Original Article

ANATOLIAN CURRENT MEDICAL

DOI: 10.38053/acmj.1353209

Anatolian Curr Med J. 2023;5(4):470-472

The prevalence of anomalies in the lumbar spine in the Turkish male population

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Cite this article as: Kurtuluş B, Atlı OY, Duman E. The prevalence of anomalies in the lumbar spine in the Turkish male population. *Anatolian Curr Med J.* 2023;5(4):470-472.

Received: 31.08.2023 ◆ **Accepted**: 25.09.2023 ◆ **Published**: 27.10.2023

ABSTRACT

Aims: It was aimed to determine the prevalence of lumbosacral anomalies in young male population.

Methods: 56.798 male patients, between 18-49 years old, were included in this study during their medical screening in Dışkapı Yıldırım Beyazıt Training and Research Hospital from July 2016-July 2020. The presence of spina bifida occulta (SBO) and transitional vertebrae (TV) anomalies were recorded in the candidates. SBO patients were evaluated according to their S1 and L5 origins, and TV patients were evaluated separately according to sacralization and lumbarization. We identified transitional vertebrae by counting down from the last thoracic vertebra on the AP X-rays, then if necessary looking at the lateral view for confirmation. If hypoplastic ribs were identified, the vertebra immediately beneath would be designated as L1. Castellvi types I, II, III, and IV were included as transitional states.

Results: 56798 patients were evaluated retrospectively. The mean age of the patients was 23.28 (18-49 years). Radiological anomalies were detected in 2577 (4.5%) of 56798 cases. No radiological anomaly was observed in other cases. Spina bifida occulta was detected in 1478 (2,6%) patients. Lumbosacral transitional vertebrae were detected in 1099 cases (1.9%). 745 (1.3%) of these anomalies are sacralization and 354 (0.6%) of them are lumbalization.

Conclusion: In the light of this information, we think that knowing the frequency of lumbosacral anomalies, especially LSVT, in our society should be considered in the evaluation before spinal surgery operations.

Keywords: Lumbar spine, spina bifida occulta, sacralization, lumbalization, transitional vertebra, prevelance

INTRODUCTION

Radiological examination of the lumbosacral region is among the routine examinations in sportsman health screening and before job applications. Spina bifida occulta (SBO) and lumbosacral transitional vertebrae (LSTV) are the most common lumbar vertebral anomalies on routine lumbosacral X-rays.[1]

SBO is a lamina deficiency that does not involve the spinal cord and spinal meninges. The incidence in the population has been reported as 0.6%-25%.[2]

LSTV consists of lumbarization of the uppermost sacral segment or sacralization of the lowest lumbar segment. It includes features of lumbarization of the S1 vertebrae, abnormal articulation, and a squarer appearance of the vertebrae. Sacralization of L5 vertebrae consists of extended longitudinal transverse processes to complete fusion to the sacrum.[3,4]

Young male patients were included in this study because they had medical screening before military service. The presence of lumbosacral anomalies was investigated by routine lumbar X-rays in the candidates. It was aimed to determine the prevalence of lumbosacral anomalies in young male population.[5,6]

METHODS

The study was carried out with the permission of Dışkapı Yıldırım Beyazıt Training and Research Hospital Clinical Researches Ethics Committee (Date: 08.02.2021, Decision No: 104/15). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The lumbosacral X-rays taken routinely of the patients who applied for a medical board report before military service in our institution were scanned. All patients over the age of 18 years were included in the study where the joint of the last rib with the vertebral body, all transverse processes and sacral wing were seen on X-ray. Patients

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with a history of surgery in the lumbosacral region were excluded from the study. 56.798 male patients, between 18-49 years old, were included in this study during their medical screening in Dışkapı Yıldırım Beyazıt Training and Research Hospital from July 2016- July 2020. Statistical analysis was performed using SPSS for Windows, version 19 (SPSS Inc, Chicago, Illinois).

The presence of spina bifida occulta (SBO) and transitional vertebrae (TV) anomalies were recorded in the candidates. SBO patients were evaluated according to their S1 and L5 origins, and TV patients were evaluated separately according to sacralization and lumbarization.

