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Congenital meningocele and cyclopia causing dystocia in a goat: A rare congenital anomaly

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Abstract
This case report describes an extremely rare and challenging instance of dystocia presented in a 2.5-year-old multiparous local breed goat at Veterinary clinical complex, College of Veterinary Science, ANDUAT, Kumarganj, Ayodhya, caused by severe fetal malformations cyclopia and cranial meningocele. The fetus exhibited a single median orbit that contained a single, large eyeball and a large, soft swelling on the forehead consistent with meningocele, both of which contributed to mechanical obstruction during parturition. The congenital anomaly was confined to head of kid.

Keywords: Dystocia, cranial meningocele, cyclopia, congenital anomaly, goat, meningoencephalocele

Introduction
Congenital anomalies in goat are relatively infrequent and may lead to serious health complications for both the dam and the fetus. Among the most significant consequences of such abnormalities is dystocia an obstruction or difficulty during parturition which, if not promptly managed and can jeopardize the life of the dam. These birth defects, defined as structural or functional abnormalities present at birth, can result in fetal mortality, including intrauterine death, abortion, stillbirth, or may reduce the economic value of the offspring as the offspring with such defects is undesirable for both farmer and consumer (Dennis and Leipold, 1976 & 1979; Roberts, 1986) [1-3]. They may involve a single organ, an entire system, or multiple systems simultaneously. Among the severe congenital defects, cyclopia and Meningocele are particularly striking. Cyclopia represents an extreme form of holoprosencephaly (HPE), a developmental failure in which the forebrain does not properly divide into two hemispheres. In cases of cyclopia, the orbits fail to separate, resulting in a single median orbital cavity with either an absent or abnormally formed eyeball (Sutaria *et al*., 2012; Sivasudharsan *et al*., 2010) [5, 6]. Another serious neural tube defect**,** meningocele**,** involves the protrusion of the meninges sometimes with brain tissue through a cranial bone defect, forming a fluid-filled sac on the skull (Jubb and Huxtable, 1993) [7]. Contributing factors to these neural anomalies include poor maternal nutrition, exposure to teratogenic viruses, or the administration of harmful drugs during gestation (Jaiswal *et al*., 2023) [8]. While each of these conditions are rare in goats, the simultaneous presence of both cyclopia and meningocele in a single fetus is exceptionally uncommon and scarcely reported in veterinary literature. These severe malformations can significantly alter fetal anatomy, prevent natural delivery and require immediate veterinary assistance to safeguard the dam's life. This case report describes a rare and compelling instance of dystocia in a goat due to a malformed fetus exhibiting both cyclopia and cranial meningocele, highlighting the clinical challenges and implications associated with such anomalies.

Case History and diagnosis
A 2.5-year-old multiparous local breed doe, known to be healthy and well-cared for by a smallholder farmer, was brought to the Veterinary Clinical Complex, college of veterinary science and animal husbandry, Ayodhya with an urgent complaint of prolonged and unproductive labor animal was in recumbent position.

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The owner reported that the doe had been in active labor for over 12 hours, during which time she showed repeated straining without any progression or visible signs of fetal emergence. The owner had attempted manual assistance, but without success, and became concerned when the doe began to appear weak and increasingly distressed. This was the doe's third pregnancy, and her previous parturitions had been uneventful, producing healthy kids. She had received routine vaccinations and deworming, and there were no known complications during the current pregnancy until the onset of labor. She showed signs of systemic stress and fatigue, including increased heart rate (tachycardia), with a heart rate of 120 bpm, Rapid respiration with respiratory rate over 45 breaths per min and mild dehydration, Abdominal straining, but with no evidence of productive uterine contractions at the time of examination. Upon vaginal examination, the fetal head was found to be partially engaged in the birth canal. However, the examiner noted several unusual features, the head presented an enlarged, soft, fluctuating swelling at the cranial region, suggestive of a fluid-filled sac. The palpation of the facial structures revealed a single median orbital cavity rather than the usual bilateral eye sockets. The fetus appeared non-viable, and its abnormal conformation raised concern for a congenital defect that was obstructing normal delivery. Based on these findings, a tentative diagnosis of fetal malformation most likely involving craniofacial and neural defects was made.

