hazards and complications were reported with these major techniques.

Methods: Ten patients had a hemivertebra, 4 had an unsegmented bar, 3 mixed anomalies and five could not be classified. Resection was performed using an anterior approach followed one week latter by completion of the resection, posterior correction and instrumentation.

Results: The mean Cobb angle of the main curve was 75° before surgery which was corrected to 29°. There was at least a 2-year follow-up period. Overall, there were no persistent postoperative neurological insults. The complications were minimal and acceptable.

Conclusions: This technique is a safe and promising procedure that offers significant advantages for controlling congenital deformity: excellent correction in frontal and sagittal planes, high stability and low neurological risk.

POSTER PRESENTATION

EARLY RESULTS OF A NOVEL SACROILIAC JOINT STABILISATION TECHNIQUE

A. AL KHAYER, J. HEGARTY, D. HAHN, M.P. GREVITT

Summary of Background Data: A variety of techniques for SH arthrodesis or stabilisation have been previously reported. There is no universally accepted technique.

Objective: To report the early results of a novel percutaneous procedure for stabilisation of sacroiliac joint (SIJ) with the aid of a Hollow Modular Anchorage (HMA) screw for SIJ related pain.

Methods: We included patients who underwent SIJ stabilisation by the novel technique with minimum 6 months follow-up. Preoperative and postoperative Oswestry Disability Index, Visual Analogue Score for pain, and postoperative subjectiye patients' satisfaction were assessed for all patients.

Results: Nine patients satisfied the inclusion criteria, on whom 12 SIJ stabilisation were performed. Average age of 42.4 years (35-56), mean follow-up of 26 months (6-58). Clinically and statistically significant improvement were achieved; mean VAS value dropped from 8.1 (7 to 9) preoperatively to 4.6 (3 to 7) postoperatively $p \leq 0.002$. Mean 001 value dropped from 59 (34 to 70) preoperatively to 45 (28 to 60) postoperatively $p \leq 0.005$. Good patients' satisfaction was evident as well.

Conclusions: To the author's knowledge this is the first procedure that combines: safe minimal surgical exposure, instrumented fixation for primary stability and bone grafting for long-term stability. And this is the first paper that documents improvement and satisfaction in 3 different validated outcome measures.

POSTER PRESENTATION

LONG TERM FOLLOW-UP OF PERCUTANEOUS COBLATION NUCLEOPLASTY IN CONTAINED DISC HERNIATION

Viviana Franca PALIOTTA, L. ALESSANDRO, Ospedale S.EUGENIO

Aims: Percutaneous coblation nucleoplasty is a technique recently introduced in the treatment of symptomatic contained disc herniation. It allows centrally decompressing the disc, then reducing the peripheral herniation. Only local anaesthesia is needed and then patients do not need to be hospitalized. No brace is needed.

Methods: Since 2002 we have introduced this technique in our hospital in patients suffering for low back pain due to contained disc herniation. 21 cases were performed in the period 2002-2003. Mean age was 43 years. Mean follow is now 3 years and 9 months. Patients were studied with X-Ray and MRI. All of them were previously treated by means of medical and physical therapy without recovering.

Results: No serious complication was observed. Short follow-up was excellent, all patients recovered but 2 that underwent open discectomy 6 and 8 months after nucleoplasty. In 4 cases mild back pain persisted, without impairing daily life activities. Long term follow-up of these first cases is too good: only 3 more cases complained of mild low back pain after hard working and only one patient needed surgery after 3 years follow -up

Conclusions: Long term follow-up confirms that percutaneous coblation nucleoplasty is a worthwhile alternative procedure in the treatment of low back pain due to contained disc herniation. The procedure is quite safe. Pain relief and recovery to previous daily life activities is achieved in a short time and the results last in the years.

POSTER PRESENTATION

CERVICAL ANTERIOR RECONSTRUCTION WITH TITANIUM MESH CAGE (TMC) FILLED WITH AUTOGENOUS BONE GRAFT, AGF AND ANTERIOR PLATE IN THE SURGICAL TREATMENT OF DEGENERATIVE CERVICAL MYELOPATHY

Viviana Franca PALIOTTA, B. MAGLIOZZI, L. ALESSANDRO

The use of titanium mesh cages (TMCs) is actually preferred to the tricortical iliac grafting for reconstruction following anterior cervical corpectomy in degenerative myelopathy.

Methods: 12 patients with myelopathy due to multilevel cervical spondylosis were treated by anterior corpectomy, titanium mesh cage (TMC) filled with autogenous bone graft, AGF and anterior plate. Mean follow-up was 31 months. Mean age was 62 years. Patients were evaluated preoperatively and postoperatively according to the JOA score. In all cases plain and dynamic cervical X-rays and M.R.I. were performed preoperatively. Postoperative X-ray examination was carried out at 1, 3 and 6 months after the operation. M.R.I. and neurological examination was performed at 6 months postoperatively.

Results: Mean hospitalization days were 9. No severe complication was observed. All patients improved neurologically at least of 1-2 points according to JOA scores. Transient postoperative neurological worsening was present in 1 patient. In 1 case a mild local infection recovered after local surgical revision. Solid fusion was achieved in all cases.

Conclusions: In conclusion anterior corpectomy and Titanium mesh cage (TMC) filled with autogenous bone graft, AGF and anterior plate seems to be aquite safe and effective surgical treatment in degenerative multilevel myelopathy. TMC and anterior plate provide good structural support, and earlier solid fusion can be achieved combining AGF to the bone graft.

POSTER PRESENTATION

LUMBOSACRAL JUNCTION ANOMALIES AND SPONDYLOLISTHESIS

Kamran AGAYEV; Burcak BILGINER; Burce Ozgen MOCAN; Atilla AKBAY; Gokhan BOZKURT; Selcuk PALAOGLU

Introduction: It is well known that lumbosacral anomalies, especially sacralization accelerate development of dejenerative lumbar disease, by increasing load to neightboring segments. However, there is al most no papers adressing association between spondylolisthesis and lumbosacral anomalies. This study was designed to research this association.

Materials And Methods: In this study 38 symptomatic spondylolisthesis cases had been analyzed retrospectively. 30 (78.95 %) were found to have certain lumbosacral anomalies. 3 patients were male, 27 female, age range was 34-82, average age was 59.18.

Grade I spondylolisthesis was find in 18, grade 11 in 12 cases. Degenerative spondylolisthesis occured in 9, and type lytic type in 21 patients. Stabilization by posterior transpedicular screw and rod fixation were performed in all patients.

Results: From total 30 patients with spondylolisthesis and lumbosacral anomalies:

2 had spondylolisthesis at L3-4 level, from which: 2 had L5 sacralization.

16 had spondylolisthesis at L4-5 level, from which: 14 had L5 sacralization, 7 had decreased hight at the posterior wedge of L4 vertebrae, 1 had S1 lumbalisation.

12 had spondylolisthesis at L5-S1 level, from which: 9 had decreased posterior wedge of L5 vertelrae, 3 had S1 lumbalization.

From 9 patients with degenerative spondylolisthesis 6 had sacralizations (66.66 %).

