Tail absence and microphtalmia associated with type I atresia ani in a calf: a case report

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SUMMARY

Multiple congenital anomalies in calves generally have poor prognosis, with most cases resulting in death. However, there is insufficient data in the literature regarding this subject. This case report aimed to evaluate a calf presenting with a combination of rare congenital anomalies, specifically atresia ani, microphthalmia, and tail absence. The study material consisted of a one-day-old Simmental calf presented to our hospital with the complaint of the absence of an anal opening. Based on the clinical and radiographic findings, the patient was classified as having type I atresia ani. Moreover, further congenital anomalies were detected, including microphthalmia in the left eye and the absence of the tail. As the general condition of the calf was stable, surgical correction of the atresia ani was performed, and postoperative defecation was observed. No treatment was applied for any other anomaly. During the postoperative follow-up, the calf's general condition was determined to be good and no complications developed. In conclusion, as demonstrated in this case, although the prognosis is generally poor for calves with multiple congenital anomalies, positive outcomes can be achieved with appropriate surgical intervention and stable general condition. This case report provides valuable information that could serve as a reference for veterinarians in this field.

KEY WORDS

Calf; Congenital Anomaly; Atresia Ani; Tail Absence; Microphtalmia.

INTRODUCTION

Congenital anomalies in ruminants may occur as single or multiple defects in the same animal. Numerous causes for these anomalies have been reported in the literature (1, 2, 3). The primary factors reported to play a role include vitamin A deficiency or excess, various viral and bacterial agents, genetic disorders exhibiting monogenic autosomal recessive inheritance, mutations, exposure to toxic agents, and inadequate or unbalanced nutrition during pregnancy (1, 4).

Atresia ani is the most common congenital anorectal malformation observed in ruminants, particularly calves, and is characterized by partial or complete failure of the rectum or anus to develop in the terminal portion of the digestive tract. The condition has been reported to occur in approximately 4.3% of neonatal calves, depending on breed and management practices (5). Cases of atresia ani in ruminants are generally classified as types I-IV (5,6,7). To classify atresia ani, the distance between the distal blind end of the rectum and perineal skin was evaluated radiographically, which is decisive for both the surgical approach and prognosis. Type I (anal stenosis) is characterized by the presence of an anal opening but a stricture is involved. Radiographically, no noticeable gap was observed between the rectum and anus. The rectal canal reached the anus, but the orifice was constricted. As the rectum does not terminate blindly in Type I, measurement of the distance is not required, and the surgical prognosis is reported to be good (6). Type II (imperforate anus - rectum ≤ 1 cm from the surface) is characterized radiographically by a blind-ending rectal pouch located less than 1 cm from the perineal skin or the closed anus. In these cases, dimples are frequently observed in the anal region. Surgical creation of the anal opening is usually sufficient. Type III (imperforate anus - rectum ≥ 1 cm from the surface) is defined as a blind-ending rectum located ≥ 1 cm from the perineal area. Dimples in the anal region are usually absent and the anal sac or sphincter structures are likely to be undeveloped. However, these patients require more invasive surgical approaches. Types II and III require more invasive surgical procedures than Type I because of disruption in the structural integrity of the rectum (7). Type IV (colonic aplasia) refers to cases in which the anus and distal rectum are formed but the proximal rectum or colon fails to develop, resulting in severe agenesis. The chances of surgical success are low and the prognosis is generally unfavorable (8).

In veterinary medicine, atresia ani is frequently accompanied by congenital anomalies (3,9,10). One congenital anomaly presented in this case report was the complete absence of tail development, a condition defined in the literature as anury or coccygeal agenesis. This anomaly [tail absence] is rare in various cattle breeds (8, 11). Microphthalmia, another accompanying malformation in this case, is an ocular developmental disorder characterized by congenital development of an eyeball that is smaller than normal. Microphthalmia has been reported in many animal species, including cattle, dogs, cats, and horses, and can be observed unilaterally or bilaterally. Anophthalmia, defined as the complete absence of the eyeball, is considered

