

Cranium bifidum with meningocele in a lamb: A case report

Mehrdad Yadegari^{1*}, Shahin Nejat Dehkordi², Elyas Vahed Dehkordi³, Mohesn Jafariyan⁴ and Faham Khamesipour⁵

^{1*}Department of Radiology, Faculty of Veterinary Medicine, Islamic Azad University-Shahrekord Branch, Iran; ²Department of Clinical Sciences, Faculty of Veterinary Medicine, Islamic Azad University-Shahrekord Branch, Iran; ³Department of Clinical Sciences, Faculty of Veterinary Medicine, Islamic Azad University-Shahrekord Branch, Iran; ⁴Department of Pathobiology, Faculty of Veterinary Medicine, Islamic Azad University-Shahrekord Branch, Iran; ⁵Young Researchers Club, Islamic Azad University-Shahrekord Branch, Iran

Abstract

Meningocele is a rare defect, which is the displacement of the structures of the brain or/and meninges through a congenital cavity in the cranium. A cranium bifidum with meningocele at the mid-parietal region was diagnosed in a three days old male lamb. General examination of lamb revealed fluctuated mass (6×8 cm) in the occipital region. Radiographic survey and ultrasonographic examination were carried out to confirm meningeal in the lamb.

Keywords: Cranium bifidum; lamb; meningocele; radiography; ultrasonographic

To cite this article: Yadegari M, SN Dehkordi, EV Dehkordi, M Jafariyan and F Khamesipour, 2013. Cranium bifidum with meningocele in a lamb: A case report, Res. Opin. Anim. Vet. Sci., 3(11), 387-390.

Introduction

Certain of the congenital defects in lamb and cattle involve the central nervous system (William et al., 2011), which may account for 12 to 21 percent of congenitally defective calves and the frequency of congenital defect in sheep is not fixed. It has been estimated that 0.5-1 percent of lamb born have congenital defects (Greene et al., 1973; Leipold and Saperstein, 1996; Kumru et al., 2007). Meningocele has been delineated as a lack of the neural tube to fuse (French, 1982; Leipod and Dennis, 1986; Back et al., 1991; Radostits et al., 2000). Congenital defects of the nervous system are high in published records and this may be related to the ease with which abnormalities of this system can be observed (Radostits et al., 2000).

The craniomeningocele is a hernial jut of the meninges and/or cerebral tissue via a cranium bifidum, generally forming a fluid-filled sac on the frontal or parietal bones. Meningocele is the protrusion of fluidfilled meninges through a defect in the cranium (crania bifida) (Jubb and Huxtable, 1993). This indisposition has been described in sheep, cattle, horses, pigs, cats and dogs (Dennis, 1975; Samuelson and Dennis, 1976; Leipod and Dennis, 1986; Fazili, 1988; Back et al., 1991; Jubb and Huxtable, 1993; Ayyappan et al., 1996; Leipold and Saperstein., 1996; Kohli, 1998; Kohli and Naddaf, 1998; Lopez and Wilson., 2000; Raoofi et al., 2004; Shivaprakash and Usturge, 2004; Kumru et al., 2007; Buck et al., 2009; Ghonghadze et al., 2011; William et al., 2011; Laiju et al., 2012).

Case study

In November 2012, a three days old male lamb was presented to the Veterinary Clinic of Shahrekord Islamic Azad University with a large fluid-filled swelling at mid-parietal region having cyst-like consistency. The size of the swelling was approximately 6cm×8cm and the overlying skin was normal (Fig. 1). The animal showed difficulty in rising and even if it could not stand without support. The lamb was standing with its forelimbs wide apart but it was suckling normally. No congenital defects similar to the present case were known to the owner.

Corresponding author: Mehrdad Yadegari, Department of Radiology, Faculty of Veterinary Medicine, Islamic Azad University-Shahrekord Branch, Iran. P.O Box: 166. Shahrekord, Iran, TeleFax: +983813361045, Mobile: +989131813028 Physical examination revealed body temperature 37.5°C, pulse rate 110 beats/min, respiratory rate 55 breaths/min, and hyperemic mucous membranes. Deep palpation of the base of the swelling revealed a defect dorsocaudally from the skull surface in the medium parietal bone and the bony margins of the defect were felt. The mass fluid was foamy, straw coloured and slightly pinkish (xanthochromic) resembling cerebrospinal fluid. Analysis of the fluid revealed specific gravity 2.052 (normal range 8-70 mg/dl) and glucose 49 mg/dl (normal range 48-109 mg/dl). Cell count was determined and white blood cells were not seen. A few lymphocytes and red blood cells were detected on microscopic examination of centrifuged sediment. A tentative meningocele with a skull defect was diagnosed.