From 21 patients with lytic spondylolisthesis 4 had decreased posterior wedge hight of superior vertebrae at spondylolisthesis level (66.66 %). 10 had sacralizations (47.62 %).

Discussion: It had been widely accepted that lumbosacral anomalies, which causes restriction of movement, accelerate progression of lumbar dejenerative disease. However, association between spondylolisthesis and lumbosacral anomalies has not been studied. We found interestingly high incidense of anomalies in patients with spondylolisthesis (78.95 %), from which 53.33 % were sacralizations. The most common anomaly occured with degenerative spondylolisthesis was sacralization (66.66 %). However, lytic type spondylolistesis most commonly occured with decreased posterior wedge hight of superior vertebrae (66.66 %).

According to this results we can say that lumbosacral anomalies play role in development of spondylolisthesis.

POSTER PRESENTATION

IDIOPATHIC SCOLIOSIS

K. ZAHARIOU; G.H.KELALIS; A.SIDERAKIS; A.KALAMPOKIS; L.KOLLINTZAS;

Purpose: The study of postoperative correction of idiopathic scoliosis in patients who were surgically treated in our department with posterior fixation and derotation technique.

Materials And Methods: Between January 2001 and October 2005, 145 patients (116 female and 29 male), aged 12-57 y.o (average 18,9 y.o) were subjected to surgical correction of idiopathic scoliosis in our department with derotation technique. We studied their preoperative AP, Lateral and Dynamic X-Rays as well as the immediate postoperative X-Rays and those obtained after 6 and 12 months.

Results: We recorded 69,3 % correction of the thoracic curvature and 70,5% correction of the lumbar curvature at the immediate postoperative period. In 74,3 % of the patients we observed improvement of the vertebral rotation while there was a significant increase of kyphosis which usually is below normal in idiopathic scoliosis. Six months postoperative we recorded a decrease of curvature correction by 4, 4 % while the rotational correction remained the same.

Conclusion: The technique of rod derotation during surgical treatment of idiopathic scoliosis corrects significantly the scoliotic curvature as well as kyphosis, mainly due to the properties of the new instrumentation devices.

POSTER PRESENTATION

INTRAOPERATIVE NEUROPHYSIOLOGICAL MONITORING IN THE SURGICAL TREATMENT OF SCOLIOSIS

Kostantinos ZACLIARIOU; G.H KELALIS; K.PAPADOPOULOS; P.AGGOURAKIS; M.PANTAZI; Kifissia ATHENS

PURPOSE: A study of the use of neurophysiological monitoring in the surgical treatment of scoliosis with posterior fixation and derotation technique.

MATERIAL AND METHODS: From January 2004 until December 2005, 86 patients (22 men and 64 women) aged 15-48 years old (average 18,4 years old) were treated in our department due to scoliosis. In all eases we perform posterior fixation with rods and screws or claws and derotation. In all cases we used Multimodal Intraoperative Neurophysiological Monitoring (SSEP's, TcMEP's, spEMG, Free-Run EMG and Triggered EMG with monopolar probe stimulator). Both SSEP's and TcMEP's were used as an index for neurophysiologie improvement while the EMG modalities were used to record intraoperative pressure to nervous or adjacent tissue so as to avoid damage.

RESULTS: In all cases after the derotation and the insertion of the fırst rod we observed an intraoperative decline of the SSEP's amplitude that recovered without any intervention in 5-10 minutes. In 3 patients we detected intraoperative ischemia of the neural tissue (Both SSEP's and TcMEP's changes that remained more than ten minutes) so we corrected the curvature of the rod.

CONCLUSION: In our up-to-date experience the use of intraoperative neurophysiological monitoring seems to be a highly satisfactory adjunct method in the surgical treatment of scoliosis.

POSTER PRESENTATION

EVALUATION OF MECHANICAL STABILITY OF SCOLIOTIC CONSTRUCTS USING SUBLAMINAR AND SUBTRANSVERSE WIRING

Surendra BANDI, A GADGIL; A RAHMATALLA; V JASANI; E B AHMED

Introduction: Segmental spinal fixation is commonly used to correct various types of scoliosis. Sublaminar wiring is a widely used posterior segmental fixation technique for long posterior fusions especially in thoracic spine. But this is associated with various complications such as dural tears, cerebrospinal fluid leak, neurological deficit and late peridural fibrosis. The most serious drawback of the sublaminar wiring is the risk of neurologic injury especially with the passage of sublaminar wires in the thoracic and thoracolumbar spine. To over come these set backs. Kemal et al used subtransverse wiring and reported that it is strong enough to correct scoliotic curves and requires less operative time and skill and is neurologically safe. There are no studies in literature comparing the stability achieved by these two techniques.

Materials and Methods: Mechanical stability under torsional strain of five specimens of each of two construct designs was compared by static and fatigue testing, using an electroservohydraulic testing machine. In construct A, a contoured hartshill rectangle was used from T2-L2, with sublaminar wires passed at every level. In construct B, subtranseverse wires were used instead of sublaminar wires. Industrially fabricated spine models were used to prepare these constructs. The intervertebral motion within the construct was measured using the Fatrack magnetic field sensor device.

Results: Static testing - Comparing the rotational displacement (in degrees) produced in the fıve samples of each of the two types of construct us ing students t-test, the displacement in construct A was found to be more than the construct B and the difference in the displacement was statistically significant ($p<0.001$).

Fatigue testing - All samples in both the constructs withstood three million cycles.

Conclusion: We conclude that subtransverse wiring offers better rotational stability and has the advantages of avoiding neurological complications associated with sublaminar wiring in addition to the case application leading to less operative time.

POSTER PRESENTATION

SCHEUERMANN'S DISEASE: INDICATION FOR SURGERY AND TRANSLATION OF THE SRS-22 INTO GERMAN.

Ulf MUZZULINI, H. WEYDT; C.BÖHM; W. HEIN; A. ZEH

Pupose: The indication for surgery of Scheuermann's disease is not clearly defined. In the presented study, the indications are outlined with respect of our own experience and a review of the literature. To assess the quality oflife, the SRS-22 was translated into German.

Methods: Retrospective study of 15 patients. Translation of the SRS-22 into German.

8 male and 7 female patients with Scheuermann's disease were eligible. Age at time of surgery 16.2 (14-19 years). Average kyphosis 78°. Dorsal approach in 4 cases, open dorsoventral in 11 cases. Examined were all hospital and outpatient charts. Follow up included clinical exam, standing x-ray of the whole spine and the SRS-22. The average follow-up was 4.4 (0.5-10) years.

Results: The average correction of kyphosis was 42°. No significant loss of correction. Erection of lumbar lordosis from 65° to 46°.

A risk for a proximal junctional kyphosis was stopping the instrumentation at T4 or below.

The SRS-22 results showed a significant improvement of the domains self image/appearance and mental health as well as a high score in the satisfaction with management. In contrast the domains function/activity and pain showed no significant improvement.

33 % of the x-rays showed degenerative changes of the lumbar spine at an average of 3 years.

