

Analysis of Maximum Transverse Diameter of Lumbar Enlargement of Spinal Cord with the Gestational Age in Indian Human Foetuses

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Abstract: Introduction: Foetal spinal cord has been the focus of interest by many scientists but the information regarding lumbar enlargement received very little attention, though important for clinical applications. Morphological studies were limited to vertebral canal and spinal cord during prenatal and postnatal periods. Readings of maximum transverse diameter of lumbar enlargement of foetal spinal cord will help in understanding the pattern of growth of spinal cord in Indian human foetuses, which may be utilised for medicolegal purpose.

Material and Methods: Foetuses without any congenital cranio-vertebral anomalies were selected for the study and divided into five groups on the basis of gestational age. Laminectomy was performed and the spinal cords from human foetuses were taken out and maximum transverse diameter of lumbar enlargement was measured by Vernier calipers under standard conditions.

Result & Conclusion: Significant increment in maximum transverse diameter of lumbar enlargement of foetal spinal cord was observed in successive adjacent groups from group II onwards. There was maximum increment in maximum transverse diameter of lumbar enlargement of spinal cord between groups IV and V human foetuses.

Key Words: spinal cord, lumbar enlargement, human foetus, transverse diameter

I. Introduction

Foetal spinal cord has been the focus of interest by many scientists but the information regarding lumbar enlargement received very little attention, though important for clinical applications. Murone (1974) emphasized the importance of sagittal diameters of cervical spinal canal in adults [1]. Manual measurements in foetal specimens provide accurate readings. Morphological studies were limited to vertebral canal and spinal cord during prenatal and postnatal periods. Readings of maximum transverse diameter of lumbar enlargement of foetal spinal cord will help in understanding the pattern of growth of spinal cord in Indian human foetuses, which may be utilised for medicolegal purpose.

II. Material And Methods

Foetuses without any congenital cranio-vertebral anomalies were selected for this study. The parameters used for determination of gestational age was foetal foot length. Fair correlation between foot length and gestational age was documented [2]. For the purpose of analysis and evaluation, foetuses were divided into 5 groups as follows.

Table -1

Groups	Age (wks)	No. of Males	No. of Females	Total
I	< 17	3	3	6
II	17-20	3	3	6
III	21-25	3	3	6
IV	26-30	3	3	6
V	> 30	3	3	6

Laminectomy was performed to open vertebral canal from behind. The method was popularly used by surgeons to approach structures inside the canal [3].

1. Vertebral canal was exposed by laminectomy performed by putting the scissor in sacral hiatus on either side and continuing it upwards (Fig. 1).
2. Spinal cord with its meningeal coverings were cleaned by removing soft tissue in vicinity.
3. A vertical cut was made in dura mater along with arachnoid mater, starting in the lumbar region and continuing upto foramen magnum.

4. Spinal cord was exposed by reflecting dura, arachnoid together laterally from aforementioned midline incision .
5. All the nerve roots were cut on both sides.
6. The spinal cord was removed after making cross section in it at the level of the upper border of atlas vertebra .
7. Maximum transverse diameter of lumbar enlargement of various spinal cords was measured by Vernier calipers under standard conditions (Fig. 2).
8. For Statistical analysis findings were analysed by using Student's 't' test.

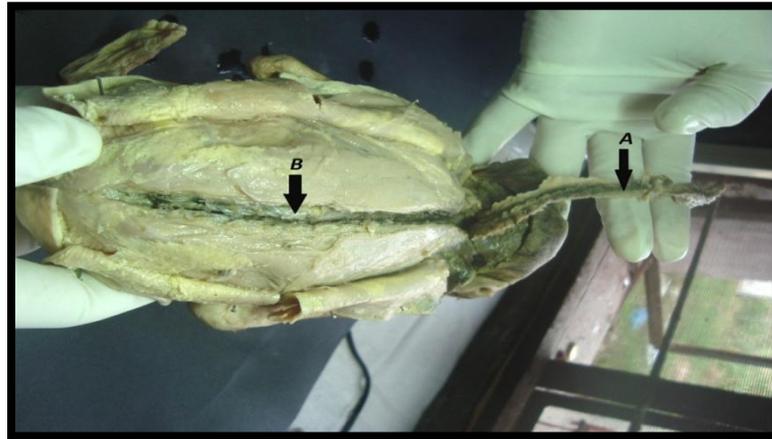


Figure -1

Dorsal aspect of human foetus showing total laminectomy (A) to expose spinal cord along with its meninges (B) in the vertebral canal.



Figure -2

Measuring the maximum transverse diameter of lumbar enlargement

III. Results

Table 2: Maximum transverse diameter of lumbar enlargement of spinal cord (mm)

Groups	No. of Foetuses	Mean \pm S.D.	Per cent change	T value	P value
I	6	2.69 \pm 0.07	-	-	-
II	6	3.35 \pm 0.13	+24	1.19	Significant*
III	6	4.10 \pm 0.14	+23	2.92	Significant*
IV	6	4.58 \pm 0.08	+12	3.42	Significant*
V	6	6.01 \pm 0.55	+31	8.88	Significant*

*P value < 0.001

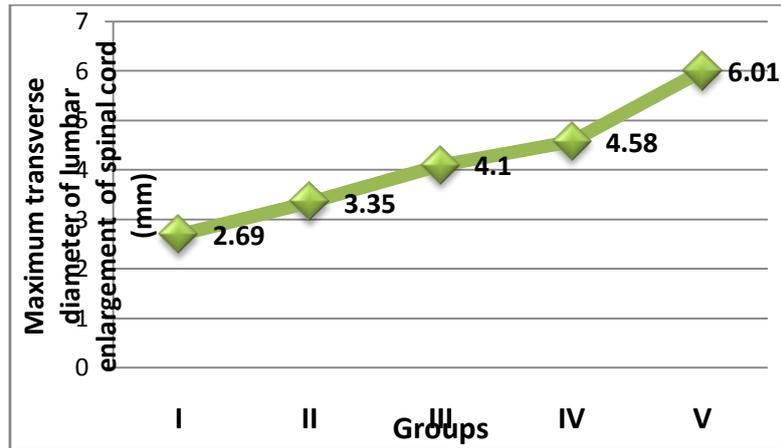


Figure – 3 Graph showing pattern in maximum transverse diameter of lumbar enlargement of spinal cord with gestational age.

IV. Discussion

Fang et al (2008) used magnetic resonance imaging technique to measure sagittal diameter of cervical spinal cord [4]. Suzuki (1994) used magnetic resonance imaging techniques for the morphological study of cervical spinal cord [5]. Few references available were based on imaging techniques having possibilities of errors. Maximum transverse diameter of lumbar enlargement increased from 2.69 mm in group I to 6.01 mm in group V. The variation was highly significant in all successive adjacent groups ie between group I and group II, group II and group III, group III and group IV, group IV and group V. In group V fetuses, 31% significant change was observed. This reflected the significant growth of the lower limbs in late fetuses. No one has earlier reported such information.

V. Conclusion

This analysis reflected the significant growth of the lower limbs in late fetuses of group IV to group V. Maximum increment in maximum transverse diameter of lumbar enlargement of foetal spinal cord in Indian human fetuses occurs after 26 weeks of gestation...

References

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