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Clinical Report

Cranium Bifidum and Meningocele in the Caudal Aspect of a Lamb Head

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ARTICLE INFO	ABSTRACT
<p><i>Article History:</i></p> <p>Received 27 February 2021 Revised 25 April 2021 Accepted 28 April 2021 Online 28 April 2021</p> <p><i>Keywords:</i></p> <p>Meningocele Cranium bifidum Congenital Lamb Surgery</p>	<p>Meningocele is a congenital defect that defined as a herniation of dura through the defect of cranial bone (cranium bifidum) with accumulation of CSF in it. This anomaly has been described in calf, lamb, foal, piglet, dog and cat. Etiology of meningocele is unknown but genetic and environmental factors may cause meningocele in lambs. A seven-day-old female Kurdish lamb with a congenital mass (8 cm in diameter) in the caudal part of its head was referred to the Veterinary Teaching Hospital of Urmia University. The lamb was lateral recumbent and the vital signs were in normal range. Symptoms of pain and paddling revealed while manipulating the mass. The fluid obtained from the mass was examined under a microscope and showed no signs of bacteria or inflammatory cells. Total serum protein was 8.9 g/dL and mean platelet volume (MPV) was 2.5 fl and other blood parameters were normal. In radiography, there was a bone defect in skull and congenital cranium bifidum and meningocele confirmed. The meningocele mass removed with surgery and the skin were stitched. The clinical condition of the lamb did not improve after surgery. The lamb had died 5 days after surgery. This report presents the clinical findings and radiographs of cranium bifidum in a Kurdish lamb. The prognosis for surgical treatment is poor in cases where the animal has not been able to stand and suckle since birth.</p>

Case Description

A seven-day-old female Kurdish lamb with a tissue protrusion (8 cm in diameter) in its head was referred to the Veterinary Teaching Hospital of Urmia University. This mass was present on the lamb's head from birth and its size was constant over time. The lamb was recumbence from birth and could only eat a small amount of milk with the owner help. The appearance of lamb feces looked normal but due to the low intake of milk, feces amount was low. On clinical

examination the mass was located on the caudal part of the head and the lamb was lateral recumbent. The vital signs were in normal range. Rectal temperature was 39.7° C, heart rate was 104 beat per minute, respiratory rate was 68 breathe per minute, and CRT was 2 seconds. Symptoms of pain and paddling revealed while manipulating the mass. The fluid obtained from the mass was examined under a microscope and showed no signs of bacteria or inflammatory cells. Except for moderate hyperproteinemia and abnormalities in some

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platelet indexes, all other CBC parameters were in normal range (Table 1). In radiography, there was a saccular soft tissue (fluid) mass with a diameter of 8 cm on dorsocaudal skull. Some fold line was drawn from mass to the skull that presented the location of the bone defect. Bone structure lost, some irregularity and depression were seen on the caudal part of parietal bone (Figure 1). On dorsoventral view, bone opacity was decreased at the summation of biparietal junction and Basioccipital bones, which revealed the bone defect position at this site (Figure 2). These findings were related to meningocele.

Treatment and Outcome

Under xylazine (0.1 mg/kg, Rompun, Bayer, Germany) sedation and local analgesia with lidocaine hydrochloride (Vetacain, Aburairhan, Iran), the meningocele mass removed with surgery and the skin were stitched. Simple interrupted pattern with polyglactin was used for inner layer suture and cross mattress suture with non-absorbable material for skin. Postoperative care of animal with oxytetracycline (Oxivet, Razak, Iran) 10 mg/kg, IM, q 24 h and dexamethasone (Dexaject, Erfan daru, Iran) 0.25 mg/kg, IM, q 24 h for 5 days was done.

The clinical condition of the lamb did not improve after surgery. Our follow-up revealed that the lamb had died 5 days after surgery and during this time the general condition, the ability to stand and sucking had not changed.