Discussion: The natural history of Scheuermann's disease is not known. It is not known whether it necessarily leads to an early degeneration of the lumbar spine nor whether surgery can avoid this. The pain occurs mainly during the adolescent growth spurt and generally subsides with bony maturity and therefore can also not be used as indication for surgery. Kyphosis progression again is only vaguely defined.

Conclusion: According to our results, a highly significant improvement is achieved only in the self image/appearance and mental health and thus is the main factor leading to a high satisfaction with surgery.

POSTER PRESENTATION

SLOW GROWING MELANOMA OF THE DURA WITH PARAPLEGIA DUE TO ANTICOAGULATION AND DELAYED DECOMPRESSION: A CASE REPORT

Ulf MUZZULINI, W.HEIN; A. ZEH

Purpose: The question of: Oral anticoagulation in patients with spinal anomaly.

Timing of spinal decompression in acute cauda equina. A rare case of a dural melanoma

Case Report: A 65 year old patient was admitted with acute onset of lumbar pain radiating into his right leg and a senso-motoric deficit of L5. Four 4 years earlier he had asimilar episode when an MRI scan revealed a large cystic tumor of the lumbar spine. A few month earlier the patient was started on Warfarin for non valvular atrial fibrillation (NVAF).

On presentation the patients INR was 4.2. The MRI showed a mainly unchanged tumour compared with 4 years ago. Due to it's size and its local expansion in relation with the neural structures the tumour was classified as inoperable.

In spite of a successful reversal of the anticoagulation a progressive worsening of the neurological deficit developed. The patient became partially paraplegie, lost control over his bowl and urinary functions and was unable to walk. After seven days the patient decided to go along with a high risk spinal decompression.

Intraoperatively there were no identifiable cauda equina fibres. The histo-chemical examination revealed a slowly growing melanoma originating from the dura. He underwent an intensiye rehabilitation program, regaining his ability to walk and his bowl control.

Discussion: Timing in patients with an acute cauda equina syndrome remains controversial. In the presented case a 7 days delayed decompression lead to good neurological recovery.

Melanomas originating from the dura are only rarely described. This case is unique in that it has no signs of progression or metastatic spread.

Conclusion: With a steadily increasing number of orally anticoagulated patients the overall number of bleeding complications will also increase. It is crucially important to define risk factors and contraindications. We think any intraspinal pathology has to be considered as a contraindication for oral anticoagulation.

SAFETY AND EFFICACY OF POSTERIOR SEGMENTAL INSTRUMENTATION AND FUSION FOR DYSTROPHIC SPINAL DEFORMITY IN PATIENTS WITH NEUROFIBROMATOSIS TYPE I

Mehmet AYVAZ, Muharrem YAZICI, İbrahim AKEL, Ahmet ALANAY, Rifat Emre ACAROGLU

Purpose: To evaluate the safety and efficacy of third generation posterior segmental instrumentation of dystrophic spinal deformities in patients with Neurofibromatosis type I.

Materials and Methods: The records of 18 patients with diagnosis of neurofibromatosis type I and spinal deformity were reviewed. The patients with dystrophic spinal deformity treated with third generation posterior instrumentation were included. Ten patients (4 female, 6 male) with an average age of 10 years (4-17) and follow-up of 45, 1 months (24-120) formed the subjects of this study. Four patients had previous subcutaneous rod and one patient had Luque instrumentation.

Five patients had dural ectasia. All patients were neurologically intact before surgery. All patients had posterior instrumentation and nine had additional anterior release and fusion. Halo traction was used in 2 patients. Sublaminar wiring was used in five and spinous process wiring was used in four patients. Intracanal anchorage by sublaminar wires or laminar hooks at the level of intraspinal pathology is avoided. Allograft was used for fusion in all patients

Results: The major curve was corrected from preoperative average of 79°(60°-115°) to postoperative 36,2° (16°-78°) (54,1 %). Hyperkyphosis was normalized in eight patients. Sagittal and coronal balance restored to normal or improved. No neurological complication or infection was observed. In one patient instrumentation was revised due to inappropriate caudal end vertebra selection. The average correction loss was 3,2° at the last f/up.

Conclusion: Third generation posterior instrumentation of dystrophic spinal deformities in neurofibromatosis type I can be done safely and corrections comparable with idiopathic curves can be achieved and maintained. Even the dystrophic vertebra can be instrumented with versatility of third generation posterior systems.

POSTER PRESENTATION

OUTCOME OF ADOLESCENT IDIOPATHIC SCOLIOSIS CORRECTION WITH AVOIDANEE OF ANTERIOR RELEASE USING TRACTION RADIOGRAPHY

Surendra BANDI, BJ DAVIS; J TRIVEDI; EB AHMED

Introdudion: Pre-operative traction radiography under general anaesthesia has been shown to have a superior role over supine bending radiography to assess the curve flexibility, to decide whether a concomitant anterior surgery can be avoided and to predict the post-operative correction, in patients with adolescent idiopathic scoliosis. To our knowledge, there are no follow up studies in the literature assessing the post-operative outcome in such patients. The objective this paper is to evaluate the post-operative outcome in patients with late-onset idiopathic scoliosis, in whom a decision was taken to avoid concomitant anterior surgery and to perform only posterior surgery after assessing the curve flexibility using traction radiography.

Methods: Anterior release was avoided in patients with curves correctable to less than 40 degrees with traction radiography under general anaesthesia. Antero-posterior and lateral radiographs were taken in the immediate post operative period and at the time of follow up. Cobb angle was measured at 2 years in each patient and compared with the post operative cobb angle, to assess the progression of the curve.

Results: Out of thirteen patients planned for anterior release surgery and posterior instrumentation, anterior release was avoided in eleven patients after review of the traction radiography. Mean loss of correction at the end ofa minimum of two years follow up was 2.

Conclusion: In patients with adolescent idiopathic scoliosis, traction radiography is a safe and reliable technique which helps in decision making to avoid anterior release and has several advantages including decrease in operative time and blood loss and better post-operative recovery.

POSTER PRESENTATION

TREATMENT OR THORACIC CONGENITAL SCOLIOSIS BY CHEST WALL COMPRESSION AND HEMIEPIPHYSIODESIS: A CASE REPORT

Selim YALCIN, Baris KOCAOGLU, Ahmet Hamdi AKGULLE

Purpose: Our purpose is to give middle term follow-up results of a patient with thoracic congenital scoliosis. Chest wall constrictors were used in this patient for the correction of both scoliosis and hemi-thorax deformity.

Methods: Four year old girl with thoracic congenital scoliosis associated with thorax deformity and fused ribs had both convex side posterior hemiepiphysiodesis and closing wedge thoracotomy at one session. The thoracotomy was performed by us ing two chest wall compressors which are known as vertical compressible prosthetic titanium rib. Hemiepiphysiodesis were done only at the apex. Radiographs were used to analyze the correction of the scoliosis as indicated by a change in the Cobb angle and the height of concave hemi-thorax compared with the height of the convex hemi-thorax. Patient was followed at duration of 20 months at out-patient clinics with a period of 6 months.

