

# MORPHOMETRIC EVALUATION OF LOWER THORACIC AND LUMBAR VERTEBRAE BY CT ANALYSIS

Kemal US \*

Umut BEKTAŞ \*

Şadan AY \*

Ercüment ÇİFTÇİ \*\*

## ABSTRACT:

In Ankara University İbn-i Sina Hospital, between the Clinics of Orthopaedics and Traumatology and Radiology a prospective study was performed, in a study group of randomized 35 patients that were evaluated by CT scan. Some parameters important for transpedicular fixation including cancellous and bicortical transverse and anteroposterior diameter of the spinal canal, distance between the pedicle and anterior border of the corpus vertebrae, anteroposterior, transverse, sagittal diameters of corpus vertebrae and angle of between pedicle and corpus vertebrae were investigated.

Between T-8 and L-5, each vertebrae was analysed and evaluated according to age, sex and localization, in the purpose of minimizing the difficulties during transpedicular fixation.

**Key Words:** Vertebral morphology, pedicular morphology.

## INTRODUCTION

At the present time, transpedicular intervention methods are used by many Orthopaedic surgeons. Although these interventions are so popular, sometimes such complications can be seen;

- 1) Loosening of screws
- 2) Pedicle penetration at the time of intervention
- 3) Fracture of the pedicle
- 4) Vascular or neurologic damage.

Many research are performed with roentgenography, CT scanning and with direct measurement to determine the structural properties of vertebrae.

To have enough knowledge about the pedicle size, the narrowest diameter of cortical and cancellous parts will allow us to use the optimal implants and to minimize the complications.

In this study, we have seen that CT scanning is a quite superior technique to determine the morphologic properties of vertebrae.

## MATERIAL AND METHOD

In Ankara University, İbn-i Sina Hospital, morphologic measurements of between T-8 and L-5 vertebrae of 27 patients and, between L-1 and L-5 vertebrae of 8 patients were done with CT scanning by Orthopaedics and Traumatology and Radiology Departments.

Cancellous and bicortical diameters of narrowest part of pedicles, length of pedicles, angles, pedicle

and vertebral body length throughout the pedicle angles, anteroposterior, transverse diameters and anterior or vertical length of corpus vertebrae, and the anteroposterior and transverse diameters of spinal canal were measured.

Totally 3100 measurements were performed on 30 vertebrae of 35 patients.

The CT Scanner with was used for measurements was G.E.Hi. Speed Advantage Spinal CT.

## RESULTS

### Pedicular Measurements:

The cancellous and bicortical diameters were gradually increasing from T-8 to L-5. Both of diameters were smallest at T-8 and greatest at L-5. The length of pedicle was smallest at T-8, and gradually increasing up to L-4 and minimally decreasing at L-5 throughout the pedicular angle. Pedicular angle was smallest at T-10. The angle at T-9 was more than T-8. The angle of pedicle was getting greater from T-10 to L-5 and greatest at L-5.

### Corpus Measurements:

Transverse diameter was wider anteroposterior diameter and orderly increasing from T-8 to L-5. Greatest diameters were at L-5. Vertical diameters were measured at anterior border of corpus vertebrae and they were gradually increasing from T-8 to L-3. Greatest diameter was belonging to L-3. It was getting smaller from L-3 to L-5. From T-8 to L-5 the difference between transverse and anteroposterior diameters were increasing.

\* Department of Orthopaedics and Traumatology, University of Ankara, İbn-i Sina Hospital

\*\* Department of Radiology, University of Ankara, İbn-i Sina Hospital

### Spinal Canal Measurements:

Transverse diameters were greater than anteroposterior diameters at every level. Transverse diameters were getting greater from T-8 to L-5 and greatest at L-5. Anteroposterior diameter was smallest at T-9 and greatest at L-2, smaller at L-3, L-4, L-5 levels and was not changing. Difference between the diameters were increasing from T-8 to L-5.

Pedicle, spinal canal and corpus vertebrae measurements were not changing significantly depending on age. There were no significant differences between male and female spinal canal diameters.

Also, when regarding the corpus heights, there was no significant difference between male and female but there were between transverse and anteroposterior diameters.

Pedicle and corpus lengths, throughout the pedicular angles were greater in males than in females.

### DISCUSSION

Knowing the structural properties of vertebrae are quite important in vertebral surgery, when regarding the preoperative planning, preventing the intraoperative and postoperative complications, establishing new instrumentational techniques, correcting the disadvantages of present ones.

Transpedicular surgical interventions are performed since many years. But, sometimes because of the discordancy of pedicle and screw sizes, some complications are seen.

In many studies, by using direct radiography, CT scanning and direct measurement methods, pedicle diameters, lengths corpus diameters were investigated.

In direct radiography, the smallest diameter of pedicle cannot be measured. Also to determine the screw length direct radiographic measurements are insufficient. Direct measurements and measurements performed by CT scanning give us sufficient knowledge about the vertebral body, pedicle and spinal canal's sizes. Measurements done with CT are quite sensitive since it does the measurements itself.

CT scanning show us the cancellous and bicortical narrowest diameters of pedicle and this will provide us to use proper screws. If screw diameter is greater than the narrowest diameter, pedicle may be broken or if smaller, loosening of screw may be faced.

By looking at the results of this study; we have seen that our results are concordant with the studies made about the morphologic properties of vertebrae.

CT scanning is a quite sufficient method determine the morphologic properties of vertebrae. It is also useful to determine the proper sized implants will be used in surgical interventions.

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