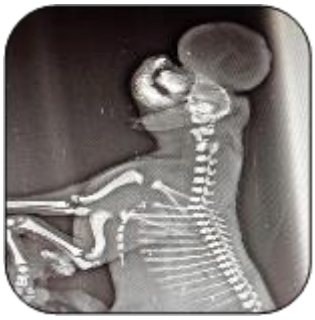
Intervention

Given the severity of the fetal abnormalities and the complete failure of manual extraction, it was clear that natural delivery would not be possible without proper professional help. The clinical team tried for manual extraction of fetus but failed due to abnormal size of head and fluctuations of meningocele create difficulty in formation of grip over fetus. Traction helps with obstetrical forceps and proper lubrication with liquid paraffin the traction was performed for fetal extraction. A single non-viable female fetus delivered. Postpartum care included administration of broad-spectrum antibiotics, non-steroidal anti-inflammatory drugs, and fluid therapy to support the doe's safe recovery were administered. The doe remained stable throughout the procedure and began to regain strength within a few hours postpartum. Later a radiographic examination was done in foetus which clearly shows meningocele and cyclopia.

Pic 1: Manual intervention for assistance in parturition

Pic 2: Deformed female fetus showing sign of meningocelefetus

Pic 3: Foetus showing cyclopic eye



Pic 4: Radiograph showing meningocele

Discussion

Congenital defects in livestock, particularly those involving the central nervous system and craniofacial structures, can present serious diagnostic and management challenges. In this report, we describe an unusual and severe case in which a goat fetus exhibited both cyclopia and cranial meningocele, resulting in dystocia life-threatening conditions for the dam. Cyclopia is exceptionally rare in goats, with an estimated prevalence of less than 0.1% among the general livestock population (Rashed *et al*., 2014) [9]. Meningocele is even less frequently observed, and though comprehensive data in small ruminants are limited, most information comes from scattered case reports. The simultaneous presence of both conditions in a single fetus is extraordinarily uncommon, with fewer than five such cases likely reported worldwide. Based on existing data and anecdotal evidence, the estimated occurrence of this dual anomaly is likely below 0.005% possibly as rare as 1 to 5 cases per 100,000 births (Rashed *et al*., 2014) [9]. Cyclopia results from a developmental defect known as holoprosencephaly, in which the embryonic forebrain (prosencephalon) fails to divide into two hemispheres. This disruption affects the normal formation of facial features, leading to the development of a single, central eye cavity. Cyclopia is typically fatal and is considered the most severe form of the holoprosencephaly spectrum. While it has been more commonly reported in sheep, sporadic cases have been observed in goats, cattle, and other domestic species. Meningocele, on the other hand, is a type of neural tube defect where the protective membranes of the brain (meninges) herniate through an opening in the skull, forming a visible, fluid-filled sac. This occurs due to incomplete closure of the cranial neural tube during early fetal development. Unlike humans and some companion animals, where surgical correction may be attempted, meningocele in livestock generally carries a poor prognosis, especially when associated with additional malformations.

The co-occurrence of cyclopia and meningocele, as observed in this case, created severe distortion of the fetal head, resulting in a mechanical obstruction in the birth canaland prolonged, non-productive labor. Such complex congenital defects often require immediate veterinary intervention to prevent loss of the dam. Though the exact cause in this instance remains unknown due to diagnostic limitations, several potential factors may be involved. In other species, ingestion of toxic plants, such as *Veratrum californicum*, has been linked to cyclopia. This plant produces cyclopamine, a compound known to inhibit the Sonic Hedgehog (Shh) pathway essential for proper midline development in embryos (Keeler & Binns, 1966) [10]. While *Veratrum* is not native to most parts of India, similar teratogenic mechanisms may be triggered by other environmental toxins. Additionally, genetic factors**,** such as inbreeding or hereditary mutations, could contribute particularly to smallholder or unregulated herds with limited genetic diversity.

In this case, the dam appeared healthy throughout pregnancy, with no visible signs of illness. However, undetected exposure

to teratogens or infections during early gestation cannot be ruled out. This report emphasizes the importance of necropsy and thorough examination of malformed fetuses. Documenting such rare anomalies not only contributes valuable data to veterinary literature but also enhances our understanding of regional trends in congenital disorders. Ultimately, this knowledge can support preventive strategies, including improved breeding practices and pre-natal care.

Conclusion

It may be concluded from our study that factors causing congenital anomalies cannot be diagnosed easily as they are high in number such as malnutrition, exposed diseases, applied medicines and growing conditions. Although congenital anomalies of this nature are infrequently documented in goats, their impact on maternal health, animal welfare, and reproductive productivity can be profound, especially in resource-limited farming systems. From a developmental biology perspective, the co-occurrence of cyclopia and meningocele reflects a severe disruption in early embryogenesis, particularly in neural tube and midline craniofacial formation. Finally, by documenting and sharing rare cases like this, we contribute meaningfully to the veterinary body of knowledge, enhancing our collective understanding of congenital disorders in small ruminants and improving clinical preparedness for future cases.

Conflict of Interest

Not available

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