Results: The patient had progressive congenital scoliosis with a mean increase of 10° per year before the operation. The Cobb angle decreased from 38° preoperatively to 25° at the time of the latest follow-up. The height ratio between concave and convex side the improved significantly. There was no significant change in primary or secondary respiration as measured by the change in the chest or abdominal circumference with breathing. Blood oxygen saturation levels also showed no significant chances.

Conclusion: In this study, we combined two techniques for the treatment of convex hemi-thorax; the correction of the rib cage deformity and scoliosis by chest wall constrictors at the convex side and the control of the scoliosis by hemiepiphyisiodesis. Closed wedge thoracotomy at the convex side corrects both the rib cage deformity and the congenital scoliosis. Hemiepiphyisiodesis at the apex of the convex side controlled the progression of the disease without affecting the growth of the whole thoracic spine.

POSTER PRESENTATION

EFFICACY OF LIGAMENT LAXITY ON SURGICAL TREATMENT OF THE SURGICAL TREATMENT OF IDIOPATHIC SCOLIOSIS

Brahim Ghayem HASSANKHANI, Mohamad Taghi PAYVANDI; Ali REZAEE

Back ground: Many factors affect on management of this disorder. The purpose of this study is evaluation of the efficacy of ligament laxity on surgical treatment of the idiopathic scoliosis.

Material and method: 36 patients, 9 male (5 %) and 27 female (75 %) with idiopathic scoliosis were studied between 2000 and 2004. The mean age was 16 years (from 12 to 22 years). Follow up time was 1.5-4 years. Nineteen (52.7 %) patients had ligament laxity. Ten patients with ligament laxity had posterior spinal fusion and instrumentation (four of them had Cobb angle of more than 65 degree) and nine had anterior spinal fusion, posterior spinal fusion and instrumentation.

Thirteen patients without ligament laxity had posterior spinal fusion and instrumentation, and four had anterior spinal fusion, posterior spinal fusion and instrumentation.

Ten patients with ligament laxity had instrumentation by Cotrel - Dubousset system (C.D) and nine by distraction rod and sublaminar wiring system (D.R + S.L.W).

Ten patients without ligament laxity had instrumentation by C.D and seven by D.R + S.L.W.

Results: The mean time of operation was 3.95 hours (SD = 0.31) in patients with ligament laxity and 4. 26 hours (SD= 0.56) in patient without ligament laxity.

Curve correction was 73.3 % in patients with ligament laxity and 57.1 % in patients without ligament laxity. There was a significant difference between two groups (p = 0.001).

Conclusion: Ligament laxity not only has an important effect on surgical correction of curvature but also in cases with curves more than 60°, anterior release and fusion is not needed.

POSTER PRESENTATION

THE IMPORTANCE OF COLLABORATION OF ORTHOPAEDIC AND NEUROSURGEON IN THE SURGICAL TREATMENT OF CONGENITAL SCOLIOSIS (PRELIMINARY REPORT)

Abtullah MILCAN, Celal BAGDATOGLU; Irfan AYAN; Ahmet KARACOR

Aim: To elucidate the importance of collaboration of orthopaedic and neurosurgeon in the surgical treatment of congenital scoliosis.

Patients and Methods: Eight patients (1 male, and 7 females) who were operated for congenital scoliosis in our Orthopaedics Department in the last three years were included in the study. Four of the patients had intraspinal pathology detected by MRI, and were operated by the same neurosurgeon (co-author). After a period of three weeks scoliosis surgery was performed.

Results: Two patients had tethered cord, and another two had diastometamyelia. Intraspinal pathologies were addressed prior to curve correction. One patient had hemivertebra excision, another one patient had posterior hemiepiphysodesis and anterior-posterior arthrodesis, and six patients had insitu fusion, two with posterior instrumentation. There was no neurological deficit or infection.

Conclusion: Unless intraspinal pathology is treated prior to the surgical treatment ofthe curve neurological deficit emerges as the most frequent complication. Neurosurgical treatment of intraspinal pathology preceding the surgical treatment of congenital scoliosis renders uncomplicated scoliosis surgery after three weeks.

POSTER PRESENTATION

OPERATIVE TREATMENT OF 4TH-DEGREE SCOLIOSIS

Kolban MACIEJ, Zaeha SLAWOMIR, Michal CHMIELNICKI

Satisfactory results following the operative treatment of scoliosis in which the Cobb angle exceeds 90° are very difficult to achieve. Anterior release followed by posterior spondylodesis only slightly improves the possibility of the deformity's being corrected. However, left untreated, scoliosis of that degree may have a detrimental effect on the patient's respiratory and circulatory system.

Aim: The aim of the study was to evaluate the degree of correction in patients with 4th-degree scoliosis in which the curve was greater than 90° before surgery.

Material and Methods: Radiographs of 14 patients with 4th-degree scoliosis, operated on between 1999 and 2001, were reviewed retrospectively. The follow-up period was at least 24 months. The Cobb angle was between 90° and 134° (mean angle 97°) in the thoracic region and 45° in the lumbar region. The average value of kyphosis in the thoracic -lumbar region measured on radiographs in the sagittal plane was 9°. In 2 cases, in the first stage anterior release was performed, which was followed by distraction of the scoliosis and posterior spondylodesis. During surgery the rib hump was partially removed by resection of between 5 and 7 ribs.

The average Cobb angle in the thoracic region directly following surgery was 43.3° and 20.4° in the lumbar region, and lordosis in the thoracic-lumbar region was 6°. The angles after 2 years of follow-up was 48.7° in the thoracic region, 26.8° in the lumbar region and 4.3° in the thoracolumbar region.

Conclusion: All patients are satisfied with the result of surgery, despite significant residual deformity. Correct balancing of both curvatures and correction of the rib hump lead to a good cosmetic and functional result.

POSTER PRESENTATION

STAGED OPERATIVE TREATMENT OF IDIOPATHIC SCOLIOSIS IN YOUNGER CHILDREN

Kolban MACIEJ, Zacha SLAWOMIR, Michal CHMIELNICKI

According to the available literature and the authors' experience, the optimal time for correction of a deformity with spondylodesis is when the Risser test is in stage 2 or 3, and for female patients when they have been menstruating for 1.5 to 2 years. However, patients with a significant progression of curvature, without signs of skeletal maturity, require an earlier operative intervention to prevent further progression.

Aim: The aim of the study was to review the results of staged operative treatment of scoliosis in younger children.

Material and Methods: A group of 43 patients operated on between 1999 and 2002 were included in the study. Partial correction of scoliosis was performed using C-D instrumentation (hooks and one rod). The age of patients was between 6 and 13 years (average age -10.3 years). The average Cobb angle in the thoracic region was 59° and in the lumbar region - 44°. At the follow-up examination 46 % correction in the thoracic region was observed and 43 % in the lumbar region.

The early introduction of operative treatment followed by the staged correction of scoliosis enables progression to be kept under control and allows appropriate distraction, until patients have reached the required skeletal maturity to perform a final correction of the deformity along with the fusion of the posterior column of the spine.

