Research Article

A study of spinal canal physiology in relation to interpedicular distance of lumbar vertebrae in Bundelkhand region

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Abstract

Background: Interpedicular distance (IPD) determines the functioning of spine. There is a significant difference in the size of the lumbar vertebral canal in different ethnic groups, emphasizing physiology and clinical problems present in that group.

Objectives: To identify IPD of lumbar vertebrae in the Bundelkhand region.

Materials and Methods: This study was conducted on 65 dry human lumbar vertebrae (20 atypical and 45 typical) obtained from 65 cadavers in the Bundelkhand region. IPD was measured with the help of a sliding vernier caliper.

Results: It was found that in the Bundelkhand region, mean transverse diameter (IPD) for typical lumbar vertebrae was 22.075 mm (range 15.4–30.5 mm) and for atypical lumbar vertebrae it was 25.16 mm (range 20.8–29.5 mm).

Conclusion: In the Bundelkhand region, IPD shows slightly less value than that reported by other studies, which may be a risk factor to clinical problems attributed to this region.

KEY WORDS: Lumbar vertebrae, interpedicular distance, transverse diameter

Introduction

Lumbar spinal canal stenosis is one of the important factors determining lumbar canal functions and clinical problems such as low back pain. The common cause of spinal canal narrowing is the reduced interpedicular distance (IPD).[1] It causes constriction of the bony ring of the canal, leading to compression of nerves. IPD of lumbar spine may also be found decreased in various spinal problems such as fracture in lumbar spine, resection of tumors in vertebral bodies, gross spondylolisthesis, and lumbar instabilities. The present study was conducted to identify IPD of lumbar vertebrae in the Bundelkhand region, which may help in understanding and resolving clinical problems attributed to this region.

Materials and Methods

We have randomly selected 65 dry human lumbar vertebrae (20 atypical and 45 typical) obtained from 65 cadavers in the Bundelkhand region for IPD measurement. Deformed and broken vertebrae were excluded. IPDs were measured using a sliding vernier caliper. All measurements were carried out at three different sittings, and the mean of the values corrected to the nearest millimeter was recorded. We used following method for recording different measurements.

Interpedicular distance (IPD): Maximum distance between two closest points on medial surfaces of right and left pedicles of same vertebra, as shown in Figure 1.

Figure 1: Interpedicular distance measurement.

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Table 1: Interpedicular distance of lumbar vertebrae

	Interpedicular distance
Atypical lumbar vertebrae	
Mean(mm)	25.16
SD	1.989
Range (mm)	20.8–29.5
Typical lumbar vertebrae	
Mean (mm)	22.075
SD	2.673
Range (mm)	15.4–30.5

Results

Interpedicular distance of atypical and typical dry human lumbar vertebrae was measured. Mean, standard deviation, and range of the IPD are shown in Table 1.

Discussion

This study emphasizes the measurement of the average IPD in the Bundelkhand region to investigate the clinical problems attributed to this region. It has been found that the reduction of coronal diameter of the lumbar spinal canal, caused by reduction in the IPD, is one of the important factors leading to narrowing of the lumbar spinal canal.

Interpedicular distance is measured by anteroposterior radiographs in various studies.[2–6] Hinck et al.[7] have shown that before the age of 19 years, the lumbar spinal canal is distinctly narrower than it is in the adult.

Because of wide variations of body sizes among the male and female subjects, there is a considerable overlapping of the ranges of IPD for male and female. Table 2 shows a comparison between the mean IPD s of lumbar spinal canal obtained from plain anteroposterior radiographs at levels L1–L5 in males and females observed in other populations in the present study.

According to Chhabra et al.[8] the intersegmental difference between mean IPD in both sexes is seen to be less in Gujaratis than that reported in north Indians. On comparing the present values with the previous values of IPD in various populations, marked differences between the mean values of different geographic regions were found. This supports the saying "There are no mean values of the vertebral dimensions that are valid for all populations." The reasons for these differences are not clear, but they may be because of racial, ethnic, and environmental factors. Variations can occur in a population related to general somatic size.

Stenosis or dilatation of the spinal canal can be identified by calculation of canal/body ratio for different segments. It helps in determining whether an individual's measurement of spinal canal are within the normal limits for the respective body size.[9] In our study, IPD of typical vertebrae showed mean value of 20.075 mm whereas that of atypical vertebrae showed mean value of 25.16 mm. The anteroposterior shortening of the pedicle and the reduction in transverse IPD is one of the most common causes of stenosis of the vertebral canal.

Conclusion

It can be concluded that in the Bundelkhand region, the mean value of IPD for typical lumbar vertebrae was 22.075 mm (range 15.4–30.5 mm) and for atypical lumbar vertebrae it was 25.16 mm (range 20.8–29.5 mm) after excluding deformed vertebrae and anatomical variations. Also IPD showed slightly less values than those reported by other studies, which may indicate a risk factor to clinical problems seen in this region. It would be prudent to further conduct such type of studies in different parts of the world for better understanding.

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Table 2: Comparison of mean of IPD of present study with earlier works

Vertebra level	Hinck et al.		Amonoo-Kuofi		Piera et al.		Present study
	Male	Female	Male	Female	Male	Female	
L1	25.9	24.3	22.6	21.3	27.79	25.66	L1–L4 = 22.075
L2	26.5	24.9	22.7	22.5	28.39	26.25	
L3	26.8	25.4	24.5	23.7	29.44	27.53	
L4	27.6	26.9	26	25.4	30.89	29.53	
L5	30.7	29	28.7	28.4	34.31	33.39	L5 = 25.16

*Interpedicular distance in millimeter.

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