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DEAR COLLEAGUES,

We sincerely wish the happy and healthy new year to all my colleagues and their families. We are happy to accomplish the first issue of 2017.

There are 7 clinical research articles in this issue. The first four articles are about the sagittal parameters of the cervical region. This new concepts of cervical plane evaluation were reviewed in these articles. In the fifth article, spinal infections due to implants with air contamination have been evaluated. In the sixth study, sexual functions have been

evaluated in the patients with cervical disc disease. In the seventh and the last study, evaluation of our journal has done. We believe that all those studies will quietly interest the readers.

In this issue, two case reports were presented. First one is about the tethered cord syndrome. Second case has got thoracic intradural cavernoma.

In this issue, there is a review article about the cervical sagittal parameters.

In this issue, in the "Frontiers of the Spinal Surgery" section, the biography was presented about the Prof. Mehmet Zileli. The author of this article is Prof. Sait Naderi.

The "Marmara Spinal Group Meetings", which includes Istanbul and neighboring cities and which is conducted to increase the interests of especially assistants and new specialist on spinal surgery and to contribute to their trainings and to transfer the experiences of experienced colleagues and will be organized each month regularly by the regulatory board, and which Assoc. Prof. Dr. Onat ÜZÜMCÜGİL will perform the headship this year just elected and Assoc. Prof. Dr. Halil BURÇ perform the secretariat just elected, you can find the other meeting contents from the announcements section.

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

Prof. Dr. İ. Teoman BENLİ JTSS Editor

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Volume: 28, Issue: 1, January 2017 pp: 5-10



EVALUATION OF CERVICAL SAGITTAL PARAMETERS IN NORMAL INDIVIDUALS BETWEEN 20-40 YEARS OF AGE

20-40 YAŞ ARASI NORMAL BİREYLERDE SERVİKAL SAGİTTAL PARAMETRELERİN DEĞERLENDİRİLMESİ

SUMMARY

Objective: To obtain data that could be beneficial for investigation of spine and pelvis parameters in a healthy Turkish population sample who haven't any spine deformities.

This article discusses the prevalence of cervical sagittal balance in the spinal column and cervical sagittal parameter values in the normal population. The parameters related to the sagittal equilibrium in the cervical vertebrae.

Material and Methods: These four parameters were analyzed in standing lateral graphics of 30 healthy individuals in 20-43 age groups (mean age:33,51±9,27). C0 inclination angle (angle made with the horizontal line of the Frankfurt line), C0-C2 angle (angle between the Mc Gregor line passing through the skull base and C2 lower end plane), T1 slope angle (angle between C7 lower end plate and T1 upper end plate), and cervical lordosis (angle between C2-C7) were assessed in normal healthy individuals between 20 and 40 years of age.

Results: Cervical sagittal parameters; C0 inclination angle $(24,82\pm 2,82)$, C0-C2 angle $(43,03\pm 14,78)$, T1 slope angle $(2,68\pm 1,33)$ and cervical lordosis $(42,39\pm 7,59)$ were measured.

Conclusion: Results of this study may be stated to be able to be used as markers to provide normal cervical sagittal balance in Turkish patients with healthy population.

Keywords: Sagittal Balance, Cervical, Sagittal Spine Parameters

Level of evidence: Retrospective Clinical Study, Level III

ÖZET

Giriş: Bu makalede omurgada servikal sagital dengenin önemi ve normal popülasyonda servikal sagital parametre değerlerinden bahsedilmektedir.

Materyal-Metot: Servikal omurgadaki sagital denge ile ilişkili anlatılan parametreler; C0 inklinasyon açısı (Frankfurt hattının horizontal ile yaptığı açı), C0-C2 açısı (kafa tabanından geçen Mc Gregor hattı ile C2 alt son plağı arasındaki açı), T1 slope açısı (C7 alt son plağı ile T1 üst son plağı arasındaki açı), servikal lordoz (C2-C-7 arasındaki açı) 20-40 yaş arası normal sağlıklı bireylerde değerlendirilmiştir.

Sonuçlar: C0 inklinasyon açısı ortalama 24,82°± °2,82, C0-C2 açısı 43,03°± 14,78°, T1 slop açısı 2,68° ± 1,33° ve servikal lordoz 42,39°± 7,59° olarak ölçüldü.

Sonuç: Bu çalışma, Türk popülasyonunda servikal sagital parametrelerin değerlendirildiği ilk çalışma olup, bu parametrelerin literatürle uyumlu olduğu görülmüştür.

Anahtar Kelimeler: Sagital Denge, Servikal Sagital Vertebra Parametreleri

Kanıt Düzeyi: Retrospektif Klinik Çalışma, Düzey III

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This article explains the significance of sagittal balance of the cervical spine parameters associated with sagittal balance of the spine. We aimed to emphasize the importance of the physiological curvature of the cervical sagittal plan. The physiological importance of the sagittal plan has long been known. Sagittal balance in the spine; Cervical lordosis, thoracic kyphosis and lumbar lordosis are in compatible harmony. Cervical, thoracic, and lumbar curvatures increasing or decreasing were known to cause pain. Spino- pelvic parameters have been used for the last 10 years and spinal deformity and especially degenerative spinal diseases are the most important. For the last few years it has begun to work on the assessment of the cervical sagittal plan. Especially the disruption of the cervical sagittal balance, has led to the formation of curvatures of the entire spine compensator. It is understood that the most important cause of neck pain is the deterioration of the cervical sagittal contours. Therefore, we have measured these cervical sagittal angle parameters in a limited number of people without any cervical spine disease between the ages of 20-40.

MATERIALS AND METHODS

These four parameters were analyzed in standing lateral graphics of 30 (6 male, 24 female) healthy individuals in 20-40 age groups (mean: 29,51±9,27), C0 inclination angle (angle made with the horizontal line of the Frankfurt line), C0-C2 angle (angle between the Mc Gregor line passing through the skull base and C2 lower end plane), T1 slope angle (angle between C7 lower end plate and T1 upper end plate) and cervical lordosis (angle between C2-C7).

RESULTS

Cervical sagittal parameters; C0 inclination angle $(24,82\pm 2,82)$, C0-C2 angle $(43,03\pm 14,78)$, T1 slope angle $(2,68\pm 1,33)$ and cervical lordosis $(42,39\pm 7,59)$ were measured **(Table-1)**.





Table-1. Normal segmental cervical angles in asymptomatic adults.					
Cervical Sagittal Parameters Mean SD					
C0 inclination angle	24,82	2,82			
C0-C2 angle	43,03	14,78			
T1 slope angle	2,68	1,33			
Cervical lordosis	42,39	7,59			

DISCUSSION

There are several causes of cervical kyphosis. This condition can develop in children and adults. The first cause is degenerative disc disease. The process of degeneration of the intervertebral discs causes many spine problems. In older adults, the wear and tear of aging on the discs between each vertebra can cause the disc to collapse. This slowly leads to an increasing curve and may end with a kyphosis ⁽¹⁵⁾.

The second cause of cervical kyphosis is congenital, meaning it is a birth defect affecting the development of the spine. Congenital kyphosis usually leads to a growth disturbance of the vertebrae themselves. Instead of growing normally, the vertebrae grow into a triangular-shape with the small end pointing forward. When a child has congenital kyphosis, there are generally additional birth defects in other areas of the body. Most commonly, there are defects of the kidneys and urinary system.

The third cause of cervical kyphosis is traumatic, meaning it is the result of an injury to the cervical spine. This may be from a compression fracture of the vertebrae or from an injury to the ligaments in the back of the cervical spine. When a compression fracture of the vertebra occurs, the vertebral body may heal in a wedge shape. Pressure on the spinal cord due to the narrowing can lead to neurological problems, such as pain, numbness, and a loss in muscle strength.

The fourth, and the most common cause of cervical kyphosis, is iatrogenic. Iatrogenic means the problem results from the effects of a medical treatment, such as surgery. Kyphosis following laminectomy surgery is quite common. It happens much more frequently with children than with adults.

Other less common causes of cervical kyphosis include infection in the spine, tumors of the spine, and systemic diseases that affect the spine (such as ankylosing spondylitis) ^(2,4). A cervical kyphosis may also occur years after radiation therapy for cancer involving the neck. The radiation therapy may affect the growth of the cervical vertebrae in children who received radiation therapy in childhood. A laminectomy is a type of surgical procedure that is done in the spine to relieve pressure on the spinal nerves. Laminectomy means "remove the lamina", which is exactly what is done. The lamina is the back side of the spinal canal and forms the roof over the spinal cord. By removing the lamina, there is more room for the nerves and bone spurs can be removed from around the nerves. A laminectomy reduces the pressure on the spinal cord and the irritation and inflammation of the spinal nerves⁽¹⁾.

Given the serious complications of cervical surgery, we need a deep understanding of spine cervical anatomy, preoperative planning, and correction methods ⁽¹²⁻¹⁸⁾. These changes between normal values we have identified correctly. Firstly, we need to know the normal cervical sagittal angles.

Knowledge of these normal relationships is of prime importance for the comprehension of sagittal balance in normal and pathologic conditions of the cervical spine ⁽⁹⁻¹¹⁾.

As the results of our study compared with the others studies in the literature, our measures were higher than literature was determined $^{(3,5-8,17)}$.

Especially normal cervical sagittal parameters compare with pathological values which are distorted, after cervical discectomy and cervical fusion will open new horizons. Results of this study may be stated to be able to be used as markers to provide normal cervical balance in healthy Turkish people.

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COMPARISON OF CERVICAL SAGITTAL PARAMETERS IN PATIENTS WITH CERVICAL DEGENERATIVE DISEASE AND NORMAL HEALTHY INDIVIDUALS

SERVİKAL DEJENERATİF HASTALIĞI OLAN HASTALAR İle Normal sağlıkli bireylerdeki servikal sagittal parametrelerin karşılaştırılması

SUMMARY

Objective: We aimed to compare the cervical sagittal parameter measurements of normal healthy population with cervical degenerative diseases in the Turkish population.

Material and Methods: These four parameters were analyzed in standing lateral graphies of 40 (10 male, 30 female) patients in 50-75 age groups (mean age: $63,69 \pm 12$) and 30 (6 male, 24 female) healthy individuals in 20-40 age groups (mean age: $29,51 \pm 9,27$). C0 inclination angle (angle made with the horizontal line of the Frankfurt line), C0-C2 angle (angle between the Mc Gregor line passing through the skull base and C2 lower end plane), T1 slope angle (angle between C7 lower end plate and T1 upper end plate), and cervical lordosis (angle between C2-C7) were assessed. We compared the angle measurements in the two groups.

Results: Cervical sagittal parameters; C0 inclination angle $(28,5^{\circ}\pm 9,2^{\circ})$, C0-C2 angle $(44,8^{\circ}\pm 9,2^{\circ})$, T1 slope angle $(3,9^{\circ}\pm 1,9^{\circ})$ and cervical lordosis $(17,5^{\circ}\pm 2,2^{\circ})$ were measured in patients with cervical degenerative disease. C0 inclination angle $(24,8^{\circ}\pm^{\circ}2,8)$, C0-C2 angle $(43,0^{\circ}\pm 14,8^{\circ})$, T1 slope angle $(2,7^{\circ}\pm 1,3^{\circ})$ and cervical lordosis $(42,4^{\circ}\pm 7,6^{\circ})$ were measured in normal individuals. Cervical sagittal parameter measurements were compared between normal healthy individuals and patients with degenerative disease. C0 inclination angle and C0-C2 angle were similar, but T1 slope was higher while cervical lordosis angle was lower with the statistically importance (p < 0,05).

Discussion: As a result, in the degenerative disc disease of the subaxial region, any changes of the C0 inclination and C0-C2 angles was not find, but T1 slop and cervical lordosis angles was disturbed. Especially, at the level of degenerative disc disease, lordosis pattern changed to kyphotic pattern was determined. Due to this situation make decrease the global cervical lordosis. In the light of our data's, we concluded that degenerative disc disease effect sagital plane parameters of the subaxial region in the patients with Cervical Degenerative Disc Disease (CDDD).

Keywords: Cervical Degenerative Disc Disease (CDDD), spine parameters of the servikal spine, sagittal plane.

Level of evidence: Retrospective Clinical Study, Level III

ÖZET

Amaç: Bu çalışmada 50-75 yaş arası servikal dejeneratif disk hastalığı olan hastalarda, servikal sagital parametre değerleri ölçülmüş ve 20-40 yaş arası normal sağlıklı bireylerin ölçümleriyle karşılaştırılması amaçlanmıştır.

Materyal – Metot: Dejeneratif hastalığı olan hasta grubu ile normal sağlıklı bireylerde ölçülen sagital denge parametreleri; C0 inklinasyon açısı (Frankfurt hattının horizontal ile yaptığı açı), C0-C2 açısı (kafa tabanından geçen Mc Gregor hattı ile C2 alt son plağı arasındaki açı), T1 slope açısı (C7 alt son plağı ile T1 üst son plağı arasındaki açı), servikal lordoz (C2-C-7 arasındaki açı)'dır.

Sonuçlar: Servikal dejeneratif disk hastalığının 1 veya 2 seviyede ve en fazla C+_% arasında olduğu belirlenmiştir. Servikal sagital parametreler dejeneratif disk hastalığı olanlarda ve normal bireylerde sırasıyla C0 inklinasyon açısı 28,5° ± 9,2° ve 24,8° ± 2,8°; C0-C2 açısı 44,8° ± 9,2° ve 43,0°± 14,8°, T1 slope açısı 3,9° ± 1,9° ve 2,7° ± 1,3° ve servikal global lordoz açısı 17,5°± 2,2° ve 42,4° ± 7,6° olarak ölçüldü. Bu verilere göre servikal dejeneratif disk hastalığı olanlarla normal bireyler karşılaştırıldığında, C0 inklinasyon ve C0-C2 açılarının istatistiki olarak benzer olduğu (p> 0.05), buna karşın T1 slope açısının daha yüksek ve servikal lordoz açısının daha düşük olduğu belirlenmiştir (p < 0,05).

Tartışma: Sonuç olarak subaksiyel bölgede servikal dejeneratif disk hastalığı olan hastalarda kafa kaidesi ile servikal bölge arasındaki sagital parametreler değişmezken, dejenere sahalarda disk aralıklarındaki lokal kifoz açısının kifoz gittiği ve global servikal lordozun da azaldığı belirlenmiştir. Bu veriler ışığı altında, disk dejenerasyonun, servikal sagital dizilimi bozduğu fikri elde edilmiştir.

Anahtar Kelimeler: Servikal dejeneratif hastalık, servikal sagittal vertebra parametreleri, sagital plan

Kanıt Düzeyi: Retrospektif Klinik Çalışma, Düzey III

We aimed to compare the cervical sagittal parameter measurements of normal healthy population with cervical degenerative diseases in the Turkish population. The physiological significance of the sagittal plane has long been known. Sagittal balance of the spine; Cervical lordosis, thoracic kyphosis and lumbar lordosis is a harmonious fit. Cervical, thoracic, and lumbar curvatures increasing or decreasing were known to cause pain. Spino-pelvic parameters have been used for the last 10 years and spinal deformity, especially degenerative spinal diseases, is of paramount importance. The last few years have started to work on the evaluation of cervical sagittal plane.

In particular, the disruption of the cervical sagittal balance has led to the curvature of the entire spine compensator. Cervical spondylosis is a degenerative disease that begins with the disc and progresses with age, which involves more than one disc. Cervical sagittal curve gradually became flattened secondary to the progress of spondylosis in all patients. Therefore, we have measured these cervical sagittal angle parameters in a limited number of people cervical degenerative disease and normal individuals. We compared the angle measurements in the two groups.

MATERIALS AND METHODS

These four parameters were analyzed in standing lateral graphics of 40 (10 male, 30 female) patients in 50-75 age groups (mean age: 63,69±12) and 30 (6 male, 24 female) healthy individuals in 20-40 age groups (mean age: 29,51±9,27). C0 inclination angle (angle made with the horizontal line of the Frankfurt line), C0-C2 angle (angle between the Mc Gregor line passing through the skull base and C2 lower end plane), T1 slope angle (angle between C7 lower end plate and T1 upper end plate) and cervical lordosis (angle between C2-C7).

RESULTS

Cervical sagittal parameters; C0 inclination angle $(28,50\pm 9,19)$, C0-C2 angle $(44,76\pm 9,19)$, T1 slope angle $(3,96\pm 1,86)$ and cervical lordosis $(17,46\pm 12,17)$ were measured in patients with cervical degenerative disease (Table-1) (Figure-1).

C0 inclination angle (24,82 \pm 2,82), C0-C2 angle (43,03 \pm 14,78), T1 slope angle (2,68 \pm 1,33) and cervical lordosis (42,39 \pm 7,59) were measured in normal individuals. (Table-1).

Cervical sagittal parameter measurements were compared between normal healthy individuals and patients with degenerative disease. C0 inclination angles and C0-C2 angles were statistically similar in the both group (p > 0,05). But was stated statistically important difference in the T1 slope of the patients between degenerative disc disease and normal individuals (p < 0,05). T1 slope of the patients with degenerative disc disease were higher than T1 slope of the normal individuals.

DISCUSSION

Cervical spondylosis is a generalized aging process that affects all levels. It involves a sequence of degenerative changes in spinal structure. Spondylosis is a degenerative disease of both the disc and the zygapophyseal joints and has a contraction and osteophyte formation in the disk and nerve foramen. The result is radiculopathy and ligament instability ^(1-3,5-8,10).

Spondylosis changes, such as narrowing of the disk and osteophytes, predominated at the lower disk levels including C5–6 and C6–7, where the range of motion decreased with advancing age. Conversely, upper disc levels, such as C3–4 and C4–5, showed a comparatively greater mobility and vertebral "olisthesis", particularly "retrolisthesis" in extension ⁽⁴⁾. The first sign of aging on the spinal column is spondylosis in the intervertebral disc, and spondylosis in the third through fifth decades. In our study, all degenerative changes were determined subaxial region. Most affected disc level was C5–6 level in our study.

