

Sexual Dimorphism of Lumbar Vertebral Canal in Different Ages of North Karnataka Population

Patil B G¹, Makandar U K², Rajendra R³, Ajay N⁴

¹Professor, Shri B M Patil Medical College (Deemed University), Vijayapur, Karnataka, ²Associate Professor, ³Professor and Head of Anatomy, ⁴Assistant Professor, in Anatomy, AIMS, B G Nagar, Mandya (Dist), Karnataka

ABSTRACT

90 (45male and 45females)cases are selected for study of APD and Transverse Diameter of lumbar vertebral canal is studied by MRI at different ages in both sexes. 30 to 40years of age -20cases, 41 to 50years of age -20cases, 51 to 60 years of age -5cases in both sexes. In 30-40 years of age APD of L3 L4 and TD of L4, L5 have significant P Value ($P<0.001$). In 41-50 years of age APD of L1, L4, L5 and TD of L5 have significant P Value ($P<0.001$). In 51-60 years of age APD of L1, L4, L5 and TD of L2, L3, L4, L5 have significant P value ($P<0.001$). This study has greater importance in Medico- legal cases for Anthropologist, Anatomist, Orthopedician. Above all radiologists to differentiate normal values from abnormal values like stenosis. These significant values are more or less in same with previous workers. But these values show latest data of North Karnataka region, as racial changes are on-going process and exact parameters of mesodermal derivatives are un-certain.

Keywords - APD= Antero-Posterior Diameter, TD= Transverse Diameter, VC= Vertebral Column, MRI= Magnetic Resonance Imaging

INTRODUCTION

Due to the re-organisation of vertebral column during evolution of quadrupeds to bipedalism has paid a big price to permit all the twisting and bending the shape of vertebra, changed to that of a wedge with thicker edge in front and thinner edge at back. Particularly in the lumbar region where wedge shape is more pronounced. Heavy lifting or any other sudden strain may cause lumbar vertebrae to slip backwards. This results in, spandylolysis or slipped disc⁽¹⁾ which is observed mainly between the ages of 30-60 years. Hence an attempt is made to compare the lumbar vertebral canal at different ages of both sexes because the lumbar pain depends on various factors like nutritional status improper posture to perform various jobs, obesity, habits like smoking and alcoholism⁽²⁾ etc.

Corresponding author :

Dr. Patil B G (MBBS, MS)
Ashirwad Building, Basava Nagar,
Opp. BLDEA's Hospital,
Ashram Road, Vijayapur-586103
Mob: 919019146969
Email: drbabasaheb_patil@rediffmail.com

MATERIAL & METHOD

The patients regularly visiting to BLDEA Hospital Vijayapura are selected for study. Total selected persons are 90 (45 male and 45 females). The age group between 30-60. They are grouped as 30to 40=20, 41 to 50 =20, 51 to 60= 5 in both sexes. Their APD (Mid sagittal) and TD (interpedicular distance) is studied by MRI of Radiology department. (1.5 tesla Philips company) and their various levels are noted and compared statistically by z test. This study is carried out for the period of two years.

OBSERVATIONS AND RESULTS

Table 1 – Significant statistical analysis of age group 30-40 years at various level of lumbar canal

a. APD analysis at L3 has significant P value ($P<0.001$)

b. APD analysis at the level of L4 has significant P value ($P<0.001$)

Table 2

a. T D of lumbar canal at the age of 30-40 at the level of L4 has significant P value ($P<0.001$)

b. TD of lumbar canal at the age of 30-40 year. At

the level of L5 has significant P value ($P < 0.001$)

Table 3 – APD and TD of the age of 40-50years

- a. At the level of L1 has significant P Value ($P < 0.01$)
- b. At the level of L4 has significant P Value ($P < 0.001$)
- c. At different level of lumbar canal at the level of L5 vertebrae has significant P Value ($P < 0.001$)

Table 4- Study of APD of the age 51-60 at various level of lumbar canal

- a. At the level of L1 has significant P value ($P < 0.005$)
- b. At the level of L4 has significant P value ($P < 0.001$)

Table 5 – Study of TD at the age of 51-60 at various level of lumbar canal

- a. At the level of L2 has significant P value ($P < 0.001$)
- b. At the level of L3 has significant P value ($P < 0.001$)

DISCUSSION

In the present study of lumbar vertebral canal, the significant values are observed in the age of 30-40years. APD at L3 and L4 have significant value ($P < 0.001$) (Table-1) and TD of L4 and L5 have significant P value ($P < 0.01$) (table -2). These significant values at the age of 30-40 years shows the normalcy of anatomy and physiology of nucleus pulposus and musculature and ligaments around lumbar canal. Moreover posterior

longitudinal ligament situated within the vertebral canal stretches from basiocciput to sacrum. It is wider over the disc than over the bodies⁽³⁾. It's stretchability maintains the vertebral canal to be patent to be occupied by spinal cord without any compression.

