

Abomasal Impaction in a Goat - Surgical Approach

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ABSTRACT

Background: The abomasum is glandular and has a bagpipe shape, with a capacity of 1 to 2 liters. It has a very acidic content with a pH ranging from 1.5 to 3, and although disturbances in this organ are uncommon in small ruminants, abomasal emptying defect is probably the most common abomasal problem in goats. The etiology of an abomasal emptying defect is unknown, however, abomasal impaction is the main cause of this condition. Since this disorder is associated with poor prognosis and information in goats is scarce, the aim of this report is to describe the success of abomasotomy as a treatment for abomasal impaction in goats, as well as to describe the clinical and laboratory aspects of this disease.

Case: A 8-month-old male Anglo-Nubian goat, weighing 33 kg, presented with apathy and decreased appetite for 4 days due to digestive disorder. According to history, the diet consisted of crushed hay *ad libitum* and 300 g of ration bran. Clinical findings were apathy, pale mucous membranes, ruminal hypomotility, decreased fecal output, tense abdomen with distention of the ventral quadrants and loss of rumen stratification. The increase in chloride ion concentration (67 mEq/L) observed in the ruminal fluid analysis was indicative of abomasal-ruminal reflux, compatible with metabolic acidosis, as well as the dense hyperechogenic content in the ventral field of the left and right abdomen corresponding to the location of the entire abomasum on transabdominal ultrasound. Thus, clinical, laboratory and ultrasound findings were indicative of impaction of the abomasum, and the goat underwent exploratory laparotomy through the left flank, which revealed a distended and compacted abomasum. Differently from reports in the literature, due to severe distension of the abomasum, abomasotomy through the right flank was chosen to reverse the condition, followed by constant monitoring and supportive therapy with antimicrobial and analgesic medication. The goat defecated normally on the second postoperative day, however, on auscultation, there was persistence of abomasal emptying failure, suggesting a situation of posterior functional stenosis. With the suspicion of type III vagal indigestion, the atropine test, along with radiographic examination of the chest and abdomen were performed, and did not reveal any changes. In order to restore abomasal motility, intensive therapy with prokinetic drugs (bromopride, metoclopramide and promethazine) was associated, and on the fifth day the animal returned to normal appetite, abomasal motility and fecal production. The goat was discharged after 14 days of intensive care with recommendations to provide good quality food and water.

Discussion: Abomasal impaction is rarely reported in goats, commonly resulting in animal death before or even a few days after surgical correction. The diagnosis of abomasal impaction was based on clinical, laboratory and ultrasound findings, and should be differentiated from other diseases that progress with abdominal distention and gradual weight loss, such as functional stenosis; duodenal obstruction; vagal nerve disorder; abomasitis; generalized peritonitis, and granuloma associated with *Actinobacillus lignieresii*. Surgical correction by right paralombar access associated with visceral emptying and supportive therapy of impaction abomasal was performed and considered successful, without relapses and secondary complications long-term.

Keywords: abomasotomy, abomasal disorders, small ruminant, hoflund syndrome.

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INTRODUCTION

Disorders of abomasum are uncommon in small ruminants, however, abomasal emptying defect is probably the most common abomasal problem in goats [10,19], and has rarely been reported [8]. The etiology of the abomasal emptying defect is unknown, but the abomasal impaction is the main cause of this condition. Abomasal impaction is defined as an accumulation of digest with aboral transport failure, and may be of primary or secondary cause [5].

As in cattle, abomasal impaction is associated with poor prognosis in small ruminants, with most available reports culminating in death or euthanasia within 24 to 48 h after therapeutic intervention or surgery [8]. Similar to other digestive disorders, the clinical presentation of abomasal impaction depends on the severity of the disease and the involvement or not of other structures [6]. In general, affected goats present with decreased appetite, apathy, weight loss, dehydration, tympanism, abdominal distension, reduced rumen dynamics, and scarce or absent feces [19]. Although there is no successful treatment in small ruminants [10] such as bovine [3,9], clinical or clinical-surgical treatment can be performed. Surgery to remove impact content can be attempted via abomasotomy [19]. However, there is no description of the surgical approach in this species and the recommended approach is through the right side, paracostal or paramedian [20].

This paper describes the clinical and surgical aspects of the abomasal impaction in a goat. It is highlighted the importance of this paper, since it describes the first successful surgical intervention of a highly lethal condition, with scarce information in this species.