We identified transitional vertebrae by counting down from the last thoracic vertebra on the AP X-rays, then if necessary looking at the lateral view for confirmation. If hypoplastic ribs were identified, the vertebra immediately beneath would be designated as L1. Castellvi types I, II, III, and IV were included as transitional states. (**Table 1**)

Table 1. Castellvi radiological classification

Type Ia	One-sided TP height from 19 mm greater or equal
Type Ib	Both sided TP height from 19 mm greater or equal
Type IIa	Presence of unilateral articulation between TP and sacrum
Type IIb	Presence of bilateral articulation between TP and sacrum
Type IIIa	Unilateral fusion of the sacrum with TP
Type IIIb	Bilateral fusion of the sacrum with TP
Type IV	Fusion of one side Type II (articulation) and the other side Type IV
**TP	Lowest lumbar transverse process

RESULTS

56798 patients were evaluated retrospectively. The mean age of the patients was 23.28 (18-49 years). Radiological anomalies were detected in 2577 (4.5%) of 56798 cases. No radiological anomaly was observed in other cases. Spina bifida occulta was detected in 1478 (2,6%) patients. Lumbosacral transitional vertebrae were detected in 1099 cases (1.9%). 745 (1.3%) of these anomalies are sacralization and 354 (0.6%) of them are lumbalization (**Table 2**). According to Castellvi classification in cases evaluated radiologically; Type 1a in 279 patients (37.4%), Type 1b in 149 patients (20%), Type 2a in 130 patients (13%), Type 2b in 89 patients 11.9%, 5.3% Sacralization was detected in 40 patients with Type 3a, Type 3b in 46 patients with 6.1%, and Type 4 in 12 patients with 1.6% (**Table 3**).

Table 3. Prevalence of Castellvi classification

	Sacralization	Percentage
Type Ia	279	37.4%
Type Ib	149	20%
Type IIa	130	13%
Type IIb	89	11.9%
Type IIIa	40	5.3%
Type IIIb	46	6.1%
Type IV	12	1.6%
Total	354	100%

DISCUSSION

This study demonstrates that 2.6% of a large, randomly selected adult male population had spina bifida occulta defects involving the lower lumbar spine or sacrum. The wide discrepancies of prevalence rates in the literature may be attributable to regional and racial variations similar to those in spina bifida cystica.[7] The variation between studies may also reflect a lack of general agreement as to what constitutes a spina bifida occulta defect. The 'minimal defect' may not be universally accepted as a form of spina bifida occulta, being dismissed as representing a small bar of unossified cartilage. Its inclusion is justified by the suggestion that tethering of the cord could occur through such a small defect, making it a finding of potential pathological relevance.[8] Similarly, the 'crossover' defect may not be generally accepted as part of the spina bifida spectrum, although it has been included in some reports where a description of the lesion has been given.[7] The differences in prevalence reported in the literature may also reflect differences in the age and sex patterns of the groups studied. Boone et al.[9] while reporting an initial figure of 22%, noted a significantly higher prevalence in the under 40 years' age group which formed the major part of their study group, which, when corrected, gave a prevalence figure of 17.3% for the population as a whole.

According to studies, the frequency of LSVT in the general population varies between 4% and 35.9%.[10] Such wide variation in LSTV prevalence studies is explained by differences in individual diagnostic and classification criteria, errors in assessment, and confounding factors among the population samples studied.[11] Nardo et al. They evaluated 4636 radiographs and found the prevalence of LSTV to be 18.1%.[12] Many authors in the literature have stated that lumbosacral region anomalies may cause pain complaints by causing changes in spine

Table 2. Distribution of lumbar anomalies

Lumbarization	Sacralization	Transitional	Spina Bifida Occulta	Combined	Total
354	745	1099	1478	173	2577
0.6%	1.3%	1.9%	2.6%	0.3%	4.5%

biomechanics over time. In their study, Eren et al.[13] found the rate of congenital anomalies in the lumbar region to be 20.7% and stated that LSVT was the most common (11.4%) and sacralization was the most common one. In our study, we found a 1.9% prevalence of lumbosacral region anomaly.[14]

LSTV anomaly can be detected by lumbosacral anteroposterior and abdominal radiographs. In the case of lumbosacral transitional vertebrae, sacralization of the L5 vertebra is more common than lumbalization of the first sacral segment. The prevalence of sacralization was reported to be between 1.7% and 14%, while the prevalence of lumbalization was found to be between 3% and 7%. Hahn et al. reported in their study that sacralization was seen more frequently than lumbalization. In our study, similar results were obtained, and the prevalence of sacralization and lumbalization was found to be 1.3% and 0.6%, respectively.[15]

Limitations of our study, clinical complaints were not evaluated in the cases included in the study, diagnosis was made with lumbar anteroposterior radiography and other radiographic methods were not used.

CONCLUSION

In the light of this information, we think that knowing the frequency of lumbosacral anomalies, especially LSVT, in our society should be considered in the evaluation before spinal surgery operations.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Dışkapı Yıldırım Beyazıt Training and Research Hospital Clinical Researches Ethics Committee (Date: 08.02.2021, Decision No: 104/15).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

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