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Fetal Dystocia due to Muscular Steatosis Coupled with Ascites and Arthrogryposis in Mehsana Buffalo

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ABSTRACT

A four-year-old primiparous Mehsana buffalo at full term of gestation suffering from dystocia was presented to Veterinary Clinical Complex, Deesa. Per-vaginal examination of the dam identified the presence of both forelimbs and fetal head at the dilated birth passage. The excessive bulging of the neck regions occupied the pelvic inlet of the dam, causing severe feto-maternal disproportion. The large dead male fetus was delivered via caesarean operation. Examination of the fetus revealed bilateral enlargement of the cervical and shoulder region along with ascites and arthrogryposis. Microscopically, the musculature of cervical and shoulder regions was replaced by massive adipose and fibrous connective tissue. The fetus was diagnosed with muscular steatosis with ascites, based on gross and microscopic features. The buffalo recovered uneventfully after five days of post-operative treatment.

Introduction

Muscular steatosis is the enlargement of atrophied muscle that occurs due to the replacement of muscle fibers with adipose and fibrous tissue in the developing fetus (Valentine and McGavin, 2007). This condition is caused by the presence of the recessive lethal gene, embryological defects of the central nervous system, environmental (including viruses and toxins), localized lack of innervation or denervation secondary to abnormal spinal cord development and muscular damage (Leipold et al., 1983; Langohr et al., 2007). However, the specific etiology is still unknown. According to Doyle et al. (1990), the rate of congenital musculoskeletal anomalies of the thorax and neck is reported to be1.48 per 10,000 births in cattle. Muscular steatosis in cattle and pigs was observed by the striking and highly marbled appearance of localized muscles (Hulland, 1993; Swatland, 1994), often leading to severe dystocia, especially in primiparous animals. Fetal ascites is an occasional cause of dystocia in many species, including cattle (Roberts, 1971) which are caused by the overproduction or insufficient drainage of peritoneal fluid, obstruction of the lymphatic flows, and developmental defect such as achondroplasia besides infectious diseases (Sloss and Duffy, 1980; Arthur et al., 1989). This report describes the

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histo-morphological findings of congenital muscular steatosis coupled with ascites in a full-term buffalo fetus and its successful removal through caesarean operation.

Clinical history and observations

A four year old, full-term primiparous Mehsana buffalo was presented to Dr. V. M. Jhala Clinical Complex, Deesa, with a history of severe abdominal straining for the past 10 hours after the rupture of the water bag without any progress in fetal delivery. Vigorous and futile efforts were made for 4-6 hours. On general inspection, the buffalo was dull, depressed, and exhausted. All vital parameters such as temperature (103.0^0F), respiration rate (24/min.), and heart rate (78/min.) were elevated. Pelvic ligaments were relaxed. The vulva was severely swollen and oedemated. The head of the fetus was seen at the vulvar orifice with a tongue outside the mouth. Per-vaginal examination revealed the fetus was in the anterior longitudinal presentation, dorso-sacral position with head extended into the fully dilated birth passage. The fetal neck was short due to severe and rigid enlargement of cervical and shoulder muscles on both sides. Forelimbs were severely flexed from the knee and crossed beneath the vast mass. Absolute fetal oversize and dilated birth passage diameter strongly leads to severe feto-pelvic disproportion, indicating there was no possibility of a vaginal delivery. Besides this, the fetal head and short neck occupied the birth canal, and severely ankylosed fore limbs beneath the bilaterally enlarged cervical region, fixed at the pelvic inlet provided insufficient space to repel the fetus and perform the fetotomy operation. Therefore, we decided to perform the caesarean operation.

