



Types of lumbar vertebral canal in the males of Western Rajasthan: A study by radiographs

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Abstract

The commonest reason of the lower back pain is lumbar canal stenosis. To know the types of lumbar canal 50 healthy males were radiographed and studied. The transverse diameter of lumbar canal was measured by the Verniercaliper at all lumbar levels. The canal was classified into various types as described by Piera et al (1988). The mean transverse diameter and its range were calculated at each lumbar level. Details of observations showed that Type "A" was the commonest type of canal present and Type "B" is the second most common type of canal found in the present study.

Keywords: Lumbar canal stenosis, mean transverse diameter, lumbar canal.

Introduction

Pain in the back is one of the commonest complaints of human being and throughout the history of healing art. Various causes have been attributed to low backache but lumbar canal stenosis, as a causative factor is only of recent thought. The stenosis may be in all parts of canal or only in the lateral part. It may give rise to pressure or tension on nerves of cauda equina or lumbar nerve roots. In the past Robertson et al. studies the lumbar spinal canal by plain films¹. Epstein et al. studies stenosis of lumbar spinal canal on plain radiography². Sandhu et al. radiologically studied the incidence of lumbar spinal canal stenosis in cases of low backache beyond the age of 35 years³. Amonoo-Kuofi established the maximum and minimum parameters of interpeduncular distances in group of Nigerians⁴. Shahane made an attempt to

describe the lumbar spinal stenosis⁵. Piera et al. describe the various types of morphology of lumbar canals⁶. Frobin et al. observed relation between height of lumbar disc and disc degeneration⁷. It is thought that this data of types of lumbar canal might prove useful to evaluate and assess the lumbar stenosis problem with the help of radiographs. The present study was undertaken to answer some of the question arising that how much variations were found in the morphology of lumbar vertebral canal in restricted area.

Material and Methods

A cross sectional observational study was carried out on randomly selected 50 healthy males in the Department of Anatomy and Radiology, Dr. Sampurnanand Medical College and Associated Group of Hospital, Jodhpur in different age group

ranging from 25-40 years. These were divided in to three age groups that is Group-I 25 to 30 years, Group-II 31 to 35 years and Group-III 36 to 40 years.

The radiographs of lumbar region were taken in anteroposterior view centered at lumbar-3 vertebra on the plate 12"X15". The horizontal distance between the pedicles of each lumbar vertebrae was obtained by marking points on the most outer boundary of inner side of pedicles and then a straight line is drawn between the two points as shown in Fig. 1A and it was termed as transverse diameter of the lumbar spinal canal. The measurement was done at all lumbar levels by Vernier caliper straight and by one observer in order to minimize the observer's error. The canal was categorized into given types. (Fig. 1B).

Type A: Transverse diameter was greater or at least equal to the one immediately above it.

Type B: Transverse Diameter was smaller than that immediately cranial to it. (This group has 4 variants, depending on whether the relative stenosis was found at L2, L3, L4 or L5 (Subtypes B2, B3, B4 & B5)).

Type C: The narrowing affects two lumbar levels.

Type D: The transverse diameter decreases from L 1 to L4.

All observations were compiled together in tabulated form. The range and mean transverse diameter and standard deviation of canal were calculated at all lumbar level. Then lumbar canals were classified into various types described by Piera et al. (Fig. 1B).

Results

The most common type of lumbar canal was type-A (54%) (Table-1). Type -C canal was found only in group-I (Table-2). The mean transverse diameter at L1 level was 24.4 ± 2.2 mm, L2 level was 24.4 ± 2.2 mm, L3 was 25.9 ± 2.2 mm, L4 was 27.0 ± 2.4 mm and L5 was 30.8 ± 2.7 mm (Table-3). The mean transverse diameter at L1, L2, L3 was lowest in age group-II 23.82 ± 1.56 mm, 24.3 ± 1.29 mm and 25.15 ± 1.47 mm respectively whereas the lowest mean transverse diameter at L4 and L5 was observed in age group-III 27.23 ± 2.45 mm and 30.03 ± 2.97 mm respectively (Table-4).