Clinical Relevance

Congenital anomalies can have a variety of causes such as genetic abnormalities, infections, hormonal imbalances, environmental, physical and managerial factors. Nutritional deficiencies such as minerals and vitamins can also be causes. In many cases, the exact cause of congenital malformations in ruminants cannot be determined. The economic significance of these abnormalities is often related to the elimination of the animal and in genetic cases the transfer of defective genes in the herd.¹ Crania bifida is a defect in the cranium bone that, if the dura protrudes through the small defect (usually in frontal suture) and fill with cerebrospinal fluid, is called a meningocele. If the brain tissue protrudes of this defect, it is called meningoencephalocele.¹ Meningocele appears to be associated with increased CSF pressure in the lateral and third ventricles. The recessive gene and

Table 1. Blood parameters include complete blood cell count, total protein and fibrinogen.

Index	Value	Unite	Normal Range
TP	8.9	g/dl	6-7.9
Fib	1.7	g/l	1-5
WBC	9	×10 ⁹ /l	4-12
RBC	8.14	×10 ¹² /l	9-15
HGB	10	g/dl	9-15
HCT	29.9	%	27-45
MCV	36.7	fl	28-40
MCH	12	pg	8-12
MCHC	334	-	310-340
PLT	709	×10 ³ /ul	260-1000
LY	4.4	×10 ⁹ /l	2-9
MO	0	×10 ⁹ /l	0-0.8
EO	0.1	×10 ⁹ /l	0-1
GR	4.5	×10 ⁹ /l	0.7-6
RDW	18	%	18-24.6
PCT	0.18	%	0.13-0.42
MPV	2.5	fl	3.6-6.5
PDW	15.5	%	29-96

Moderate hyperproteinemia and a decrease in MPV and PDW levels are abnormal in the results and the rest are in the normal range.

TP: total protein, Fib: fibrinogen, WBC: white blood cell, RBC: red blood cell, HGB: hemoglobin, HCT: hematocrit, MCV: mean corpuscular volume, MCH: mean corpuscular hemoglobin, MCHC: mean corpuscular hemoglobin concentration, PLT: platelet, LY: lymphocyte, MO: monocyte, EO: eosinophile, GR: granulocyte, RDW: red cell distribution width, PCT: plateletcrit = volume occupied by platelets in the blood, MPV: mean platelet volume, PDW: platelet distribution width.

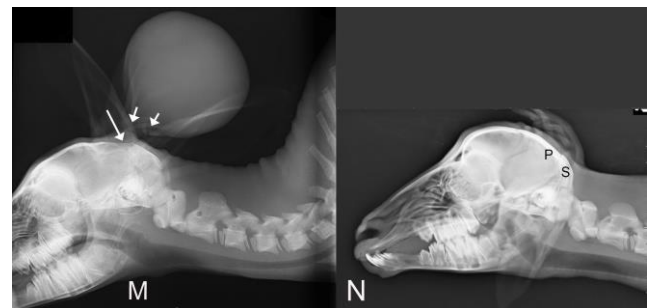


Figure 1. Lateral skull plain radiograph in lamb with meningocele (M) and a healthy lamb same age as (N): the radiograph demonstrates a soft tissue (fluid) mass with a diameter of 8 cm in the dorsocaudal part of the skull. In the caudal part of the parietal bone, just at its junction to the occipital bone, loss of normal bone thickness, irregularity, reduce of bone opacity and desperation indicates a bone defect in this place (long arrow). Soft tissue folds drawn from mass to the skull indicates the location of the defect (small arrows). P: Parietal bone; S: Squamous part of occipital bone.