CASE

An 8-month-old male Anglo-Nubian goat weighing 33 kg was referred to the Veterinary Hospital with a history of apathy and reduced appetite for 4 days. At its farm of origin, the animal had been treated with flunixin meglumine¹ [Flumax® - 2.2mg/kg IV, single dose], which resulted in a temporary appetite improvement. According to its known history, the animal was raised in an intensive system, on a diet consisting of crushed hay *ad libitum* and 300 g of ration bran.

In clinical examination, apathy, pale mucous membranes, ruminal hypomotility (three incomplete contractions in 3 min), tense abdomen with distension of the ventral quadrants (Figure 1A), and reduced fecal

output were observed indicating the digestive disorder. The rectal temperature, heart and respiratory rates were within reference interval for the species. Furthermore, blood samples and ruminal fluid were taken for further examinations. The complete blood count revealed hypoproteinemia and monocytosis. In addition, the ruminal fluid analysis demonstrated significant changes, namely prolonged methylene blue reduction test (time over 15 min) and high chloride content (67 mEq/L), indicative of abomasum-ruminal reflux and compatible with the observed metabolic acidosis. The goat also presented high levels of gamma glutamyl transferase (359 UI/L) and decreased levels of total protein (5.4 g/dL). All significant changes observed in the exams are summarized in Table 1. Transabdominal ultrasonography revealed dense hyperechoic content in the ventral region of left and right abdomen corresponding to the location of the entire distended abomasum, thus suggested an abomasum impaction (Figure 1B).

The animal was subjected to a general anesthesia, with isoflurane² in oxygen [Isoforine®], followed by exploratory laparoruminotomy in the left flank, which revealed an empty rumen, and a distended and compacted abomasum occupying much of the abdominal cavity. Based in these findings, we opted for an abomasotomy by the right side.

The animal was placed in left lateral recumbency (Figure 2A) for abomasotomy according to standard procedure [20]. The skin was prepared in the routine way, and a paracostal incision 12 cm in length was made in the abdominal wall nearly 3 cm distance from the last rib; however, the approach did not permit exposure of the large curvature of the abomasum. After that, a 15 cm paramedian incision was attempted, caudal and lateral to the xiphoid, initiating at the ventral vertex of the first incision. This approach easily obtained exposure of the abomasum. An 8 cm abomasotomy was performed at the large curvature of the organ, followed by emptying of the viscera. About 7 kg of dry and impacted contents was removed (Figure 2B). The exploration of the abomasum revealed hyperemia of the mucosa and the presence of 2 ulcers near the pylorus. The abomasum was closed with the Schiemen-Cushing suture pattern, in a double layer, using absorbable thread Poliglactina 910 2.0³ [Poliglactina 910]. The abdominal wall was closed in the standard way.

In the postoperative period, the animal was subjected to constant monitoring, and received ceftiofur⁴ [Microfluid Ceft® - 5 mg/kg IV, SID for 6 days], gentamicin⁵ [Gentomicin® - 6.6 mg/kg IV, SID for 6 days], and flunixin meglumine¹ [Flumax® - 2.2 mg/kg IV, SID for 4 days]. Furthermore, was administered vitamin B1⁶ [Monovin B1® - 200 mg SC, SID for 5 days], dexamethasone⁷ [Dexoflan® - 0.2 mg/kg IV, SID for 2 days], ranitidine⁸ [Cloridrato de Ranitidina Injetável® - 2 mg/kg IV, BID for 2 days], transfaunation, and calcium replacement⁹ [Calfoz® - 20 mL SC, SID, for 6 days]. Although the goat defecated normally on the 2nd postoperative day, abomasal emptying remained reduced to auscultation. Thus, in order to stimulate abomasal emptying, treatment with prokinetics was initiated. At first, only Bromopride¹⁰ was used [Digesan® - 20 mg IM, QID for 4 days), but in the course of the postoperative period there was an association with metoclopramide¹¹ [Noprosil® - 0.2 mg/kg SC, QID for 4 days] and promethazine² [Pamergan® - 0.5 mg/kg IM, BID for 4 days].

In view of the clinical suspicion of posterior stenosis due to persistent abomasal hypomotility, the atropine test, thoracic and abdominal radiographic examination (Figure 2C & 2D) were performed, and revealed no abnormalities. On the 5th day, the animal returned to a normal appetite, abomasal motility and fecal production. After 14 days of postoperative care, the goat no longer presented abomasal motility disturbance, and was discharged with recommendations to provide good quality food and water *ad libitum*.