Table No. 1: Various types of lumbar canals in study subjects

Types of Lumbar Canal	A	B					C
		B2	B3	B4	B5	Total	
No. of subject	27	8	6	5	3	22	1
Percentage	54%	16%	12%	10%	6%	44%	2%

Table No. 2: Various types of lumbar canals in different age groups

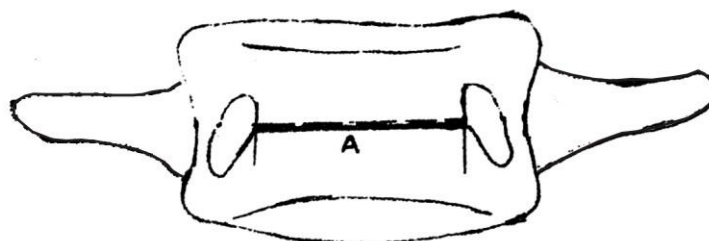
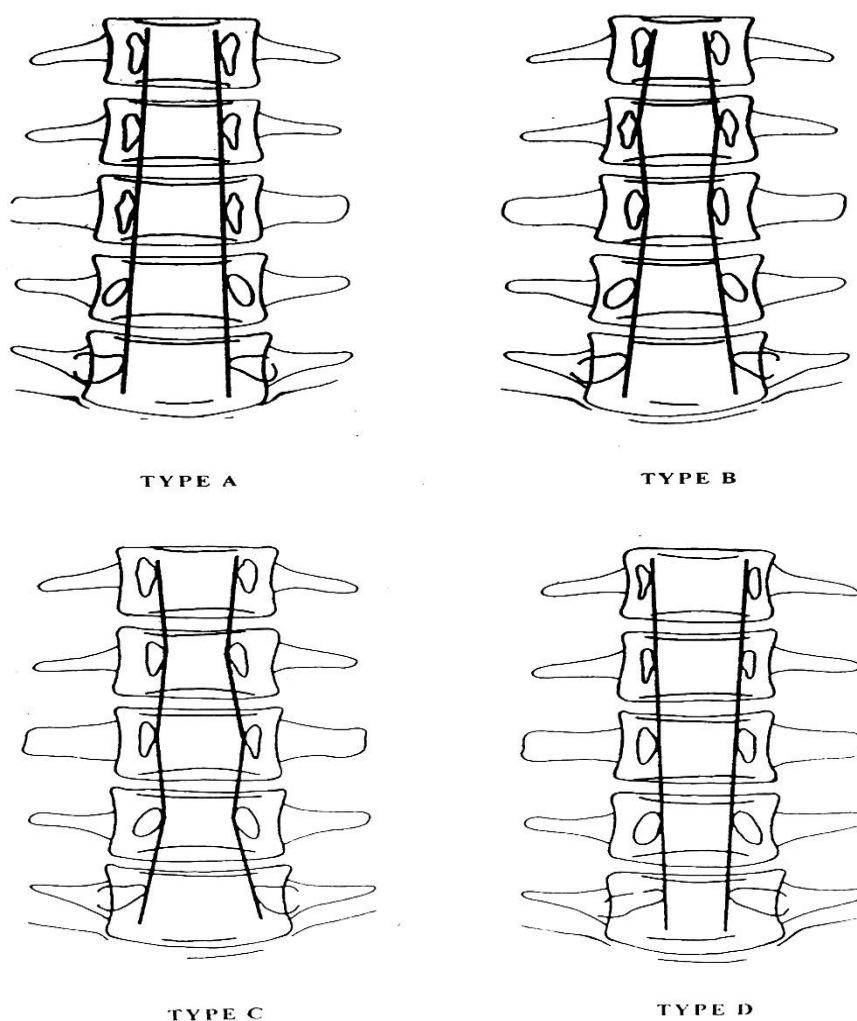
Type of lumbar Canals	Group-I (n=20)		Group-II (n=15)		Group-III (n=15)	
	Number	%	Number	%	Number	%
A	11	55%	7	46.66%	8	60%
B2	3	15%	3	20%	2	13.33%
B3	3	15%	4	26.66%	0	0%
B4	1	5%	1	6.66%	3	20%
B5	1	5%	0	0%	1	6.66%
C	1	5%	0	0%	0	0%

