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Caprine neonatal spinal ultrasonography

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ABSTRACT

Spinal ultrasonography is a safe, rapid, and non-invasive diagnostic tool that allows visualization of the spinal cord and its surrounding meninges. The non-ossified spinous processes were used as an acoustic window for imaging the spinal cord in human and canine neonates. No available literatures have been published describing the ultrasonographic appearance of caprine neonatal spinal cord. The present study was performed on 20 one day-old goat kids. Sagittal and transverse ultrasound scans were obtained using 8 MHz linear transducer. The spinal cord appeared as a tubular anechoic to hypoechoic structure within the spinal canal. The cord was surrounded by hyperechoic dura and pia matter as well as the anechoic subarachnoid space in-between. The mean sagittal diameter of the cord at the cervical region was (4.6 ± 0.3 mm), the thoracic region (3.9 ± 0.2 mm), and the lumbar region (4.3 ± 1.1 mm). The sagittal diameter of the cord at the cervical and lumbar regions was significantly wider than the diameter at the thoracic region. Identification of the normal ultrasonographic appearance of caprine neonatal spinal cord may represent the basis for diagnosing congenital spinal cord lesions.

1. Introduction

Spinal ultrasonography is a safe, rapid and non-invasive diagnostic tool that allows visualization of neonatal spinal cord and subsequently diagnosing spinal diseases in human and canine neonates (Kawahara et al., 1987; Amer et al., 2016). The incompletely ossified posterior arches in human neonates and spinous processes in canine neonates act as acoustic windows for visualization of the spinal cord within the spinal canal (Rubin et al., 1988; Mankin et al., 2012; Amer et al., 2016). In canine neonates, the spinous processes could be used for imaging the cord till 30 days old (Amer et al., 2016). In adult human or canine, it is difficult to visualize the spinal cord except in cases of spina bifida or following laminectomy (Mankin et al., 2012). Spinal ultrasonography allows diagnosing congenital spinal malformation such as myelomeningiocele, spinal lipoma, and syringomyelia or acquired diseases such as meningeal tears or spinal injury due to birth trauma (Braun et al., 1983; Hecht et al., 2014). All these spinal cord anomalies could be diagnosed shortly after birth.

No available literatures have been published describing the normal ultrasonographic appearance of caprine neonatal spinal cord. The purpose of the present study was to describe the normal ultrasonographic appearance of caprine neonatal spinal cord to facilitate the diagnosis of spinal cord anomalies just after birth using a simple, rapid, economic and non invasive diagnostic tool. Also the study aimed to record the sagittal diameter of the cord at different spinal segments.

2. Materials and methods

The present study was performed on 20 goat kids of the same breed (Egyptian Baladi Goats) collected from 13 does. The kids were one day old and weighing 2.1 ± 0.3 kg. All study procedures were done in accordance to the Institutional Animal Care and Use Committee of Faculty of Veterinary Medicine- Cairo University. Complete physical and neurological examinations were performed to exclude the evidence of systemic and/or neurologic diseases. All kids were free from neurologic manifestation (ataxia, circling and postural deficits) according to Clarkson and Faull (1990). Spinal ultrasonography was performed using 8 MHz linear transducer attached to ultrasound machine (Toshiba just vision 200- Japan). Sagittal and transverse scans were performed after application of acoustic coupling gel. In sagittal scan, the transducer was placed over the midline starting from the atlanto-ocipital articulation and moved backward till lumbo-sacral articulation. Ultrasonographic images were recorded at the upper and lower cervical, cranial and caudal thoracic as well as cranial and caudal lumbar regions according to the previously described technique in canine neonates (Amer et al., 2016). The transverse scan was obtained from the sagittal scan through rotation of the transducer 90°. The kids were held in ventral recumbency and kept in straight position by an assistant to obtain exact midline images. The focal zone of the transducer, image resolution and time gain compensation were fixed during examination in order to compare between appearance and echogenicity of different spinal cord segments. The diameter of the spinal cord was measured

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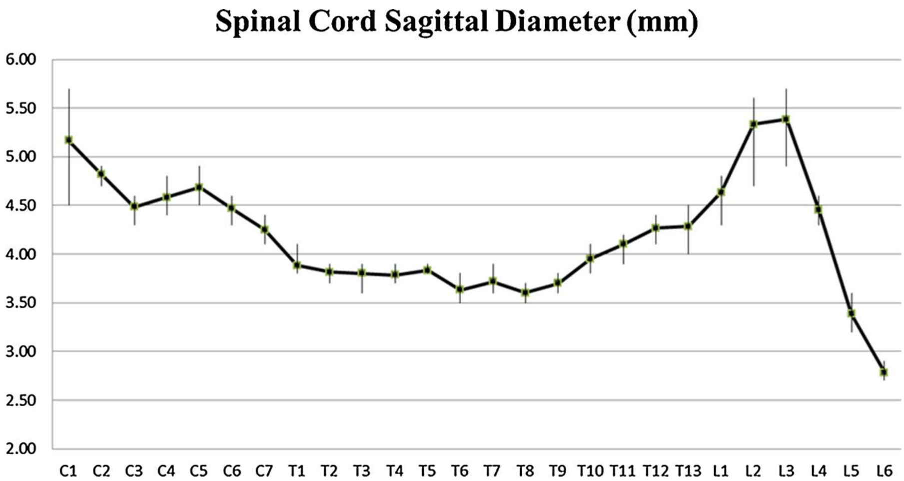

Fig. 1. The mean spinal cord sagittal diameter (mm) of the caprine neonate at the different spinal cord segments.