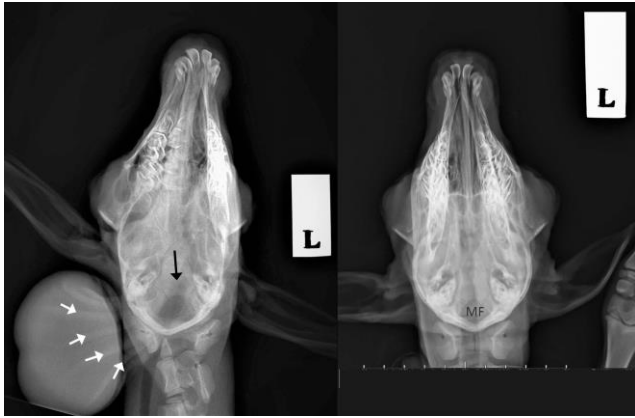


Figure 2. Dorsoventral radiograph from the same lambs as in figure 1. Meningocele lamb (left) and healthy lamb (right): Soft tissue mass on the right side of the head and neck with folds drawn to the defect site (small white arrows) is seen. Compared to normal skull, a decrease in bone opacity is observed at the silhouette summation of parietal and Basioccipital bones, the bone defect position, (black arrow). MF: foramina magnum.

hypovitaminosis A have been shown to be effective in pig meningocele.² Cranium bifidum and meningocele have been found in pigs, calves, foals and lambs.³⁻⁶ Radiography, ultrasonography and computed tomography can be used to diagnose meningocele.^{6,7}

The present report describes meningocele in female Kurdish lambs, while in most reports meningocele is reported in male lambs.⁷ In one case, meningocele was reported to be associated with teratoma⁸ but in our case, there was no abnormal proliferative tissue showed in lamb head. In a report of meningocele in a foal, blood parameters were normal, and after surgery, the animal showed neurological complications from the 13th day and died on the 14th day. Studies have shown that death is due to bacterial meningitis.⁴ Blood counts in the present case were also normal. Moderate hyperproteinemia, which could be due to insufficient water supply and dehydration and abnormalities in platelet indexes can also reflect congenital abnormalities in platelet synthesis. There was no response to surgical treatment in our case too but in one case of lamb meningocele surgery, the animal lived healthy for up to two months. Of course, in this case, the lamb had normal vital signs at the first examination and had no problem standing.¹

In one report, a calf with meningocele underwent surgery, which was successful. This calf also had normal activity at the time of the visit had only a relative difficulty in standing and sucking, but could stand.⁹ In one case, a meningocele of lamb was located in the caudal of the head, and the animal was unable to stand and hold its head from birth. The lamb's herniated mass

was surgically removed, and although it was noted that it had fully recovered three weeks after surgery, there was no indication that it was able to stand or suck.¹⁰ In another surgical report on lamb meningocele, the animal was alive after one week but no improvement in symptoms was reported.¹¹ Meningocele surgery in another lamb did not have positive results and the lamb died due to seizures and drop in body temperature.⁶ In one case of meningocele in lamb that was unable to stand, the animal died before surgery.⁷ There is a report of meningocele in a lamb whose surgery has had good results. This animal had difficulty in rising and gate but had no problem in sucking. The animal was alive after the meningocele mass was removed, but ataxia remained.¹²

80.6% of congenital neurological abnormalities have been associated with abnormalities in other organs.¹³ Although similar cases in meningocele lambs and calves were associated with other congenital anomalies such as teratoma,⁸ and nasal choristoma,⁹ no other macroscopic complications were seen in the present case. Of course, there may be other microscopic or macroscopic abnormalities in the internal organs that have been overlooked and may even be involved in the death of the animal. It is interesting to note that the meningocele reported so far have been more prevalent in males, while the current report is in female lamb. This is consistent with previous findings on congenital anomalies of the nervous system, which indicate that male lambs are twice as involved as female lambs.¹³

Meningocele is a congenital anomaly of the nervous system in lambs that is also seen in Kurdish lambs. Radiography is a great way to diagnose this abnormality. Prognosis is poor in cases where the animal is unable to stand and suckle from birth. The cause of meningocele and cranium bifidum in lambs is not known exactly and further research is needed.

Acknowledgments

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Conflict of Interest

The authors declare no conflicts of interest related to this report.

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