Table No. 3: Range and mean transverse diameter of lumbar canals

Level	Number	Range (mm)	Mean $\pm$ SD (mm)
L1	50	20.1 $\pm$ 31.1	24.44 $\pm$ 2.20
L2	50	21.2 $\pm$ 30.4	24.98 $\pm$ 1.98
L3	50	21.1 $\pm$ 32.4	25.90 $\pm$ 2.26
L4	50	22.1 $\pm$ 35.1	27.08 $\pm$ 2.49
L5	50	26.1 $\pm$ 34.5	30.08 $\pm$ 2.27

Table No. 4: Range and mean transverse diameter of lumbar canal in different age groups

Age group (yrs) Level	Group-I		Group-II		Group-III	
	Range (mm)	MTD mean $\pm$ SD	Range (mm)	MTD mean $\pm$ SD	Range (mm)	MTD mean $\pm$ SD
L1	20.5-29.3	24.6 $\pm$ 2.37	20.1-26.3	23.82 $\pm$ 1.56	20.7-31.1	24.6 $\pm$ 2.58
L2	21.2-30.4	25.05 $\pm$ 2.07	21.5-26.4	24.3 $\pm$ 1.29	22.6-30.1	25.50 $\pm$ 2.23
L3	21.1-32.4	25.95 $\pm$ 2.50	23.1-28.1	25.15 $\pm$ 1.47	23.5-31.6	26.60 $\pm$ 2.36
L4	22.1-32.8	27.46 $\pm$ 3.01	23.2-28.5	28.42 $\pm$ 1.37	23.7-33.8	27.23 $\pm$ 2.45
L5	26.1-34.5	29.68 $\pm$ 3.08	27.7-34.1	30.4 $\pm$ 1.93	25.4-31.5	30.03 $\pm$ 2.97

**Fig. 1A:** Anterior posterior view of Lumbar vertebra showing "A" Transverse diameter of canal**Fig. 1B:** Various Types of Lumbar Canal