Similar significant values are also observed in both sexes of 40-50 years of age in L1, L4, L5 APD (table -3) and TD at L5 (table -4). At the age 51-60 also, both sexes show significant values at APD at the level of L1, L4, L5 (table -5) and TD at the level of L2, L3, L4, L5 (table – 5). These significant values are more or less same with previous worker's ⁽⁴⁾⁽⁵⁾⁽⁶⁾. The remaining insignificant values are un-answered. These differences poses very interesting in relation to body size, bipedal locomotion, vertebral body size and spinal card size also play contributing role⁽⁷⁾. These variations are due to shortening of lumbar region to permit new method of locomotion (arm-swinging), bending forward and on both side in erect posture. Since the long rod – like lumbar column of pronograde leapers is no longer necessary⁽⁸⁾. Many lumbar spines have undergone secondary elongation in order to provide enough space between his /her rib cage and pelvis to accommodate lumbar curve. This marked anterior convexity of lumbar spine increases APD and TD in the canal to adapt the movements of the erect posture by keeping spinal cord and its meanings un-twisted and uncompressed⁽⁹⁾. Apart from this as the age advances TD and APD are more in both sexes due to osteoporotic changes. But in males TD of vertebral canal is more. It could be due to more exercise and locomotion encountered in males than in females⁽¹⁰⁾.

Table -1: a. Sexual diamorphism of APD of lumbar canal at the age of 30-40years at the level of L3 and L4 vertebrae

Particulars		Level	Z test	P value
Mean Value of Male (cm)	Mean value of Female (cm)			
12.10cm (SD±0.33)	12.13cm (SD±1.22)	L3	0.375	$P < 0.03$ Highly Significant
12.50cm (SD±1.30)	12.98cm (SD±1.20)	L4	1.2133	($P < 0.01$) Highly Significant

Table 2: a. TD of lumbar canal at the age of 30-40 years at the level of L4 and L5 vertebrae

Particulars		Level	Z test	P value
Mean Value of Male(cm)	Mean value of Female(cm)			
25.05cm (SD±1.88)	23.98cm (SD±2.42)	L4	1.532	$P < 0.001$ Highly Significant
27.67cm (SD±1.97)	26.92cm (SD±1.72)	L5	1.282	$P < 0.001$ Highly Significant

Table 3; a. APD of lumbar canal at the age of 41-50years at the level of L1,L4 and L5 vertebrae and TD at L5 vertebra.

Particulars		Level	Diameter	Z test	P value
Mean Value of Male(cm)	Mean value of Female(cm)				
14.11cm (SD±1.01)	14.10cm (SD±0.66)	L1	APD	0.037	P<0.01 Highly Significant
13.50cm (SD±1.22)	12.97cm (SD±1.30)	L4	APD	1.329	P<0.01 Highly Significant
14.12 cm (SD±1.03)	13.02 (SD±2.15)	L5	APD	1.68	P<0.01 Highly Significant
27.98cm (SD±2.18)	24.14cm (SD±1.30)	L5	TD	0.88	P<0.01 Highly Significant

Table 4: a. APD of lumbar canal at the age of 51-60 years at the level of L1 and L4 vertebrae

Particulars		Level	Z test	P value
Mean Value of Male(cm)	Mean value of Female(cm)			
14.42cm (SD±2.01)	13.01cm (SD±1.22)	L1	1.34	P<0.001 Highly Significant
12.98cm (SD±1.28)	12.21cm (SD±0.32)	L4	1.49	P<0.01 Highly Significant

Table 5 : a. TD of lumbar canal at the age of 51-60 years at the level of L2,L3 and L5 vertebrae

Particulars		Level	Z test	P value
Mean Value of Male(cm)	Mean value of Female(cm)			
23.01cm (SD±2.60)	24.14cm (SD±1.05)	L2	1.14	P<0.001 Highly Significant
23.9cm (SD±1.60)	22.89cm (SD±1.60)	L3	1.07	P<0.001 Highly Significant
26.98cm (SD±2.33)	25.70cm (SD±1.23)	L5	0.611	P<0.001 Highly Significant

SUMMARY AND CONCLUSION

The present study of lumbar vertebral column in both sexes at different ages 30-60 years shows more values in males than in females in both APD and TD as an average observation. This study will have greater importance for Medico-legal expert, Anthropologist, Anatomist, Orthopedician. Above all to the radiologist to differentiate pathological lumbar vertebral canal from physiological. But this study demands further genetic, embryological and bio-mechanical study, because there is no exact parameter to determine the APD and TD of this osteo lumbar canal. Moreover exact mechanism of primary curvatures in intra uterine life and secondary

curvatures of vertebral column in child hood is yet to be known.

This research paper is approved by the ethical committee of Shri B M PATIL MEDICAL COLLEGE, Vijayapur.

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