Despite the high incidence of spondylosis, even symptomatic spondylosis patients complaining shoulder-to-neck-brachial pain can be well controlled by conservative methods and surgery is often not necessary ^(9,11-12). The loss of cervical lordosis depended on the severity of disc degeneration, and the numbers of the degenerated discs.

Cervical sagittal parameter measurements were compared between normal healthy individuals and patients with degenerative disease. C0 inclination angles and C0-C2 angles were statistically similar in the both group (p > 0,05). But was stated statistically important difference in the T1 slope of the patients between degenerative disc disease and normal individuals (p < 0.05). T1 slope of the patients with degenerative disc disease were higher than T1 slope of the normal individuals. In the other hand cervical lordosis angles of the patients with degenerative disc disease were lower than cervical lordosis angles of the normal individuals. As a result, in the degenerative disc disease of the subaxial region, any changes of the C0 inclination and C0-C2 angles was not find, but T1 slop and cervical lordosis angles was disturbed. Especially, at the level of degenerative disc disease, lordosis pattern changed to kyphotic pattern was determined. Due to this situation make decrease the global cervical lordosis. In the light of those values, we concluded that degenerative disc disease effect sagital plane parameters of the subaxial region in the patients with CDDD.

Table-1. Comparison cervical angles in patients with cervical degenerative disease and normal individuals.							
Cervical Sagittal Parameters Normal Individuals Cervical Degenerative Disease t p							
C0 inclination angle	24,8 ± 2,8	28,5 ± 2,2	-0,02	> 0.05			
C0-C2 angle	43,0 ± 17,8	44,8 ± 9,2	1,47	> 0.05			
T1 slope angle	$2,7 \pm 1,3$	13,9 ± 5,9	5,61	< 0.05			
Cervical lordosis	42,4 ± 7,8	17,5 ± 12,2	-16.9	< 0.05			



Figure-1. a) Degenerative disc disease with the osteophytes in the disc joints of the C3-4 and C6-7 levels were determined. b) C0 inclination angle (angle made with the horizontal line of the Frankfurt line: white lines) was 40° and cervical lordosis (angle between C2-C7: yellow lines) was 20° in the another patient. c) C0-C2 angle (red lines) was 45°, and T1 slope angle (angle between C7 lower end plate and T1 upper end plate: yellow lines) was 18°.

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RELATION BETWEEN CERVICAL SAGITTAL ALIGNMENT AND SURGICAL OUTCOME FOR LAMINECTOMY AND POSTERIOR FUSION OPERATIONS

LAMİNEKTOMİ VE POSTERİOR FÜZYON OPERASYONLARININ SONUÇLARI İLE SERVİKAL SAGİTAL DİZİLİM İLİŞKİSİ

SUMMARY

Cervical sagittal balance and alignment have received increased awareness as important factors of radiological and clinical outcomes. The goal of this study is to evaluate preoperative and postoperative alterations in cervical sagittal plane situations and correlation between these changings and surgical outcome in patients undergo laminectomy and fusion for some cervical pathologies. In this retrospectively designed study 44 men and 6 women with some degree cervical stenosis at various cervical levels were included. The mean value of the preoperative and postoperative mJOA scores of the patients were 7.76 and 12.96 respectively. Cervical lordosis angle (CLA) changing was statistically significant after operations. But, $C_{2.7}$ SVA changing was not statistically significant. The contribution of cervical sagittal balance and alignment should be considered in evaluating surgical outcomes for patients undergoing cervical posterior decompression and instrumented fusion.

Key words: Laminectomy and fusion, cervical sagittal parameters, surgical outcome

Level of evidence: Retrospective clinical study, Level III.

ÖZET

Servikal sagittal denge ve dizilim radyolojik ve klinik sonuçlarda oynadığı rol ile son zamanlarda dikkat çekmektedir. Bu çalışmanın amacı bazı servikal patolojiler nedeniyle laminektomi ve enstrümanlı füzyon yapılan hastalarda servikal sagittal denge değişimlerini ve bunun sonuçlara etkisini araştırmaktır. Retrospektif olarak düzenlenmiş bu çalışmada çeşitli derece ve seviyelerde kanal darlığı olan 44 erkek ve 6 kadın hasta yer almışlardır. Ameliyat öncesi ve sonrası mJOA derecesi ortalama değerleri sırasıyla 7.76 ve 12.96 'dur. Servikal lordoz açısı (CLA) değişimi istatistiksel olarak anlamlı olmakla beraber C2-7SVA değişimi istatistiksel olarak anlamlı değildir. Servikal sagittal denge ve dizilim posterior dekompresyon ve enstrümanlı füzyon yapılması planlanan hastalarda cerrahi sonuçlar değerlendirilirken mutlaka göz önüne alınmalıdır.

Anahtar kelimeler: Laminektomi ve füzyon, Servikal sagittal parametreler, Cerrahi sonuç

Kanıt düzeyi: Retrospektif klinik çalışma, Düzey III.

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To our experience, existing kyphotic cervical deformity or even loss of some degree cervical lordosis may effect on surgical outcomes after posterior cervical approaches for various cervical spine pathologies. Cervical sagittal balance (SB) has received increased awareness as an important factor of radiological and clinical outcomes. Some authors claimed that cervical laminectomy (CL) in patients with ossified posterior longitudinal ligament (OPLL) can cause neurological deterioration due to gained kyphotic deformity⁽⁵⁾. Conversely, some investigators wrote that postlaminectomy cervical kyphosis was not correlated with clinical outcome although progressive cervical kyphosis has been associated with myelopathy ⁽³⁾. Besides this controversy, there is another perplexing state in the literature. The question of which sagittal plane parameters should be measured to the best evaluation has not been clarified yet. The literature is overcrowded of sagittal plane measurement methods; and everyday new ones are suggested (1).

The aim of this study is to assess preoperative and postoperative changings in cervical sagittal plane situations and correlation between these changings and surgical outcome in patients undergo laminectomy and fusion for some cervical pathologies.

Two simple and classic methods were used for measurement of cervical sagittal alignment.

That why were these parameters chosen is explained in the next sections.

PATIENTS AND MEASUREMENTS

This retrospectively designed study was conducted in two centers, the neurosurgery clinics of the private Sincan Lokman Hekim Hospital and Düzce University Medical center in between 2014 November and 2016 December.

Patient population is consisted of 44 men and 6 women with some degree cervical stenosis at various cervical levels. Age of patients was between 50 and 84 with a mean of 69.44 years.

Including criteria:

Men or women aged between 45 and 85 year-old underwent a CL and instrumented fusion operation for cervical stenosis diagnosed by clinically and confirmed by an MRI were included in this study.

Excluding criteria:

Patient with severe metabolic diseases, severe diabetes mellitus, cardiac failure, hypertension, hyper or hypothyroid, malign diseases were excluded from the study. Also patients with cervical or other regional benign spine or spinal cord tumors, and patients had previously underwent spinal surgery were excluded from the study.

Operation is standard CL at various levels between C3 and C7, and an instrumented fusion was added to this CL. Cervical vertebral mass screws were used for instrumented fusion. Because patients in this study were generally elderly population, artificial bone grafts made of hydroxyapatite with amount of 5 cc for a cervical segment was used.

Measurements

For clinical follow-up mJOA scores by modified by Benzel EC $^{(1)}$ and recovery rate (RR) measurement was used. RR= (Postop mJOA score - Preop mJOA score) x 100 / 18 – preop mJOA score formula is used for calculation of RR.

For sagittal plane alignment two measurements were used. Cervical lordosis angle (CLA) and the cervical vertical axis (C_{2-7} SVA) (Fig. 1 a, b). These measurements were calculated on plain lateral X-rays. Roentgenograms were taken in the standing position.

CLA is defined as the angle between the line parallel to the C_2 lower end plate and the C_7 upper end plate on the lateral cervical roentgenogram ⁽²⁾. Measurement was performed by Cobb method.

 C_{2-7} SVA is defined as the distance between the vertical line dropped from the centroid of C_2 corpus and the posterosuperior aspect of C_7 corpus ⁽⁵⁾.

Radiologic measurements were performed before and immediately after operations. Postoperative mJOA scores were taken 2 mounts after operations.

Statistical analysis

SPSS ver. 15.0 for windows (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. A descriptive statistics (mean, median, standard deviation, minimum-maximum values) for numerical variables were given. Numerical comparisons in data with normal distribution were carried out by T-test for independent variables and analysis of variance for dependent variables. The results were taken as statistically significant if the p-value was less than 0.05.



Figure-1. CLA (a) and $C_{2-7}D$ (b) measurements are seen.

RESULTS

The mean value of the preoperative and postoperative mJOA scores of the patients were 7.76 and 12.96 respectively. This result was accepted as statistically significant (p<0.001). The mean RR was 51.62. This result was also statistically significant (p<0.001) (Table-1).

CLA changing was statistically significant after operations (p<0.05). The mean preoperative CLA value was 12.9° , and

the mean postoperative value was 14.1°. That the rate of increasing is approximately 8.5 % was slightly more than expected.

The mean preoperative C_{2-7} SVA was 25.9 mm, and the mean postoperative value was 28.1 mm. This changing is not statistically significant (p>0.05).

Table-1. Summary of results								
n=50 44 M, 6 F (50-84yo)	Preop mJOA	Postop mJOA	RR	Preop CLA	Postop CLA	Changing rate	Preop C ₂₋₇ SVA	Postop C ₂₋₇ SVA
Mean	7.76	12.96	51.62	12.9	14.1	8.5%	25.9	28.1
Min-Max values	4.0-10.0	9.0-15.0	33.3-66.7	2.6-23.0	7.2-21.0		8.0-44.0	10.0-61.0

mJOA: Modified Japanese Orthopedic Association scores; RR: Recovery rate; CLA: Cervical lordosis angle in degrees; C2, SVA: C2, vertical distance in mm.

DISCUSSION

Degenerative cervical diseases generally cause symptoms by compressing some regions of cervical cord or spinal nerves emerging from it at various levels. Besides this main mechanism of pathology, changings in bony structures around the cord affect the function in some degree. In majority of elderly population, simple decompression of neural tissue does not provide a sufficient removal of symptoms. Therefore, existing sagittal alignment disorder or developed disorder after a posterior surgery should be considered when planning a posterior cervical operation for decompression of neural tissue.

In this study mainly two sagittal parameters, CLA and C_{2-} , SVA were considered. For evaluation of cervical lordosis and SB, these two measurements generally accepted as good radiographic parameters respectively ⁽⁶⁾. We also decided to use these parameters. Because restoring lordosis is a vital part of surgical treatment and CLA is a direct method to measure lordosis. Changing in lordosis angle may correlate clinical outcomes ⁽²⁾. In this study, importance of restoring lordosis may be seen clearly. Approximately 8.5% increase in CLA provided a better horizontal gaze for patients after operation.

A good horizontal gaze carries with an important quality of life for especially kyphotic elderly people (10-12). Conversely, adults with positive sagittal spinopelvic malalignment compensate with abnormally increased cervical lordosis in an effort to maintain horizontal gaze (10). Or some adults with negative SB compensate this with dropping their head forward. Therefore the second measurement which was used in this study was C_{2-7} SVA. Because it is a way to directly measure shearing of head forwardly. Unexpectedly, it is seen that, shearing of head toward the front cannot be restored patients covered by this study. In fact, a slight increase of the mean distance can be said. Cervical sagittal imbalance arising from regional and/or global spinal sagittal malalignment may play a part in aggravating adjacent segment disorders after multilevel instrumented fusion (8). But, restoring cervical lordosis can be compensate this forward sliding that patients generally no longer suffer from horizontal gaze problem. This event shows us that cervical lordosis may be the most important parameter for cervical sagittal alignment. Although the improvement after cervical decompression was not greatly affected, some authors claimed that postoperative functional outcome scores were significantly lower in patients with C2- $_{7}$ SVA >4-5 cm (10,11). In this study, there was no patient with $C_{2,7}$ SVA<8.0 mm. In the new literature, some authors claimed that posterior decompression is not suitable for degenerative cervical myelopathy patients with preoperative cervical sagittal imbalance⁽⁹⁾. Some investigators asserted that laminectomy is superior to laminoplasty in treatment cervical myelopathy. Base of their opinions is better restoring cervical alignment only⁽⁴⁾.

That the mean RR was 51.62 can be shown restoring cervical lordosis is also vital part of operation besides decompression. Preoperative SB and cervical contour should be always considered and if there is an existing cervical malalignment it must be restored during fixation with lateral mass screws and rods.

The involvement of global sagittal balance and cervical regional alignment should be considered in evaluating surgical outcomes for patients undergoing cervical posterior decompression and instrumented fusion.

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MEASUREMENT OF CERVICAL LORDOSIS WITH DIFFERENT METHODS

SERVİKAL LORDOZUN FARKLI METODLAR İLE ÖLÇÜMÜ

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SUMMARY:

Aim: The purpose of this study is therefore to compare Cobb angles, Jackson stress lines and Harrison tangents methods to measure the cervical lordosis angle using lateral cervical X-ray graphics and collect nominative values.

Materials-Method: We evaluated 76 patients' lateral cervical X-ray graphics between the ages of 18 to 60 years retrospectively. Exclusion criteria was any pathology that seen on graphics. Cervical X-ray graphics were taken as standing lateral neutral positioned. Cervical lordosis measured with Cobb, Jackson and Harrison techniques on pacs system.

Results: 47 patients (61.8%) were female, and 29 patients (38.2%) were males. Mean age was 43.83 \pm 15.9 years. We found mean values of C₀₋₂, C₂₋₇, Jackson stress lines and Harrison tangents as 30,72° \pm 7,76°, 18,37° \pm 9,44°, 18,92° \pm 10,98° and 22,91° \pm 8,96°. Cobb C0-C2 (p=0.307), Jackson (p=0.106), and Harrison (p=0.688) measurements were similar between males and females. But Cobb C₂₋₇ was significantly different between genders (p=0.017), and males had significantly higher Cobb C₂₋₇ values. The comparisons of methods revealed that Cobb C₀₋₂ had highest values, and Cobb C₂₋₇ and Jackson was lower than Harrison (Cobb C₀₋₂>Harrison>Cobb C₂₋₇~Jackson) (p<0.001).

Conclusion: Harrison tangent technique is difficult to measure but we thought its results are better to show the best values because tangents also could measure the internal curve. All these techniques must be understood well with the biomechanics features so that surgeons could choose which technique would be better to use for the management of deformities.

Key Words: Cervical lordosis, Cobb angles, Jackson stress lines, Harrison tangents

Level of Evidence: Retrospective clinical study, Level III.

ÖZET:

Amaç: Çalışmamızın amacı Cobb açıları, Jackson stres çizgileri ve Harrison tanjant metotlarının direkt yan servikal grafide servikal lordoz ölçümlerinin karşılaştırılması ve normal değerlerin elde toplanmasıdır.

Materyal-Metot: Çalışmada 60-18 yaş arası yan servikal grafileri çekilmiş 76 hasta retrospektif olarak değerlendirildi. Grafilerde herhangi bir patolojiye rastlanan hastalar çalışma dışında bırakıldı. Servikal grafiler ayakta, yan ve nötr pozisyonda çekildi. Cobb, Jackson ve Harrison metotları uygulanarak servikal lordoz açıları pacs sisteminden ölçüldü.

Sonuçlar: Hastaların 47' si kadın (%61.8), ve 29' u erkek (38.2%) idi. Ortalama yaş 43.83±15.9 olarak bulundu. $C_{0.2}$, $C_{2.7'}$ Jackson stres çizgileri ve Harrison tanjant ölçümleri ortalama değerleri 30,72°±7,76°, 18,37°±9,44°, 18,92°±10,98° ve 22,91°±8,96° olarak hesaplandı. Cobb C0-C2 (p=0.307), Jackson (p=0.106) ve Harrison (p=0.688) ölçümlerinde kadın ve erkekler arasında anlamlı fark bulunamadı. Fakat Cobb C_{2.7} değeri kadın ve erkekler arasında (p=0.017) anlamlı bulundu ve erkeklerde daha yüksek idi. Değerler karşılaştırıldığında en yüksek Cobb C_{0.2} bulundu(Cobb C_{0.2} + Harrison>Cobb C_{2.7}~Jackson) (p<0.001).

Sonuç: Harrison tekniği güç olmasına karşın daha doğru sonuçlar vermektedir. Servikal sagital parametrelerin bilinmesi cerraha cerrahı tedavi için önemli bililer vermekte olup, tüm patolojilerde ayrıntılı olarak ölçülerek göz önünde tutulmalıdır.

Anahtar Kelimeler: Servikal lordoz, Cobb açıları, Jackson stres çizgileri, Harrison tanjantları

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III

Cervical lordosis (CL) may be dependent on the anatomy of the cervico-thoracic junction (CTJ), which typically involves the C_7 and T_1 vertebrae, the C_{1-7} discs, and the associated ligaments ^(5,14). CTJ is the site at which lordosis of the cervical spine changes to kyphosis in the thoracic spine ⁽⁴⁾. This change in curvature causes a significant amount of stress at the CTJ, both in the static and dynamic states ^(1,16).

In asymptomatic normal volunteers approximately 75 % – 80 % percentage of cervical standing lordosis is localized to C_{1-2} and relatively little lordosis exists in the lower cervical levels $_{(8,10)}$.

Lippman reported the procedure of drawing perpendiculars to vertebral body endplate lines to evaluate scoliotic curves on anteroposterior radiographs in 1945, which was later popularized in 1948 by Cobb ^(3,15). Cobb angles were subsequently drawn on lateral radiographs in the cervical, thoracic, and lumbar areas to evaluate the state of the sagittal spinal curves ⁽³⁾. In 1957, Jackson presented her physiologic stress lines on the posterior vertebral body margins of C2 and C7 in the cervical spine ⁽¹¹⁾. In 1986, Gore et al used Jackson's stress lines at C2 and C7 to measure CL ⁽⁷⁾. In 1986, Harrison began drawing posterior tangents on each vertebra to measure segmental angles on lateral radiographs ⁽⁹⁾. The purpose of this study is therefore to compare these three different methods to measure the CL angle using lateral cervical X-ray graphics.

