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Original Research Article

A Morphometric Analysis of the Normal Thoracic Vertebral Body in Arid Humans in the Marathwada Region

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Conflict of interest: Nil

Abstract:

Background: Thoracic spine stabilization and correction instrumentation has seen significant advancements in recent years. Currently, infections, fractures, and other illnesses can be successfully treated using artificial vertebral implants. The morphometry of the vertebral body in normal thoracic vertebrae is important since studies indicate that moveable artificial vertebral implants need to be improved.

Objective: Using a digital vernier calliper, measure different aspects of the vertebral body in normal thoracic vertebrae.

Materials and Methods: For the investigation, 75 normal thoracic vertebrae with unknown ages and genders were chosen. A digital vernier calliper was used to take a variety of measurements.

Results: In normal thoracic vertebrae, the superior anteroposterior distance of the vertebral body varied from 14.61 to 31.85 mm, with a mean of 22.37+3.80 mm. With a mean of 23.21 + 3.79 mm, the inferior anteroposterior distance varied from 12.60 to 32.79 mm. The anterior height had a mean of 20.15+2.81mm and varied from 11.92-27.23mm. With a mean of 21.12+2.78mm, the posterior height varied from 12.31 to 27.28mm. With a mean of 20.60+2.84mm, the right lateral height varied from 10.83 to 25.61mm. With a mean of 20.37+2.89mm, the left lateral height varied from 11.31 to 26.76mm. With a mean of 28.25 + 3.56 mm, the superior transverse diameter varied from 18.70 to 34.87 mm. With a mean of 29.65 + 3.82 mm, the inferior transverse diameter varied from 19.75 to 35.58 mm.

Conclusion: In conclusion, the information supplied will serve as a helpful guide for more precise design and modelling of artificial vertebral body implants and apparatus for the Indian population.

Keyword: Typical thoracic Vertebra, Anterior Height, Superior Anteroposterior Distance.

Introduction

One of the most intricate structures in the human body, the adult vertebral column is made up of 33 spinal segments (7 cervical, 12 thoracic, 5 lumbar, 5 scaral, and 5 coccygeal). Numerous ailments, including infections, inflammatory diseases, cancers, fracture, and aberrant curvatures including scoliosis and kyphosis, can affect the vertebrae. Significant advancements have been made in the apparatus used to stabilize and realign the lumbar and thoracic spine in recent years.

The majority of earlier research has mostly concentrated on the angulations and diameters of the pedicles, with the vertebral body receiving relatively little attention. The compressive force in the thoracic curvature1 centers on the vertebral bodies. Similarly, a change in the curvature of the vertebral column may induce a change in the quantity of compressive force that is distributed between the body and arch, altering the structure and shape of the vertebral column in the thoracic region. The vertebral body has been given priority in this study due to the complexity of the thoracic spine.

Materials and Methods

75 typical thoracic vertebrae from different colleges in the Marathwada region's anatomy departments were used in the study. The age and sex of the intact vertebrae were unknown.

A serial number was assigned to every vertebra. These specimens were measured anatomically with a computerized Vernier calliper.

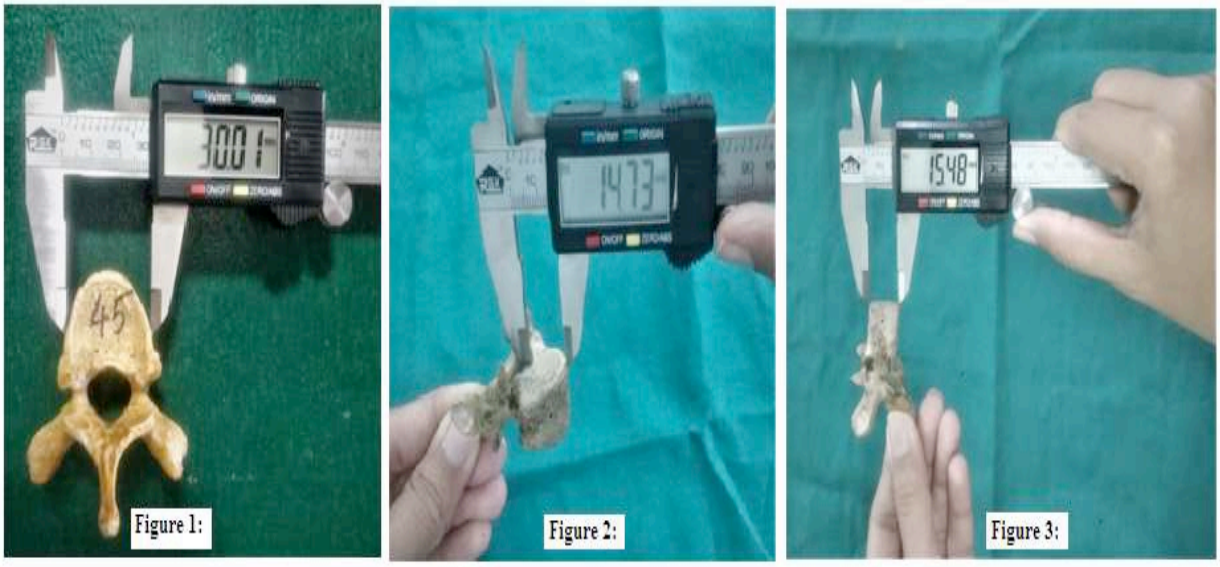
On a proforma, the following parameters were noted:

1. The distance in midline between the anterior and posterior borders of the superior surface of the vertebral body is known as the superior anteroposterior distance.
2. The distance in midline between the anterior and posterior borders of the inferior surface of

the vertebral body is known as the inferior anteroposterior distance.
3. The vertical distance between the superior and inferior surfaces in the anterior midline is known as the anterior height of the body.
4. The vertical distance between the superior and inferior surfaces in the midline posteriorly is known as the posterior height of the body.
5. The vertical distance on the lateral side of the spine between the superior and inferior surfaces of the body is known as the right lateral height.
6. The vertical distance on the lateral side of the spine between the superior and inferior surfaces of the body is known as the left lateral height.
7. The maximal transverse diameter of the vertebral body at the superior surface is known as the superior transverse diameter.
8. The maximal transverse diameter of the vertebral body at the inferior surface is referred to as the inferior transverse diameter.

Results

1. The vertical body's superior anteroposterior distance in normal thoracic vertebrae varied between 14.61 and 31.85mm, with an average of 22.37 + 3.80mm.
2. The vertical body of normal thoracic vertebrae had an inferior anteroposterior distance ranging from 12.60 to 32.79mm, with a mean of 23.21 + 3.79mm.
3. The vertebral body's anterior height in normal thoracic vertebrae had a range of 11.92-27.23mm, with a mean value of 20.15+2.81mm.
4. In normal thoracic vertebrae, the posterior height of the vertebral body varied between 12.31 and 27.28mm, with an average of 21.12+2.78mm.
5. In typical thoracic vertebrae, the right lateral height of the vertebral body varied between 10.83 and 25.61mm, with an average of 20.60+2.84mm.
6. In normal thoracic vertebrae, the left lateral height of the vertebral body varied between 11.31 and 26.76mm, with an average of 20.37+2.89mm.
7. The range of superior transverse diameter in normal thoracic vertebrae was found to be between 18.70 and 34.87mm, with a mean value of 28.25 + 3.56mm.
8. In typical thoracic vertebrae, the inferior transverse diameter of the vertebral body varied between 19.75 and 35.58mm, with a mean value of 29.65 + 3.82mm.



Figures 1 and 2: depict illustrations illustrating the measurement of the superior transverse diameter and superior anteroposterior distance, respectively, in typical thoracic vertebra. Additionally, Figure 3 illustrates the measurement of the anterior height in typical thoracic vertebra.

Discussion

Different authors have conducted studies on thoracic vertebrae using diverse methodologies, including plain radiography, quantitative 3D anatomic procedures, and direct measurements. The aforementioned studies encompass Panjabi MM et al, Tan et al, Patil Dhaval et al, M. Vasantha et al, Singh R et al, and Kunkel et al. In contrast, Berry et al. exclusively examined the second and seventh thoracic vertebrae in their study.

The tables provided below illustrate the comparison of means for the several parameters assessed in prior research with those obtained in the current study.

Table 1 shows a comparative analysis of the average superior anteroposterior distance of the vertebral body in typical thoracic vertebrae, in relation to information obtained from other studies.

Table 1: comparative analysis of the average superior anteroposterior distance of the vertebral body in typical thoracic vertebrae

Study	Year	Country	Material for study	Mean (in mm)
Panjabi MM [2] et al	1991	USA	Dry bones	24.26
Tan [3] et al	2004	Singapore	Dry Bones	20.21
Patil Dhaval K [6] et al	2014	India	Dry Bones	20.78
M.Vasantha [7] et al	2017	Telangana-India	Dry Bones	21.96
Present study	2021-22	Marathwada- India	Dry Bones	22.37

In the current study, the average superior anteroposterior distance of the vertebral body is lower than the finding reported by Panjabi MM [2] et al, but higher than the results reported by Tan [3] et al, Patil Dhaval [6] et al, and M.Vasantha [7] et al.