Treatment

As per standard caesarean operation, shaving and scrubbing was done on left lateral and parallel to the milk vein. Then, a 1 percent solution of povidone iodine was applied at the operative site. Local infiltration of 2 % lignocaine hydrochloride injection (Recaine®) was performed linearly. Approximately 25 cm long skin incision was made, and then the muscles and peritoneum were incised. Omentum was reflected to approach the gravid uterine horn. Exteriorized the gravid uterine horn at the site and dropped it to minimize the peritoneal contamination. A stab incision was placed on the gravid horn and extended with the help of a scissor. Hind limbs were pulled, and traction applied, but the fetus could not expel due to its enlarged abdominal cavity. A stab incision was done on the ventral abdomen to reduce the fetal size, and about 3 liters of light yellow peritoneal fluid escaped (Fig. 1). To extract the fetus, traction was applied, but the fetus was pulled only up to the thoracic portion. Therefore, the incision site was extended on both sides for easy fetal removal. In addition, the long obstetric hook was fixed to the left knee joint, and the two forelimbs were removed. Forced traction to the fetus resulted in the removal of a dead male fetus, which was characterized by multiple congenital abnormalities, including the severe bilateral enlargement of the neck and shoulder area, coupled with the abnormally distended abdomen in addition to the arthrogryposis suggested by ankylosed and rigid forelimbs (Fig. 2). The uterus was flushed with warm normal saline followed by manual removal of placenta. Intrauterine boluses were inserted into the uterus before surgical closure (Bolus Utra, Geevet remedies, Mehsana). The uterus, peritoneum, muscles, and skin incision were closed routinely.

Fig. 1: Stab incision made on the ventral abdomen of the fetus to relieve the peritoneal fluid.

Fig. 2: Abnormal fetus with multiple congenital anomalies: Excessive enlargement of the neck and shoulder musculature (pseudohypertrophy), ascites and arthrogryposis.

The buffalo was treated post-operatively with Inj. Dextrose 5 % 2 liter IV, Inj. Normal Saline 2 liter IV, Inj. Oxymor-vet® (Oxytetracycline Hydrochloride; Morevel Laboratories (P) Limited) 60 ml IV, Inj. Melonex® (Meloxicam; Intas Pharmaceuticals Limited) 15 ml IM, Inj. Calcimust® (Calcium Levulinate, Cholecalciferol, Cyanocobalamin; Vet Mankind) 10 ml IM, and Inj.

Anistamin® (Intas Pharmaceuticals Limited) 10 ml IM. The owner was advised to continue treatment for five days. The skin suture was removed on the 12th post-operative day. The dam was shown an uneventful recovery.

Gross and histo-morphological findings

Grossly, the caudal part of the fetal neck was severely deformed due to enlarged, firm, and spherical masses found bilaterally and covered within intact skin. It was challenging to identify the different muscles of the cervical and shoulder, but they could be detected based on their position. The left side enlargement was remarkably more than the right side (Fig. 3). In the present case, the left side of the neck was enlarged due to splenius and serratuscervicis muscle, whereas the right side was only due to the latter one. The other cervical and shoulder region muscles: supraspinatus, Trapezius, omotransversarius, deltoideus, and part of the triceps, were either slightly enlarged or atrophied. The severely enlarged splenius and serratuscervicis muscles ranged from 27-32 cm in length and 17-23 cm in width. The brisket region was stretched due to enlargement of the caudal part of brachiocephalicus and superficial and deep pectoral muscles. The enlarged muscles were covered by a thick, rigid, shining epimycium layer. The affected muscles were doughy and showed mild capillary bleeding with prominent perimycium on the cut section (Fig. 4). Some of the incised muscles were white and light pink, indicating that adipose and fibrous connective tissue could replace the muscle fibres. The distended abdomen was filled with profuse peritoneal fluid and diffusely accumulated fatty connective tissue surrounding the different visceral organs. All the visceral organs were normal in appearance except both the kidneys, which were enlarged, lobulated, soft, and brownish discoloration beside surrounded by a thick and dispersed layer of capsulaadiposa.

Fig. 3: Muscular pseudohypertrophy in buffalo calf showed cervical deformity as a result of enlargement of splenius and serratuscervicis muscles

Fig. 4: Incised splenius muscle showed mild capillary bleeding with prominent perimycium.

The piece of tissue from the enlarged muscles of the cervical region was collected and fixed in 10 percent formalin solution, embedded in paraffin, sectioned, and stained with hematoxylin-eosin for histopathological examination. The enlarged muscles had a noticeable myofibers loss and atrophy. It was replaced massively by densely packed polygonal adipocytes separated by a delicate fibro vascular stroma (Fig. 5). Adipocytes had a distinct cell border and clear vacuole (cytoplasm) compressing the nucleus and peripheral zing it. The nucleus was found to be flattened and hyperchromatic. In some fields, most myofibers were replaced by abundant adipose tissue. There were considerable variations in the cross-sectional diameter of myofibers; many were markedly thin and poorly defined, and some were lack of cross striation. The numerous bizarre-shaped sarcolemmal nuclei were internalized between the adipocyte cells. Mitoses were rarely observed. Multifocal, an aggregation of basophilic cells resembling hematopoietic cells was evident.