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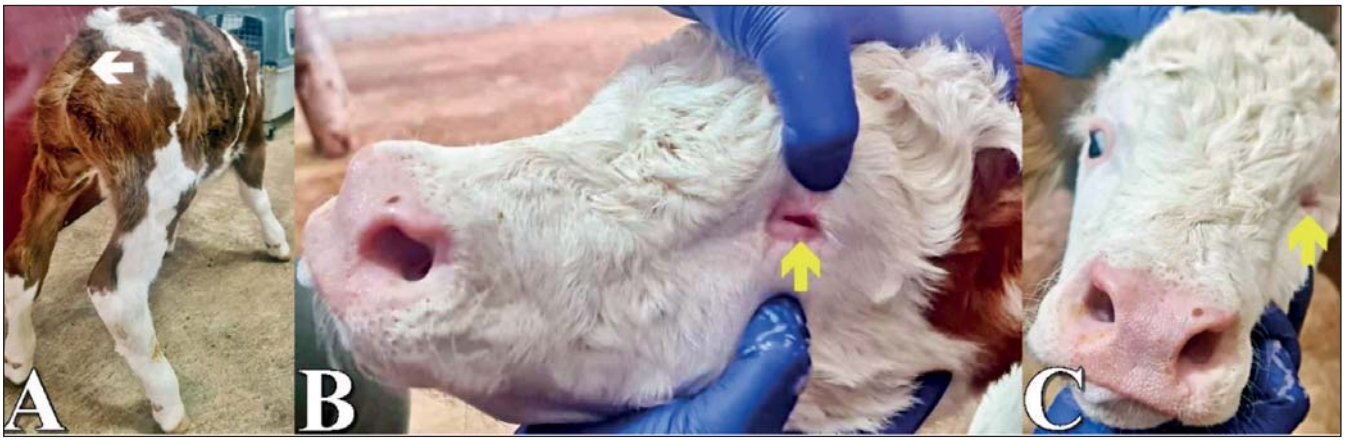

Figure 1 - **A.** Observation of co-occurring tail absence and atresia ani during clinical examination (white arrow). **B-C.** Lateral (B) and frontal (C) view of the unilateral microphthalmia detected in the left eye of the same calf (yellow arrow).

an advanced form of microphthalmia that can be definitively distinguished by histopathological examination alone (3,4,12). According to the Online Mendelian Inheritance in Animals (OMIA) database, microphthalmia (OMIA 000649-9913) and anophthalmia (OMIA 001042-9913) have been reported in cattle (13). However, the vast majority of cases diagnosed as anophthalmia without histological confirmation are actually cases of severe microphthalmia, characterized by the presence of rudimentary ocular tissue (3, 14). Only two case reports have been found in the literature in which these three congenital anomalies were observed together. However, information regarding the surgical approaches and prognoses applied in these cases is limited and insufficient (2, 15).

This case report aimed to evaluate the postoperative course and clinical prognosis following atresia ani surgery in a Simmental calf that presented with a combination of rare congenital anomalies: Type I atresia ani, tail absence (anury), and unilateral microphthalmia.

CASE REPORT

A one-day-old male Simmental calf was presented to the Surgery Clinic of Harran University Faculty of Veterinary Medicine Animal Hospital with the complaint of an absence of an anal opening. Clinical examination of the perineal region revealed no anal opening; however, a superficial depression was observed in the anal area (Figure 1A). In addition, complete absence of the tail (anury) and unilateral microphthalmia, characterized by a noticeably small eyeball structure, were detected in the left eye (Figure 1B-C).

Radiographic evaluation revealed that in the lateral radiographic view of the pelvic region, the caudal (tail) vertebrae, which normally extend distal to the sacrum, were absent. Furthermore, evaluation of atresia ani typing demonstrated that the blind-ending rectum was in direct continuity with the perineal skin without any visible gap, confirming the diagnosis of atresia ani Type I (Figure 2).

Based on the hematological and biochemical analysis results of the calf (Table 1), surgical intervention was deemed appropriate. Written informed consent was obtained from the owner of each animal prior to the procedure. The calf was administered xylazine HCl (Rompun®, Bayer) at a dose of 0.1 mg/kg intramuscularly for sedation. The calf was placed in the sternal position, the surgical field was shaved, and then antiseptically prepared with 10% povidone-iodine. Infiltrative anesthesia was performed in the operative area using 2% lidocaine HCl (Adokain®, Sanovel) for local anesthesia.

Table 1 - Mean Measured Values of Hematological and Biochemical Parameters for the Case (16,17).