Conclusions: 1. Staged operative distraction of idiopathic scoliosis in younger children results in a good outcome, and prevents an increase of the deformity during growth.

2. Staged operative distraction of idiopathic scoliosis in younger children prevents the development of the crankshaft phenomenon.

POSTER PRESENTATION

CHRONIC RECURRENT MULTIFOCAL OSTEOMYELITIS PRESENTING AS ACUTE SCOLIOSIS - A CASE REPORT

Kedar DEOGAONKAR; Adel GHANDOUR; Alwyn JONES; Sashin AHUJA; Kathleen LYONS

Chronic relapsing multifocal osteomyelitis (CRMO) is an inflammatory bone disease of unknown aetiology characterised by exacerbations and spontaneous remissions. It occurs during childhood and adolescence.

CRMO presenting as acute onset scoliosis is a rare thing and only one such case has been reported before.

We present a case of a young girl presenting with acute onset scoliosis with mild backache. On investigation it turned out to be a case of CRMO involving multiple vertebrae.

Examination of her back and spine revealed a marked thoracic scoliosis with convexity to the right. She had significantly restricted spine movements.

All blood parameters were normal & cultures were negative.

X-ray revealed slight collapse of the body of T10 with minimal sclerosis. There was a right convex scoliosis with the apex of the curve at the level of T10. The curve was 22 as measured by the Cobb angle method. We think that the particular pattern of scoliosis was a protective mechanism to offload the right sided T10 vertebral pedicle.

MRI revealed abnormal signal in T10, L2 and L3 vertebral bodies, with some compression of T10 body and extension into the right pedicle. The discs were of normal appearance. There was no intra-spinal or extra-osseous component.

CT scan revealed lytic lesions of the right side of body and right pedicle of T10, bodies of L2 and L3.

Trans-pedicular biopsy of T10 & L2 showed loose fibrous tissue with plasmacytosis' - highly suggestive of CRMO.

She was managed with analgesics for pain relief and no external splintage. The lesions have subsided and the patient is symptomatically improving at 10 month follow up. The scoliosis has improved uneventfully.

We report this case due to the unusual nature of this condition and to highlight the importance of diagnosis before treating acute onset painful scoliosis in adolescents.

POSTER PRESENTATION

IDIOPATHIC SCOLIOSIS TREATMENT WITH ANTERIOR STABILISATION

Pawel Jerry MICHALSKI, Grzegorz MOEZKO

All modern posterior stabilisation systems for scoliosis treatment give:

- good three-dimensional correction of a spine

- excellent stability

- no need for postoperative external immobilisation.

All modern systems for an anterior spinal stabilisation enables additionally: short spinal fusion and saving of spinal segments.

Anterior blocs or staples the use of a segmental wedge locked double or single rod fixation, the prevention of dislocation of the cancellous bone screw and the segmental cross-link principle are the main characteristics of modern devices.

The systems relates to the three-dimensional anatomy of the spine by the application of distraction, compression and rotational forces.

We have been using anterior double-rod fixation systems since 1993.

Our special modification - direct fusion ("cheek to cheek technique") we have been using since 1996.

376 patients with thoracic, thoracolumbar and lumbar scoliosis were treated.

During the observation period no revision surgery was necessary.

Mean preoperative angle 65°.

Mean operation time 143 min.

Average intraoperative blood loss 80 ml.

Mean correction of the frontal deformity 74 %

Anterior spine correction and stabilisation is the method of choice for some thoracic, lumbar and thoracolumbar scoliosis.

POSTER PRESENTATION

DYNAMIC STABILIZATION OF THE LUMBAR SPINE

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Objetive: A retrospective study was conduced to review the results ofa pedicle screw system dynamic stabilization, consisting of titanium alloy screws connected by an elastic synthetic compaund (Dynesys).

Materials and Methods: Our retrospective study included 59 patients (39 females, 20 males) treated at our Department from 2002 to 2004 using Dynesys instrumentation. The average age at operation time was 53.3 years (range, 25 to 78 years). Twenty-two cases (37.2 %) had a previous failed low back pain surgery (15 discectomy and 7 bilaterallaminectomy). All patients presented a lumbar instability (in 7 of them a degenerative grade I spondylolisthesis and in 3 an early degenerative scoliosis) combined in 43 cases with a severe stenosis.

All patients were treated using Dynesys pedicular instrumentation without fusion, combined with laminectomy in 42 procedures: 23 cases received a one level stabilization, 27 two levels, 8 three levels and 1 patient 4 levels. All patients completed the Oswestry Disability Index (ODI), the SF-36 and the VAS questionnaires.

Results: At an average follow-up of 38 months (range: 14 to 45), the ODI score (32.6 vs 47.6), the SF-36 (Physical Function; Mental Function) and the VAS score (leg pain 50 vs 63.9; back pain vs 70.7) appeared significantly better versus the preoperative values. The mean values of the lumbar lordosis, preoperatively and postoperatively, resulted unchanged (-54.8 vs -50.3).

An additional surgery was necessary in 2 patients . In 1 case a seroma had to be drained 2 weeks later. In another case, for unresolved persisting low back pain, the removal of Dynesys instrumentation was performed.

Conclusions: These preliminary results showed very encouraging clinical and radiographic outcomes by using Dynesys associated to bilateral laminectomy (73% of cases) for a narrow canal in old patients.

POSTER PRESENTATION

SAGITTAL PLANE AND LUMBOSACROPELVIC JUNCTION ANALYSIS IN PATIENTS WITH SEVERE LOCALIZED KYPHOSIS

Olcay GÜLER; Ufuk TALU, Cüneyt ŞAR, Azmi HAMZAOğLU, Ünsal DOMANIÇ

Introduction: Radiological parameters related to the sagittal balance of the spine and lumbosacropelvic junction in healthy individuals have been extensively analyzed and normal range of values have been defined. However, to our knowledge, these parameters have not been investigated in a population ofpatients with pure sagittal plane deformity.

The purpose of this study is to analyze all positional and anatomic radiological parameters related to the sagittal plane in patients with severe localized kyphosis and determine the reciprocal interference of these parameters with special emphasis on lumbosacropelvic junction.

Methods: All positional [local kyphosis (LK), cervicallordosis (CL), thoracic kyphosis (TK), lumbar lordosis (LL), sagittal plumbline (PL), pelvic tilt (PT), sacral slope (SS), lumbosacral angle (LSA), L5-incidence angle (IL5), pelvic-radius SI angle (PRSI)] and anatomic [sacral inclination angle (SI), pelvic incidence (PI)] radiological parameters were measured by two independent spine surgeons in 20 patients with severe, angular, lower thoracic or thoracolumbar kyphotic deformity secondary to trauma in 5, healed infection in 4 and congenital malformation in 11 patients. Average age was 30.4 (18-48) years. Measurements obtained in this pathologic population were compared to the established normal values in healthy individuals in the literature. Statistical analyses were performed by paired t-test with significance at $p<0.05$.

