

# Evaluation of Congenital Lumbosacral Malformations and Neurological Findings in Patients with Low Back Pain

## Bel Ağrılı Olgularda Saptanan Nörolojik Bulgu ile Konjenital Lombosakral Anomalilerin Değerlendirilmesi

### ABSTRACT

**AIM:** To investigate the correlation of congenital lumbosacral abnormalities with neurological signs in young patients with low back pain (LBP)

**MATERIAL and METHODS:** The study included 401 patients with LBP that lasted longer than 2 weeks. All cases were screened by standard lumbosacral x-rays for the presence of the most common congenital vertebral abnormalities i.e. spina bifida occulta (SBO) and transitional vertebra (TV). Patients were divided into two groups according to presence of a neurological sign. Patients with a neurological sign were referred for computerized tomography and/or magnetic resonance imaging.

**RESULTS:** Sixty-two patients had a neurological sign. Congenital vertebral abnormalities were detected in 52 patients (12.1%); 34 of these (8.5%) were spina bifida, whereas 18 (4.5%) were transitional vertebra. SBO was most commonly observed at the S1 level (30 patients). No correlation for SBO or TV was determined in patients with and without neurological signs but these groups showed significant difference for disc herniation in CT or MRI (P=0.001). Congenital abnormalities had no correlation with disc herniation in CT or MRI.

**CONCLUSION:** LBP in young adults with TV or SBO showed no correlation with neurological signs. Therefore patients with prolonged LBP that present with neurological signs may be scheduled for CT and/or MRI, but reevaluation of the patient with psychometric tests is recommended if there is no neurological sign.

**KEYWORDS:** Low Back Pain, Spina Bifida Occulta, Transitional Vertebra

### ÖZ

**AMAÇ:** Bel ağrısı olan genç nüfusta kongenital vertebral anomali ile nörolojik bulgular arasındaki ilişkiyi değerlendirmek.

**YÖNTEM ve GEREÇ:** 2 haftadan daha uzun süredir bel ağrısı yakınımı olan 401 hasta çalışmaya alındı. Olguların hepsi standart ön-arka ve lateral lombosakral grafi ile en sık görülen kongenital vertebral anomalilerinden; Spina bifida okulta ve Transizyonal vertebra açısından değerlendirildi. Hastalar nörolojik bulgusu olup olmamasına göre 2 gruba ayrıldı Nörolojik bulgusu olan hastalar ek olarak bilgisayarlı tomografi ve/veya magnetik rezonans görüntüleme yapıldı.

**BULGULAR:** Nörolojik bulgusu olan hasta sayısı 62, Konjenital anomali olan hasta sayısı 52 (%12,1), bu hastaların 34 (%8,5)'ünde spina bifida, 18 (%4,5)'inde transizyonal vertebra saptanmıştır. SBO en çok S1 düzeyinde (30 hastada) izlenmiştir. Nörolojik bulgusu olan ve olmayan gruplar SBO ve TV açısından karşılaştırıldığında korelasyon bulunmaz iken, iki grup arasında disk herniasyonu açısından BT ve MRG'de anlamlı fark bulunmuştur (P=0,001) Konjenital anomali ile BT ve MRG'de disk herniasyonu arasında korelasyon bulunamadı.

**SONUÇ:** Genç erişkinde bel ağrısı; TV ve SBO yönünden ele alındığında nörolojik bulgulara yol açtığı izlenmemiştir. Dolayısıyla uzamış bel ağrılı hastaların değerlendirilmesinde; nörolojik bulgu saptanmış ise ileri BT ve/veya MRG gibi inceleme yöntemleri planlanmalı ancak nörolojik bulgu saptanmamışsa psikometrik testler ile hastaların yeniden değerlendirilmesinin uygun olacağı kanatındeyiz.

**ANAHTAR SÖZCÜKLER:** Bel Ağrısı, Spina Bifida Okulta, Transizyonal Vertebra

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## INTRODUCTION

Low back pain (LBP) is a very common disorder that affects the whole population, but it is frequently observed in patients 30 to 50 years of age, and exhibits particular importance as a cause of significant workday loss; however no pathology can be demonstrated in 85% of the patients that present with LBP. "Mechanical low back pain" constitutes more than 97% of common LBP. Bones, intervertebral discs, joints, ligaments that form the spine and degenerative changes of these structures are considered to be responsible. Congenital abnormalities of the spine are responsible for less than 1% of LBP (6).

Spina bifida (SB) and transitional vertebra are the two most common congenital vertebral abnormalities. Both frequently involve the fifth lumbar vertebra. Spina bifida occulta (SBO) is caused by failure of fusion between posterior vertebral elements without affecting the spinal cord or meninges. It is usually observed at the fifth lumbar vertebra and/or upper one or lower two sacral vertebrae (13). Although its prevalence ranges from 0.6 to 25%, fusion of the posterior elements can develop at later ages during growth of the bones (16). Therefore, it is rather considered an incidental finding.

Lumbosacral transitional vertebra (TV) is defined as congenital lengthening of the transverse process of the fifth lumbar vertebra and its fusion with the first sacral segment (sacralization). Similarly, presence of abnormal transverse processes in the first sacral segment that resemble that of lumbar vertebra (lumbalization) is another, but less common, type of TV (3,7). Its frequency in the normal population ranges from 4 to 24% but it may be present in up to 16-30% of patients with low back pain. It is therefore a congenital abnormality blamed more often in the etiology of low back pain.

This study investigated the correlation of low back pain with common congenital vertebral abnormalities, i.e. SBO and TV, in young adults between 20 and 30 years of age.