MATERIALS AND METHOD

We evaluated 76 patients' lateral cervical X-ray graphics between the ages of 18 to 60 years retrospectively. Exclusion criteria was any pathology that seen on graphics. All patients were reported as normal. Cervical X-ray graphics were taken as standing lateral neutral positioned. These graphics were searched with the radiology pacs program and CL angle measurement of these patient was evaluated with the techniques being explained below:

Cobb Angle:

Cobb angles are measured with the 4-line method includes drawing a line either parallel to the inferior endplate of C_2 to the posterior margin of the spinous process, and another line parallel to the inferior endplate of C_7 . C_{0-2} angle, an angle between the McRae line and the C_2 lower end plate was measured using Cobb method Perpendicular lines are then drawn from each of the 2 lines noted above and the angle subtended between the crossing of the perpendicular lines is the cervical curvature angle (Figure-1,2).



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Jackson Physiological Stress Lines:

The Jackson physiological stress lines method which requires drawing 2 lines, both parallel to the posterior surface of the C_7 and C_2 vertebral bodies, and measuring the angle between them (Figure-3).

Harrison Posterior Tangent Method:

Harrison posterior tangent method involves drawing lines parallel to the posterior surfaces of all cervical vertebral bodies from C_2 to C_7 and then summing the segmental angles for an overall cervical curvature angle (Figure-4).

STATISTICAL ANALYSIS:

Descriptive data were presented as mean and standard deviations for numerical variables, and frequencies and percent for categorical variables. Independent group comparisons were analyzed with Mann-Whitney U test between genders. A Type I error level of 5% was considered as statistical significance in analyses. SPSS 18 (IBM Inc., Armonk, USA) was used for the statistical assessments.



RESULTS:

Table-1 represents the patients' demographics. Accordingly, 47 patients (61.8%) were female, and 29 patients (38.2%) were males. Mean age was 43.83±15.9 years.

The measurements according to gender were presented in **Table-2**. Accordingly, Cobb C_{0-2} (p=0.307), Jackson (p=0.106), and Harrison (p=0.688) measurements were similar between

males and females. But Cobb $C_{2.7}$ was significantly different between genders (p=0.017), and males had significantly higher Cobb $C_{2.7}$ values.

The comparisons of methods **(Table-3)** revealed that Cobb C_{0-2} had highest values, and Cobb C_{2-7} and Jackson was lower than Harrison (Cobb C_{0-2} >Harrison>Cobb C_{2-7} ~Jackson) (p<0.001).

Table-1. Patient demographics				
		Count	%	
CENIDED	Female	47	61,8%	
GENDER	Male	29	38,2%	
		Mean	SD	
AGE (year)		43,83	15,90	

 Table-2. Measurement comparison between genders

	Female		Male		
	Mean	SD	Mean	SD	р
COBB_C ₀₋₂	31,43	7,12	29,57	8,72	0,307
COBB_C ₂₋₇	16,30	9,18	21,73	9,01	0,017
JACKSON	17,43	11,02	21,33	10,66	0,106
HARRISON	22,43	9,48	23,69	8,14	0,688

Table-3. Comparison of measurement methods						
Mean SD p						
COBB_C ₀₋₂	30,72	7,76				
COBB_C ₂₋₇	18,37	9,44				
JACKSON	18,92	10,98	p<0.001			
HARRISON	22,91	8,96				

DISCUSSION:

The widest range of motion is on the cervical spine relative to the rest of the spine and also this region supports the mass of the head ⁽¹³⁾. Beier et al. reported that CL is localized to C₁₋₂ and the center of gravity of the head sits almost directly above the centers of the C₁ and C₂ vertebral bodies². Only 6° (15%) of lordosis occurs at the lowest 3 cervical levels (C₄₋₇). The loss of subaxial lordosis has been reported in occiput–C₂ fusions in which excessive hyperlordosis is created at occiput–C₂ ⁽¹⁷⁻¹⁸⁾.

Although a few studies have reported the normal sagittal balance of the cervical spine and physiological CL has not been clearly defined yet, Hardacker et al. reported a mean CL of $40.0^{\circ}\pm9.7^{\circ}$ that had a significant correlation with thoracic kyphosis ⁽⁸⁾.

Lee et al. reported that the mean values $C_{0.2}$ angle was $22.4^{\circ} \pm 8.5^{\circ}$ and $C_{2.7}$ angle was $9.9^{\circ} \pm 12.5^{\circ} {}^{(12)}$. The ratio of the $C_{0.2}$ angle and the $C_{2.7}$ angle was 77 % and 23 % of the total CL¹². Also Gore et al. reported C_2 - C_7 cervical lordosis angles of 16° for men and 15° for women⁶.

Harrison et al. made a comparison of two techniques which were 4 line Cobb method and Harrison Tangents to measure CL ⁽⁹⁾. They found that Cobb method at C_1-C_7 overestimated

the cervical curvature (-54°) and, at C₂–C₇ it underestimated the cervical curve (-17°), whereas the posterior Harrison tangents were the slopes along the curve (-26° from C₂ to C₇) ⁽⁹⁾.

Harrison et al. also suggest this as the posterior tangent method is part of an engineering analysis and more accurately depicts cervical curvature than the Cobb method ⁽⁹⁾. We found mean values of C₀₋₂, C₂₋₇, Jackson stress lines and Harrison tangents as $30,72^{\circ} \pm 7,76^{\circ}$, $18,37^{\circ} \pm 9,44^{\circ}$, $18,92^{\circ} \pm 10,98^{\circ}$ and $22,91^{\circ} \pm 8,96^{\circ}$. Our results are similar to Harrisons'.

Harrison tangent technique is difficult to measure but we thought its results are better to show the best values because tangents also could measure the internal curve. All these techniques must be understood well with the biomechanics features so that surgeons could choose which technique would be better to use for the management of deformities.

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CAN THE AIRBORNE CONTAMINATION OF SURGICAL INSTRUMENTS BE RESPONSIBLE FOR SURGICAL SITE INFECTION?

CERRAHİ ENSTRÜMANLARIN HAVA KAYNAKLI KONTAMİNASYONU CERRAHİ ALAN ENFEKSİYONUNDAN SORUMLU OLABİLİR Mİ?

SUMMARY

Back-round data: Surgical site infections, which are the primary of nosocomial infections, continue to be an issue as they result in increased rates of morbidity, healthcare costs and patient dissatisfaction. The aim of this study was to reveal the role of airborne particle contamination of surgical instruments in surgical site infection.

Material-Method: In this prospective study, an evaluation was made of a total of 25 simple and complex spinal surgery cases performed over a one month period. In order to demonstrate that there were no contaminants in the surgical set preoperatively, 2 instruments were randomly selected and culture samples were taken from a 1 cm2 surface area of each. The instruments were not used in surgery and one was covered to remain sterile while the other was exposed to airborne particles on the nurse's desk. At the end of the operation, culture samples were taken from all instruments.

Results: The samples taken preoperatively from the airborne particle exposed and sterile covered instruments showed no bacterial growth postoperatively. No surgical site infections developed in any of the patients.

Conclusion: When appropriate precautions are taken, it is possible to avoid contamination of surgical instruments with airborne particles. Therefore, great attention must be given to appropriate behavior regarding contamination in the operating room, activity must be kept to a minimum, and doors must be controlled.

Key words: Spinal infections, contamination, spinal surgery, transmitted with air.

Level of evidence: Prospective clinical study, Level II.

ÖZET

Giriş: Cerrahi alan enfeksiyonları, morbidite oranlarını ve sağlık harcamalarını, hasta memnuniyetsizliği arttırarak sorun teşkil etmeye devam etmekte ve birçok klinikte hastane enfeksiyonları arasında ilk sıradaki yerini korumaktadır. Bu çalışmanın amacı cerrahi aletlerin hava kaynaklı partiküllerle kontaminasyonun cerrahi alan enfeksiyonu oluşumundaki rolünün ortaya konmasıdır.

Materyal-Metot: Bu prospektif araştırmada bir aylık zaman diliminde gerçekleştirilen toplam 25 basit ve karmaşık spinal cerrahi olgu üzerinde çalışılmıştır. Cerrahi setten rasgele seçilerek çıkarılan 2 adet aletten kontamine olmadıklarını göstermek amacıyla operasyon öncesi dönemde alet yüzeyinin 1 cm2 'lik bölümüne sürülerek kültür örnekleri alındı. Aletler cerrahi girişimde kullanılmaksızın birinin üzeri arınık bir şekilde örtülerek muhafaza edildi. Diğeri ise üzeri açık bir şekilde hemşire masasında hava kaynaklı parçacık maruziyetine bırakıldı. Operasyon bitiminde tüm aletlerden tekrar kültür örnekleri alındı.

Bulgular: Preoperatif alınan kültürlerde, hava kaynaklı parçacık maruziyetine bırakılan ve üzeri örtülen aletlerden postoperatif dönemde alınan kültürlerin hiçbirinde üreme olmamıştır. Hiçbir hastada cerrahi alan enfeksiyonu gelişmemiştir.

Sonuç: Operasyon odasında kontaminasyon açısından uygun davranış, minimize edilmiş aktivite, operasyon odası kapı kontrolü gibi gerekli önlemler alındığında cerrahi aletlerin hava kaynaklı partiküllerle kontamine olmayabileceği görülmüştür.

Anahtar Sözcükler: Omurga enfeksiyonları, kontaminasyon, spinal cerrahi, hava kaynaklı

Kanıt Düzeyi: Prospektif klinik çalışma, Düzey II

Surgical site infections (SSI) develop within 30-90 days after surgery and are believed to be related to the surgical incisions or perioperative organ or cavity intervention ⁽⁴⁾. These infections, which are the primary of nosocomial infections, continue to be an issue as they result in increased rates of morbidity, healthcare costs and patient dissatisfaction ^(4,6).

The incidence of SSI is related to contamination of the site (Altemeier classification), the general health status of the patient (ASA classification), and the duration of the operation, and is assessed using the National Nosocomial Infection Surveillance Risk Index (NNIS). This rate has been reported to be 1 % lower in a low-risk patient group and 15 % higher in a high-risk patient group ⁽³⁾.

Contaminating pathogens may be endogenous or exogenous. The source of endogenous pathogens is the skin of the patient. The sources of exogenous pathogens are airborne particles, the hands or other exposed skin areas of the surgical team, mucous membranes, surgical instruments, materials and irrigation solutions ^(14,17).

In the vast majority of cases, the source held mainly responsible is airborne particles. The direct contamination rate from the patient's skin is only 2 % ⁽¹⁸⁾. In contamination with airborne particles, 30 % is by direct inoculation and 70 % by transfer to the wound through the surgeon's hands or instruments ⁽¹³⁾.

In clean surgical injuries, microorganisms carrying airborne particles are found to be mostly responsible for surgical site contamination. The source of these airborne particles are usually the skin residues that are spilled from the operating room staff ^(14,17).

A person leaves 104 skin residues around while walking, and 10 % of these residues carry bacteria ⁽⁵⁾. The size of the bacteriabearing particles is 4-60 micrometers ⁽¹⁰⁻¹¹⁾. The maximum number of acceptable colonies to reduce postoperative surgical site infection is 103 cfu/mm3. Therefore, perioperative contamination control has become a necessary measure to prevent surgical site infection ⁽¹²⁾.

Air contamination can be reduced by removing contaminants from the air using an effective ventilation system, limiting the number and activity of people in the operating room, using appropriate clothing and controlling the doors ^(9,19). Thus, the use of laminar air flow ventilation systems is recommended in implantation surgeries ⁽⁷⁾.

However, laminar air flow ventilation systems are expensive and subsequent installation in an operating room is complicated.

The role of airborne particles in the formation of surgical site infection, the contamination of the wound site with these particles, and the postoperative contaminations of surgical instruments have been shown in previous studies. However, there has been little research into whether or not these particles contaminate surgical instruments. The aim of this study was to reveal the role of airborne particle contamination of surgical instruments in surgical site infection.

MATERIALS AND METHODS

In this prospective study, an evaluation was made of a total of 25 simple and 47 complex spinal surgery cases performed over a one month period. The operations comprised 13 microdiscectomies for lumbar disc hernia, three microdiscectomies and cage implantation for cervical disc hernia, five decompression and instrumentation operations for spinal stenosis and instability, two tumor excisions for spinal tumor, and two decompression and instrumentation operations for unstable spinal fracture diagnosis. All operations were performed by the same surgeon in the same operating room with the use of intraoperative x-ray. No blood product was used in any patient. The average duration of the operations was 2.2 ± -0.5 hours.

Operating Room

The study was performed in a 120 m3 operating room equipped with a standard ventilation system. The average temperature was 19°C±0,5°C, and average humidity was 48.2 $\% \pm 0.8 \%$.

Surgical Team

The surgical team consisted of a main surgeon, an assistant and a nurse, together with an anesthesiologist, an anesthesia technician and a circulating nurse. The maximum number of people in the operating room during the entire operation was six.

The entire surgical team used sterile, wool-free clothing, facial masks, caps and sterile gloves. The anesthesiologist and technician wore operating scrubs, face masks, caps and disposable gloves. The number of people in the operating room and their activities were minimized, and the operating room door was kept under control during the operation.

Collection of Samples

In order to demonstrate that there were no contaminants in the surgical set preoperatively, two instruments were randomly selected and culture samples were taken from a 1 cm2 surface area of each. The instruments were not used in surgery and one was covered to remain sterile while the other was exposed to airborne particles on the nurse's desk. At the end of the operation, culture samples were taken from all instruments.

Samples were taken by using Stuart transport swab and mediums and sent to the laboratory for calculation of the bacterial load in colony forming units per square centimeter (cfu/cm2) by cultivation in sheep blood agar and eosin methylene blue agar. The samples were incubated for 48 hours at 37 $^\circ$ C. 82

RESULTS

The samples taken preoperatively from the airborne particle exposed and sterile covered instruments showed no bacterial growth postoperatively. No surgical site infections developed in any of the patients.

DISCUSSION

Surgical site contaminations in clean surgical wounds are mostly caused by microorganisms in airborne particles. Previous studies about surgical instrument contamination have focused more on the contamination of used instruments. The rate of biological load per instrument has been shown to be closely related to the surgical field in which the instrument is used. Chu-Nancy et al. found the biological load levels after clinical use to be 0 and 4415.

In the current study, the biological load levels were <1000 on 88% of the instruments ⁽²⁾. Gordon Smith et al. showed that microbial contamination on used dental handpieces varies from 42 to 250 cfu/mL16. Percin et al. showed that the bacterial load on used instruments varied between 10 and 102 cfu/cm2. The most contaminant instruments were reported to be those used in reconstructive surgery operations, which was thought to be related to the number of pseudomanas in burn wounds being 106 cfu/g per tissue. No contamination was detected in biopsy instruments, which was associated with the short duration of the intervention. Three instruments used in neurosurgical operations showed only 10 cfu/cm2 bacterial load ⁽¹⁵⁾.

In many studies on contaminants leading to surgical field infection, airborne particles in the operating room have been found to be responsible. The amount of these particles in the wound and instrumentation areas has been determined. The use of a mobile laminar air flow (LAF) has been suggested to reduce the number of particles.

In a study of airborne contamination, Sossai et al. compared the standard ventilation status with the addition of a LAF unit. Bacterial air contamination in the wound area was determined to be 23.5 cfu/m3 with standard ventilation and 3.5 cfu/m3 with the LAF unit addition. In the instrument desk area, the contamination was found to be almost the same (28.6 cfu/m3, 30.8 cfu/m3). With the addition of the LAF unit, the particle number of 0.5 Im was reduced from 970,533 particles/m3 to 17,361 particles/m3⁽¹⁷⁾.

Amaral et al. studied bacterial contamination on the plastic covered instrument desk and compared the plastic

covers sterilized with ethylene oxide and plastic covers also disinfected with 70% alcohol and 1% iodine solutions in clean surgical procedures.

Positive test rates on desk surfaces with the ethylene oxide sterilized plastic covers were 2.9 % before and 45.7 % after surgery. Although bacterial growth in preoperative cultures was not expected, it was detected. No statistically significant difference was determined between ethylene oxide sterilization and disinfection with all protection procedures in respect of colony numbers before and after surgery. Micrococci were identified as the main contaminants in both groups, followed by Staphylococcus aureus. It was claimed that these bacteria were the main microorganisms in the air of the operating room. Only one case resulted in surgical site infection1.

Litrico et al. evaluated cases where disposable instrument sets were used and screws and rods were kept in their sterile packages until the beginning of the implantation, and reported that the infection rate was lower compared to cases where reusable instrument sets were used and this finding was attributed to the reduced exposure time to airborne bacteria⁽⁸⁾.

Yin et al. demonstrated that the speed of air contamination of air exposed surgical instruments was 1.18 times faster than that of covered surgical instruments by taking samples for cultures at 30, 60 and 90 minutes. It has been suggested that this study provided laboratory evidence of the infection in the operating room ⁽²¹⁾.

In the current study, there was no growth in the preoperative cultures from surgical instruments as expected. Neither was there any growth in the postoperative cultures obtained from the instruments exposed to airborne particles. According to the calculations in this period, the number of particles were determined as 750.456 particles/m3, which is consistent with the literature. It has been observed that surgical instruments may not be contaminated with airborne particles when appropriate precautions are taken, such as appropriate behavior regarding contamination in the operating room, minimized activity, and door control.

A limitation of this study could be said to be that the amount of bacterial contamination (cfu/m3) and particle numbers (particle/m3) in the operating room and on the instrument desk were not calculated.