DISCUSSION

Abomasal impaction is a sporadic cause of digestive tract dysfunction in small ruminants, and has been well documented in sheep [9,10] and rarely reported in goats [8]. Unfortunately, abomasal impaction results in animal death, with no successful treatment in goats reported in the literature. To the best of the authors' knowledge, the current paper is the 1st report of a successful surgical treatment in an exclusive abomasal impaction in a goat. The diagnosis of abomasal impaction is challenging due to its insidiousness and chronicity. In goats, this condition must be differentiated from other diseases that progress

with abdominal distension and gradual weight loss and functional stenosis, especially duodenal obstruction; vagal nerve disturbance; abomasitis; generalized peritonitis and granuloma associated with *Actinobacillus lignieresii* [10,19].

In the current case, some aspects of the clinical history and clinical exam were suggestive of abomasal impaction, namely scant feces, feed crushed hay, mild hemodynamic compromise and a large mass palpated in the abdomen, occupying the entire bilateral ventral cavity. Although the clinical conditions of abomasal impaction, vagal indigestion, and peritonitis are similar, they differ in some aspects. In the vagal indigestion, especially in functional posterior stenosis, it is common to observe a persistent abomasal emptying defect in cattle [20], differing from the present case,



Figure 1. A- Goat with distended ventral quadrants. B- Transabdominal sonogram suggesting compression of the abomasum.