Results: LK at lower thoracic or TL spine was 62.6° (19° -120°). Parameters affected by the deformity and changed for compensation were determined and measured. Those were CL: - 26.4°(-75°-20°), PT: 9.7°(-18°-38°), SS: 27.6°(-3°-48°), LSA: 19.8°(5°-34°), IL5: 1I.4°(-10°-48°), PRSI: 41°(7°- 64°), SI: 43°(22°-64°), PI: 36.2°(7° -82°).

Conclusion: In patients with severe lower thoracic or thoracolumbar kyphotic deformity, average LL is noted to remain within normal limits but the deformity is initially compensated with decreased average TK. Despite normal average LL in these patients SS and PI are decreased compared to healthy population. There is no compensatory increase in LL because of the structural changes but instead the pelvis is tilted resulting in decrased SS and PI.

POSTER PRESENTATION

BIOMECHANICAL ANALYSIS OF A NOVEL POLYAXIAL PEDICLE SCREW LOCKING MECHANISM

John I. Williams, John P. KOSTUIK, Richard W. WOODS; Michael C. BARRUS; John HAMMILL

Production: The development of polyaxial pedicle screws to facilitate spinal fusions has evolved to include a multitude of mechanisms for locking rods to screws at the varying angles necessary to accommodate human anatomy.

Purpose: The purpose of this study was to evaluate the biomechanical performance of a new low-profile polyaxial pedicle screw that utilizes dual locking tapers to lock rod to screw without necessity of separate locking elements.

Methods used: Mechanical component interface and construct testing in a vertebrectomy model : conducted in accordance with ASTM standards F1717-04 and ASTM F1798, including 5 million cycle compression bending fatigue.

The applicability and use of these constructs was validated in human cadaveric implantations with fluoroscopic imaging used to measure profiles of standard screws vs. the proposed design.

Reults and Conclusion: The constructs surpassed 5 million cycles with no evidence of rod disengagement and exhibited implanted profiles up to 4 mm lower than standard screw designs, dating it's use as a viable altemative to currently available pedicle screws.

POSTER PRESENTATION

SURGICAL MANAGEMENT OF LUMBAR DEGENERATIVE SPINAL STENOSIS WITH LAMINECTOMY AND POSTERIOR PEDICLE SCREW INSTRUMENTATION

Okay GÜLER, Fatih DIKICI; Ufuk TALU, Cüneyt ŞAR, Azmi HAMZAOGLU, Ünsal DOMANIÇ

Introduction: Degenerative lumbar spinal stenosis was commonly treated with laminectomy, with or without arthrodesis. Recent reviews demonstrated that arthrodesis with instrumentation have incremental clinical benefit.

Purpose: The purpose of the study was to evaluate the clinical results of decompression with laminectomy and posterior instrumentation and fusion of the patients with lumbar degenerative spinal stenosis.

Materials And Methods: Bilateral posterior titanium pedicle screw fixation with laminectomy was performed in seventy patients with lumbar degenerative spinal stenosis. 56 females and 14 males with an average age of 62.6 (range 35-85) were evaluated. Mean follow-up was 35.8 months (range 24-96). Bilateral posterolateral arthrodesis with allogenous bone graft was performed. Solid fusion was analyzed clinically, and roentgenographically. Clinical symptoms were assessed based on the Japanese Orthopaedic Association Back Score (JOA score) and Oswestry disability index (ODI).

Results: Fourteen patients had spondylolysis or spondylolysthesis additionally. Decompression levels were between Tl2 and Sl vertebrae. Decompressions of one level in 12 patients, two levels in 19 patients, three levels in 22 patients, four levels in 8 patients, five levels in 9 patients were performed respectively. Intraoperative and postoperative complications were seen in 14 (20 %) patients. These were 3 deep, 1 superficial wound infections, 2 sterile drainage, 5 dural injury, 2 transient root irritation, and 1 hematoma. There was no reoperation. Solid bone fusion was observed roentgenographically in all patients. The ODI improved from a preoperative of 50 (+/-7) to a 16 (+/-3) at last follow-up. Clinical outcome was excellent or good in 58 (82.8 %) of patients.

Conclusion: Decompressive surgery with laminectomy is the standard surgical procedure for patients with spinal stenosis. Fusion with instrumentation should be considered when spinal stenosis is accompanied by spondylolysthesis or having any suspicion of instability after decompression procedures.

POSTER PRESENTATION

CORRECTION OF SCHEUERMANN'S KYPHOSIS BY POSTERIOR ONLY THORACIC PEDICLE SCREW FIXATION

Caner GÜNERBÜYÜK; Fatih DIKICI; Ufuk TALU, Cüneyt ŞAR, Azmi HAMZAOGLU, Yasemin SONUK; Ünsal DOMANIÇ

Summary: A retrospective review of patients who underwent posterior fusion with segmental thoracic pedicle screw fixation for Scheuermann's kyphosis was conducted.

Purpose: The purpose of this study was to evaluate correction of sagittal alignment, maintenance of correction with junctional kyphosis.

Materials And Methods: This retrospective study used data submitted for posterior segmental titanium pedicle screw fixation performed from 2001-2005. Kyphosis, lordosis, C7 sagittal plumbline, junctional sagittal alignment were assessed.

Results: Of the 14 patients operated with pedicle serew fixation 8 were female, 6 were male. Mean age was 17.7 years (range 13-35 years). Mean follow-up was 27.6 months (range 11-60 months). Median preoperative thoracic length was 208 mm (168-235 mm) and lumbar length 166 mm (range 140-220 mm). Median postoperative thoracic and lumbar lengths were 263 mm (ran ge 217-302 mm) and 187 mm (range 154-249 mm) respectively. Median preoperative thoracic kyphosis was 79.5 degrees (range 62-105 degrees) and median preoperative lumbar lordosis was 71.1 degrees (range 65-80 degrees). At final follow-up, the median thoracic kyphosis was 41.4 degrees (range 30-58 degrees) and lumbar lordosis was 46 degrees (range 28-61 degrees). Median preoperative and postoperative C7 sagittal plumbline were -23 mm and -12.3 mm respectively. There was no sagittal imbalance during last follow-up. In all patients solid clinical and radiological fusions were achieved with no loss of correction.

Conclusion: This study demonstrates that surgical treatment of Scheuermann's kyphosis with pedicle screw fixation maintain good and satisfactory correction.

POSTER PRESENTATION

SURGICAL THERAPY OF HEMIVERTEBRAE SCOLIOSIS AND KYPHOSIS: A RETROSPECTIVE ANALYSIS OF 27 CASES

Fuad OKEN; Ozgur YILDIRIM; Vuslat S. UNAL; Murat GULCEK; Zafer SOYDAN; Ahmet UCANER; Korhan OZLU

Aim Of The Study: We performed a retrospective analysis of the results of operative treatment of 27 patients with congenital scoliosis (n = 24) or kyphosis (n = 3) due to hemivertebrae.

Patients And Methods: The mean age of the patients (16 girls and 11 boys) at the time of the initial examination was 7 years. Surgical treatment was carried out on average at the age of 9 years. Follow-up examinations were carried out up to a mean 6.5 (3-9) years.

