SURGICAL MANAGEMENT OF CRANIUM BIFIDUM WITH MENINGOCELE IN A JERSEY CALF UNDER RESOURCE-LIMITED SETTINGS: A RETROSPECTIVE CASE REPORT

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ABSTRACT: *Cranium bifidum is a congenital defect that develops due to the failure of neural tube closure during fetal development. This results in the development of an osseous defect in the calvaria, through which herniation of meninges and cranial structures occurs. The congenital defect in a four-day-old male Jersey calf suffering from large fluctuating swelling over the parieto-occipital region was reported to Regional Veterinary Hospital & Epidemiology Center, Dewathang from Gomdhar Gewog under Samdrup Jongkhar Dzongkhag. Upon close examination, the calf was recumbent and exhibited rapid abdominal respiration. The swelling was warm, fluctuating, and pedunculated. Preemptively, a fine-needle aspiration was performed and serosanguinous fluid was observed. The fluid inside the swelling was drained and the skin flap produced was then excised completely. The hernial ring-like opening at the base was closed initially with absorbable suture material; PGA Sterile (2-0), followed by in-layers with same suture material and size. The skin was apposed using a horizontal-mattress pattern using silk suture. Then the calf was treated with antibiotic (Injection Cefotaxime) and analgesic (Injection Meloxicam) post-surgery along with daily antiseptic dressing of the surgical wound. The prognosis was grave due to the involvement of neurological structures, which required specialized surgical intervention, and unfortunately, the patient did not recover uneventfully. The condition was diagnosed retrospectively as Cranium Bifidum with Meningocele, and this unique case highlights the diverse range of clinical conditions encountered in the field and underscores the need for in-depth knowledge in diagnosing and managing such condition within resource-limited veterinary settings, such as certain remote places in Bhutan.*

Keywords: Cranium bifidum; Herniation; Meningocele; Meningoencephalocele; Pedunculated

1. INTRODUCTION

Cranium bifidum is a congenital osseous defect in the calvaria, which can lead to the herniation of meninges and brain tissue (Atasever et al. 2013), resulting in a condition called meningocele and meningoencephalocele, respectively. These conditions are most frequently found to develop in the frontal and occipital regions, although, in other animals, they may occasionally occur in the cervical, thoracic, lumbar, and vertebral regions (Kumar et al. 2017). Such defects primarily arise from a focal failure of neural tube closure during fetal development, and this condition has been reported in various species of domestic mammals, with cattle being the most commonly affected (Kisipan et al. 2016; Kohli 1998). The clinical signs of meningocele mainly include a floating saccular protrusion of varied size and volume and are associated with cranium bifidum in the frontal or parietal region (Abdulrasheed et al. 2023).

Figure 1: Swelling over the parieto-occipital region

The report presents a case of cranium bifidum with meningocele, diagnosed retrospectively in a four-day-old male Jersey calf in Gomdhar Geog under Samdupjongkhar Dzongkhag.

2. A CASE STUDY

2. 1 History and clinical observation

A male Jersey calf was reportedly born with a large growth in the poll region, as evidenced in Figure 1. The calf was delivered naturally, with minimal force-traction applied by the owner to facilitate complete fetal exteriorization. The calf was recumbent and bottle-fed with the dam's milk since day one. On anamnesis, the growth size gradually increased over a few days. The case was reported to the Regional Veterinary Hospital & Epidemiology Center at Dewathang.

Upon close examination, the growth was found to measure approximately 18 cmx17cm, and the base was seated on the parieto-occipital region. The calf was suffering from rapid abdominal respiration and exhibited several episodes of convulsions. On palpation, the growth was warm, fluctuating, and pedunculated. The pain was exhibited on deep palpation of the swelling.

Preemptively, a fine-needle aspiration was performed and serosanguinous fluid was observed. The immediate surgical management of the condition was considered due to its critical nature, even in a very resource-limited setting in the field.

2.2 Surgical intervention

2.2.1 Drainage of fluid

A stab incision was made on the dorsal part of the growth after infiltrating it subcutaneously with a 2% lignocaine injection. Approximately 180ml of serosanguinous fluid was drained, and an external skin flap measuring roughly 20 cm long vertically was created (Figure. 2).

Further, upon palpating the base of the growth, a defined hernial ring-like opening was observed, and a flap of cartilaginous tissue was felt embedded in the interior lining near the base of the growth.