When appropriate precautions are taken, it is possible to avoid contamination of surgical instruments with airborne particles. Therefore, great attention must be given to appropriate behavior regarding contamination in the operating room, activity must be kept to a minimum, and doors must be controlled.

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THE EFFECT OF CERVICAL DISC HERNIA ON SEXUAL FUNCTION

SERVİKAL DİSK HERNİASYONLARININ CİNSEL FONKSİYONLAR ÜZERİNE ETKİSİ

SUMMARY:

Introduction: The sexual activity of patients with cervical disc hernia (CDH) can be affected by pain or the use of analgesia. The aim of this study was to evaluate the sexual problems and sexual behavior of patients diagnosed with CDH.

Material-method: The study included 30 patients, evaluated in respect of pain and sexual dysfunction with preoperative Visual Analog Scale (VAS), Oswestry Disability Index (ODI), Hospital Anxiety and Depression Scale (HADS) and Sexual Assessment Questionnaire (SAQ).

Results: The mean age of patients was 44.0 \pm 10.1 years and the duration of symptoms was determined as mean 26.93 years. A statistically significant difference was determined between patients aged >41 years and < 41 years in respect of the duration of pain (p <0.05). The frequency of neck pain was statistically significantly different between males and females (p<0.05). It was reported by 65.5 % of patients that after the onset of neck pain, the frequency of sexual intercourse decreased. Impaired orgasm was reported in 51.7% of cases and in those who reported decreased sexual desire, this rate was 58.6%. Pain was reported during sexual intercourse by 65.6 % of patients. No change in sexual life was reported by 17.2 % of patients.

Conclusion: The results of this study showed that all stages of sexual life could be affected by CDH and thereby demonstrated a need for closer investigation of this complaint.

Key Words: Cervical disc herniation, sexual function, sexual problem

Level of evidence: Retrospective clinical study, Level III.

ÖZET:

Amaç: Servikal disk herni (SDH)'li hastalarda cinsel aktivite, ağrı veya analjezik kullanımı nedeniyle etkilenebilir. Bu çalışmanın amacı, SDH tanısı konulan hastalarda, cinsel problemler ve cinsel davranış biçimlerini değerlendirmektir.

Yöntem: Otuz hasta çalışmaya alındı. Ağrı ve cinsel fonksiyon bozukluğu, cerrahi öncesi Görsel Analog Ölçeği (VAS), Oswestry Yetiyitimi Ölçeği (ODS), Hastane Anksiyete ve Depresyon Ölçeği (HAD) ve Cinsellik Değerlendirme Ölçeği ile değerlendirildi.

Bulgular: Hastaların yaş ortalaması 44.0 ± 10.1 yıldı. Semptom süresi ortalama 26.93 ay idi. Boyun ağrısı süresi 41 yaşından büyük ve 40 yaşından küçük olgular karşılaştırıldığında istatistiksel olarak anlamlı farklılık bulunmuştur (p < 0.05). Boyun ağrısı sıklığı istatistiksel olarak kadın ve erkek grupları arasında (p < 0.05) farklıydı. Olguların % 65.5'inde boyun ağrısının başlangıcından sonra cinsel ilişki sıklığının azaldığı belirlenmiştir. Olguların % 51.7'sinde orgazm bozukluğu saptanmış, bu oran cinsel istek azalması tanımlanan olgularda % 58.6 olarak belirlenmiştir. Cinsel ilişki esnasında ağrı belirlenen hastalar tüm hastaların % 65.6'sını oluşturmaktadır. Olguların % 17.2'sinde cinsel hayatta değişiklik bildirilmemiştir.

Sonuç: Bu çalışma, SDH'sinde cinselliğin tüm aşamalarında etkilenme olabileceğini ortaya koyarak, bu yakınmanın daha yakından sorgulanması gerektiğini göstermektedir.

Anahtar Sözcükler: servikal disk hernisi, cinsel işlev, cinsel işlev bozukluğu

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III

Sexual function plays an important role in people's lives. Differing from animals, it is not just a reproductive function but a necessary component in the ability to maintain healthy relationships and self-confidence. A cessation in sexual life for any reason may lead to serious problems between partners.

Body movements with increasing chronic pain syndromes significantly restrict sexual activity. Other factors increasing sexual problems are depression caused by chronic pain and medical agents used. All these negative factors result in a vicious circle between the individual in pain and their partner.

Previous studies in literature have reported that impaired sexual activity is associated with chronic pain syndromes such as lumbar disc hernia, diabetes, cardiac dysfunctions and rheumatismal diseases (8,15-16). Detailed studies have been made examining the preoperative and postoperative results in respect of sexual activity problems in cases with LDH and low back pain (1,7,10,14). However, there are no studies including sexual problems related to CDH. There are studies which have examined sexual function impairments which have developed related to cervical spondylotic myelopathy (CSM) and posttraumatic spinal cord damage, although these studies have been directed to pathologies formed by sexual function loss created in the neural arch engendered by spinal cord damage. In addition to the neurological deficits in these pathologies, abnormal psychogenic erection and normal reflexogenic erection are seen. Together with postoperative neurological recovery, an improvement can be seen in sexual functions in most patients (6).

In patients with CDH, neck and radicular pain are the primary complaints. No significant neurological deficit is seen in the majority of patients. In particular, pain which varies with position has significant negative effects on the tempo of daily work. The chronic pain table which develops also has a negative effect on sexual life.

The aim of this study was to evaluate the sexual problems and forms of sexual behavior in patients diagnosed with CDH.

MATERIAL AND METHOD:

The study included a total of 30 patients who presented at our clinic with neck and/or arm pain and were determined with CDH on magnetic resonance imaging (MRI). The patients were evaluated preoperatively in respect of pain and impaired sexual function, using a Visual Analog Scale (VAS), Oswestry Disability Index (ODI), Hospital Anxiety and Depression Scale (HAD) and Sexual Assessment Questionnaire (SAQ) **(Table-1).**

Table-1. Demographic characteristics

81				
Gender	13 Female,			
	<35	7 (23.3%)		
A ce croups (vears)	35-44	8 (26.7%)		
rige groups (years)	45-54	10(33.3%)		
	55+	5(16.7%)		
	<40	12 (40%)		
	>40	18(60%)		
Marital status	Married	27(90.0%)		
ivialital status	Single	3(10.0%)		
Habite	Smoking	13(43.3%)		
Tables	Alcohol	3(10.0%)		
Previous neck surgery	Yes	5(16.7%)		

Table-2. Pain Status						
Pain frequency	Continuous Sometimes Rarely	18(60%) 8(26.7) 4(13.3%)				
Pain localization	Neck Arm Neck and arm	2(6.7%) 8(26.7%) 20(66.6%)				

Table-3. Frequency of sexual intercourse						
frequency of sexual intercourse	Every day 1 per Week 2-5 times per Week Rarely	1(3.3%) 11(37.9%) 6(20.7%) 10 (33.3)				
frequency of sexual intercourse after the onset of pain	Never Very decreased Slightly decreased No change	5(17.2%) 11(37.9%) 20(27.6%) 5 (17.2%)				

Table-4. VAS, HAD and ODI scores						
	Gender	Ν	Mean±Standard deviation	P value		
VAS	Female	12	7.2±2.2	p<0.05		
	Male	17	6.4±1.8			
HAD score	Female	12	33.3±3,4	p<0.003		
	Male	17	34.7±2.5	Protoco		
Oswestry Disabilty Index	Female	12	32.1±8.6	n>0.05		
	Male	17	22.2±9.1	P. 0.05		

The patients were separated according to gender and age groups for comparison. The results were compared between two age groups of >40 years and < 40 years in particular. Patients were excluded from the study if they had other musculoskeletal system disorders, psychiatric disorders or were using narcotic analgesics, opioids or psychotropic drugs which could affect sexual functions. Approval for the study was granted by the Local Ethics Committee.

Informed consent was obtained from all the patients and confidentiality of all personal information was guaranteed.

In the first stage, all the cases were evaluated with the SAQ. In this evaluation, questions were asked about the frequency of sexual intercourse, sexual desire and stimulation, the time from the onset of pain to sexual problems, whether or not there had been any sexual problems before the onset of clinical problems and whether or not their partner had any sexual problems.

The ODI was developed by Fairbank et al to evaluate functional deficiency ⁽⁵⁾. This scale was 73 adapted for a Turkish population by Yakup et al 17. In the scale, daily living activities are evaluated with 10 questions scored from 0-5 as 6 options. In this evaluation, a total score of 0-4 indicates no disability, 5-14; mild disability, 25-34; serious disability, and 35-50; functional insufficiency. The VAS evaluation for the general level of pain was made on a horizontal line marked 0-10.

HADS is an evaluation made with 14 questions. The Turkish version of HADS was used in this study $^{(2)}\!.$

All the scales were applied in a gender-appropriate manner to all patients. To prevent test-related anxiety developing, detailed information was given and patient consent was obtained before the tests.

Statistical Analysis:

Demographic data were analyzed using the Student's t-test and the Chi-square test. The Wilcoxon test and the Mann Whitney U-test were used to evaluate within-group changes.



RESULTS:

The patients were 13 females (mean age, 44.2 ± 8.1 years) and 17 males (mean age, 43.8 ± 11.0 years). The mean age of the whole group was 44.0 ± 10.1 years. Marital status was reported as married in 27 patients and single in 3. Five patients had previously undergone surgery for CDH.

Cigarette smoking was reported by 13 (43.3 %) patients and alcohol consumption by 3 (10%).

The duration of symptoms in the whole group was mean 26.9 months; in the group aged <40 years, mean 3.5 months (range 1-12 months) and in the group aged >40 years, mean 42.5 months (range, 1-240 months). When the duration of neck pain was compared between the groups aged >40 years and < 40 years, the difference was determined to be statistically significant (p < 0.05).

Pain was reported as continuous by 18 patients, intermittent by 8 and occasional by 4. In 2 patients only neck pain was experienced, in 8 patients only arm pain and in 20 patients, neck and arm pain together. The frequency of pain was determined to be statistically significantly different between the male and female groups (p < 0.026).

A decrease in the frequency of sexual intercourse after the onset of pain was reported by 65.5 % of the patients. Impaired orgasm was reported in 51.7 % of cases and in those who reported decreased sexual desire, this rate was 58.6 %. Pain was reported during sexual intercourse by 65.6 % of the whole patient group. No change in sexual life was reported by 17.2 % of cases. No statistically significant difference was determined in respect of sexual desire, sexual pleasure, gender or age (p > 0.05).

In the VAS and ODI evaluations, a significant restriction in daily living was reported by 27 patients. The VAS and ODI values were 7.2 \pm 2.2, and 32.0 \pm 8.6 respectively for females

and 6.4 ± 1.8 and 22.2 ± 9.0 for males. The HAD values were calculated as 33.3 ± 3.4 for females and 34.7 ± 2.5 for males. When comparisons were made between the genders, a statistically significant difference was determined in the VAS and ODI scores (p < 0.05) but no significant difference was seen in respect of the HAD scores (p > 0.05).

DISCUSSION

Spinal diseases are problems which affect the patient's life in many respects. Cervical spinal diseases lead to a deterioration in quality of life by restricting activities. Chronic

pain makes it difficult to undertake daily activities. Simple daily activities such as dressing, washing and lying down are restricted. Limited or total loss of working capacity related to disc diseases leads to severe losses in an economic sense. Discopathy pain often leading to chronic pain causes depression. The most common findings of depression are seen as sleep disorders, eating disorders, insecurity, low libido, irritability, reduced social relationships and a reduction in social and physical activities (12). All these factors affect quality of life and sexual life, which is an important component of quality of life. In a questionnaire-based study by Lew-Strowicz conducted between 2002 and 2005, of the factors affecting sexual relationships between partners, health status was reported by 77 % to have an effect⁽⁹⁾. Whatever factor it is related to, conditions developing sexual dysfunction trigger other depressive conditions.

Various studies have been conducted which have shown a relationship between sexual behavior and pain in LDH patients 10,14. The effect of different sexual positions on lower back pain and the lumbar spinal segment movement gap during coitus have been examined in many different studies^(7,13). In cervical pathologies, there are studies which have been conducted on cases who develop CSM and cervical spinal cord damage in particular (^{3-4,6)}. However, to the best of our knowledge, there has been no research into sexual behavior impairment seen in CDH cases.

In the current study, evaluation was made of male and female cases separately and by classifying different age groups. While no difference was seen between patients aged <40 years and >40 years in respect of the severity of neck pain, a statistically significant difference was observed between male and female patients. In addition to sexual dysfunctions, patients were evaluated in respect of VAS, ODI and HAD scores, depression, and smoking and drinking habits. While 43.3 % of the current cases reported smoking, the rate of alcohol consumption was extremely low at 10 %. The cases who smoked were evaluated in respect of peripheral vascular disease and no evident pathology was determined in any case. The mean duration of symptoms was 3.5 months in patients aged < 40 years and 42.5 months in those aged >40 years. The difference between the two groups was determined to be statistically significant. The majority of patients (60 %) had complaints of continuous neck pain and most reported that arm pain accompanied the neck pain. The frequency of pain was seen at a greater rate in females than in males.

In the cases of the current study who developed neck pain, 65.5 % reported a decrease in frequency of sexual relationships in the period following the onset of pain. Many factors together were seen to have an effect on this decrease in frequency. Problems common to both genders, but seen more frequently in females, were reduced sexual desire (58.6 %), orgasm disorders (51.7

%) and dyspareunia (23.3 %). In male patients, problems were seen such as premature ejaculation (26.6 %), impotence (3.4 %) and difficulty ejaculating (3.4 %).

Pain was reported to have prevented initiating sexual intercourse by 50 % of the patients and of these, 16.6 % reported that it completely prevented them. These rates showed that pain was a factor in couples planning relationships. Due to depressive psychology and mood changes caused by pain, 73.3 % of the patients reported that interest in sexual subjects had decreased or been completely lost. Sexual pleasure was reported to have decreased by 56.6 % of patients. No statistically significant difference was determined in this respect between those aged older or younger than 40 years.

Chronic pain is a recognized cause of depression ⁽¹¹⁾. In the HAD scoring to evaluate the general health status and psychological health, 23.3 % of patients reported a poor general health status and 93 % reported a deteriorated psychological state. These results demonstrate how important chronic pain is as an indicating factor of mental health. Although no statistically significant difference was determined between males and females in respect of HAD scores, a statistically significant difference was seen in the ODI scores at 32.0 ± 8.6 for females and 22.2 ± 9.0 for males.

In conclusion, just as the neck and arm pain developing in CDH patients has a negative effect on general living performance, as in other cases of chronic pain, it also significantly affects sexual life. The loss of sexual desire and sexual pleasure that was seen showed no difference between the genders or the age groups. Preventative measures taken with both medical and surgical methods to reduce pain in CDH patients will reduce secondary losses engendered by chronic pain in the long term. Therefore, in addition to the classic examination findings, patients with CDH should be evaluated in respect of sexual problems and referred accordingly.

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CONTENT AND BIBLIOMETRIC ANALYSIS OF ARTICLES PUBLISHED IN THE JOURNAL OF TURKISH SPINAL SURGERY

TÜRK OMURGA CERRAHİSİ DERGİSİ'NDE YAYINLANMIŞ MAKALELERIN İÇERİKLERİ VE BİBLİYOMETRİK ANALİZİ

SUMMARY:

Objectives: To conduct a content and bibliometric assessment of publications within the Journal of Turkish Spinal Surgery (JTSS) and report the publication trends.

Material and Methods: All available JTSS manuscripts published from 1990 through June 2016 were reviewed. The mentioned time period evaluated by dividing in 3 parts. Retrospective or prospective clinical articles, topical reviews, meta-analyses, case reports/series, experimental studies, expert opinions and biographies/chronologies were included in the current analysis. Articles were coded by 3 reviewers based on the first author and article characteristics.

Results: There was a total of 754 articles. The first author was orthopaedic surgeon in 559'u (74,1%) and neurosurgeon in 150 (19,8%) articles. The top 3 institutions to submit article were Dokuz Eylul University Medical Faculty (n=80, 10,6%), Ufuk University Medical Faculty (n=41, 5,4%) and Ankara University Medical Faculty (n=37, %4,9) respectively. The top 3 cities to submit articles were Ankara (n=214, 28,3%), istanbul (n=197, 26,1%) and izmir (n=108, 14,3%) respectively. The study was retrospective in 367 (48,6%), prospective in 35 (4,6%) and experimental in 31 (4,1%) articles. The most studied subjects of the studyes were spinal deformity (n=181), spinal trauma (n=174), degenerative spine (n=130), spine tumors (n=71) and spine infections (n=65).

Conclusion: It is found out that most of the articles are consisted of retrospective studies, reviews and case report, which are with lower level of evidence. We think that this is due to the fact that the journal is not indexed in well-known data bases such as PubMed. It is essential to increase the impact factor of JTSS and make it better known in order to improve Turkish spine surgery research and practice. For this reason, we think Turkish spine surgeons supporting JTSS with scientifically qualified studies with higher levels of evidence will help achieving this goal.

Key Words: Spine surgery; Journal of Turkish Spinal Surgery; bibliometric analysis; publication trends; journal; research.

Level of Evidence: Bibliometric analysis, Level III.

ÖZET

Amaç: Türk Omurga Cerrahisi Dergisi'nde (JTSS) yayınlanmış makalelerin içerik ve bibliyometrik değerlendirmesinin yapılması ve yayın eğilimlerinin rapor edilmesidir.

Materyal ve Metodlar: JTSS dergisinde 1990- Haziran 2016 tarihleri arasında yayınlanmış olan tüm makaleler değerlendirildi. Bu periyod 3'e bölünerek incelendi. Retrospektif/prospektif klinik çalışmalar, derlemeler, meta analizler, olgu sunumları/serileri, deneysel çalışmalar, uzman görüşleri ve biyografiler/ tarihçeler çalışmaya dâhil edildi. Tüm makaleler 3 değerlendirici tarafından makale ve birinci yazar özellikleri açısından etiketlendi.