Results: The results of operative treatment depended on the localization of the hemivertebrae and the surgical technique. Progression of scoliosis due to a thoracic hemivertebra was halted, but the scoliosis could not be corrected (Cobb angle at initial examination mean 48 degrees at follow-up mean 36 degrees). Surgery without instrumentation led to worse results than did surgery with instrumentation with thoracic scoliosis. We performed anterior or posterior procedures with resection of the hemivertebra or without resection of the hemivertebra. Surgical correction of kyphosis associated with dorsal hemivertebrae was performed by means of dorsal or dorsoventral spondylodesis with hemivertebra resection (preoperative kyphosis mean 60 degrees, at follow-up mean 44 degrees).

Conclusion: Spondylodesis without instrumentation is associated with an unsure prognosis with respect to effects on the progression of the scoliosis, even if it is performed on very young patients. In contrast, spondylodesis with instrumentation can achieve better and longer-lasting corrections of scoliosis even with larger initial curvatures. Scoliosis due to distal thoracic hemivertebrae is more amenable to surgical correction than thoracic scoliosis due to hemivertebrae.

POSTER PRESENTATION

EARLY RESULTS OF TOTAL DISC ARTHROPLASTY FOR SYMPTOMATIC CERVICAL DEGENERATIVE DISC DISEASE

Mehmet AYDOGAN, Ufuk TALU, Cuneyt MIRZANLI, Mehmet TEZER, Azmi HAMZAOGLU

Introduction: Cervical anterior decompression and total disc replacement is currently being investigated as an altemative treatment in patients with symptomatic intervertebral cervical losis with and without radiculopathy. Motion preservation and prevention of adjacent disc ration are the two theoretical advantages of disc arthroplasty compared to fusion . The purpose of this study was to investigate the efficacy of cervical disc prosthesis and short term of this procedure.

Materials and Method: 21 total disc arthroplasty was performed between August 2004-September 2005 in 14 patients (6 female, 8 male) with symptomatic cervical degenerative disc. The average age was 41.4 (35- 47) years. Level of surgery was C3-C4 in one, C4-5 in 4, C5-C6 10, C6-C7 in 4 and C7-T1 in 2 patients. Overall 16 one level and 5 two or more level procedures were performed. JOA criteria were used for clinical evaluation. Dynamic radiographs were used to determine motion at levels with prosthesis and motion at adjacent levels.

Results: The JOA scores improved by 65 % after surgery. The average range of motion at levels, with disc replacement was 12.8 degrees before surgery and 10.7 degrees after surgery in sagittal direction. The average range of motion at adjacent intervertebral disc spaces was 10.7 degrees before and 9.2 degrees after surgery. No surgery-or device-related complications were confronted either intraoperatively or post-operatively and none of the patients developed heterotrophic ossification.

Conclusion: Analysis of preliminary results involving cervical disc arthroplasty indicates ant improvement İn pain and functional outcome scores despite decreased segmental after surgery. Studies involving larger patient populations and having long term follow-up are necessary for formuiating definitive recommendations.

POSTER PRESENTATION

THE EFFECT OF PARTIAL FACETECTOMY VS. NO FACETECTOMY ON VERTEBRAL PURCHASE OF COLORADO-2 PEDICLE HOOKS

Nazir Cihangir ISLAM, Thomas STEFFEN; Ensor E. TRANSFELDT, James D. SCHWENDER, Lara COHEN

Introduction: Partial facetectomy can improve the seating of the hook on the pedicle by different ways. The recommended pedicle hook placement in Colorado-2 system is without facetectomy. There is no biomechanical study in the literature comparing the strength of hook/laminar interface between the parti al facetectomy and no facetectomy in the Colorado-2 pedicle hook (C2PH) design against 45 degrees posterolateral pull-out force.

Methods: T4, TS, T8, and T9 levels of 5 fresh frozen human cadavers were instrumented with C2PH. Half of the implant sites were undergone to facetectomy. The potted specimens, embedded in U shaped metal profile fılled by PMMA, were mounted with a 45 degrees of angle to the lower platform of MTS Mini Bionix Model Machine and a pull-out force 45 degrees posterolateral to the specimen was applied by the upper arm of the MTS machine. The lower platform was blocked and the upper arm permitted only for hinge movement between the rod and instrument during the posterolateral pull-outs.

Results: All of the no facetectomy cases (100 %) showed gap between pedicle and the hook and medialization in the x-rays. Half of the facetectomy cases showed ideal seating while the others showed some medialization or gap. The failure forces and failure patterns of no facetectomy (609 N) and facetectomy (636 N) groups were quite similar. But a trend of difference appeared when the ideally seated facetectomy group (778 N) compared with the other cases (493 N) of this group ($p<0.1$).

Conclusion: Facetectomy can reduce the strength of the lamina in cases which the hook does not seat ideally. This effect probably due to destruction of the integrity of the lamina and facetectomy can become a risky procedure if the hook misses the pedicle. But facetectomy can facilitate the ideal seat of the pedicle hook onto the pedicle in Colorado-2 pedicular hooks and contribute more strength even without using any additional tools.

POSTER PRESENTATION

SURGICAL TREATMENT FOR TANDEM (CONCURRENT) CERVICAL AND LUMBAR SPINAL STENOSIS

Cuneyt MIRZANLI; Ufuk TALU; Omer KARATOPRAK; Mehmet KORKMAZ; Azmi HAMZAOGLU

Introduction: Tandem spinal stenosis is a rare disorder which affects cervical and lumbar spine. Primary manifestations include neurological claudication, gait disturbance and a mixture of findings of myelopathy and polyradiculopathy in both upper and lower extremities due to simultaneous involvement of cervical and lumbar spine. The purpose of this retrospective study was to evaluate the results of two stage surgical treatment for tandem spinal stenosis.

Method: Between 1998 and 2004, 8 patients were diagnosed with tandem spinal stenosis in a series of 230 patients who underwent surgery for spinal stenosis (frequency of 3.4%). The mean age was 68 (51-80) years. All patients underwent staged surgical treatment to address both pathologies. Clinical findings dictated which region had the priority for surgery (cervical in 5, lumbar in 3). The second surgical procedure for either cervical or lumbar spine was performed 2 to 8 weeks after the index procedure. Decompression with instrumented fusion was the preferred surgical treatment. The mean follow-up was 34.6 months. The clinical results were evaluated according to the Japanese Orthopedic Association (JOA) scoring system.

Results: The JOA score of all patients improved from an average of 8.1 points preoperatively to an average of 11.8 points at the time of discharge and to an average of 12.7 points at final follow-up. None of the patients developed infection. Pre and postoperative complications included one dural tear and one deep venous thrombosis. Excellent or good results were obtained in all patients and none of the patients had deterioration of neurologic functions.

Conclusion: Staged surgery for tandem spinal stenosis is a safe and effective treatment option. Advanced cervical myelopathy may require earlier surgical consideration. Our results reveal that proper diagnosis and management in these patients provide satisfactory outcomes.

