

## Original Article

### Determination of Measurement of Vertebral Canal and body- A Clinical Study

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#### ABSTRACT:

**Background:** Lumbar Spinal Canal Stenosis is considered to be the main etiology of lumbar pain. The present study was conducted to compare the transverse diameter of lumbar vertebrae body and canal in both genders. **Materials & Methods:** The present study was conducted on 20 subjects of both genders. All subjects were subjected to lumbar radiographs in supine position with X-ray beam centred at L3 vertebral level. In all radiographs, the transverse diameter of vertebral body (TDVb) and transverse diameter of vertebral canal (TDVc) was measured from L1 to L5 vertebral levels. **Results:** The mean transverse diameter of vertebral body (TDVb) (mm) at L1 was 36.4, L2 38.5, L3 39.2, L4 41.6 and L5 42.7 and the mean transverse diameter of vertebral canal (TDVc) (mm) at L1 was 28.6, L2 was 28.7, L3 was 29.1, L4 was 29.5 and L5 was 29.7. The difference was non- significant ( $P > 0.05$ ). The mean TDVb and TDVc value in all vertebrae were higher in males than females. **Conclusion:** The measurement of transverse diameter of lumbar canal and body is an important tool for diagnosis of lumbar spinal stenosis.

**Key words:** Vertebral body, Vertebral canal, Spinal canal stenosis

**Received:** 24 May 2013

**Revised:** 14 June 2013

**Accepted:** 15 June 2013

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**This article may be cited as:** Kumar R. Determination of Measurement of Vertebral Canal and body- A Clinical Study. J Adv Med Dent Scie Res 2013;1(2):183-185.

#### INTRODUCTION

The pioneering works of Elsberg & Dyke<sup>1</sup> have established the clinical value of dimensions of interpedicular distances in diagnosis of narrowing of spinal canal. Since then, the size of spinal canal has attracted increasing attention for its use in clinical practice. Low back pain is one of the most common health problems affecting up to 80% of people. The causes of low back pain are multi-factorial, but the narrowing of the lumbar canal plays a significant role. 'Lumbar Spinal Canal Stenosis' (LSS) is a causative factor for low back pain. Thus measurement of transverse diameter of lumbar canal is an important means for diagnosis of lumbar spinal stenosis.

The lumbar vertebrae are the five vertebrae between the rib cage and the pelvis. They are the largest segments of the vertebral column and are characterized by the absence of the foramen transversarium within the transverse process and by the absence of facets on the sides of the body. They are designated L1 to L5, starting at the top. The lumbar vertebrae help support the weight of the body, and permit movement.<sup>2</sup>

The normal values of transverse diameter (TDVc) show variation in gender and region. These values can be used for

the diagnoses of LSS by morphometric evaluation.<sup>3</sup> The present study was conducted to compare the transverse diameter of lumbar vertebrae body and canal in both genders.

#### MATERIALS & METHODS

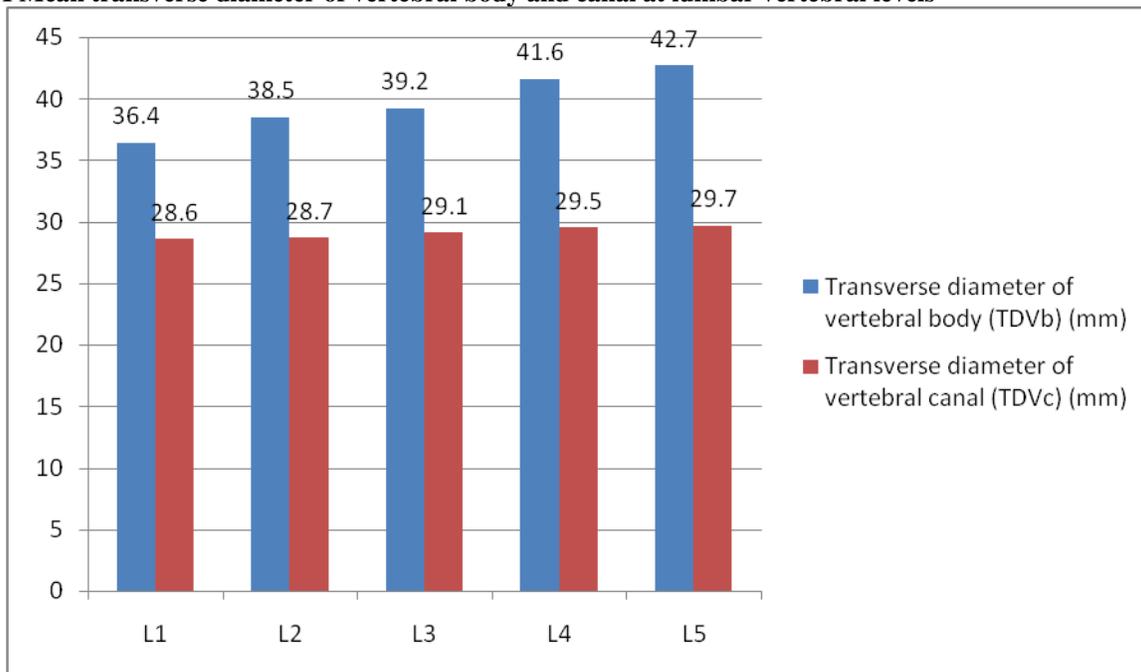
The present study was conducted in the department of Anatomy. It comprised of 20 subjects of both genders (males- 10, females- 10). Institutional ethical clearance was obtained prior to the study. Written consent was obtained from all subjects.