Sonuçlar: Toplam makale sayısı 754 idi. İlk yazarların 559'u (%74,1) ortopedi ve travmatoloji uzmanı, 150'si (%19,8) nöroşirurji uzmanı idi. İlk yazarların kurumlarına göre en çok makale gönderilen ilk 3 kurum sırasıyla Dokuz Eylül Üniversitesi Tıp Fakültesi (n=10,6%,80), Ufuk Üniversitesi Tıp Fakültesi (n=41, %5,4) ve Ankara Üniversitesi Tıp Fakültesi (n=37, %4,9) idi. Makalelerin en çok gönderildiği ilk 3 şehir sırasıyla Ankara (n=214, %28,3), İstanbul (n=197, %26,1) ve İzmir (n=108, %14,3) idi... Çalışmaların 367'i (%48,6) retrospektif, 35'i (%4,6) prospektif, 31'i (%4,1) deneysel çalışma idi. Deformite (n=181), omurga travmaları (n=65) başlıca işlenen ana konulardı.

Çıkarımlar: Yayınlanan makalelerin çoğunluğunu daha düşük kanıt düzeyine sahip retrospektif çalışmaların, derlemelerin ve olgu sunumlarının oluşturduğu görülmektedir. Bu durumun derginin Pubmed gibi internet veri tabanlarında taranmıyor olmasına bağlı olduğunu düşünmekteyiz. JTSS dergisinin bilinirliğinin arttırılarak, etki (impakt) faktörünün yükselmesi ve uluslararası indekslerde taranır hale gelmesi Türk omurga cerrahisinin gelişimi ve dünyada daha üst sıralarda yer alması açısından önem arz etmektedir. Bu sebeple Türk omurga cerrahlarının JTSS dergisinin bilimsel açıdan kaliteli, kanıt düzeyi daha yüksek çalışmalarla desteklemesinin bu amaca hizmet edeceğini düşünmekteyiz.

Anahtar Sözcükler: Omurga cerrahisi; Türk Omurga Cerrahisi Dergisi; bibliometrik analiz; yayın trendi; araştırma.

Kanıt Düzeyi: Bibliyometrik analiz, Düzey III

INTRODUCTION

The Journal of Turkish Spinal Surgery (JTSS) (International Standard Serial Number (ISSN) 1301-0336) is a peerreviewed journal which is issued quarterly. The journal publishes clinical or basic research, topical reviews, and case reports/series after approval by the Editorial Board. It has been the official journal of the Turkish Spinal Surgery Society since 1990 being as old as the Turkish Spinal Surgery Society. The first congress organized by the Society took place in Çeşme, Izmir, coincident with the publication of the first four issues. Authors were encouraged by the Society to prepare original articles from the studies presented in international congresses organized by the Society every two years, and these articles were published in the Journal. As of 2016, the society began publishing only in English in order to promote the journal to an international audience. Moreover, the articles dating after the 1st issue of 23rd volume were all translated in English.

The word "bibliometrics" has been derived from the Latin and Greek words "biblio" and "metrics" which refer to the application of mathematics to the study of bibliography. The term was first described in 1969 ⁽¹⁷⁾. It is a generic term for a range of evaluations directed at quantifying output levels, collaboration patterns and impact characteristics of scientific research. In other words, it is the organization, classification and quantitative evaluation of the publication pattern of macro-communication, along with their authorship, by mathematical and statistical calculations.

The focus of bibliometrics is on assessing patterns in published literature within a given field (20). Bibliometric analysis is as a useful tool in evaluating the quality of a journal and its articles. Bibliometric studies have been applied mainly to scientific fields and are based principally on various metadata elements such as author, title, subject, citations, etc. related to scholarly publication within a discipline with the hope that such studies may help to provide an insight into the dynamics of the field under consideration. Thus, this type of analysis provides useful indicators of scientific productivity, trends, emphasis of research in various facets and researchers' preferences for publication ⁽¹¹⁾. More specifically, when a single journal is studied bibliometricaly, it draws a portrait of the journal, providing a description that offers an insight that is beyond the superficial. It can indicate the quality, maturity and productivity of the journal in any field, in a country or region. It also informs us about the research orientation that it supports to disseminate and its influence on author's choice as a channel to communicate or retrieve information for their research needs (24,26). Moreover, bibliometric studies have been immensely useful for librarians in selection and weeding policies. It is useful for the academic community in identifying most popular authors, institutions and potential publications. Furthermore, it helps in determining the highly cited journals, ranking of prolific authors, authors' productive pattern, the journal impact factor, and other significant details of any specific literature under study $^{\rm (23)}.$

Recently, bibliometric analysis for assessing the worldwide research productivity has been increasingly performed in topics related with spine surgery ^(1-10,12-16,18-19,21-22,25). However, to our knowledge, bibliometric studies concerning solely the content of a spine surgery journal has not been reported yet. JTSS strives to be the premier journal for spinal surgery research in Turkey and is the official journal of the Turkish Spine Society. The current study was planned to investigate the different aspects of the articles published in JTSS. Therefore, the aim of the present study was to provide an insight into the characteristics of the articles published in JTSS, to know the contribution of authors' geographical affiliation, to know the types of the articles and to classify articles by spinal surgery sub-branches.

MATERIALS AND METHODS

In order to examine the characteristics and trends of articles published in JTSS, all available original articles, review articles and case reports published from 1990 to June 2016 (Volume 27, Issue Number 3) were analyzed. The archive of JTSS original web site (http://www.jtss.org/arsiv/arsiv.aspx) was used for this purpose. The mentioned time period was divided in 3 parts as 1990-1996 (Period 1), 1997-2008 (Period 2) and 2008-2016 (Period 3). In each time period, retrospective or prospective clinical articles, topical reviews, meta-analyses, case reports/series, experimental studies, expert opinions and biographies/chronologies were included in the current analysis. For each article, type of the article, the number of the authors, the author's geographical location (taken to be the country or region of their institutional affiliation at the time of publication and provided by the authors themselves), the institutional affiliation of the first author, the department of the first author and subject of the article were noted down. Geographical location was defined as the city in which the institutional affiliation of the first author was in and the geographical region in which the city was located in, as Turkey was divided into 7 regions: Marmara, Central Anatolia, Aegean, Mediterranean, Black sea, Eastern Anatolia and Southeastern Anatolia regions. Articles were comprehensively analyzed by 4 of the authors based on author and affiliation characteristics, research design, and the subject of the article. To find out the authorship productivity, the ranking of the most prolific contributors, the ranking of authors by geographical affiliation and the ranking of authors by institutional affiliation, the first authors were considered only.

RESULTS

The total number of the articles that were evaluated was 754. The total number of the issues was 91. The mean number of

the articles per issue was 8,3. The mean number of the authors per article was 4,04 (range,1-11). The top 3 cities which the institutional affiliation of the first authors were located in were Ankara (n=214, 28 %), Istanbul (n=197, 26 %) and Izmir (n=108, 14 %) respectively. The top 3 geographical regions which the cities of institutional affiliation of the first authors were located in were Marmara Region (n=242, 32 %), Central Anatolian Region (n=231, 30 %) and Aegean Region (n=144, 19 %). Sixty-five (8,6 %) of the articles were submitted from abroad. According to the institutional affiliation of the first authors, the first 3 institutions which sent the most articles were Dokuz Eylul University Medical Faculty (n=100, 13 %), Ufuk University Medical Faculty (n=41, % 5) and Ankara University Medical Faculty (n=37, 4 %) respectively. The first author of the article was an orthopedic surgeon in 559 (74%) articles, a neurosurgeon in 160 (21%) articles and from another department in 55 (5%) articles.

According to the type of the article, 451 (59,8%) articles were original article, 148 (19,6) articles were case report/series, 138 (18,3%) articles were review, 13 (1,7%) articles were biography/chronology, 2 (0,02%) articles were meta-analysis and 2 (0,02%) articles were expert opinion. The study was retrospectively designed in 385 (85%) articles, prospective in 35 (8%) articles and the study was experimental in 31 (7%) studies. The subject of the article was spinal deformity in 181 (24%), spinal trauma in 174 (23%), spinal infection in 65 (8,6%) articles. The results of the three time periods which are evaluated separately are demonstrated in Table-1

Table 1. The results	of the bibliographic analys	is demonstrated in 3 sepa	rate time periods and in t	otal.
	1990-1996	1997-2008	2009-2016	Total
Number of issues	26	34	31	91
Number of articles	278 (mean 10,7 per issue)	199 (mean 5,8 per issue)	277 (mean 8,9 per issue)	754 (mean 8,3 per issue)
Number of authors	4,06 (range,1-8)	3,21 (range,1-8)	4,63 (range,1-11)	4,04 (range,1-11)
	Ankara 91	Ankara 64	Istanbul 124	Ankara 214
City of the institutional affiliation	Izmir 63	Izmir 45	Ankara 59	Istanbul 197
	Istanbul 52	Istanbul 21	Bursa 11	Izmir 108
	Adana 11	Denizli 12	Edirne 9	Edirne 23
	Edirne 7	Edirne 7	Afyon 8	Adana 21
	Other 54	Other 50	Other 66	Other 191
	Central Anatolia 94	Central Anatolia 73	Marmara 149	Marmara 242
	Aegean 64	Aegean 60	Central Anatolia 64	Central Anatolia 157
	Marmara 60	Marmara 33	Aegean 20	Aegean 144
Region of the institutional	Mediterrenean 13	Mediterrenean 10	Mediterrenean 11	Mediterrenean 34
affiliation	Southeastern Anatolia 5	Blacksea 3	Blacksea 8	Blacksea 14
	Blacksea 3	Southeastern Anatolia 2	Eastern Anatolia 8	Southeastern Anatolia 13
	Eastern Anatolia 3	Eastern Anatolia N/A	Southeastern Anatolia 6	Eastern Anatolia 11
	Abroad 36	Abroad 18	Abroad 11	Abroad 65
	Dokuz Eylul University 51	Ufuk University 31	Baltalimani Bone Diseases H 22	Dokuz Eylul University 80
	Ankara University 25	Dokuz Eylul University 26	Istanbul Education and Research H 12	Ufuk University 41
	Hacettepe University 21	Pamukkale University 12	Bakirkoy Education and Research 11	Ankara University 37
Institution of the first author	Istanbul Medical Faculty 19	Trakya University 7	Ufuk University 10	Hacettepe University 28
	Diskapi Training and Research H 18	American Hospital 6	Uludag University 10	Dıskapi Training and Research H 30
	Cukurova Medical Faculty 11	Osaka University 6	Baskent University 10	Istanbul Education and Research 23
	Cerrahpasa Medical Faculty 10	Hacettepe University 5	Intercontinental Hospital 9	Trakya University 23
	Istanbul Education and Research H 9	Ankara Numune T&R Hospital 5	Trakya University 9	Baltalimani Bone Dis. T&R H 22
	Other 114	Other 101	Other 183	Other 470
Department of the first author	Orthopaedics and Traumatology 250	Orthopaedics and Traumatology 139	Orthopaedics and Traumatology 170	Dıskapi Training and Research H 30 Istanbul Education and Research 23 Trakya University 23 Baltalimani Bone Dis. T&R H 22 Other 470 0 Orthopaedics and Traumatology 559 Neurosurgery 150 Other 45
	Neurosurgery 21	Neurosurgery 40	Neurosurgery 89	Neurosurgery 150
	Other 7	Other 20	Other 18	Other 45
	Retrospective clinical article 175	Review 66	Retrospective clinical article 146	Retrospective clinical article 367
	Case report/series 32	Case report/series 48	Case report/series 68	Case report/series 148
	Review 26	Retrospective clinical article 46	Review 46	Review 138
m 64 44	Prospective clinical article 17	Prospective clinical article 12	Experimental 9	Prospective clinical article 35
Type of the article	Experimental 11	Experimental 11	Prospective clinical article 6	Experimental 31
	Expert opinion 2	Expert opinion N/A	Expert opinion N/A	Biography/chronology 23
	Meta-analysis 1	Meta-analysis 1	Statistical 1	Meta-analysis 2
	Biography/chronology 11	Biography/chronology 11	Biography/chronology 1	Expert opinion 2
Subject of the article	Spinal Deformity 89	Spinal Trauma 44	Degenerative spine 75	Spinal Deformity 181
	Spinal Trauma 81	Spinal Deformity 31	Spinal Deformity 61	Spinal Trauma 174
	Degenerative spine 30	Degenerative spine 25	Spinal Trauma 49	Degenerative spine 130
	General spine surgery topics 29	Spine infection 23	General spine surgery topics 43	General spine surgery topics 80
	Spine tumor 26	Spine tumor 22	Spine tumor 23	Spine tumor 71
	Spine infection 22	General spine surgery topics 18	Spine infection 20	Spine infection 65
	Other 1	Other 36	Other 6	Other 53

DISCUSSION:

There has not been significant publication growth in JTSS since 1990. First, the total number of publications has not increased. In direct contradiction, the number of the published papers reduced between the years 1998 and 2005 as only 2 issues were published per year in this period. The mean number of articles per issue was only 5,8. JTSS started with quarterly issues in 1990, was published in 2 issues between the years 1998 and 2005, and went on again with quarterly issues after 2005 till now.

Ankara (214 articles, 28,3 %), Istanbul (197 articles, 26,1 %) and Izmir (108 articles, 14,3 %) have been to found to be the 3 leading cities in publishing in JTSS. This is not surprising since these 3 cities are the most developed cities of the country as well as they are the pioneering cities not only in spinal surgery but also in the medical education and improvement in Turkey. However, the increased share of Istanbul from the first period of 1990-1996 (52 articles, 18,7 %) to the second period of 1997-2008 (21 articles, 10,5 %) to the last period of 2009-2016 (124 articles, 44,7 %) is noteworthy. We think that this is due to superior numbers of institutions and spine surgeons in the mentioned city. Also the decline of the number of the articles from Izmir is observed. Izmir was the second most publishing city with the number of 51 (18,3 %) articles in the first period 1990-1996. However, Izmir was not one of the top 5 cities in the last period of 2009-2016.

We have found that vast majority of the articles were published from 3 geographical regions as Marmara (32 %, n=242), Central Anatolia (20,8 %, n=157) and Aegean (19 %, n=144) regions. There were very few articles from the Blacksea, Southeastern Anatolia and Eastern Anatolia regions with the rates of 1,8 % (n=14), 1,7 % (n=13) and 1,4 % (n=11) respectively. We think that this difference in the number of publications from the Turkish geographical regions is due to the disparity between these regions concerning the number of institutions with the opportunities provided to perform spine surgery and the number of the researcher's eager to carry out scientific research as well as the relative discrepancy among the regions regarding population. It is possible to evaluate the articles from abroad as a separate geographical region.

There was the most number of articles from abroad in JTSS in the first period of 1990-1996, with 36 (12,9 %) out of 278 articles. In the second period of 1997-2008, there were 18 (9%) articles from abroad out of 199. In this period a foreign institution, Osaka University from Japan, was among the top 8 institutions. In the last period there were 11 (3,9 %) articles out of 277. In total there were 65 (8,6%) articles from abroad. There is a gradual decrease of the number of articles submitted from abroad. We think that this is due to the fact that JTSS is not indexed in well-known indexes as well as it is not present in PubMed database which is the most popular database worldwide in the scientific research in medical sciences. PubMed was released in 1996 by the United States National Library of Medicine and is used since then. The decreasing interest of foreign institutions may be due to fact that JTSS is not indexed on PubMed.

In JTSS, several institutions are the most impactful. Dokuz Eylul University was the most prolific institution in JTSS. As we do not have yearly data for each institution, it is not possible to determine whether Dokuz Eylul University has maintained a steady rate of publication or produced more within recent years. However, it is observed that the number of the articles has gradually decreased. With 51 articles, the institution was the most contributing institution between the years 1990-1996, the second most contributing between 1997-2008, whereas Dokuz Eylul University was not among the top 8 institutions in the last evaluated period of 2009-2016. Ankara University is another such example. Although the institution was the second most contributing institution in the first period of 1990-1996 and with 37 articles the third most contributing overall, it has been out of the top 8 most contributing institutions in both the second (1997-2008) and the second (2009-2016) periods. Baltalimani Bone Diseases Training and Research Hospital is an emerging institution to publish papers in JTSS. Although this institution had no paper published in JTSS before the year 2009, it was the most contributing institution with 22 articles in the period 2009-2016.

The department of the first author was also evaluated in the study. Orthopaedic surgeons were the most contributing author is all 3 periods. However there was a gradual decrease of the rate of orthopaedic surgeons in the 3 evaluated periods, with the percentages of 89,9 % (n=250), 69,8 % (n=139) and 61,3 % (n=170) respectively. The percentage of orthopedic surgeons as the first authors in the total number of articles was found as 74,1 % (559). Neurosurgeons were the first author in 7,5 % (n=21) of the articles published between 1990-1996, in 20,1 % (n=40) of the articles published between 1997-2008 and in 32,1 % (n=89) of articles published between 2009-2016. The overall percentage of neurosurgeons was 19,8 % (n=150) as the first author in all published papers. The increasing interest of the neurosurgeons to JTSS is obvious.

The bibliometric assessment of the studies published in JTSS showed that the most published designs were retrospective clinical studies, case reports/series and literature reviews, with only 2 meta-analysis study. There was a predominance of retrospective clinical articles (48,9 %) and case reports (19,6 %). Although, retrospective designs are easier to perform they are with many limitations. Case report is the most basic descriptive study. It is generally used in the initial evaluation of little known problems, with characteristics that are not well understood. Its main advantages are low cost and ease

of performance, but its scope is limited because there is no control mechanism to attest to its efficiency, and because of the subjectivity involved in the appreciation of facts.