Parameter	Unit	Mean ± SD	Reference Range
WBC	10^3/µL	11.1	7-12
RBC	10 /µL	7.32	6.5-9.0
HGB	g/dL	11	10-12.5
HCT	%	34	30-38
MCV	fL	46.5	42-50
MCH	pg	14.7	13-16
MCHC	g/dL	32	30-34
PLT	10^3/µL	450	350-700
NEU	%	36	35-60
LYM	%	32	30-55
MONO	%	4	2-6
EOS	%	2	1-4
Glucose	mg/dL	84	75-110
Urea (BUN)	mg/dL	25	20-30
Creatinine	mg/dL	1	0.8-1.2
Total Protein	g/dL	5.5	5.0-6.0
Albumin	g/dL	3	2.8-3.3
AST	U/L	62	40-80
ALT	U/L	23	15-30
ALP	U/L	176	150-300

Notes: The table presents the mean values of hematological and biochemical parameters obtained prior to surgical intervention. The values were compared with the reference ranges reported in the literature for 0-7 day-old healthy neonatal calves. All parameters were within normal limits, and the case was evaluated as systemically suitable for surgery. **Abbreviations:** 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; NEU: Neutrophil; LYM: Lymphocyte; MONO: Monocyte; EOS: Eosinophil; BUN: Blood urea nitrogen; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; ALP: Alkaline phosphatase.

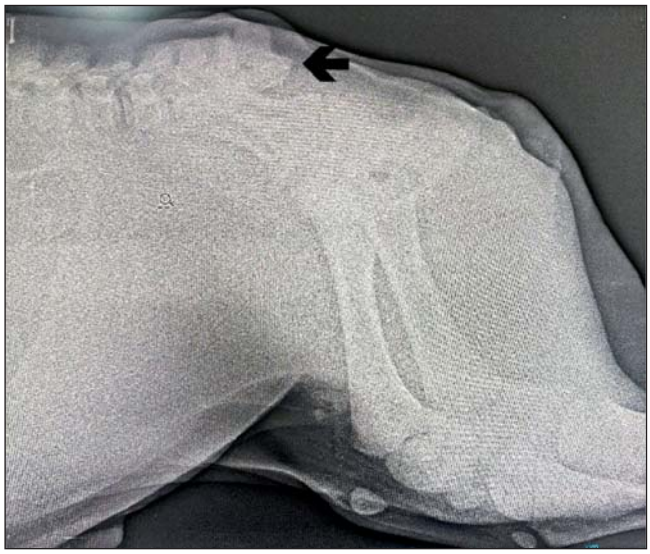

Figure 2 - Lateral radiographic view of the calf demonstrating absence of the tail (black arrow) and anatomical evaluation of type I atresia ani.

Under aseptic conditions, a cruciate incision was made in the perineal region to expose the termination point of the rectum. Upon incision of the rectal cavity, the meconium was spontaneously expelled (Figure 3A). The opened mucosal structure was sutured to the surrounding skin using size 2 silk thread (Katsan, Turkey) to create a functional anal opening.

During the postoperative period, the wound area was dressed daily with povidone-iodine for seven days. To prevent infection, a combination of procaine penicillin G (1,200,000 IU) and streptomycin sulfate (2 g) (Vetimisin®, VETA) was administered intramuscularly (IM) at a dose of 8 mg/kg. At the end of the seventh day, the calf's general condition was assessed as good; no complications were observed in the wound area, and defecation was normal (Figure 3B). During the entire postoperative period, the calf was followed up for a total of 3 months via telephone calls with the owner, and its general health status was reported to be good throughout this process.

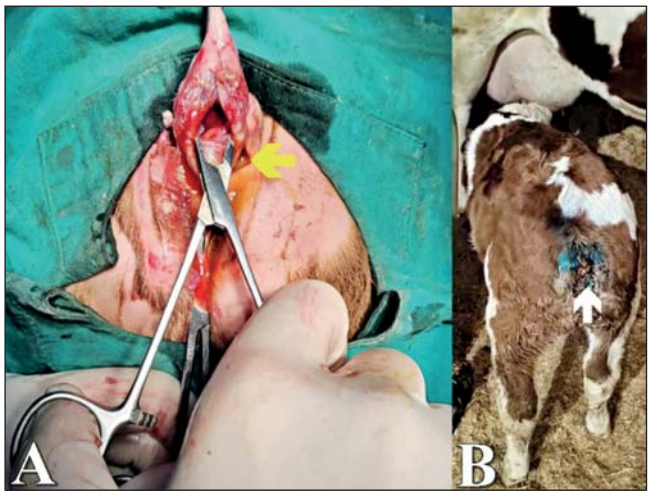

Figure 3 - **A.** Intraoperative observation of meconium passage through the surgically created rectal opening (yellow arrow). **B.** Clinical view on postoperative day 7 demonstrating complete healing of the surgical site (white arrow) and overall good health of the calf.