POSTER PRESENTATION

THORACIC SPINAL STENOSIS ABOVE SEVERE THORACOLUMBAR KYPHOSIS CAUSING NEUROLOGICAL DEFICIT

C. OZTURK; U. TALU; MK. CAMURDAN; O. KARATOPRAK; A. HAMZAOGLU

Purpose: We describe a new entity of neurological deficit mechanism due to the thoracic spinal stenosis produced above the severe thoracolumbar kyphosis. Our aim is to define exact reason of neurological deficit in 3 patients with a severe thoracolumbar kyphotic deformity.

Cases: First patient was a 53-year-old man with history of spinal tuberculosis, spastic paraparesia and urinary incontinence with a thoracolumbar kyphosis ofmore than 90 and compensatory thoracic lordosis with spinal canal stenosis at the lordotic segment. Posterior decompressive surgery was performed and the cord was adequately decompressed. The patient was neurologically asymptomatic now. The second patient was a 78-year-old woman with a spinal elaudication previously operated due to the degenerative disc disease and osteoporotic Th12 vertebra fracture. She suffered from upper and lower motor neuron signs. The radiological examination revealed thoracolumbar kyphosis involving Th11-L1 vertebrae and compensatory thoracic lordosis. She underwent Th12 total vertebrectomy; instrumentation and fusion were performed through Th2 to lumbopelvic junction. The patient was asymptomatic now. The last patient was a 34-year-old man presented with a spastic paraparesia with a kyphotic deformity of 90, corresponding thoracic lordosis above the deformity and L1 hemivertebra. Posterior hemivertebrectomy and decompressive surgery is being planned.

Discussion: We believe in that facet orientation change and direction of them towards spinal canal cause spinal canal stenosis and foraminal stenosis in the transition zone from the severe kyphotic segment to the compensatory lordotic segment above. These changes result in shearing stresses in long period and cause facet hypertrophy and spinal canal narrowing. We would like to remind the surgeons that survey of the spine above the kyphotic segment, especially transition zone from kyphotic segment to the proximal lordotic segment should be done to identify the cause of neurological deficit in patients with severe thoracolumbar or upper lumbar kyphosis of different etiologies.

POSTER PRESENTATION

CONTROLLABLE FACTORS ON DURATION OF SURGERY AND BLOOD LOSS IN ANTERIOR SPINE SURGERIES

Nazir Cihangir ISLAM, Necdet SAGLAM; Osman EKINCI; İlhan OCAK

Introduction: The purpose of this retrospective analytic study is to explore which factors influence duration of anterior surgery/blood loss and determine whether they are controllable factors by the surgeon/surgical team or not.

Methods: Mean age of the patients (n=30) underwent anterior surgery by the same surgical team during last 12 month-period was 43. Fifty-three percent were male. 20 % of the patients suffered from trauma,10 % from deformity, 40 % from degenerative diseases, 17% from neoplastic diseases and 13 % from infectious diseases. Mean number of corpectomies and discectomies were 1.23 and 0.73. Mean intubation-extubation time was 254 min and mean blood loss was 1906 ml. Mean blood pressure was measured as 92 preoperatively. The effects of age, sex, number of discectomy and corpectomy levels, primary or revision surgery, diagnosis, type of cage, no of screws, high speed burr use, and mean blood pressure on both duration of surgery and blood loss were studied.

Results: Pearson's Correlation coefficient was 0.79 (p=0.000) between duration of surgery and blood loss; 0.43 (p=0.019) between number of corpectomy levels and duration of surgery; and 0.54 (p=0.002) between number of corpectomy levels and blood loss. Differences in blood loss between deformity cases (992) and neoplastic cases (3380).

Conclusion: Two controllable factors for decreasing blood loss in anterior spine surgeries are the use of high-speed burr and expansible cages instead of regular cages.

POSTER PRESENTATION

POSTERIOR VERTEBRECTOMY IN KYPHOSIS, KYPHOSCOLIOSIS AND SCOLIOSIS CAUSED BY HEMIVERTEBRA

Ömer KARATOPRAK; Ufuk TALU; Mehmet Nuri ERDEM; Cagatay OZTURK; Azmi HAMZAOGLU

Purpose: Purpose of this study is to evaluate the clinical and radiological results of hemivertebrectomy and instrumentation only via posterior approach in sagittal, frontal plane and combined spinal deformities.

Method: Between the years of 1998 and 2003, 19 patients (3 scoliosis, 5 kyphosis, 11 kyphoscoliosis) underwent hemivertebrectomy and interbody fusion using posterior instrumentation with titanium mesh cage (TMC) via only posterior approach. The age of the patients ranged from 2 to 22 and hemivertebrectomy was performed at thoracallevel in 6, thoracolumbar in 8 and lumbar in 5 patients. TMC was used for anterior column support and interbody fusion in patients who had residual anterior gap preventing bone to bone contact. Correction and stabilization were achieved by posterior polyaxial pedicle screws.

Results: Average follow-up is 4.6 (3-7) years. The degree of scoliosis of main curve in average preoperatively was 47° and 90° postoperatively (correction rate of 81 %); the degree of kyphosis in average preoperatively was 29° and 60° postoperatively (correction rate of 79 %). We did not confront any loss of correction, pseudoarthrosis, and TMC collapse or implant failure.

Conclusion: As the procedure shortens the vertebral column, it increases the effectiveness of additional neurosurgical procedures. However, there are some disadvantages of the technique. There is some difficulty to perform enough decompression in the opposite site by this method. And the major disadvantage compared to standard posterior and combined procedures is the possibility of significant bleeding. As a conclusion; hemivertebrectomy and instrumentation via posterior approach only is a good one-stage surgical treatment option which avoids the surgical trauma and morbidity related to anterior surgery. However, it is a technically demanding surgical procedure requiring extreme care and experience in spine surgery.

POSTER PRESENTATION

CONTROLLABLE FACTORS ON DURATION OF SURGERY AND BLOOD LOSS IN POSTERIOR SPINE SURGERIES

Nazir Cihangir ISLAM, Necdet SAGLAM, Osman EKINCI, İlhan OCAK

Introduction: The purpose of this retrospective analytic study is to explore which factors influence duration of posterior surgery/the blood loss and determine whether they are controllable or not.

Methods: Mean age of the patients (n=56) underwent posterior surgery by the same surgical team during last 12 month-period was 34.46 % were male. 41 % suffered from trauma, 9 % from deformity, 34 % from degenerative diseases, 7 % from neoplastic diseases and 9 % from infectious diseases. Mean number of screws and hooks used in the fixation system were 8 and 1 respectively. Mean intubation-extubation time was 293min and mean blood loss was 2151 ml. Mean blood pressure was measured as 89 mmHg preoperatively.

Results: Pearson's Correelation Coefficient was 0.85 (p=0.000) between duration of surgery and blood loss; 0.47 (p=0.000)between number of screws and duration of surgery; and 0.50 (p=0.000) between number of screws and blood loss. Differences in duration of surgery between deformity and trauma cases.

Conclusion: Controllable factors for shortening duration of surgery/decreasing blood loss for posterior spine surgeries are the number of screws, the use of high-speed burrs and the use of allografts/synthetic bone grafts.