

## MICROMETRY OF SPINAL CORD DURING PRENATAL LIFE IN BUFFALO

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### ABSTRACT

The present study was conducted on micrometry of spinal cord of buffalo during prenatal life. A total of 18 buffalo foeti were divided into three groups (groups I, II and III) depending upon their age. Micrometry revealed that the vertical diameter was the lowest in thoracic region and the highest in sacral region in all age groups whereas the transverse diameter was the highest in cervical region of groups I and II and in lumbar region of group III and the lowest in sacral region in all age groups of buffalo foeti. The lumen of the central canal was narrowed down with advancement of foetal age. The height of ependymal cells of the spinal cord was negatively correlated in groups I and II and was positively correlated in group III.

**Key words:** Buffalo, foeti, spinal cord, micrometry

Most of the research on micrometry of spinal cord has been reported during prenatal life in dog (Garcia *et al.*, 2005), goat (Maya, 2005) and in rats (Khaksar *et al.*, 2010). But scanty work has been reported on the micrometry of spinal cord of buffalo foeti. The biometry of spinal cord during prenatal life has been reported in buffalo (Kumar *et al.*, 2012a). In addition, transmission electron microscopy of spinal cord has been studied in buffalo foeti (Kumar *et al.*, 2012b). Hence, the present study was undertaken on micrometry of spinal cord in buffalo during prenatal life.

### MATERIALS AND METHODS

The present study was conducted on spinal cord of 18 buffalo foeti obtained from Abattoir, Ghazipur, New Delhi. After the collection of foeti, the foetal body length was measured as curved line in centimetres with the help of inelastic thread along the vertebral column between the most anterior part of frontal bone to the rump at ischiatic tuberosity and designated as crown rump length (Edward, 1965). The approximate age of the foetus was calculated by using the formula given by Soliman (1975).

$$Y = 28.66 + 4.496 X \text{ (CVRL } < 20 \text{ cm)}$$

$$Y = 73.544 + 2.256 X \text{ (CVRL } > 20 \text{ cm)}$$

Where Y is age in days and X is CVRL in centimeters.

Based on CVRL the foeti were divided into three groups viz. Group I (CVRL between 0 – 20 cm), Group II

(CVRL above 20 cm and upto 40 cm) and Group III (CVRL above 40 cm).

The small pieces of 0.5 cm thickness of spinal cord were collected from different regions (cervical, cervical enlargement, thoracic, lumbar, lumbar enlargement, sacral and coccygeal). The tissue samples were fixed in 10% neutral buffered formalin immediately after collection and later the tissues were processed for paraffin processing by acetone-benzene schedule (Luna, 1968). The paraffin sections of 5-6  $\mu\text{m}$  thickness were stained with haematoxylin and eosin stain (Luna, 1968) to study the micrometrical details.

### RESULTS AND DISCUSSION

Mean vertical diameters of central canal of the cervical, cervical enlargement and thoracic region were  $175.59 \pm 61.73$ ,  $220.85 \pm 51.26$  and  $149.94 \pm 37.38$   $\mu\text{m}$  in group I,  $186.90 \pm 18.71$ ,  $195.01 \pm 5.23$  and  $164.46 \pm 7.48$   $\mu\text{m}$  in group II and  $210.85 \pm 26.73$ ,  $188.98 \pm 13.64$  and  $184.45 \pm 11.88$   $\mu\text{m}$  in group III of buffalo foeti, respectively. Whereas the average vertical diameters of central canal of lumbar, lumbar enlargement and sacral region were measured as  $230.09 \pm 34.93$ ,  $299.12 \pm 87.20$  and  $273.28 \pm 78.54$   $\mu\text{m}$  in group I,  $184.45 \pm 17.37$ ,  $224.25 \pm 31.64$  and  $281.96 \pm 30.35$   $\mu\text{m}$  in group II and  $194.64 \pm 19.75$ ,  $212.93 \pm 31.11$  and  $277.43 \pm 21.26$   $\mu\text{m}$  in group III of buffalo foeti, respectively. The micrometrical data showed that the vertical diameter was the lowest in thoracic region and the highest in sacral region in all the age groups of buffalo foeti. The present findings were in agreement with the findings of Garcia *et*

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*al.* (2005) in dog, Maya (2005) in goat foeti and Khaksar *et al.* (2010) in rats.

The average transverse diameters of central canal of the cervical, cervical enlargement and thoracic region were  $95.30 \pm 18.43$ ,  $101.28 \pm 27.04$  and  $101.84 \pm 17.20$   $\mu\text{m}$  in group I,  $101.09 \pm 3.34$ ,  $100.71 \pm 3.52$  and  $84.49 \pm 7.96$   $\mu\text{m}$  in group II and  $135.63 \pm 10.93$ ,  $123.72 \pm 12.15$  and  $112.59 \pm 21.71$   $\mu\text{m}$  in group III of buffalo foeti, respectively. Whereas the mean transverse diameters of central canal of lumbar, lumbar enlargement and sacral region were  $88.07 \pm 21.23$ ,  $92.25 \pm 22.23$  and  $66.20 \pm 23.40$   $\mu\text{m}$  in group I,  $88.83 \pm 17.94$ ,  $84.30 \pm 10.32$  and  $90.53 \pm 26.13$   $\mu\text{m}$  in group II and  $178.42 \pm 30.24$ ,  $176.34 \pm 22.32$  and  $112.97 \pm 26.46$   $\mu\text{m}$  in group III of buffalo foeti, respectively. The micrometrical data showed that the transverse diameter was highest in cervical region in groups I and II and in lumbar region in group III whereas it was the lowest in sacral region in all age groups of buffalo foeti. Garcia *et al.* (2005) reported that the diameter of the central canal is related to the age of the dog. However, Khaksar *et al.* (2010) reported a decrease in transverse diameter and an increase in vertical diameter of central canal with age in rats.

The vertical and transverse diameters of central canal of the spinal cord were negatively correlated with the CVRL of buffalo foeti in group I. This suggested that in the initial stage, the lumen of the central canal had higher parameters and it was not in mature form.

The mean height of ependymal cells of the cervical, cervical enlargement and thoracic region was  $28.10 \pm 5.95$ ,  $29.61 \pm 5.68$  and  $31.12 \pm 5.22$   $\mu\text{m}$  in group I,  $26.97 \pm 1.45$ ,  $26.78 \pm 1.35$  and  $25.84 \pm 0.92$   $\mu\text{m}$  in group II and  $27.72 \pm 3.60$ ,  $29.80 \pm 2.24$  and  $26.78 \pm 1.99$   $\mu\text{m}$  in group III of buffalo foeti, respectively. The mean height of ependymal cells of the lumbar, lumbar enlargement and sacral region were

measured as  $34.89 \pm 4.99$ ,  $39.23 \pm 7.23$  and  $42.25 \pm 4.61$   $\mu\text{m}$  in group I,  $25.65 \pm 1.17$ ,  $33.76 \pm 3.37$  and  $39.04 \pm 2.24$   $\mu\text{m}$  in group II and  $29.23 \pm 1.43$ ,  $32.44 \pm 3.19$  and  $36.40 \pm 2.40$   $\mu\text{m}$  in group III of buffalo foeti, respectively. The micrometrical data showed that the mean height of ependymal cells of the spinal cord was negatively correlated in groups I and II and was positively correlated in group III with the advancement of buffalo foetal age. The data showed that the height of ependymal cells was maximum in sacral region and minimum in cervical region in all age groups of buffalo foeti. This suggested that cells were becoming mature as the age advanced.

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