General information such as name, age, gender etc. was recorded. All subjects were subjected to lumbar radiographs taken at kVp- 120 and mA- 12 in supine position with X-ray beam centered at L3 vertebral level.

The shortest distance at the most constricted part of the vertebral body was the transverse diameter of vertebral body (TDVb) and the interpedicular distance of vertebral canal (TDVc) was taken as the distance between medial margins of pedicles in millimetres from L1 to L5 vertebral levels. Results thus obtained were subjected to statistical analysis. P value  $< 0.05$  was considered significant.

**RESULTS**

**Graph I Mean transverse diameter of vertebral body and canal at lumbar vertebral levels**



Graph I shows that mean transverse diameter of vertebral body (TDVb) (mm) at L1 was 36.4, L2 38.5, L3 39.2, L4 41.6 and L5 42.7 and the mean transverse diameter of vertebral canal (TDVc) (mm) at L1 was 28.6, L2 was 28.7, L3 was 29.1, L4 was 29.5 and L5 was 29.7. The difference was non- significant (P> 0.05).

**Table I Comparison of (TDVb) in both genders**

TDVb	Males	Females	P value
L1	37.42	35.5	0.1
L2	38.23	38.33	0.5
L3	39.72	40.12	0.3
L4	42.60	40.65	0.5
L5	42.45	42.25	0.5

Table I shows that mean TDVb at L1 (Males- 37.42, females- 35.5), L2 (Males- 38.23, females- 38.33), L3 (males- 39.72, females- 40.12), L4 (males- 42.60, females- 40.65) and L5 (males- 42.45, females- 42.25). The difference was non-significant (P>0.05).

**Table II Comparison of (TDVc) in both genders**

TDVc	Males	Females	P value
L1	26.8	28.45	0.1
L2	26.5	28.9	0.5
L3	27.9	28.85	0.3
L4	28.40	30.20	0.5
L5	28.35	30.65	0.5

Table II shows mean TDVc at L1 (males- 26.8, females- 28.45), L2 (males- 26.5, females- 28.9), L3 (males- 27.9, females- 28.85), L4 (males- 28.40, females- 30.20) and L5 (males- 28.35, females- 30.65). The difference was non- significant (P>0.05).

## DISCUSSION

Low backache is a common clinical complaint. The etiology in many of these patients is narrowing of the lumbar canal. In the recent years, there has been a regeneration of interest in spinal stenosis syndromes, especially in the level to which the cauda equina may be compressed within the lumbar spinal canal by constriction or narrowing of the bony ring of the canal in contrast to impingement of soft tissues.<sup>4</sup>

Lumbar spinal stenosis is one of the most common cause for spinal surgical interventions nowadays. Diagnostic imaging techniques continue to play a pivotal role in the diagnosis, clinical and surgical management of lumbar spinal stenosis. Of all the diagnostic procedures, radio-diagnosis continues to be the most commonly applied methodology due to its cost effectiveness and easy availability.<sup>5</sup> The present study was conducted to compare the transverse diameter of lumbar vertebrae body and canal in both genders.

In this study, 20 subjects of both genders were selected. We found that mean transverse diameter of vertebral body (TDVb) (mm) at L1 was 36.4, L2 38.5, L3 39.2, L4 41.6 and L5 42.7 and the mean transverse diameter of vertebral canal (TDVc) (mm) at L1 was 28.6, L2 was 28.7, L3 was 29.1, L4 was 29.5 and L5 was 29.7. This is in agreement with Christenson et al.<sup>6</sup>

Piera et al<sup>7</sup> in their study dimensions of lumbar vertebrae from L1 to L5 were measured in 200 plain radiographs. Mean transverse diameter of vertebral body as well as of spinal canal were minimum at L1 and maximum at L5. Making use of above parameters, canal-body ratio and intersegmental difference were calculated. These parameters and indices can be useful in detection of clinical conditions like spinal canal stenosis and some cases of intraspinal tumours. The present study showed regional and ethnic variation in parameters of lumbar vertebrae, thus emphasizing the need to determine normal range of values for different populations.

In present study, mean TDVb at L1 in males was 37.42 and in females was 35.5, L2 in males was 38.23 and in females was 38.33, L3 in males was 39.72 and in females was 40.12, L4 in males was 42.60 and in females was 40.65 and L5 in males was 42.45 and in females was 42.25. The increase in size of lower lumbar vertebrae is attributed to it being site of maximum load bearing, performing extensive flexion, extension, rotation and gliding movements. This is in agreement with Amonoo-Kuofi et al.<sup>8</sup>

Hinck et al<sup>9</sup> in their study 50 healthy subjects, within age range of 20-70 years were radio-imaged and transverse diameter of vertebral body and canal were assessed. There was a gradual increase in diameter from L1 to L5 vertebral levels. The means of transverse diameter of vertebral body

and vertebral canal showed no significant differences between genders and the results were compared with earlier published research work. There are subtle differences in morphometry of lumbar canal in different population group suggesting regional and ethnic differences.

We observed that mean TDVc at L1 (males- 26.8, females- 28.45), L2 (males- 26.5, females- 28.9), L3 (males- 27.9, females- 28.85), L4 (males- 28.40, females- 30.20) and L5 (males- 28.35, females- 30.65).

## CONCLUSION

The value of transverse diameter of lumbar canal and body was comparatively higher in males as compared to females. The measurement of transverse diameter of lumbar canal and body is an important tool for diagnosis of lumbar spinal stenosis.

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Source of support: Nil

Conflict of interest: None declared

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