It is also prominent that the number of the case reports increase from 11,5 % (n=32) in 1990-1996 period to 24,1 % (n=48) in 1997-2008 period and at last to 24,5 % (n=68) in 2008-2016 period. The total percentage of reviews were found as 18,3 %. There were only 2 meta-analyses and no study of systematic review was found. Systematic reviews are strict reviews of specific clinical issues that summarize the original research, and meta-analysis, which consists on the combination of study findings, providing precise and concise estimates on a given topic (3). There was a striking increase in the rate of reviews when compared in the overall number. There were only 26 reviews with a rate of 9,3 % in the period 1990-1996 whereas this rate increased to 33,1 % with 66 out of 199 articles in the period 1997-2008. This result demonstrates a decrease in the scientific value of the articles published as topical nonsystematic reviews are lower level evidence as compared to empirical studies, and a trend of this nature is encouraging for a profession with explicit interest in evidence-based practice ⁽²⁴⁾. However, topical reviews, of which expert opinion and commentary are a part, are still of interest to JTSS readers.

A percentage of 12,7 % was found for articles of prospective, randomized and controlled clinical trials. There is a noteworthy decrease of the numbers of prospective, randomized and controlled studies from the percentages of 6,1 % in the first period (1990-1996) to 6 % in the second period (1997-2008) and to 2,1 % in the last period (2009-2016). This result may be interpreted as the value of research published in JTSS is declining. However, from another view, although randomized controlled trials are heralded as the highest standard for intervention research, it is unclear whether increasing the number or percentage of randomized controlled trials is ideal or realistic ⁽¹³⁾.

More randomized controlled trials published within a journal with limited space yields a smaller proportion of other types of articles that may also impact other clinical practice such as diagnostic or prognostic studies. Also, there is a recent emphasis that both subjects enrolled and treatment effects reported in randomized controlled trials may not be representative of routine clinical practice, so different standards may have to be explored for guidance of intervention research ⁽¹⁰⁾. However, these data do not reflect that papers with prospective, randomized and controlled design are not necessary to improve the quality of articles published in JTSS, in accordance with the level of hierarchy of evidence-based spine surgery.

In the analysis of the areas of interest, there was a predominance of some topics in the journal evaluated by the present study, with spinal deformity being the most researched area, representing 24 % (181 articles) of the articles. The second most researched topic was spinal trauma with a total share of 23 % (174 articles). Other areas that were found to be widely covered in the present research were related to degenerative spine with a rate of 17,2 % (130 articles) and general spine surgery topics with a rate of 10,6 % (80 articles). It is found out that the number of the degenerative spine articles increased significantly in the last period (2008-2016). This may be attributed to the aging population and probable increase of the number of surgeries related with degenerative disorders of the spine, in Turkey. In the current study, it is observed that spine tumors and spinal infections which are 2 essential sub-branch of spine surgery are underestimated with total rates of 9,4 % (71 articles) and 8,6 % (65 articles) respectively. This may be given to 2 facts; one is the rarity of spine tumors and the other is recently improved health care services in Turkey which may effect on eradication of some spinal infections such as spinal tuberculosis.

There are several implications for Turkish spine surgery research, based on the results from this study. First, prospective, randomized and controlled studies are considered the gold standard study design. Given the trend for lack of growth in these types of publications in JTSS, there may be a need to encourage the submission and publication of high-quality randomized controlled trials. One recent study demonstrated that Turkey was one of the most productive countries in the field of spine surgery with a total number of 116 articles and worldwide ranking of 13rd place ⁽⁵⁾. This shows that Turkey is in a good rank in spine surgery research. The decreasing number of papers with higher level of evidence in JTSS maybe a sign that researcher from Turkey prefer publishing in international journals rather than national journals. We think that the reason behind this fact is academicals concerns of the researchers in Turkey where the main scale of scientific productivity is measured within the number of papers published especially in the journals indexed in Science Citation Index and Science Citation Index- Expanded or the number of citations. It is obvious that an article indexed in PubMed database would be more accessible worldwide than the other indexes. Therefore, we think that JTSS being indexed in PubMed may increase popularity among the researchers and may have the opportunity to publish papers of higher quality.

The present study showed the trends in nationwide research on spine surgery in Turkey and draws a picture of the knowledge produced. Thus, some areas of interest where little research has been done were identified, indicating that more research is needed on these topics, such as spine tumors and spine infections. Also, it has become clear that scientific studies are not being conducted under very strict conditions and should be improved to ensure that the knowledge produced on spine surgery be based on evidence. While the optimal proportion of publication types for a given journal is unknown, we suggest continued need to increase efforts for the submission and publication of a greater proportion of randomized controlled trials and articles focused on diagnosis.

It was concluded that most articles refer to studies with low potential to establish scientific evidence, indicating a need for conducting spine surgery research based on better quality methodology. Moreover, it was found that the assessed literature reflected the trends observed in the clinical practice of spine surgery in Turkey. It further identified areas of interest where little research has been done, indicating a need for more research on these topics. Furthermore, the present study identified a disparity between the cities and the geographical regions in Turkey, concerning project development and scientific production, reflecting the lack of governmental incentive and support to scientific and technological advancement in Turkey. These analyses provide a unique opportunity to discuss content and trends within JTSS. In addition, these analyses provide data that may be useful to those involved with JTSS's future mission and vision. It is essential to increase the impact factor of JTSS and make it better known in order to improve Turkish spine surgery research and practice. For this reason, we think Turkish spine surgeons supporting JTSS with scientifically qualified studies with higher levels of evidence will help achieving this goal. Moreover, we think that JTSS should be indexed in well-known data bases such as PubMed to achieve the goal of publications with higher scientific value.

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ADULT TETHERED CORD SYNDROME: TWO CASE REPORTS AND LITERATURE REVIEW

ERİŞKİN GERGİN OMURİLİK SENDROMU: 2 OLGU SUNUMU VE LİTERATÜRÜN GÖZDEN GEÇİRİLMESİ

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SUMMARY

Tethered cord syndrome is a childhood disease and rarely seen in adults. In adult patient's pain and bladder dysfunction are essential symptoms in respect of children. While evaluating the low back pain, the diagnosis of tethered cord syndrome must keep in mind at adulthood. Surgery performed by an experienced surgeon is satisfactory at symptomatic patients. Here we presented two cases of adult tethered cord syndrome treated with surgery successfully.

Key words: Surgical treatment, adult, tethered cord syndrome.

Level of evidence: Case report, Level IV.

ÖZET

Gergin omurilik sendromu bir çocukluk çağı hastalığıdır ve erişkin yaşta nadiren görülür. Erişkin hastalarda çocuklardan farklı olarak ağrı ve mesane disfonksiyonu esas semptomlardır. Erişkin çağda bel ağrısı ayırıcı tanısında gergin omurilik sendromu mutlaka akılda tutulmalıdır. Semptomatik hastalarda deneyimli bir cerrah tarafından yapılacak cerrahi yüz güldürücüdür. Bu makalede cerrahi ile başarıyla tedavi edilen iki erişkin gergin omurilik sendromu hastası sunulmuştur.

Anahtar Sözcükler: Cerrahi tedavi, erişkin, gergin omurilik sendromu.

Kanıt Düzeyi: Olgu sunumu, Düzey IV.

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INTRODUCTION

The symptoms of elongated spinal cord and a thick filum terminale was described by Hoffman and colleagues as tethered cord syndrome (TCS) in 1976 ⁽⁴⁾. This failure is result of the low lying placement of the spinal cord within the vertebral column during embryogenesis. Ischemia, decrease of the electrophysiological activity and deteriorated oxidative process are the pathophysiological factors of TCS. Lipomas, scar lesions, myelomeningoceles, epidermoid tumors, lipomatous or thick filum terminale are the causes of low lying adherence of the spinal cord ⁽¹³⁻¹⁴⁾.

TCS is a childhood disease and rarely seen in adults. The real incidence of adult TCS is unknown ⁽³⁾. Surgery for TCS patients at the right time after comprehensive evaluation may prevent neurological deterioration at chosen.

In this manuscript we presented adult TCS cases that was presented with low back pain with the light of the literature.

CASE-1

Twenty years old woman was admitted to the hospital with the complaint of low back pain for 3 years, numbress and weakness in feet for 4 months. Positive Lhermitte sign, 5/5 dorsal flexion weakness at left foot and 3/5 at left foot, perianal hypoesthesia and hypoactive Achilles reflex were detected at neurological examination. Cystometry showed normal urodynamic signs. Whole spine magnetic resonance imaging and lumbar computed tomography showed evidence of low-lying conus ending at L4-L5 level. Syringomyelia at T1 level, diastomatomyelia at S2-S3 level and thick fatty filum was observed. Surgical detethering of the spinal cord was performed. Fatty filum was resected. In early postoperative period her right foot dorsal flexion paresis improved to 3/5.

CASE-2

Twenty-three years old man was admitted to hospital with right leg and low back pain after a 10 hours long journey. He had perianal hypoesthesia. Lumbar MRI revealed diplomyelia and tethered cord. Surgical detethering was performed. He was discharged with no additional neurological deficit. At 10 months' follow-up his low back and right leg pain was ameliorated.



Figure-1. Preoperative sagittal MRI of the Case-1 (A) and Case-2 (B).

DISCUSSION

Spina bifida is the second most common childhood abnormality and most frequent spinal cord disorder in children ⁽²⁾. TCS is part of this entitiy that may cause progressive neurologic deficits. The cord extends to the lower end of the sacrum in normal fetal development. The vertebral column lengthens caudad and the conus ascends the canal to reach the L-3 level at about 30 weeks of gestation. If at this stage the conus is trapped at a low level by a short filum, a lipoma, a sagittal septum, fibrous adhesions, normal ascent would be arrested ⁽¹⁰⁾.

The pathophysiology of adult TCS is unclear. Why do some patients with TCS remain asymptomatic till adulthood is still unclear? Some authors postulated that the degree of traction determines the age of symptom onset ⁽¹⁰⁾. The spinal cord was ended at L4 and L2 level at our cases; but the roots were placed dorsally at L2 that might be a sign of tethered cord.

The asymptomatic patients became symptomatic due to the situations, that may cause sudden spinal cord traction like the lithotomy position during childbirth, movement occurring during road traffic accidents. There were no history of childbirth or accident at our cases. The symptoms were slightly begun and progressed on a long time at the first case and there was a history of a long journey at the second case.

In adult patients pain and bladder dysfunction are essential symptoms in respect of children⁽¹⁾. Low back and leg pain that may spread to genital and rectal area can be the key symptom at adults. Surgery may be beneficial at the patients who has just low back pain or bladder dysfunction. Early surgical treatment in patients without deficit have been reported better results in postoperative outcomes ⁽⁶⁻⁷⁾.

These facts show that surgery give good results in adult patients. Patients may have motor and sensory deficits, what symptoms are numbness, weakness, muscle's atrophy. Approximately 50 percent of patient have bowel and bladder dysfunction, which are presented as constipation and frequency of urination. Our first patient have low back pain, numbness and weakness in feet and observed Lhermitte sign, weakness in dorsal flexion for 5/5 in left leg, 3/5 in right leg, perianal hypoesthesia and hypoactive Achilles reflex. Her right foot dorsal flexion paresis improved to 3/5 at follow-up visits. The second patient had perianal hypoesthesia.

Adults with TCS may be aware of their significant symptoms and this carelessness come to a conclusion with late diagnose and finally disability ^(9,11). If TCS is not treated this disease may progress 27 % in first, 40 % in second and 60 % in 5th year ⁽¹¹⁾.

Magnetic resonance imaging is the gold standard for the diagnosis of TCS. Visualization of filum terminale, meningomielocele, Syringomyelia, adhesions are mandatory before the operation. Syrinx cavity could be detected. This syrinx may cause pain, motor deficit, atrophy and rarely headaches. 73 % of patients tortured from back pain, 56 % of patients from leg pain ⁽⁸⁾. There was syringomyelia at T1 level in our first case and the second case had diplomyelia.

Cranial computed tomography for detecting hydrocephalus may be valuable. Urodynamic tests can detect the changes of bladder function. Somatosensory evoked potentials (SEP) and EMG can give useful information ⁽¹²⁾. SEP is useful to compare pre and postoperative evidence and shows the benefits of surgery ⁽⁵⁾.

While evaluating the low back pain, the diagnosis of TCS must keep in mind at adulthood. Surgery performed by an experienced surgeon is satisfactory at symptomatic patients.

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THORACIC INTRADURAL INTRAMEDULLARY CAVERNOMA

TORAKAL İNTRADURAL İNTRAMEDÜLLER KAVERNOM

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ABSTRACT

Spinal cavernomas are rare pathologies that account 5% to 12% of spinal vascular abnormalities. Sensory or motor symptoms are most frequent followed by pain and bladder dysfunction. Since development of ultra-high resolution magnetic resonance imaging techniques and modern sequences like susceptibility-weighted imaging, spinal cavernous malformaions can be diagnosed more accurately. Surgical removal of a symptomatic cavernoma is suggested to prevent further neurological deterioration, but must be weighed against the potential risks of surgery. We represent a rare illustrative case of thoracal spinal intradural cavernoma associated with multiple intracranial cavernomas.

Key Words: Spinal cavernoma, thoracic intramedullary cavernoma, multiple cavernoma

Level of Evidence: Case report, Level IV.

ÖZET:

Spinal kavernomlar nadir görülen patolojilerden olup spinal vasküler patolojilerin %5 - %12' sini oluşturur. Görülen duyusal ve motor semptomları en sık ağrı ve mesane disfonksyonları takip eder. Yüksek çözünürlüklü ve modern manyetik rezonans görüntüleme tekniklerinin gelişmesiyle beraber spinal kavernöz malformasyonların tanısı artmıştır. Potansiyel cerrahi riskleri kabul edildiği takdirde semptomatik kavernomların nörolojik defisitin ilerlememesi için çıkarılması önerilir. Olgu sunumumuzda nadir görülen ve çoklu kranial kavernomların eşlik ettiği torakal spinal intradural intramedüller kavernom anlatılmaktadır.

Anahtar Kelimeler: Spinal kavernom, Torakal intramedüller kavernom, Çoklu kavernom Kanıt Düzeyi: Olgu sunumu, Düzey IV.

INTRODUCTION

Spinal cavernomas are rare pathologies that account 5 % to 12 % of spinal vascular abnormalities ⁽³⁾. Risk of hemorrhage ranges between 1.4 % and 4.5 % per patient per year, increasing to 66 % per patient per year in patients with a previous history of hemorrhage ⁽¹⁷⁾. In contrast to the sporadic form, patients suffering from a familial syndrome or genetic alteration are at an increased risk for the development of both cerebral cavernous malformations as well as spinal cavernous malformations ^(4,16). Sensory or motor symptoms are most frequent followed by pain and bladder dysfunction ⁽²⁾.

Since development of ultra-high resolution magnetic resonance imaging (MRI) techniques and modern sequences like susceptibility-weighted imaging (SWI), spinal cavernous malformations can be diagnosed more accurately ⁽⁴⁾.

Surgical management of spinal cord cavernous angiomas is challenging due to the risk of additional neurological deficits ⁽⁸⁾. Surgery of intramedullary lesions has become safer after technical improvements of intraoperative electrophysiology⁽¹¹⁾. We represent a rare illustrative case of thoracic spinal intradural cavernoma associated with multiple intracranial cavernomas.

CASE REPORT:

A 54 years old male patient presented with paresthesia of bilateral upper extremities to our outpatient clinic. Neurological examination was normal except paresthesia. Patient had been send to radiology for diagnostic imaging with MRI.

Cervical MRI showed a lesion at upper thoracic region. A detailed contrast enhanced spinal MRI was made and lesion diagnosed as thoracic intradural cavernoma with axial and sagittal images (Figure-1).

Cranial MRI with SWI was made to diagnose whether the lesions were multiple or not. Cranial MRI reported multiple intracranial cavernomas (Figure-2).

Patient had been followed up for one year with pregabaline treatment. Cavernoma did not grow up and patient's symptoms were decreased with medical treatment so surgery was not suggested.



Figure-1. a) Sagittal thoracic contrast enhanced MRI image with cavernoma at T4, b) Sagittal cervico-thoracic SWAN MRI image, c) Axial SWAN MRI image at T4 level presenting the cavernoma.



Figure-2. Cranial MRI axial images of cavernomas, a) Vertex, b) Left temporal, c) Cerebellum.

DISCUSSION

The entity of spinal intramedullary cavernous malformation was first reported in 1903 in an autopsy study of a 35-year-old woman with a lesion at L_1 that had bled ⁽⁶⁾. Spinal cavernous malformations are rare vascular lesions which may lead to symptoms such as sensory/motor deficits, myelopathy, or para/tetra paresis ^(7,9). Progressive worsening is because of the changes in lesion such as micro hemorrhage, microcirculatory changes, hyalinization, wall thickening, gliosis or partial thrombosis ^(10,13).

Cavernous malformations must remain in the differential diagnosis of intradural intramedullary lesions. The differential includes multiple sclerosis, spinal ependymomas, astrocytomas, metastatic disease, hemangioblastomas, spinal arteriovenous malformations, and transverse myelitis. The deposition of hemosiderin resulting in a hypointense rim around a mixed signal intensity leads to the pathognomonic appearance of cavernous malformations on T2-weighted MRI ^(5,14).

Surgical removal of a symptomatic cavernoma is suggested to prevent further neurological deterioration, but must be weighed against the potential risks of surgery. In 1912 the first successful excision of an intramedullary cavernous malformation was performed that was completely resected and the patient's condition improved postoperatively⁽¹²⁾.

Patients with spinal cavernomas improve after surgery account 59 % to 66 %, and only 6 % have permanent disabling neurological deficits ⁽¹⁵⁾. Intraoperative neuromonitoring is crucial as it helps to avoid neurological deterioration during surgical resection ⁽¹⁾.

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BRIEF REVIEW ON FUNDAMENTALS OF CERVICAL SPINE ALIGNMENT

SERVİKAL SPİNAL DENGE PARAMETRELERİNİN KISA DERLEMESİ

ABSTRACT

The cervical spine where not only loads the mass of the head but also makes the widest range of motion relative to the rest of the spine, plays an important role in influencing subjacent global spinal alignment and pelvic tilt as compensatory changes occur to maintain horizontal gaze. The management of complex cervical pathologies could be handled with understanding of cervical biomechanics as well as the normative data for cervical alignment.