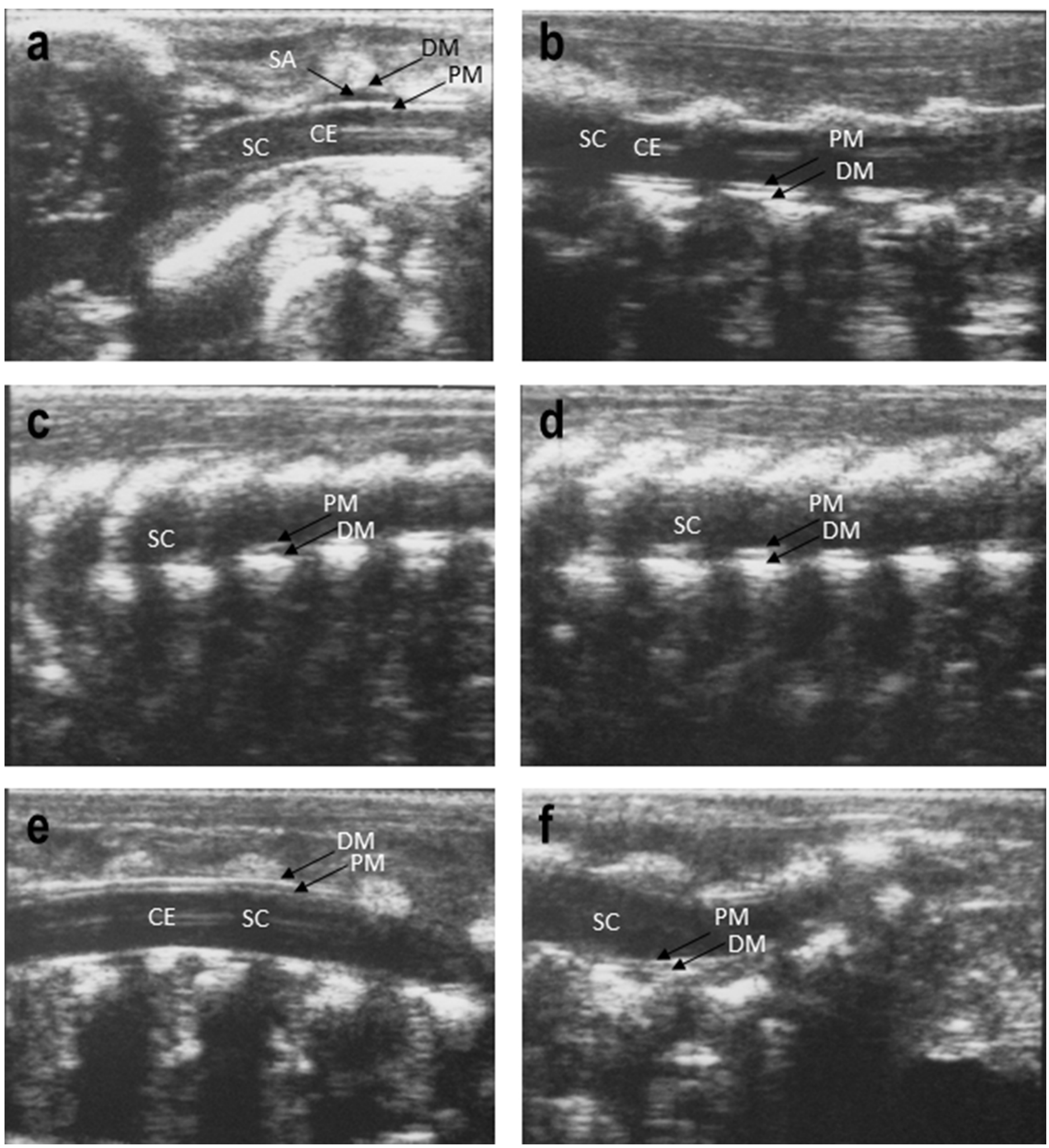

Fig. 2. Sagittal scan of the cervical (a,b), thoracic (c,d) and lumbar (e,f) spinal cord segment (CE: central echo; DM: dura matter; PM: pia matter; SA: subarachnoid; SC: spinal cord).