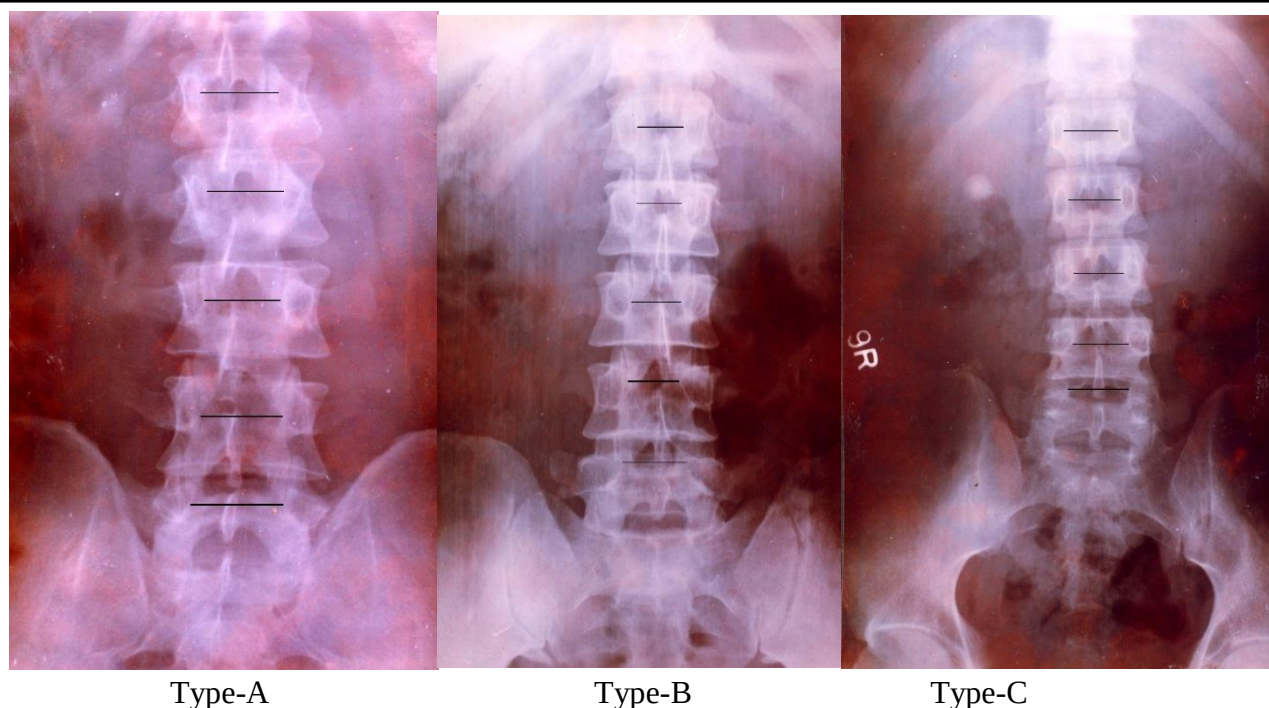


Fig. 1C: X-ray lumbar region (Showing various types of lumbar canals)

Discussion

Type-A lumbar canal was found in 54% subjects while type-B was present in 44% and type-C was seen in only 2% and type-D was completely absent in this study (Fig. 1C) whereas Piera et al. found type-A canal in 78.14% type-B in 19.53% type-C in 1.87% and type-D in 0.50%⁶. Results were consistent with above study for Type-A being most common type but the ratio of type-B was found more in present study in comparison Piera et al. The mean transverse diameter (MTD) at L1 level was 24.4 ± 2.2 mm, L2 level was 24.4 ± 2.2 mm, L3 was 25.9 ± 2.2 mm, L4 was 27.0 ± 2.4 mm and L5 was 30.8 ± 2.7 mm. Hinck et al. measured mean transverse diameter of lumbar canal in Americans and the values obtained were 25.9 mm at L2 26.8 mm at L3, 27.6 mm at L4 and 30.7 mm at L5⁸. Sandhu et al found mean transverse diameter at L1 was 26.87 mm, L2 was 26.3 mm, L3 was 27.6 mm, L4 was 28.8 mm and L5 was 32.1 mm³. Einsenstein found little difference in canals of males and females and also showed that in Negroids canals were marginally less capacious than the caucasoid⁹. Amonoo-Kuofi measured mean transverse diameter of lumbar canal in adult Saudi's¹⁰. Singh et al in measured the mean transverse diameter of lumbar

spine in normal subjects and the cases of spinal stenosis¹¹. Piera et al. found transverse diameter of lumbar canal in Spanish subjects and it was at L1– 27.79 ± 2.54 mm, L2– 28.09 ± 2.53 mm, L3– 29.55 ± 2.60 mm, L4– 30.84 ± 3.19 mm and L5– 34.31 ± 3.57 mm⁶.

Conclusion

The present study concluded that type-A and type-B are most common types of lumbar canals present and the mean transverse diameter of lumbar spinal canal was almost similar to previous studies done by various authors throughout world which can be helpful to the orthopedicians to predict the lumbar canal stenosis by observing the type of canal by plain radiography.

Conflict of Interest: Department of Anatomy and Radiology, Dr Sampurnanad Medical College, Jodhpur Rajasthan.

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