The lamb's skull was X-rayed to determine whether there was a bone defect. On the lateral view, the caudal region of the skull showed decreased bone opacity due to a defect on the cortex of interparietal bone (Fig. 2). In sonographic examination, there was a large anechoic cyst-like mass that seemed to be part of duct and was attached to the skull (Fig. 3).

Positive contrast radiography was performed to evaluate any communication between the mass fluid and cerebro-spinal fluid flow, the lamb was placed in lateral recumbency and the tip of a needle was inserted through the skin into the fluctuating mass. For prevention of increasing cerebro-spinal fluid pressure, after removal of 12 ml mass fluid, equal volumes of Iohexol (Omnipaque 240 mg I/ml, Nycomed, Ireland) was injected into the mass. Two radiographs were taken In contrast radiographs, the contrast medium was seen in the subarachnoid space after 20 min and it was distributed into the spinal canal after 30 min (Fig. 4).

Discussion

Meningocele is a dislocation of the brain structures and/or meninges via congenital bone deficiency of the skull. Based on the hernial sac, the hernias can be classified to meningoceles and menigocephaloceles (Dennis, 1975; Leipold and Saperstein, 1996; Kohli, 1998).

Meningocele has been reported in white German Holstein calf) Buck et al., 2009), buffalo calf (Ayyappan et al., 1996) and a female Jersey calf (William et al., 2011).

The morphogenesis of meningocele is not simply a difficulty of faulty ossification of the skull with secondary herniation of preformed intracranial tissue but, instead, depends on a preliminary defect of the neural tube, from which there is a focal defect of efflorescence of the neural tube from the embryonic ectoderm and, in outcomes, a focal defect of expansion of the skeletal encasement (Jubb and Huxtable, 1993; Shivaprakash and Usturge, 2004).



Fig. 1: Congenital cranial meningocele in three days old male lamb. The size of the sac with normal skin and hair was approximately 6cm× 8cm



Fig. 2: Lateral survey radiograph of skull. Arrow shows the radiographic appearance of defect in the occipital region of the case. The caudal region of the skull showed decreased bone opacity due to a defect on the cortex of interparietal bone



Fig. 3: In sonographic examination, a mass that attached to the skull was seen by arrow (Left figure) and there was a large anechoic cyst-like space (Right figure)



Fig. 4: Showing lateral view of contrast radiograph of skull. After 20 min, the contrast medium still remained in the mass (was seen in the subarachnoid space), and arrow indicates the bone defect

Meningocele is a congenital defect with unknown etiology (Fazili, 1988; Lopez and Wilson, 2000) but can be inherited in pigs and in cats and has been associated with treatment of the pregnant queen with Griseofulvin (Jubb and Huxtable, 1993. Environmental factors may influence the degree of penetration of the gene and therefore various meningocele phenotypes exist (Back et al., 1991). The position of the large and heavy suspended mass at occipital region and small diameter of the cranial osseous defect results in compression of blood vessels particularly thin-walled veins (strangulation). As a result of impaired venous return, the hydrostatic pressure increases which leads to decreased return of interstitial fluid to venous circulation (Thomson, 1984; Raoofi et al., 2004). Since dural sinuses were not present and the function of arachnid villi was impaired due to increased hydrostatic pressure, the filtrated fluid has not returned to circulation and gradually has accumulated. Therefore, it seems that straw coloured fluid in cystic mass has originated from cerebro-spinal and interstitial fluids (Raoofi et al., 2004).

External pressure and stagnation of blood in vessels result in hypoxia which increase permeability of capillary endothelium and facilitates leakage of plasma proteins into the tissue space (Thomson, 1984. Because there were no lymphatic vessels or active dural sinuses for draining these proteins, they were remained and the protein content of the mass fluid was increased. The presence of red blood cells in the mass fluid appears to be the cause of diapedesis. This process occurs when there is increased venous hydrostatic pressure in vessels that are not visibly broken but perhaps somewhat anorexic and not functioning properly (Thomson, 1984). A neonate with a congenital defect is an adapted survivor from a disruptive event of a genetic or environmental nature or of a genetic-environmental interaction at one or more of the stages in the sequences of embryonic and fetal development (Radostits et al., 2000).

Conclusion

Radiography and ultrasonography can be used as an efficient diagnostic tool to determine the scope of the meningocele. Due to the lack of an expert surgeon, surgical treatment applied to the lamb failed. The Lamb because of seizures and a severe drop in body temperature died.

Acknowledgement

The authors would like to express their gratitude to staff of the Veterinary Department of the Shahrekord Veterinary Hospital.

