

Morphometric Analysis of Adult Human Vertebrae: An Institutional Based Study**Vibha Singh^{1*}, Jitendra Singh², Rohin Garg^{3*}, S. K. Jain⁴**¹*MSc (Medical Anatomy), Department of Anatomy, TMMC & RC, Moradabad, Uttar Pradesh, India*²*SMO (UP Health and Family Welfare), Amroha, Uttar Pradesh, India*³*Associate Professor, Department of Anatomy, AIIMS, Rajkot, Gujarat, India*⁴*Professor & Head, Department of Anatomy, TMMC & RC, Moradabad, Uttar Pradesh, India*

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Abstract

Background: The vertebral column is composed of Vertebrae and intervertebral discs. It stretches right from the skull extending upto coccyx. The vertebral body is made up of trabecular bone (comprised of red marrow) surrounded by compact bone layer. Posteriorly and inferiorly, the spinous process projects from vertebral arch. T12 vertebra is exclusive in the sense that it marks the transition from thoracic to the lumbar vertebra. Hence; the present morphometric study was planned for assessing the adult human vertebrae. **Materials & Methods:** A total of 40 dried human lumbar vertebrae were collected. Vertebra with presence of congenital anomaly, disfigured or distorted structure was excluded. Pedicle height and pedicle width of all the specimens were measured. Pedicle height was assessed by measuring points just opposite each other on the upper and lower margins of the Pedicles in the vertical plane. Pedicle width was assessed by measuring the points on the medial and lateral surfaces of each Pedicle at right angle to the long axis of Pedicle. **Results:** A total of 40 dried human lumbar vertebrae were collected. Mean lumbar vertebra height of L1, L2, L3, L4 and L5 was 5.11 mm, 15.56 mm, 14.95 mm, 13.95 mm and 13.65 mm respectively. Mean lumbar vertebra width of L1, L2, L3, L4 and L5 was 8.39 mm, 8.93 mm, 9.42 mm, 10.45 mm and 12.08 mm respectively. **Conclusion:** A constant increase in the mean pedicle width along with decrease in pedicle height is seen lumbar vertebra in the present study.

Keywords: Human Vertebrae, Lumbar.

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Introduction

The vertebral column is composed of Vertebrae and intervertebral discs. It stretches right from the skull extending upto coccyx. It is comprised of cervical, thoracic, lumbar and sacral class. Major functions of the vertebra include spinal cord protection, protection of spinal nerves branching, thorax and abdominal support and allow flexibility. At the same time, it also permits mobility of the body. Role of the intervertebral discs includes mobility without surrendering the supportive power of the vertebra[1-3]. Typical vertebrae are comprised of vertebral body, a vertebral arch and processes. Maximum force exerted on the vertebral column is beard by the body. While moving from superior to inferior, there is a concomitant increase in size of vertebral bodies. The vertebral body is made up of trabecular bone (comprised of red marrow) surrounded by compact bone layer. Posteriorly and inferiorly, the spinous process projects from vertebral arch. T12 vertebra is exclusive in the sense that it marks the transition from thoracic to the lumbar vertebra[4-6]. Hence; the present morphometric study was planned

for assessing the adult human vertebrae.

Materials & methods

The present morphometric study was conducted in Department of Anatomy, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, UP (India) for morphometric analysis of adult human vertebrae. A total of 40 dried human lumbar vertebrae were collected. Vertebra with presence of congenital anomaly, disfigured or distorted structure was excluded. Pedicle height and pedicle width of all the specimens were measured. Pedicle height was assessed by measuring points just opposite each other on the upper and lower margins of the Pedicles in the vertical plane. Pedicle width was assessed by measuring the points on the medial and lateral surfaces of each Pedicle at right angle to the long axis of Pedicle. All the results were recorded and analysed by SPSS software.

Results

A total of 40 dried human lumbar vertebrae were collected. Mean lumbar vertebra height of L1, L2, L3, L4 and L5 was 5.11 mm, 15.56 mm, 14.95 mm, 13.95 mm and 13.65 mm respectively. Mean lumbar vertebra width of L1, L2, L3, L4 and L5 was 8.39 mm, 8.93 mm, 9.42 mm, 10.45 mm and 12.08 mm respectively.

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E-mail: rohingarg99@gmail.com**Table 1: The mean height of pedicle**

Lumbar vertebra	Mean (mm)	SD
L1	5.11	2.12
L2	15.56	2.36
L3	14.95	2.17
L4	13.95	1.81
L5	13.65	1.75

Table 2: The mean width of pedicle

Lumbar vertebra	Mean (mm)	SD
L1	8.39	0.85
L2	8.93	0.96
L3	9.42	1.12
L4	10.45	1.69
L5	12.08	2.37

Discussion

Vertebra is very important component of spine as they are subjected to a number of degenerative, infective, and traumatic spinal conditions. Routine orthopaedic surgical procedures involving spine includes Pedicle screw fixation, Transforaminal Lumbar Interbody Fusion, Anterior Lumbar Interbody Fusion corpectomy etc. The lumbar region has significantly less prevalence of neuropathic lesions and injuries because of fractures in comparison to thoracic region [7-9]. Hence; the present morphometric study was planned for assessing the adult human vertebrae. In the present study, a total of 40 dried human lumbar vertebrae were enrolled. Mean lumbar vertebra height of L1, L2, L3, L4 and L5 was 5.11 mm, 15.56 mm, 14.95 mm, 13.95 mm and 13.65 mm respectively. In a previous study conducted by Choubisa L et al, authors assessed the morphometric norms of Pedicle of the lumbar vertebra. They evaluated a total of 110 dry adult human lumbar vertebrae specimens. The records of the lumbar vertebrae's pedicle were evaluated by them using digital vernier calliper. They observed decrease in height of pedicle from L1 to L5. They observed decrease in the width of Pedicle from L1 to L5 [9]. In the present study, mean lumbar vertebra width of L1, L2, L3, L4 and L5 was 8.39 mm, 8.93 mm, 9.42 mm, 10.45 mm and 12.08 mm respectively. Zhou SH et al in another study reported the database of lumbar spinal characteristics from 126 digitised computed tomographic (CT) images. Mean disc height in the lower lumbar segments was 11.6 +/- 1.8 mm for the L3/4 disc, 11.3 +/- 2.1 mm for the L4/5, and 10.7 +/- 2.1 mm for the L5/S1 level. Their results were priceless in creating an anthropometric model of the human lumbar spine [10]. Wang TM et al, in another study analysed lumbar vertebrae of 126 adult skeletons, 90 Chinese and 36 Indian. The results demonstrated showed that the midsagittal and transverse diameters, the heights of the lumbar vertebral bodies and the interpedicular diameters of the lumbar spinal canals increased progressively from L1 to L5, while the midsagittal diameters of the lumbar spinal canals decreased progressively from L1 to L5 in both Chinese and Indian adult skeletons [11]. In Berry et al, not all pedicle dimensions were measured, and there was insufficient information to calculate lateral vertebral body and disc entry. In Zindrick et al, no information other than for pedicles was provided. The investigation of Van Schaik et al focused on the transverse process structure and dimensions. Other works studied different anatomic spine structures such as the lumbar vertebral canal, as well as the pedicle and vertebra body in different spinal sections, for instance, the cervical spine and the thoracic spine [12-17].

Conclusion

A constant increase in the mean pedicle width along with decrease in pedicle height is seen lumbar vertebra in the present study.

Conflict of Interest: Nil
Source of support: Nil

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