Figure 2: Extra Skin

2.2.2 Surgical procedures

The hair at the base of the growth was clipped and scrubbed with a Povidone-Iodine solution, and an aseptic surgical site was prepared. Subsequently, a 2% Lignocaine injection was infiltrated circumferentially over the base of the sac to achieve local analgesia. The skin flap was then extirpated completely.

The hernial ring-like opening at the base was closed initially with absorbable suture material; PGA Sterile 2-0, followed by in-layers with the same suture. The skin flap was appositioned using a horizontal-mattress pattern using Silk suture.

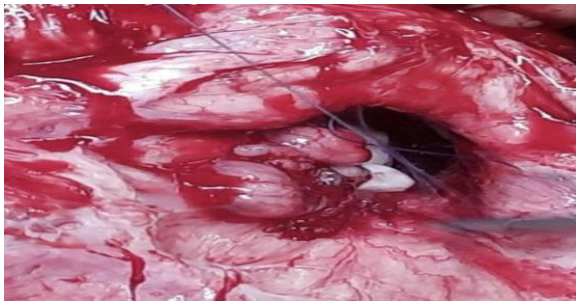

Figure 3: Opening at base of swelling with posterior cerebrum

2.3 Post-operative treatment and care

Daily antiseptic dressing of the surgical site using Povidone Iodine solution was performed and additionally, Gamma Benzene Hexachloride ointment was applied on the surgical site, daily. For post-operative treatment, a course of 0.3 ml of Meloxicam injection once a day (od) for five days and 1 ml of Cefotaxime injection twice a day (b d) for five days was administered.

Figure 4: Calf after surgery

3. DISCUSSION

This abnormality, cranium bifidum, arises due to the interruption of calvaria bone formation during the embryonic stage, resulted due to the failure of neural tube closure during fetal development (Kisipan et al. 2014). It is characterized by the incomplete midline migration of the cranial vault (Suat et al. 2008). This condition is reported to occur in all domestic mammals but is most frequently encountered in cattle (Kisipan et al. 2014). Typically, the cases are presented with fluctuating swelling, primarily over the frontal and occipital regions.

The exact etiology of this congenital defect has not been defined. However, research in pigs and cats has reported hereditary meningocele and meningoencephalocele in association with this condition (Atasever et al. 2013). Additionally, it has been noted to be linked to Griseofulvin treatment in pregnant queens (Jubb et al. 1993; Yadegari et al. 2013).

In meningocele and meningoencephalocele cases, the herniated pouch may or may not be covered with the skin (Erdoğan et al. 2013), and in the present case, the herniated pouch was covered by skin.

In this particular case, the calf was found in lateral recumbency. Frequent jerking of the head backward was observed and the owner reported a gradual increase in the size of the swelling. The base of the extracranial sac; interiorly, was extended to the occipital region of the cranial cavity, and a portion of the posterior cerebrum protruded through the opening (Figure 3). A similar observation was made by Atasever et al. (2013).

Further, the dorso-caudal part of the cerebellum could be viewed through a hernia-like opening. A cartilaginous structure of an undefined shape, measuring approximately 4cm vertically embedded, was observed in the wall of a skin sac. This structure was distinctly palpable after the removal of fluid and this finding concurs with the findings of Kisipan et al. (2016), as well as in Kohli (1998).

The presence of red blood cells in the serous fluid, which appeared serosanguinous is believed to have resulted from diapedesis (Yadegari et al. 2013). This process occurs as a result of increased venous hydrostatic pressure in vessels due to the compression of vessels passing through a small diameter of cranial osseous defect.

The prognosis for this condition largely depends on whether neurological symptoms are present. The occurrence of neurological signs is typically linked to structural abnormalities in the brain tissue, which often indicate a poor prognosis (Abdulrasheed et al. 2023).

4. CONCLUSION

This congenital condition was diagnosed retrospectively. The prognosis was grave due to the involvement of neurological structures, which required specialized surgical intervention. Unfortunately, the patient did not recover uneventfully. The specific condition has not been previously reported in the Veterinary Information System (VIS) or documented in existing animal health literature in Bhutan. However, similar cases in the field are presumed to be under-reported, and reports of such cases underscore a critical need for in-depth knowledge about the diagnosis and management of this clinical condition in a resource-limited veterinary setting like Bhutan.

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