References

- Ayyappan, S., Balasubramanian, S., Subramanian, A. and Dhanapalan, P. 1996. Congenital meningocoele in a buffalo calf-a case report. *Cheiron*, 25: 162-163.
- Back, W., van den Belt, A.J.M., Lagerweij, E., van Overbeeke, J.J. and van der Velden, M.A. 1991. Surgical repair of cranial meningocele in a calf. *Veterinary Research*, 128: 569-571.
- Buck, B.C., Ulrich, R., Wohlke, A., Kuiper, H., Hewicker-Trautwein, M. and Distl, O. 2009. Two rare brain malformations in black and white German Holstein calves. *Dtsch Tierarztl Wochenschr*, 116: 192-199.
- Dennis, S.M.1975. Congenital defects of the nervous system of lambs. *Australian Veterinary Journal*, 51: 385-388.
- Fazili, M.R. 1988. Meningocele in a crossbred lamb. Indian Journal of Veterinary Surgery, 19: 51-51.
- French, B.N. 1982. Neurological Surgery. 2nd edition. WB Saunders, Philadelphia, pp: 1298.
- Ghonghadze, T., Lekiashvili, M., Gogatishvili, T. and Pagava, K. 2011. Encephalocele and skeletal malformations (case report). *Georgian Medicine News*, 193: 97-99.
- Greene, H.J., Leipold, H.W., Huston, K., Noordsdy, J.I. and Dennis, S. 1973. Congenital defects in cattle. *Irish Veterinary Journal*, 27: 37-45.
- Jubb, K.V.F. and Huxtable, C.R. 1993. Crania Bifida and Related Defects, In: Pathology of Domestic Animals, Jubb, K.V.F., Kennedy P.C. and Palmer N. (editors), Vol. 1, 4th ed., Academic Press, San Diego, pp: 273-274.
- Kohli, R.N. 1998. Congenital meningocele with a rare skull defect in a lamb. *Australian Veterinary Journal*, 76: 252-252.

- Kohli, RN. and Naddaf, H. 1998. Surgical treatment of cranial meningocele in Iranian calves. *Veterinary Record*, 142: 145-145.
- Kumru, I.H., Cecen, G., Alasonyalhlar, A., Kahraman, M.M. and Kabakaya, U. 2007. A congenital craniomeningocele in a Holstein calf. Proceedings of the15th International Congress of Mediterranean Federation for Health and Production of Ruminants, May 15-19, 2007, KusadasY-Turkey.
- Laiju, M.P., Ranjith, M.M., Francis, B. and Sajesh, M. 2012. Gsurgical repair of frontal meningeal in a kid. *Journal of Indian Veterinary Association Kerala*, 10: 50-52.
- Leipod, H.W. and Dennis, S.M. 1986. Congenital Defects Affecting Bovine Reproduction. In: Current Therapy in Theriogenology 2: Diagnosis, Treatment and Prevention of Reproductive Diseases in Small and Large Animals, Morrow D.A. (editors). 2nd ed., W.B. Saunders, Philadelphia, pp: 177-199.
- Leipold, H.W. and Saperstein, G. 1996. Congenital Defects and Hereditary Diseases in Sheep. In: Large Animal Internal Medicine, Smith B.P. (editors). 2nd ed., Mosby, Louis, pp: 1770-1796.

- Lopez, M.J. and Wilson, D.G. 2000. Crania bifida with meningocele in a Holstein calf. *Large animal practice*, 21: 16-19.
- Radostits, O.M., Gay, C.C., Blood, D.C. and Hinchcliff, K.W. 2000. Veterinary Medicine. 9th Edn., WB Saunders, London, pp: 120-125.
- Raoofi, A., Dehghan, M.M., Mardjanmehr, S.H., Soroori, S., Hemmatzadeh, F., Lotfollahzadeh, S. and Nekoei, S.H. 2004. Cranium bifidum with meningocele in a lamb. *Small Ruminant Research*, 55: 253-256.
- Samuelson, M.L. and Dennis, S.M. 1976. Cleft palate associated with meningocele in a pup. *Veterinary Record*, 104: 436-436.
- Shivaprakash, B.V. and Usturge, S.M. 2004. Cranioschisis and meningocele in a bovine calf. *Indian Veterinary Journal*, 81: 1153-1154.
- Thomson, R.G. 1984. General Veterinary Pathology. 2nd ed., WB Saunders, Philadelphia, pp: 109-131.
- William, J., Shiju Simon, B.M., Ayyappan, S., Ramani, C., Velavan, R. and Suresh, K. 2011. Surgical management of cranial meningocoele in a calf tamilnadu. *Journal of Veterinary and Animal Sciences*, 7: 164-166.