DISCUSSION AND CONCLUSION

In the veterinary literature, atresia ani cases, which are among the congenital anomalies observed in calves, have been reported alone or in combination with other congenital anomalies (1,2,18,19). When additional anomalies accompanying atresia ani do not affect vital functions, the type of atresia is the main determining factor for the prognosis of the disease. In the present case, atresia ani Type I was observed concurrently with unilateral microphthalmia and tail absence in the calf. The surgically favorable prognosis of Atresia Ani Type I was evaluated to mitigate the potential negative outcomes arising from the accompanying anomalies and to contribute positively to the recovery process of the calf (5,7).

Although the anomaly of tail absence co-occurring with atresia ani in calves is one of the most frequently reported congenital anomalies, the overall number of cases in the literature remains quite limited. However, case reports of three or more congenital anomalies are rare (1,10,20). Similar to the present case, only two studies have reported the co-occurrence of atresia ani, tail absence, and microphthalmia. In one of these studies, although microphthalmia and tail absence did not pose a vital risk, radiographic evaluation revealed a 2 cm distance between the blind-ending rectum and perineal skin, indicating a more severe form of atresia ani (compatible with Type III according to the current classification), and euthanasia was consequently performed. In another study, although the type of atresia ani was not specified, the calf was reported to have died within 48 h because of underdevelopment of the urogenital system (2). In the present case report, however, despite the presence of microphthalmia and tail absence along with atresia ani, the atresia ani was classified as Type I, and surgical intervention was successfully performed. The generally favorable prognosis of Type I atresia ani was the decisive factor in calf survival despite the accompanying anomalies. In this regard, the classification of complex anomalies seen in atresia ani offers clinicians crucial information regarding the patient's surgical suitability and prognosis.

When evaluating similar congenital anomalies observed in different types in the literature, it is noteworthy that a case in which tail absence, atresia ani, and microphthalmia were observed simultaneously in the same individual has not been reported previously. However, the sudden occurrence of tail absence and atresia has only been reported in a limited number of species, specifically in cats, dogs, and camels, in the form of case presentations (9,20,21). The rare anomalies identified in the present case not only contribute to the literature but also provide valuable clinical information that will guide prognosis determination and treatment planning in the surgical management of similar cases.

Type determination is frequently neglected in cases of atresia ani co-occurring with tail absence in veterinary literature (2,9,10). This suggests that the prognostic value of these classification systems has not been considered sufficiently. However, the present case demonstrates that the clinical course can vary depending on the type of atresia ani, and that quality of life can be maintained in some cases through surgical intervention. Therefore, classification of atresia ani should be viewed not only as a diagnostic tool but also as a crucial parameter for clinical decision-making and prognosis determination.

A review of the literature on microphthalmia in calves revealed

that calves with bilateral microphthalmia survived for up to 15 months (3). However, another study reported that the prognosis was unfavorable owing to the presence of multiple ocular anomalies accompanying bilateral microphthalmia, such as microphakia and aphakia, and euthanasia was performed accordingly (12). These findings suggest that the prognosis of microphthalmia may primarily depend on factors other than the accompanying ocular anomalies. Indeed, in the calf with unilateral microphthalmia in the present study, this anomaly was not a determining factor for life prognosis; the calf survived after surgical treatment of atresia ani type I.

Another important factor influencing the prognosis in studies involving tail anomalies is the level at which vertebral agenesis begins. Literature reports that in cases where the absence of sacral and lumbar vertebrae accompanies the absence of caudal (tail) vertebrae), the risk of neurological dysfunction and disorders related to the pelvic organs increases, which usually results in euthanasia (22,23). These types of complex vertebral anomalies are decisive factors not only as morphological abnormalities but also in terms of quality of life and treatability. Therefore, the systematic classification of congenital anomalies is not only important for providing anatomical classification but also for predicting the patient's chances of survival and determining the appropriate clinical approach.

In conclusion, the absence of a tail, sudden onset of atresia, and coexistence of microphthalmia observed in this case highlights the clinical diversity of congenital anomalies and underscores the importance of identifying and classifying such rare cases to determine prognosis and establish appropriate treatment strategies.

Author contributions

Author 1 performed the clinical examination, radiographic evaluation, and surgical correction of the atresia ani and wrote the manuscript. Author 2 assisted with surgery, participated in postoperative monitoring and data collection, and contributed to the literature review and revision of the manuscript. Both authors read and approved the final version of the manuscript.

Conflict of interest

The authors have no conflicts of interest to report.

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