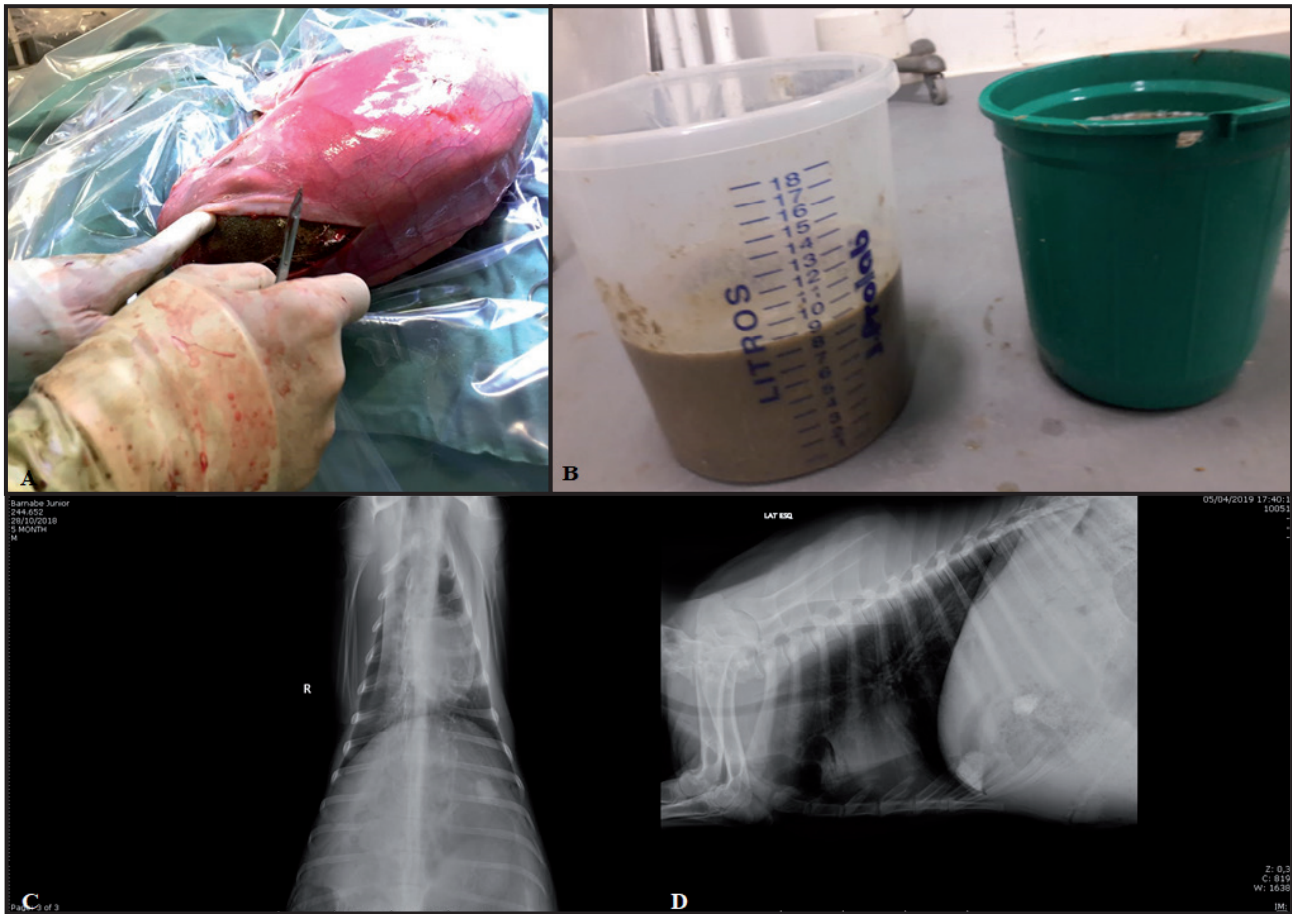


Figure 2. A- Distended abomasum of goat with the presence of compacted content (7 kg). B- Emptying of the content from abomasotomy. C & D- Radiographic examination of the goat's thorax without changes.

Table 1. Findings from complementary exams of a goat compared with the reference intervals for the specie.

Parameter	Goat	Reference Interval*
Ruminal fluid analysis		
Consistency	fluid	lightly aqueous
Methylene blue reduction test (min)	> 15	3 - 6
Presence of protozoa	decreased and small	small, medium and large
Chloride content (mEq/L)	67	± 25
Blood gas analysis		
pH (mmHg)	7.3	7.32 - 7.54
HCO ₃ ⁻ (mmol/L)	15.4 mmol/L	21 - 23
BE (mmol/L)	- 9.7 mmol/L	-5 - 5
Cl ⁻ (mmol/L)	120 mmol/L	99 - 110
Blood count		
Plasma protein (g/dL ⁻¹)	5.8	6 - 7.5
Monocytes (cells/μL)	726	0 - 550

*Smith M.C. & Sherman D.M. (Eds). *Goat Medicine*. [19].

which had complete recovery of abomasal function after treatment. In generalized peritonitis in goats, usually it is possible to observe altered vital signs, toxemia and septicemia [19]. Although the etiology of impaction is not yet fully elucidated in goats, the possible causes include low quality fiber diet intake or vagal indigestion [13,15,17,20]. The presence of tricho-phytobezoars or enteroliths is described as causing pyloric obstruction in this species [19]; however, no intrabomasal concretion was observed [19].

In the present report, it is suggested that the triggering factor resulting in the abomasal impaction was the low-quality hay-based diet [3,17,20]. The diagnosis was based on the clinical, laboratorial and sonographic findings. Similar to described literature cases, the clinical presentation of the goat in the current study was nonspecific. However, ruminal fluid analysis and sonographic findings were suggestive of abomasal impaction, which was subsequently confirmed by exploratory laparotomy [2,16,20,21].

The laboratory findings demonstrated the failure of abomasal emptying, whereas the electrolytic profile indicated an abomasal disturbance, but could not distinguish the abomasal impaction from other abomasal disorders, such as displacements [20].

In contrast with the expectation in an abomasal impaction, the hemogasometry revealed a metabolic acidosis, probably secondary to the chronicity of the disease. Biochemistry indicated elevated gamma glutamyl transferase, possibly a consequence of the increased abdominal pressure [7,11,18]. Although in goats, the sonographic descriptions are documented only in healthy animals [4], it was possible to localize and identify the abomasal impaction based on previous

cattle reports [1]. The surgical approach for abomasal impaction has been previously described in cattle [3,12], but no reports address surgical interventions in goats. In the present case, the abomasal approach was firstly tried through right paracostal incision; however, although this technique is well described in cattle [20], it does not allow sufficient exploration of the omaso-abomasal junction in the goat. Thus, a second incision, in compliance with a previous report [3] was necessary, and was performed in a paramedian position, allowing complete exposure of the organ. A similar difficulty was described in large cows or in cases of severe abomasal distension [20], corroborating this report, in which abomasal distension was severe.

In conclusion, the paramedian abomasotomy, in association with visceral emptying and supportive therapy, is effective in the treatment of the abomasal impaction in a goat, a result that emphasizes the possibility of attempting treatment of this condition that otherwise commonly results in euthanasia.

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