## MATERIALS and METHOD

The study included 401 young male adults that presented with LBP between November 2006 and June 2007. The mean age of the patients was 21.1 years (range 20 to 30 years). Patients had LBP for at least 2 weeks. All patients were assessed through a

standard protocol including history, physical examination, complete blood count, CRP, sedimentation rate and anteroposterior and lateral x-rays. Patients with scoliosis, traumatic vertebra fracture, spondylolisthesis, previous spine surgery, rheumatoid arthritis, ankylosing spondylitis and any systemic disease that could affect CRP values were excluded from the study.

Patients were divided into two groups as having a neurological sign or not. Patients that showed abnormal straight leg raising test and deep tendon reflexes, radicular sensory or motor loss were included in the group with neurological signs. Patients in the second group had no neurological sign. Anteroposterior and lateral x-rays of lumbosacral vertebra were taken in all cases. Computerized tomography and magnetic resonance imaging was performed for patients with a neurological sign. All acquired images were evaluated by a radiologist blinded for physical examination and laboratory results.

The t-test and Mann-Whitney test were used to compare the groups and a p value less than 0.05 was accepted as significant.

## RESULTS

The study included a total of 401 young male patients with a mean age of  $21.1 \pm 0.1$ . Sixty-two (15.5%) patients had a neurological sign. Congenital abnormalities were detected in 52 patients (12.1%), 34 (8.5%) of which were spina bifida and 18 (4.5%) were transitional vertebra (Table I). SBO was most commonly observed at the S1 level (30 patients).

Patients with and without neurological signs showed no correlation for the presence of SBO or TV, but a significant difference was observed between these groups for disc herniation in CT and MRI ( $P=0,001$ ) No correlation was observed between congenital abnormalities and the presence of disc herniation in CT or MRI.

## DISCUSSION

More than 90% of non-specific LBP cases resolve spontaneously within two weeks. Prolonged LBP has a higher tendency for recurrence, thus disturbing the quality of life and leading to workday loss. Our study involved 401 symptomatic patients that suffered from LBP with no identified etiology such as scoliosis, traumatic vertebra fracture, ankylosing spondylitis or rheumatoid arthritis. All cases were examined for the presence of congenital vertebral

**Table I.** Distribution of congenital abnormalities according to the presence of a neurological sign

	No congenital abnormality	Congenital abnormality present		Total
		TV	SBO	
With neurological sign	58	1	3	62
Without neurological sign	291	17	31	339
<b>Total</b>	<b>349</b>	<b>18</b>	<b>34</b>	<b>401</b>

abnormalities and correlation of these abnormalities with the presence of neurological signs was investigated.

Although there are studies that have investigated whether SBO or TV increases tendency to LBP, their results are controversial. Some authors state that SBO and TV are incidentally diagnosed and have no clinical impact (12,17) whereas others claim that these abnormalities may predispose to certain clinical disorders (2,11). In their study including randomly selected patients aged from 18 to 55 years, Frymoyer et al. have determined similar rates of radiological abnormalities in three groups of patients with no LBP, moderate LBP and severe LBP (8). Similarly Otani et al. have reported the incidence of transitional vertebra to be 13% in patients with LBP and 11% in the control group (11). In the general population, the incidence of TV ranges from 4 to 24%, and SBO ranges from 17 to 30% (4,9). Our incidence of TV and SBO was 4.5% and 8.5% respectively.

SBO has been accused as the cause of LBP due to pressure of spinous processes of the fifth lumbar vertebra on nerve roots during extension through compression of spinous processes over the membrane closing spina bifida (1). Additionally, lack or hypoplasia of posterior elements in SBO may increase the stress on pars interarticularis and lead to acquired deformities such as isthmic spondylolisthesis (14). Studies on children with SBO have suggested that new bone formation may occur with increasing age and the defect on posterior arc may be filled up (15). Avrahami et al. reviewed the lumbosacral CT images of 1200 patients aged 18 to 72 years and reported a higher incidence of SBO at the S1 level in young adults which later was found to decrease with increasing age (2). In our study, SBO was detected in 34 (8.47%) of 401 adults aged 20 to 30 years. SBO was present in 3 of the 62 patients with a radicular sign (4.83%) and 31 of the 339 patients (9.14%) with no radicular sign. Spondylolisthesis

was not observed in any of the patients with SBO. However long-term follow-up is required to demonstrate this degenerative disorder.

Amongst the congenital abnormalities, TV is accused more often of causing LBP and nerve root findings due to accompanying disc hernia (5, 16). Similar to hypermobility of spinal segments adjacent to a block vertebra or fusion, loss of motion at the L5-S1 disc level due to sacralization causes flexion to occur at the more mobile L4-5 level. Hypermobility of the segment adjacent to TV increases the facet joint wear and disc degeneration which in turn leads to stenosis of spinal canal and neural foramina (4,7,10). However, this degenerative process involving discs adjacent to TV requires a long period before any finding is observed. Otani et al. have reported the mean age of the patients with TV and disc herniation to be 35 years (11). In our study, TV was observed in 17 (5.01%) of the 339 patients with no radicular sign and only in one (1.61%) of 62 patients with a radicular sign.

In conclusion, although an objective basis has been searched for the subjective symptom of LBP, TV or SBO was not found to cause neurological findings in young adults. Patients with prolonged low back pain may therefore be scheduled for CT and/or MRI if a neurological sign is determined, but reevaluation of the patient with psychometric tests is recommended in the absence of a neurological sign.

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