The major parameters used to assess cervical spine alignment include Cobb angles, Jackson stress lines, and Harrison posterior tangent lines for sagittal curvature; gravity line or C-2 plumb line for sagittal vertical axis; and the Chin-Brow to vertical angle for horizontal gaze. Thoracic inlet angle, cervical tilt, neck tilt, and cranial tilt are new parameters that being discussed in the literature for cervical alignment.

Key Words: Cervical alignment, cervical lordosis, sagittal vertical axis

Level of Evidence: Review article, Level V

ÖZET

Servikal omurga sadece kafanın yükünü taşımakla kalmaz, omurganın kalanından daha fazla hareket kabiliyetine sahiptir ve pelvik tilt kadar horizontal dengenin sağlanmasında da önemlidir. Kompleks servikal patolojilerin yönetilmesinde servikal biyomekaniğinin anlaşılması ve normal değerlerine hâkim olunması büyük önem taşımaktadır. Servikal omurga denge parametrelerinde en sık kullanılan parametreler Cobb açısı, Jackson stres çizgileri, Harrison posterior tanjant çizgileri, yerçekimi merkezi veya sagital verteks aksı için C-2 şakül hattı ve kaş-çene hattının vertikal açısıdır. Torasik giriş açısı, servikal tilt, boyun tilti ve kranial tilt ise servikal denge için literatürde tartışılan yeni parametrelerdir.

Anahtar Kelimeler: Servikal denge, Servikal lordoz, Servikal vertikal aks Kanıt Düzeyi: Derleme, Düzey V.

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INTRODUCTION

The cervical spine where not only loads the mass of the head but also makes the widest range of motion relative to the rest of the spine, plays an important role in influencing subjacent global spinal alignment and pelvic tilt as compensatory changes occur to maintain horizontal gaze ⁽²⁰⁾. However, there are few literature that have defined the baseline values for cervical spine alignment.

Indications for surgery to correct cervical alignment are not inspected in the recent publications and there is no set standard to suggest the ratio of correction to be planned. Classifications of cervical deformity have yet to be fully established and treatment options defined and clarified ⁽²⁰⁾.

The management of complex cervical pathologies could be handled with understanding of cervical biomechanics as well as the normative data for cervical alignment. The aim of our paper is to review the cervical alignment parameters in the literature and provide guidance for proper surgical treatment and search the nominative data.

THE PARAMETERS OF CERVICAL SPINE ALIGNMENT

3 Column Theory

Louis defined a 3 column theory for cervical spine in 1985 ⁽¹⁶⁾. Vertebral bodies and discs compose the anterior column and articulating facet joints compose two posterior columns. The weight of the head is transferred to the condyle to the lateral masses of C_1 and then to the C_{1-2} joint. Then load is divided

with the C₂ articular pillars to the anterior column which includes the C₂₋₃ disc and the posterior column which includes the C₂₋₃ facets ⁽¹⁸⁾. The load distribution of the cervical spine is primarily in the posterior columns with the ratios 36 % in the anterior column and 64 % in the 2 posterior columns ⁽¹⁸⁾. The natural curvature of the cervical spine is a lordosis as a result of the wedge shaped cervical vertebrae to compensate for the kyphotic curvature of the thoracic spine⁴. Pathologies of this curvature like loss of lordosis or the development of cervical kyphosis, are associated with neurological symptoms such as pain and disability ^(1,5,8,17,22).

Cobb Angle

Cobb angles are measured from C_1 to C_7 or C_2 to C_7 . The 4-line method includes drawing a line either parallel to the inferior endplate of C_2 or extending from the anterior tubercle of C_1 to the posterior margin of the spinous process, and another line parallel to the inferior endplate of C_7 . Perpendicular lines are then drawn from each of the 2 lines noted above and the angle subtended between the crossing of the perpendicular lines is the cervical curvature angle (**Figure-1**)^(2,9).

Jackson Physiological Stress Lines

The Jackson physiological stress lines method which requires drawing 2 lines, both parallel to the posterior surface of the C_7 and C_2 vertebral bodies, and measuring the angle between them **(Figure-2)**⁽¹¹⁾.



Figure-1. C₂₋₇ Cobb angle

Figure-2. Jackson stress lines angle

Harrison Posterior Tangent Method

Harrison posterior tangent method involves drawing lines parallel to the posterior surfaces of all cervical vertebral bodies from C_2 to C_7 and then summing the segmental angles for an overall cervical curvature angle (**Figure-3**) ⁽⁹⁾.



Sagittal Vertical Axis

Translation of the cervical spine in the sagittal plane is measured through the cervical sagittal vertical axis (SVA). Both C_2 SVA and C_7 SVA have been used to define sagittal alignment globally by measuring the distance between the C_2 and C_7 plumb lines, respectively, from the posterior superior corner of the sacrum. Cervical SVA can also be defined regionally using the distance between a plumb line dropped from the centroid of C_2 (or dens) and the posterosuperior aspect of C_7 (**Figure-4**)⁽²⁰⁾.

Chin-Brow to Vertical Angle

The Chin-Brow to vertical angle (CBVA) is an assessment of horizontal gaze. This measurement is especially useful in the management of severe, rigid, cervical kyphotic deformities, as the loss of horizontal gaze has a significant impact on activities of daily living and quality of life ⁽²¹⁾. The CBVA is defined as the angle subtended between a line drawn from the patient's chin to brow and a vertical line (Figure-5).



Figure-4. Sagittal vertical axis C_2 - C_7 plumb lines distance measurement

The angle is measured on clinical photographs of the patient standing with hips and knees extended while the neck is in a neutral or fixed position ⁽²¹⁾. This parameter is gaining popularity, and deformity correction that has considered CBVA has been shown to be associated with positive postoperative outcomes such as improved gaze, ambulation, and activities of daily living ^(3,12,19,23).



Figure-5. Chin-Brow vertical angle

Thoracic Inlet

The thoracic inlet angle (TIA) was defined as the angle between a line originating from the center of the T_1 endplate and perpendicular to the T_1 endplate and a line from the center of the T_1 endplate and the upper end of the sternum (**Figure-6**)¹⁴.

a vertical line and the other connecting to the center of the $\rm T_{1}$ endplate (Figure-7) $^{(14)}$.

A relationship exists such that thoracic inlet angle equals T_1 slope (T1S) which is the angle between a horizontal plane and a line parallel to the superior T_1 endplate (Figure-8); plus neck tilt. This is similar to the equation in the lumbar spine in which pelvic incidence equals the sacral slope plus the pelvic tilt.



Figure-7. Neck tilt



Figure-6. Thoracic inlet angle

Neck Tilt

Neck tilt was defined as an angle between 2 lines both originating from the upper end of the sternum, with 1 being



Figure-8. T₁ Slope angle

Cervical Tilt

Cervical tilt was defined as the angle between 2 lines, both originating from the center of the T_1 upper endplate; one is perpendicular to the T_1 endplate and the other passes through the tip of the dens (**Figure-9**)⁽¹⁴⁾.



Cranial Tilt

Cranial tilt was defined as the angle between 2 lines, both originating from the center of the T_1 upper endplate, with 1 passing through the dens (same as the second line in cervical tilt) and the other being a vertical line (**Figure-10**)⁽¹⁴⁾.



Figure-10. Cranial tilt

Cervical Lordosis Measurement with $(C_0) - (C_{0-2}) - (C_{2-7})$ Angles

 $\rm C_0$ angle was defined as an angle formed between the Frankfort plane and the McRae line **(Figure-11).** C_{0-2} angle, an angle between the McRae line and the C_2 lower end plate was measured using Cobb method. For the C_{2-7} angle, an angle between the posterior wall of the C_2 vertebral body and the C_7 vertebral body was measured using Gore method ⁽⁶⁾.



Figure-11. C_0 angle

DISCUSSION

Sagittal balance of the cervical spine may affect the clinical outcomes of fusion or deformity correction of cervical spine diseases such as cervical degenerative disc diseases ^(7,15). In the recent studies criteria for physiological reconstruction of cervical spine lordosis remains unclear. Only a few studies define the nominative data's of alignment parameters.

Lee et al. reported the widest range of nominative data for cervical spine alignment in their study $^{(14)}$. They found that the mean values of TIA was 69.5° ± 8.6° and T1S was 25.7° ± 6.4°; neck tiling was 43.7° ± 6.1°; C₀₋₂ angle was 22.4° ± 8.5° and C₂₋₇ angle was 9.9° ± 12.5°. The ratio of the C₀₋₂ angle and the C₂₋₇ angle was 77 % and 23 %, respectively, of the total cervical lordosis (CL). The mean C₀ angle was 9.3° ± 7.3° and cranial offset was 20.9 ± 11.7mm. The mean cervical tilting was 18±6.6 degrees and cranial tilting was 7.7° ± 5°. On the basis of the formula, T₁ slope=cervical tilt + cranial tilt, the ratio of cervical tilting to cranial tilting was 70.2% : 29.8% ⁽¹⁴⁾.

Harrison et al. made a comparison of two techniques which were 4 line Cobb method and Harrison Tangents to measure cervical lordosis⁹. They found that Cobb method at C_1-C_7

overestimated the cervical curvature (-54°) and, at C_2 - C_7 it underestimated the cervical curve (-17°), whereas the posterior Harrison tangents were the slopes along the curve (-26° from C_2 to C_7) ⁽⁹⁾.

Hardacker et al. reported a mean value of C_1 - C_7 lordosis angle -41.8 degree, C_7 sagittal vertical axis mean value 15.6 mm in their study ⁽⁸⁾.

Gore et al. reported C_2 - C_7 cervical lordosis angles of 16 degrees for men and 15° for women ⁽⁵⁾. The mean SVA was reported 16.8 mm. They also suggested that cervical lordosis increased with age but did not address adjacent spinal alignment measures or segmental cervical values ⁽⁵⁾.

The cervical spine carries the load of the head and neck with a 3-column model unlike the 3-column model in the thoracolumbar spine consisting of an anterior and 2 posterior columns. The major parameters used to assess cervical spine alignment include Cobb angles, Jackson stress lines, and Harrison posterior tangent lines for sagittal curvature; gravity line or C₂ plumb line for SVA; and the CBVA for horizontal gaze ⁽¹⁰⁾.

Thoracic inlet angle, cervical tilt, neck tilt, and cranial tilt are new parameters that being discussed in the literature for cervical alignment. It has been shown that these parameters affect the alignment of the cervical spine like T_1 slope and thoracic inlet angle, as they relate to cervical lordosis, are important parameters to consider in optimizing cervical deformity correction ⁽¹³⁾.

Further investigation with increased number of nominative data of the cervical spine is needed especially the relationship between the thoracic and lumbar alignment parameters and more standardized indications for correction of deformities with surgery.

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MEHMET ZILELI: A PIONEER, A MASTER, AND **A MENTOR**

MEHMET ZİLELİ: BİR ÖNCÜ, BİR USTA VE BİR YOL **GÖSTERİCİ**

Sait NADERİ¹

SUMMARY:

Prof. Dr. Mehmet Zileli was born in 1956, in. In 1980, he did graduate from Ege University Faculty of Medicine. He completed his neurosurgery speciality education in the same universiity. He became assistant Professor of Neurosurgery in 1989, associate professor of neurosurgery in 1989, professor of neurosurgery in 1996 in Ege University Department of Neurosurgery, Izmir, Turkey. Since late 1980's he interested to spine surgery. In mid 1990's he completed spine fellowships in USA. He became founding president of Spine section of Turkish neurosurgery society. During the recent 20 years he worked hardly on different aspects of spine surgery. He published many manuscripts and books. He actively worked in many national and international societies and journal. Prof. Zileli has been a good teacher, and mentor who trained many spine surgeons.

Key Words: Prof. Dr. Mehmet Zileli, spinal diseases, spine surgery, Ege University Faculty of Medicine.

Level of Evidence: Biography, Level V

ÖZET:

Prof. Dr. Mehmet Zileli 1956 yılında dünyaya gelmiştir. Dr. Zileli nöroşirürji uzmanlığını aynı kurumda yapmii, 1989'da yardımcı doçent, 1989'da doçent, 1995 yılında profesör olmuştur. Dr. Zileli 1980'li yılların sonlarından itibaren omurga cerrahisine ilgi duymuş, 1990'lı yılların ortasında Amerika Birleşk Devletlerinde omurga cerrahisinde üst eğitim almıştır. Dr. Zileli Türk Nöroşirürji Derneği'nin kurucu başkanı olup, son 20 yılda omurga cerrahisi alanında yoğun olarak çalışmıştır. Dr. Zileli omurga cerahisi ile ilgili birçok makale ve kitap yazmış, birçok ulusal ve uluslar arası dernekte görev almıştır. Prof. Zileli birçok omurga cerrahisinin gelişiminde rol alan iyi bir eğitmen ve mentördür.

Anahtar Sözcükler: Prof. Dr. Mehmet Zileli, omurga hastalıkları, spinal cerrahi, Ege Üniversitesi Tıp Fakültesi

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INTRODUCTION

A great teacher has little external history to record. His life goes over into other lives. These men are pillars in the intimate structure of our schools. They are more essential than its stones or beams, and they will continue to be a kindling force and a revealing power in our lives.

Quotes from emperors' club

It was 1983, when I was student in Ege University school of medicine. At that times, there was final thesis even for medical students. My thesis topic was cerebral and medullar cyst hydatics. I used to call operated cases, and examine them with residents. I met for the first time with Dr. Mehmet Zileli, resident of nerosurgery in Ege University school of medicine, at that time. This started a friendship which increased with the time. Next year, 1984 december, I started to my neurosurgery training programme. However, our firendship continued during last 33 years. These years showed that he was not only a friend, but also a teacher, and a mentor, in the field of spine health care medicine.

As other medical discipline, spine medicine has unique story. Spine surgery develops in many countries as a result of improvements in different surgical disciplines. Previous developments before 1950'ies have not been specialized, except for some developments in specific centers. Spine surgery, as a separate discipline, started to grow after advancements in microsurgery, biomechanics, methalurgy, and imaging. All these advancements changed many concepts in spine surgery. These changes resulted in establishment of new institutions and occurence of new figures in the field of spine surgery. Some of these figures are pioneers. Dr. Mehmet Zileli is among the pioneers in the field of spine surgery. I will try to summarize life, studies and contributions of Dr. Zileli.

LIFE STORY

Mehmet Zileli was born in Kırkağaç, Manisa, Turkey, in November 30, 1956. He did graduate from Ege University Faculty of Medicine, Izmir, Turkey, in 1980. He completed his residency in neurosurgery after working as resident in the Department of Neurosurgery, Ege University Faculty of Medicine, Izmir, Turkey, in years between 1980 and 1986 (**Fig.1**).

After being neurosurgeon he worked as research fellow in different centers, including Department of Neurosurgery, University of Erlangen-Nürnberg, Germany, (with Professor Johannes Schramm, 1987-1988), University of Bonn, Department of Neurosurgery (with J.Schramm June 1991), Division of Neurosurgery, University of New Mexico, Albuquerque, New Mexico, U.S.A. (with Dr.E.C.Benzel, November-December 1996), and Barrow Neurological Institute, Phoenix, Arizona, U.S.A. (with Dr.VKH Sonntag, January 1997).

He became assistant Professor of Neurosurgery in 1989, associate professor of neurosurgery in 1989, professor of neurosurgery in 1996 in Ege University Department of Neurosurgery, Izmir, Turkey, where he worked until 2011 (Fig. 2). He became chairman of the department of neurosurgery between 2009 and 2011, and retired from university position in 2011. Since 2011 he works in private practice.



Figure-1. Dr. Zileli with some residents and professors in Ege University

Figure-2. Dr. Mehmet Zileli

CONTRIBUTIONS OF DR. ZILELI TO SPINE SURGERY

In early 1990s Dr. Erdem Tunçbay, founding chairman of the Department of Neurosurgery in Ege University, encouraged Dr. Zileli to work in the field of spine surgery. Soon, Dr. Zileli started to work in the field of spine surgery. It was the second division of the department after pediatric neurosurgery division. Dr. Zileli answers the question "why did you choose spine surgery?": "I was trained to be a perfect neurosurgeon. I did some research in Germany with Professor Schramm on intraoperative monitoring. My first interest was on neurophysiology, more on electrophysiology. I was too much interested on direct recordings from the brain and spinal cord. I have got a continuing support from Humboldt Foundation and created a Clinical Neurophysiology Laboratory in the department. I had also interest on functional issues and pain. However, as a practicing neurosurgeon the senior members in the department did not allow me to work on the brain. Being a brain surgeon, operating on cerebral aneurysms were a much privileged area. They left me the spine surgery, which was a quite neglected discipline compared to others. After being an associate professor in 1989, I gave most of my power to learn and practice spine surgery. In the following years, it did not make me dissappointed. By the years, spine surgery among Neurosurgeons reached a more privileged place".

Working in a specific branch made him think about the possibility of his role in the field of spine surgery in Turkey. Therefore, he and Dr. Fahir Özer have started the steps by applying to Prof. Dr. Yücel Kanpolat, President of Turkish Neurosurgical Society, to establish spine section under the umbrella of the society. This application was accepted and the spine section was established in 1995. Dr. Zileli was the founding president of the spine section of the Turkish Neurosurgical Society. Soon after, first symposium of the Spine Section was held in 1996 in Izmir. This was the first step of the hard working in this field. The first hands on courses have aimed to teach pedicle screw fixation, fusion techniques to neurosurgeons. Dr. Zilelli remarks "Until late 1989s, neurosurgeons were mainly performing decompressive surgeries. It was important because there were many neurosurgery departments that were performing simple laminectomy after trauma and scheduuling a fixation/fusion surgery to another stage. These courses change this situation.