Table 2: Comparison of mean superior transverse diameter of the vertebral body in typical thoracic vertebrae

Study	Year	Country	Material for study	Mean (in mm)
Panjabi MM [2] et al	1991	USA	Dry bones	26.06
Tan [3] et al	2004	Singapore	Dry bones	23.84
Singh R [5] et al	2011	India	Dry bones	25.9
Patil Dhaval K [6] et al	2014	India	Dry bones	27.02
M.Vasantha [7] et al	2017	Telangana-India	Dry bones	27.9
Present study	2021-22	Marathwada- India	Dry bones	28.25

The current study demonstrates a higher mean superior transverse diameter of the vertebral body compared to previous investigations.

Table 3: Comparison of mean anterior height of the vertebral body in typical thoracic vertebrae

Study	Year	Country	Material for study	Mean (in mm)
Tan [3] et al	2004	Singapore	Dry bones	15.04
Kunkel [4] ME et al	2011	Germany	Cadaveric, Radiographic	15.84
Singh R [5] et al	2011	India	Dry bones	17.39
Patil Dhaval K [6] et al	2014	India	Dry bones	17.17
M.Vasantha [7] et al	2017	Telangana-India	Dry bones	17.71
Present study	2021-22	Marathwada- India	Dry bones	20.15

The current study demonstrates a higher average anterior height of the vertebral body compared to previous investigations.

Table 4: Comparison of mean posterior height of the vertebral body in typical thoracic vertebrae

Study	Year	Country	Material for study	Mean (in mm)
Berry JL [8] et al	1987	USA	Dry bones	17.8
Panjabi MM [2] et al	1991	USA	Dry bones	16.86
Tan [3] et al	2004	Singapore	Dry bones	16.41
Kunkel ME [4] et al	2011	Germany	Cadaveric, Radiographic	17.99
Singh R [5] et al	2011	India	Dry bones	18.19
Patil Dhaval K [6] et al	2014	India	Dry bones	18.27
Present study	2021-22	Marathwada- India	Dry bones	21.12

The current study demonstrates a higher average posterior height of the vertebral body compared to previous investigations. In a study conducted by Singh R^2 et al, it was observed that the anterior height of the vertebral body was comparatively lower than the posterior height of the body across all levels of the thoracic spine. The researchers observed this phenomenon as a potential rationale for the typical physiological kyphosis observed in the thoracic area. The current investigation yielded a comparable finding.

Conclusion

The growing fascination with vertebral body implants and spinal implants need a comprehensive understanding of their anatomical structure. The most effective approach for obtaining morphometric data from anatomical structures is through direct measurements conducted on specimens. The current investigation has concentrated on an extensive dataset that offers quantitative information regarding the anatomical structure of the vertebral body in typical thoracic vertebrae.

The disparities in the findings of the current study compared to earlier investigations, particularly in terms of some parameters, could be attributed to variations in race, ethnicity, and research methodologies employed. The quantitative results obtained from this study have the potential to offer more precise insights for the development of spinal implants in the targeted group.

References

1. Pal GP, Routal RV. A study of weight transmission through the cervical and upper thoracic regions of the vertebral column in man. J Anat. 1986 Oct; 148: 245-61.
2. Panjabi MM, Takata K, Goel V, Federico D, Oxland T, Duranceau J, Krag M. Thoracic human vertebrae. Quantitative three-dimensional anatomy. Spine (Phila Pa 1976). 1991 Aug; 16(8):888-901.
3. Tan SH, Teo EC, Chua HC. Quantitative three-dimensional anatomy of cervical, thoracic and lumbar vertebrae of Chinese Singaporeans. Eur Spine J 2004; 13:137-46.
4. Kunkel ME, Herkommmer A, Reinehr M, Bockers TM, Wilke HJ. Morphometric analysis of the relationships between intervertebral disc and vertebral body heights: an anatomical and radiographic study of the human thoracic spine. J Anat 2011; 219: 375-80.
5. Singh R, Srivastva S, Prasath C, Rohilla R, Siwach R, Magu N. Morphometric measurements of cadaveric thoracic spine in Indian population and its clinical applications. Asian Spine J 2011; 5(1):20-34.
6. Patil Dhaval K, BhuiyanPritha S. A morphometric study of the vertebral body in dry human typical thoracic vertebrae. International Journal of Anatomy Physiology and Biochemistry 2014; 1(1):24-8.
7. M.Vasantha, P. Koteswararao, V. Janaki. A morphometric study of the vertebral body in dry human typical thoracic vertebrae in Telangana Region. IOSR Journal of Dental and Medical Sciences 2017 March; 16(3), 04-07.
8. Berry JL, Moran JM, Berg WS, Steffee AD. A morphometric study of human lumbar and selected thoracic vertebrae. Spine (Phila Pa 1976). 1987 May; 12(4):362-7.
9. Garg. S, Saha. S, Saxena. A. K, Aneja. P. Morphometric analysis of typical thoracic vertebrae and its clinical relevance. Int J Anat Res 2020, Vol 8(1.3):7356-59.