

ISSN 2278 - 5221

Vol. 2, No. 3, July 2013



International Journal of

Pharma Medicine and Biological Sciences

IJPMBS



WWW.IJPMBS.COM

editorijpmbs@gmail.com or editor@ijpmbs.com



Research Paper

MORPHOMETRIC ANALYSIS BASED ON LENGTH OF SPINAL CORD IN DIFFERENT AGE GROUP OF INDIAN HUMAN FOETUSES

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Introduction: Foetal spinal cord seemed to be the focus of interest by many scientists but its morphometric information received little attention, though important for clinical applications. Morphometric readings of foetal spinal cord will help in determining the age of foetuses, which are of great medicolegal significance. 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 length was measured by Vernier calipers under standard conditions. Result and Conclusion: Significant gain in weight of foetal spinal cord was observed in successive adjacent groups from group II onwards. There was maximum gain in length of spinal cord between groups III and IV human foetuses.

Keywords: Morphometry, Spinal cord, Length, Human foetus

INTRODUCTION

Foetal spinal cord seemed to be the focus of interest by many scientists but its morphometric information received little attention, though important for clinical applications. Few references available were based on imaging techniques having possibilities of errors. Manual measurements in foetal specimens provide accurate readings. Wallny (2002) showed spinal cord length correlation with lumbar spine length

between 16 and 41 weeks of gestation, but these findings were based on three dimensional sonography (Wallny *et al.*, 2002). As we knew, sonography had its own limitations, so manual measurements for the morphometry of spinal cord might be better option. Other scientists gave detailed information about cross sectional areas of various sections (Suzuki and Shimamura, 1994 and Bayer and Altman, 2002), but they did not comment on length of foetal spinal cord in humans. Morphometric readings of foetal spinal

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cord will help in determining the age of foetuses, which are of great medicolegal significance. The aim of present study is to obtain accurate measurements of length of spinal cord in human foetuses different age groups.

MATERIALS 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 (Streeter, 1920). For the purpose of analysis and evaluation, foetuses were divided into 5 groups as follows.

Laminectomy was performed to open vertebral canal from behind. The method was popularly used by surgeons to approach structures inside the canal (Fu et al., 2007).

1. Vertebral canal was exposed by laminectomy performed by putting the scissor in sacral hiatus on either side and continuing it upwards (Figure 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. Length of various spinal cords was measured by Vernier calipers under standard conditions (Figure 2).
8. For Statistical analysis findings were analyzed 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.

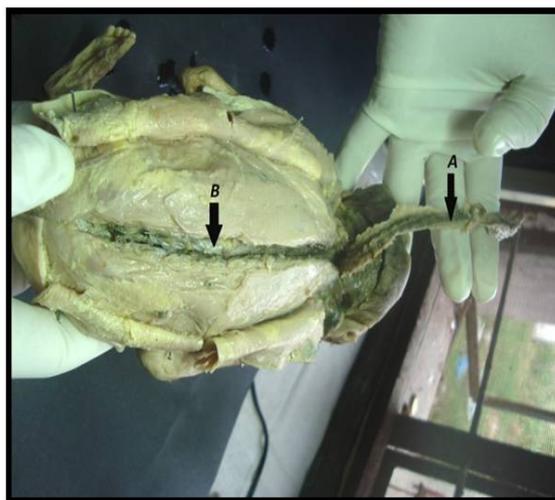


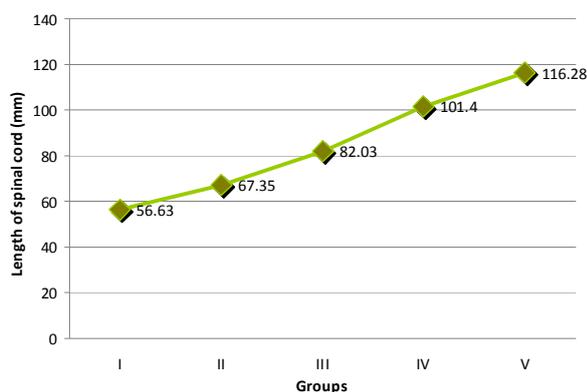
Table 1: Division of Groups Based on Gestational Age

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

Figure 2: Measuring the Length Of Spinal Cord



Figure 3: Graph Showing Pattern in Length of Spinal Cord with Gestational Age



RESULTS AND DISCUSSION

The descriptions of spinal cord found in literature were based mainly on specimens derived from adults. Raoof *et al.* (2001), showed that there was no correlation between spinal cord length and crown-rump length with gender and ethnicity using room temperature plastination technique (Raoof, 2001). Thus the detailed morphometric analysis of based on length of human foetal spinal cord by direct dissection and observations in our study was first of its kind.

Length of spinal cord increased from 56.63 mm in group I to 116.28 mm in group V (Figure 3). Initially from group I to group II, change was insignificant. Then in successive groups, changes were statistically significant, i.e., from group II to group III, group III to group IV and group IV to group V.

CONCLUSION

Growth in length of foetal spinal cord (Table 2) showed the increase in length between I and II foetal groups which was insignificant, there was steady and significant growth subsequent adjacent group II onwards.

Our study establishes that the maximum increment in the length of human foetal spinal cord occurs during 21 to 30 week of gestational

Table 2: Length of Spinal Cord (mm)

Groups	No. of Foetuses	Mean ± S.D.	Per cent change	T value	P value
I	6	56.63 ± 4.87	-	-	-
II	6	67.35 ± 1.90	+19	0.005	Insignificant
III	6	82.03 ± 3.86	+22	8.12	Significant*
IV	6	101.40 ± 3.24	+24	2.80	Significant*
V	6	116.28 ± 4.42	+15	5.77	Significant*

Note: *P value < 0.001

age. The significance of the maximum increment in length of spinal cord during 21 to 30 weeks of gestation is not known but this study can be further extended.

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International Journal of Pharma Medicine and Biological Sciences

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