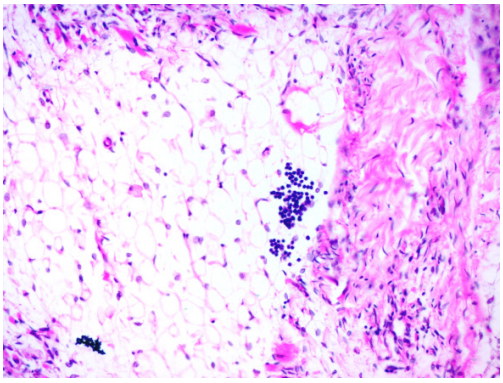

Fig. 5: Massive accumulation of adipose tissue (adipocytes) and fibrous connective tissue replaced entire myofibers of enlarged musculature.

Discussion

Muscle pseudohypertrophy varies from muscle hypertrophy or double muscling in an attack line. The former is

characterized by an atrophic muscle replaced by adipose and fibrous connective tissue. At the same time, later, there is total hyperplasia and hypertrophy of muscles or muscle fibres affected without fat deposition (Valentine and McGavin, 2007). This deformity cause's dystocia due to absolute oversizing of the fetus, which is handled immediately based on history and dam status, by either fetotomy or caesarean section. Ghuman et al. (2012) had previously reported enlargement of the unilateral shoulder due to muscular pseudohypertrophy and a considerable amount of adipose tissue below the eyeballs, managed by by partial fetotomy. Similar to the present case, excessive bilateral enlargement of the cervical region was managed successfully by caesarean operation (Prabaharan et al., 2013). The management depends on the availability of space in birth passage and enlargement of the fetus. Muscular hypertrophy was also reported in Riverine buffaloes that delivered fetus by fetotomy (Dutt et al., 2018), which were quite similar in gross appearance to the present case, with no evidence of fatty tissue. Manual puncturing of the fetal abdominal cavity can successfully manage fetal ascites (Roberts, 1971). In the present case, fetal ascites was a primary hindrance found during the caesarean section, which may occur due to the grossly inadequate disposal of fetal peritoneal fluid by defective kidneys. A Lipomatous fetus accompanied with ascites in a Murrah buffalo was delivered per-vaginally by Singh et al. (2019).

The muscular pseudo-hypertrophy involves various cervical and shoulder muscles, either unilaterally or bilaterally. Langohr et al. (2007) and Ghuman et al. (2012) reported the pseudo-hypertrophy of the left splenius and right serratusventraliscervicis, while Singh et al. (2017) reported the hypertrophy of brachiocephalicus, trapazius, sternocephalicus, and serratuscervicis muscles. In the present case, excessive pseudo-hypertrophy of left splenius, left and right serratuscervicis, brachiocephalicus, and pectoral muscles were observed, while supraspinatus, trapazius, omotransversarius, deltoideus and part of triceps were remarkably either enlarged or atrophied. Gross and histological findings were similar to Langohr et al. (2007), and they opined that muscle severity and selective involvement are always associated with a lack of innervation or denervation of affected muscles due to the cervical spinal cord deformation. If the denervation is permanent, it leads to atrophy of the respective muscle. Subsequently, pseudo-hypertrophy was formed by substituting fibrous and adipose connective tissue for myotubes/myofibers (Russel and Oteruelo, 1983). The differentiation of muscular steatosis was identified by the combination of gross and histological examination, and it must be differentiated lipoma and lipomatous fetus. The splenius muscle is innervated by the 3rd to 8th cervical nerves, and serratusventraliscervicis muscles are innervated by the 3rd to 5th cervical nerves and long thoracic nerve, while the first two cervical nerves innervate the other cervical muscles in bovine (Getty, 1975). In the present case, muscular pseudo-hypertrophy might be due to a lack of innervations of 3rd to 8th cervical nerves or embryological defects of the central nervous system during the early gestational period leading to the proliferation of adipose tissue in atrophied muscles. Muscles of the ventral cervical group and dorso-lateral cervical region were affected mildly reflected the nerve supply. Arthrogryposis in the calf may be linked with decreased numbers of motor neurons in cervical intumescences, as described by Van Huffel et al. (1988). This report of multiple congenital anomalies (muscular steatosis, ascites, and arthrogryposis) in Mehsana buffalo calf delivered via caesarean section, which may have occurred due to neurogenic origin during embryological development.