He organised many basic and advanced spine courses (16 courses since 1997) (**Fig. 3**). Izmir courses are now an advanced spine course, and Turkish Neurosurgical Society has declared the name of the course to be "Dr. Mehmet Zileli Advanced Spine Course". He was selected as director of the host institute of "Travelling Fellowship of Spine Society of Europe", 2002, 2003, 2004, and director of the "Spine Fellowship Programs for Neurosurgeons" since 1996. Ege Neurosurgery Department has been the first neurosurgery department that pioneered training and education of many fellows. Even after leaving the university those efforts have continued and he has trained 35 national and 44 international fellows. He organised Aegean Spine Review 2003, 2005 and 2010 "Cadaver Course and Symposia", Izmir: in colloboration with Cleveland Clinic, Ege University, and Dokuz Eylül University (**Fig. 4**).



Figure-3. Zileli during one of spine courses in Ege University

Figure-4. Zileli during hands-on course with Clevelan Clinic performed in Ege University

Dr. Zileli published many manuscripts and books (**Table-1**). Dr.Mehmet Zileli and Dr.Fahir Ozer have edited a multiauthor spine book first in 1997. Third edition of the book was published in 2014 with three volumes. This book has been widely accepted as a reference for many surgeons.

Table-1. Books edited, co-edited or authored by Dr. Mehmet Zileli

- 1. Ertekin C, <u>Zileli M</u>, Ertaş M. **Motor Evoked Potentials** (Turkish) Publications of the Association of Clinical Neurophysiology and EEG-EMG. No:1, İzmir, 1992
- 2. <u>Zileli M</u>. Electrophysiological Monitoring Techniques in Neurosurgery. (Turkish) Publications of the Society of Clinical Neurophysiology and EEG-EMG, No:3, İzmir, 1994
- 3. Zileli M, Özer F. Spine and Spinal Cord Surgery. (Turkish) 1st Edition. Saray Med. Publ, İzmir, 1997
- 4. Zileli M, Özer F. Spine and Spinal Cord Surgery. (Turkish) 3rd Edition., 2014
- 5. Demircan N, Zileli M. Peripheral Nerve Surgery. (Turkish) Turkish Neurosurgical Society Publications, No:6, 2008,
- 6. Korfalı E, <u>Zileli M</u>. **Basic Neurosurgery**. (Turkish) Turkish Neurosurgical Society Publications, No:10, 2010, ISBN: 978-605-4149-04-9
- 7. Ramani PS, Shoda M, <u>Zileli M</u>, Dohrmann GJ. **Surgical Management of Cervical Disc Herniation**. Jaypee Med Pub, New Delhi, 2012

His training efforts have also evolved in international level (**Fig.5**). He has been the chairman or moderator in many spine courses and cadaver workshops in Pakistan, India, Indonesia, Bangladesh, and a resident course in Berlin. One such efforts was to establish the Middle East Spine Society in 2011. After organizing two congresses of the Middle East Spine Society, he is organizing an advanced international course called "Istanbul Spine Masters".



Figure-5. Dr. Zileli and Dr. Benzel

He responded to my question "Do you think we as spine surgeons in Turkey have reached a satisfactory level? What is the future of spine surgery?"

"This is a difficult question to answer. The level of spine surgery has improved a lot during the last 20 years. However, there are many critics that some surgeries are with wide indications, and there are many unnecessary applications of spinal implants. Such critics are not just in our country, but international level. Such conditions may only be avoided by more training. Fellowship programs must be improved, courses and cadaver workshops in the hands of societiees, not by companies must be increased. I also criticise the training if it is done with the images of the patients. General level of spine surgery in Turkey is quite advanced bot in the hands of neurosurgeons and orthopedic surgeons. For that reason, we can play a role in improving the spine surgery and train the surgeons in Middle East region and some other resource challenging countries.

The future of the spine surgery will be affected by many issues. Aging populations will force us to apply more surgeries in elderly, which is full with traps. I also have some bad expectation for the future, since we do not improve our skills of choosing proper patients for surgery and getting less patient cooperation, relying more on the imgaes. Another future expectation is that I believe the spine will be a discipline, not a supspecialty under neuro or ortho surgery." he said.

He has memberships in many international spine societies (Table-2):

He was appointed in many societies, and worked hard for advancements in spine surgery worldwide.

Current appointments of Dr. Zileli are as follows:

Honorary President, Middle East Spine Society (2015-Present) Executive Committee Member World Federation of Neurosurgical Societies Spine Section, 2009-present

Executive Committee Member World Federation of Neurosurgical Societies Training and Education Committee, 2009-2013

Executive Committee Member, Asian Congress of Neurological Surgeons, 2009-Present

Executive Committee Member, Asia-Pacific Cervical Spine Society, 2009-Present

Executive Committee Member, AOSPine Turkey (Neuro Education), 2013-Present

Honorary President ISMISS Turkey Congress, 2015, 2016

Table-2. Memberships of Dr. Zileli

Memberships in International Societies:

World Spinal Column Society (WScS) (President, 2011-2014) Middle East Spine Society (President, 2011-2015) Asia Pacific Cervical Spine Society (APCSS) (Ex-com member) American Association of Neurological Surgeons (AANS) Congress of Neurological Surgeons (CNS) Deutsche Gesellchaft für Neurochirurgie (German Neurosurgical Society) European Association of Neurosurgical Societies (EANS) Individual Member Spine Society of Europe (SSE) North American Spine Society (NASS) Cervical Spine Research Society (CSRS) International Medical Society of Paraplegia (IMSOP) International Association for the Study of Pain (IASP) International Brain Research Organisation (IBRO) **ARGOS** Society AO Spine Society International Society for Minimal Intervention in Spinal Surgery (ISMISS) Asian Congress of Neurosurgery (ACNS) International Society for the Advancement of Spine Surgery (ISASS) The Mediterranean Association of Neurological Surgeons (Founding member)

Memberships in National Societies:

Turkish Neurosurgical Society Spine and Peripheral Nerve Section of the Turkish Neurosurgical Society Turkish Spine Society (TSS) Turkish Society of Spinal Cord Diseases (TrSCD) Turkish Society of Clinical Neurophysiology and EEG-EMG Turkish Society of Brain Research and Neuroscience (TÜBAS) Turkish Neuroscience Society Turkish Society of Pain Turkish Society of Pain Turkish Society of Emergency Medicine (ATD) Turkish Society of Spinal Cord Paralysed (OFD) Turkish Society of Neurooncology Ege Medical Faculty Social Support and Aid Society Ege Faculty Members Society Humboldt Scholars Society

His previous spine appointments are as following: Program Chairman, World Spine IV Congress, Istambul, Turkey, 2007 Founding President, Spine Section of Turkish Neurosurgical President, Turkish Neurosurgical Society, 2006-2008 Society, 1995-1999 First Vise Chairman, World Spine Society, 2007-2008 Vise President, Turkish Society of Clinical Neurophysiology President, 6th Black Sea Neurosurgical Congress, 2009, and EEG-EMG, 1993-1995 Istanbul, Turkey Member, Turkish Neurosurgical Society Long Term Planning Vise President, World Spinal Column Society 2009-2010 Committee, 2001-2004 President, Turkish Neurosurgery Board, (2010-2012) Member, Spine Society of Europe, Educational Committee, Chairman, 1st Middle East Spine Meeting, Istanbul, Turkey, 2011 2004-2006 Chairman, 9th Asian Congress of Neurological Surgeons Executive Committee Member, Treasurer, World Spine (ACNS), 2012, Istanbul, Turkey Society 2003-2009

Chairman, 2nd Middle East Spine Meeting, Izmir, Turkey, 2013 President, World Spinal Column Society (2010-2014) President, Middle East Spine Society, (2011-2015)

Awards and Grants:

Dr. Zileli gained many grants and awards in the field of spine surgery (Fig. 6)(Table-3).

He is also member of advisory board - editorial committee – reviewer in many medical Journals, listed below:



Figure-6. Dr. Zileli during award ceremony

Table-3. Awards and Grants of Dr. Mehmet Zileli

- 1974-1980, Educational grant of "Turkish Scientific and Technical Research Council" for university students
- 1987-1988, Research grant of Alexander von Humboldt Foundation, Bonn, Germany, "Spinal Cord Monitoring"
- 1989, Second prize winner of "Poster Presentations Award" of 40th Congress of German Neurosurgical Society
- 1989, First prize winner of a national award, "Neurological Sciences Research Competition"
- 2005, First prize winner of a Best Poster Award "Cervical Spine Research Society, European Section" Meeting in Rome Italy
- 2009, Best Research Paper Award, Federation of Turkish Pathology Societies, Turkish Journal of Pathology

2009, Honorary Member "Indian Neurospinal Foundation" 2010, Turkish Neurosurgical Society Outstanding Service Award

Journals listed in SCI-expanded

Turkish Clinics 2008-2013 (Editor of Neurosurgery) Turkish Neurosurgery 2003-present (Editorial Board Member) The Spine Journal 2011-present (Editorial Board Member) Journal of Craniovertebral Junction and Spine, 2009-present (Editorial Board Member) Journal of Neurological Sciences (Turkish) 2003-Present (Advisory Board member) Spine Journal, 2004-present (Reviewer) Spinal Cord (Reviewer) European Spine Journal (Reviewer) Central European Neurosurgery 2007-present (Reviewer) Acta Neurochirurgica 2008-present (Reviewer) Child's Nervous System 2010-present (Reviewer) Asian Journal of Neurosurgery (Reviewer) International Journal of Orthopaedics, 2014-present (Editorial Board Member) Spinal Cord Series and Cases (Reviewer) International J of Integrated Health Sciences (Editorial Board Member) Asian Spine J (Editorial Board Member) Neurosurgical Review (Reviewer) European Spine Journal (Assistant Editor) World Journal of Orthopedics (Reviewer) Moroccan J Neurosurg (Editorial Board Member) Saudi Medical J (Reviewer) World Neurosurgery (Reviewer, Art Director) The Journal of Spinal Surgery (Reviewer)

Other Journals

World Spinal Column Journal, 2009 present (Editorial Board Member) Journal of Neurosciences in Rural Practice (Editorial Board Member) Journal of Spine Surgery (India), 2009-present (Editorial Board Member) Pakistan Journal of Neurological Surgery, 2011-present (Reviewer) The Journal of Turkish Spinal Surgery 2004-present (Editorial Board Member) Turkish Journal of Emergency Medicine 2005-present (Editorial Board Member) Ege Medical Journal 2004-present (Editorial Board Member) Adnan Menderes University Medical Journal 2007-present (Editorial Board Member) Trakya Medical Journal 2007-present (Reviewer) Literature Journal 2006-present (Editorial Board Member) Medimagazin (Column author) Medical Sciences (Reviewer) He is currently art director of World Neurosurgery (Fig. 7). He

is married, with Berna Zileli and has two children, Başak and Ekin (**Fig. 8,9**). He can speak Turkish (native), English and German in fluent level. Some of his studies and contribution were listed in reference list.

Last Words

This study confirms that Dr. Zileli worked in all fields of spine surgery since early 1990's, as surgeon, as teacher, as academician, and as mentor. He has been Pioneer of many aspects of spine surgery in our country, particularly among neurological spine surgeons. His contributions enlighted the road of many young surgeons.



Figure-7. One painting painted by Dr. Zileli in the cover of World Neurosurgery



Figure-8. Dr. Zileli and his wife Berna Zileli



Figure-9. Dr. Zileli and his wife Berna Zileli

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CME QUESTIONS / STE SORULARI

1- Which paramaters of the below had been measured in the study of Yılmaz et al.

- a) Pelvic incidance
- **b)** Lumbar lordosis
- c) Thoracic kyphosis
- **d)** T-1 slop angle
- e) None of above
- 2- How many normal healthy patients had been evaluated in the study of Yılmaz et al?
 - **a)** 10
 - **b)** 20
 - **c)** 30
 - **d)** 40
 - **e)** 50
- 3- Which sentence of the below is true according to the second study of Yılmaz et al?
 - **a)** C0 inclination angles has been increased.
 - **b)** CO-C2 angle has been decreased.
 - c) T1 slope angle has been decreased.
 - d) Cervical lordosis has been unchanged.
 - **e)** Degenerative disc disease effect sagital plane parameters of the subaxial region

4- How many patients with the degenerative disc disease was evaluated in the second study of Yılmaz et al?

- **a)** 30
- **b)** 40
- **c)** 50
- **d)** 60
- **e)** 70
- 5- Which parameters below had been changed with the statistically significance according to the study of Er *et al*?
 - **a)** C0 inclination angle
 - **b)** CO-C2 angle
 - c) C7-T1 local sagittal contour
 - d) T1 slope angle
 - e) Cervical lordosis

6- How many male patients had been evaluated in the study of Er *et al*?

CME QUESTIONS / STE SORULARI

- **a)** 14
- **b)** 24
- **c)** 34
- **d)** 44
- **e)** 54

7- How many complex operation had been performed according to the study of Gerilmez *et al*?

- **a)** 17
- **b)** 37
- **c)** 37
- **d)** 47
- **e)** 57

8- Which sentence below was true according to the study of Gerilmez *et al*?

- a) It has been observed that surgical instruments may not be contaminated with airborne particles.
- **b)** Great attention must be given to appropriate behavior regarding contamination in the operating room,
- c) Activity must be kept to a minimum,
- d) Doors must be controlled.
- e) All of the sentence above
- 9- How many cases had been evaluated for the sexual function in the study of Onen *et al*?
 - **a)** 50
 - **b)** 40
 - **c)** 30
 - **d)** 20
 - **e)** 10
- 10-Which percentages of the patients with the sexual disfunction due to herniation of cervical disc below has been calculated in the study of Onen *et al*?
 - **a)** 17.2 %
 - **b)** 34.5 %
 - **c)** 58.6 %
 - **d)** 65.6 %
 - **e)** 78.1 %

JTSS 27(3) issue CORRECT ANSWERS OF CME QUESTIONS:

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


Yer: Taksim Acıbadem Hastanesi, Taksim, İstanbul.

19 EKİM 2016 - Çarşamba, Saat: 19.00 / *"Omutga Travmaları: Stabil Burst Kırığı"* Moderatör: Teoman Benli Deneyim 1: R. Erden Ertürer (Konservatif tedavi) Deneyim 2: Onat Üzümcügil (Cerrahi tedavi) Kanıt ve Olgu Sunumu: Sinan Erdoğan

16 KASIM 2016 - Çarşamba, Saat: 19.00 *"Omurga Enfeksiyonları: Postoperatif Enfeksiyonlar"* Moderatör: Mehmet Tezer Deneyim 1: Derya Bayırlı Turan (Medikal tedavi) Deneyim 2: Halil Burç (Cerrahi tedavi) Deneyim 3: Aydın Gözü (Rekontrüksiyon teknikleri) Kanıt ve Olgu Sunumu: M.Nuri Erdem

21 ARALIK 2016 - Çarşamba, Saat: 19.00 "Omurga Tümörleri: Metastatik Omurga Tümörleri" Moderatör: Ufuk Aydınlı Deneyim 1: Mehmet Aydoğan-cerrahi tedavi Deneyim 2: Tayfun Hancılar Kanıt ve Olgu Sunumu: Yunus Emre Akman 18 OCAK 2017 - Çarşamba, Saat: 19.00

"Büyüyen Omurga: Adölesan idiopatik skolyozda füzyon seviyesi seçimi, sınıflama

Moderatör: Ünsal Domaniç

Deneyim 1: Meriç Enercan

Deneyim 2: Fatih Dikici

Kanıt ve Olgu Sunumu: Seçkin Sarı

15 Şubat 2017 - Çarşamba, Saat: 19.00

"Yaşlanan Omurga: Osteoporozda fiksasyon teknikleri, osteoprozun medikal tedavisi".

Moderatör: Cüneyt Şar

Deneyim 1: Çağatay Öztürk (Cerrahi tedavi)

Deneyim 2: Refik Tanakol (Medikal tedavi)

Kanıt ve Olgu Sunumu: Hilmi Karadeniz

15 Mart 2017 - Çarşamba, Saat: 19.00

"MIS: Dejeneratif Omurga ve MIS Uygulamaları, Girişimsel algoloji teknikleri"

Moderatör: Murat Bezer

Deneyim 1: Gül Köknel Talu

Deneyim 2: A. Akın Uğraş

Kanıt ve Olgu Sunumu: Turgut Akgül

12 Nisan 2017 - Çarşamba, Saat: 19.00

"Erken Başlangıçlı Skolyoz: Tanı ve Tedavi yöntemleri"

Moderatör: Onat Üzümcügil

Deneyim 1: Muharrem Yazıcı

Deneyim 2: Mehmet B. Balioğlu

Kanıt ve Olgu Sunumu: Murat Korkmaz

13 Mayıs 2017 - Cumartesi, Saat: 19.00 / Yer: Trakya Üniversitesi, Edirne "Spinal Kord Yaralanmaları Paneli"

Koordinatör: Cumhur Kılınçer

14 Haziran 2017 - Çarşamba, Saat: 19.00 Nöromonitorizasyon

Moderatör: Alpaslan Şenköylü

Deneyim 1: Alpaslan Şenköylü

Deneyim 2:Murat Binnuroğlu

Kanıt ve Olgu Sunumu: İsmail Oltulu

DÜZENLEME KURULU

- Dr. Onat ÜZÜMCÜGİL (Başkan)
- Dr. Mehmet AYDOĞAN (Önceki Başkan)
- Dr. Halil BURÇ (Sekreter)
- Dr. Erden ERTÜRER
- Dr. Ali Akın UĞRAŞ
- Dr. Mehmet Bülent BALİOĞLU
- Dr. Fatih DİKİCİ
- Dr. Cumhur KILINÇER

KURUCU BAŞKAN

Dr. İ. Teoman BENLİ

* Bu toplantılar Türk Ortopedi ve Travmatoloji Birliği Derneği (TOTBİD), Türk Omurga Derneği (TOD) tarafından desteklenmektedir.