Conflict of interest

The authors have declared no conflict of interest for this manuscript.

References

Arthur GH, Noakes DE, Pearson H. Veterinary Reproduction and Obstetrics, 6th ed, Bailliere Tindall, Oval Road, London, England, 1989; 121.

Doyle PE, Beral V, Botting B, Wale CJ. Congenital malformations in twins in England and Wales. J Epidemiol Community Health. 1991;45(1):43-8. doi: 10.1136/jech.45.1.43.

Dutt R, Dalal J, Yadav V, Gahalot SC, Patil SS, Singh G, Dhaka AP. Dystocia due to fetal muscular hypertrophy and its successful management through fetotomy in a Riverine buffalo (*Bubalusbubalis*). Explor Anim Med Res. 2018; 8(1): 118-119.

Getty R. Ruminant – Myology. In: Sisson and Grossman's the anatomy of the domestic animals, ed. Getty R, 5th ed., WB Saunders, Philadelphia, PA 1, 1975:791–860.

Ghuman SPS, Honparkhe M, Singh J. Muscular pseudohypertrophy (steatosis) in a buffalo calf delivered by fetotomy. Indian J Anim Reprod. 2012; 33(2):107-108.

Hulland TJ. Muscle and tendon. In: pathology of domestic animals, ed. Jubb, K.V.F., Kennedy. P.C., Palmer, N., 4th ed., Academic Press, San Diego, CA 1, 1993:183-265.

Langohr IM, Stevenson GW, Valentine BA. Muscular pseudohypertrophy (steatosis) in a bovine fetus. J Vet Diagn Invest. 2007;19(2):198-201. doi: 10.1177/104063870701900212.

Leipold HW, Huston K, Dennis SM. Bovine congenital defects. Adv Vet Sci Comp Med. 1983;27:197-271.

Prabaharan V, Jayakumar K, Selvaraju M, Manokaran S, Ezakial Napolean R. Dystocia due to muscular hypertrophy in a graded Murrah buffalo. Shanlax Int J Vet Sci. 2013; 1(1): 45-46.

Roberts SJ. Veterinary Obstetrics and Genital Diseases. 2nd Edn., CBS Publishers and Distributors, New Delhi, India, 1971; 179.

Russell RG, Oteruelo FT. Ultrastructural abnormalities of muscle and neuromuscular junction differentiation in a bovine congenital neuromuscular disease. Acta Neuropathol. 1983;62(1-2):112-20. doi: 10.1007/BF00684927.

Singh G, Dutt R, Dalal J, Arjun V, Yadav V and Jangir BL. Per-vaginal delivery of a lipomatous fetus accompanying with ascites in a Murrah buffalo. Int J Vet Sci Anim Husbandry 2019;4(1):29-31.

Singh V, Sachan V, Yadav M, Kumar G, Gupta R, Saxena A (2017) Per-vaginal delivery of calf with muscular hypertrophy through fetotomy in a Murrah buffalo. Int J Livestock Res. 2017; 7(3): 186-188. doi:10.5455/ijlr.20170221044813

Sloss V, Duffy JH. Handbook of bovine obstetrics. Williams and Wilkins, Baltimore, USA, 1980.

Swatland HJ. Structure and development of meat animals and poultry. CRC Press, Boca Raton, Florida, 1994.

Valentine BA, McGavin MD. Skeletal muscle in: Pathologic basis of veterinary disease, ed. McGavin, M.D. and Zachary, J.F., Mosby, st. Louis, MO., 4th ed., 2007; 973 1039.

Van Huffel X, Weyns A, Van Nassauw L, Cockelbergh D, De Moor A. Decreased number of alpha-motoneurons in the cervical intumescence of calves with arthrogryposis multiplex congenita of both thoracic limbs. Vet Res Commun. 1988;12(2-3):237-43. doi: 10.1007/BF00362806.