

Two-stage Rumenostomy in Buffaloes

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ABSTRACT

Background: Rumenostomy may be performed for therapeutic and digestibility research purposes in bovines, small ruminants and camelids. Several studies requires rumenostomy in buffaloes in order to sample ruminal content for laboratorial assays. However, complications and outcome of rumenostomy was poorly studied in buffaloes. Therefore, the aim of the current study was to describe a two-stage rumenostomy technique in buffaloes, focused on intra and post-operative period. **Materials, Methods & Results:** Nine Murrah buffaloes were submitted to a 36-h and 12-h of food and water fastening. The animals were given acepromazine and maintained in standing position. Flank local anesthesia was carried out. A circular skin incision was carried out in the center of the left flank, followed by divulsion of the external and internal obliques and transversus abdominus muscles, and incision of the peritoneum. Subsequently, a segment of the dorsal aspect of the rumen was grasped and pulled through the flank incision. The rumen was attached to the peritoneum and skin incision margins in four points (dorsal, ventral, cranial and caudal). Additional simple interrupted sutures attaching the rumen serosa to the skin were applied subsequently. Four additional interrupted horizontal mattress sutures were applied equidistantly, taking bites only in the skin and rumen serosa. Following 12 h, the second stage was carried out. The buffaloes were prepared and restrained as performed for the first stage. A circular flap was excised from the exteriorized rumen and the silicone rumenostomy cannula was placed. Clinical parameters, postoperative recovery, weight and behavioral pain scale were assessed. Positioning and anesthesia regimen were adequate for the achievement of the procedure. However, two animals fell in the restraint chute during the first surgical stage. Mild ischemia of the exteriorized rumen segment was observed on the second surgical stage, which resulted in less hemorrhage and enhanced cannula positioning. Complete cicatrization and permanent adhesion of the rumen to the skin were achieved. No ruminal leakage to the abdominal cavity occurred. No signs of pain were reported. There were few cases of laxity of the rumenostomy opening leading to drop of cannula, myiasis on the margin of the stoma site and few cases of mild ruminal content leakage on the long-term assessment. **Discussion:** Restraint in standing position was considered adequate, although lateral recumbence constitutes another option. However, higher risk of contamination and technical difficulties in placing the cannulas are expected if lateral recumbence is considered. In other trials using acepromazine, no accidental recumbence occurred. Xylazine was also indicated for chemical restraint of buffaloes. It is known that flexible cannulas provide better anatomic adjustment and adaptation as well as being effective for sampling ruminal content, as seen in the current study. Ruminal leakage is one of the most frequent complications of rumenostomy, which may affect animal's welfare. The animals in the current study presented no variations on the body score, even though on those presenting cannula loosening or ruminal content leakage. Moreover, no significant changes of the ruminal content parameters were noticed. Myiasis was also reported following ruminal surgical interventions, which were mainly attributed to extensive breeding. Loss of the cannula, subcutaneous emphysema and suture dehiscence are common complications of rumenostomy. Nonetheless, none of those complications were found on the current study. Thus, rumenostomy was feasible and efficient for sampling and performing assays of the ruminal content in buffaloes.

Keywords: rumen cannulation, *Bubalus bubalis*, ruminal stoma, surgery.

INTRODUCTION

Rumenostomy is used for therapeutical purposes in cases of recurrent tympanism and ruminal disorders. However, the main aspect of cannulation of the gastrointestinal tract is to provide access to the digestive chambers for assaying *in situ* digestibility and nutrition on breeding animals, especially concerning nutrition in ruminants [6, 7]. Several surgical techniques were reported, mainly in bovines, small ruminants, alpacas and llamas [2, 3, 8, 10].

Although several studies regarding nutrition of buffaloes were carried out, which were basically conducted following cannulation of the rumen for laboratorial assays, [4, 5], there are no studies focusing on the technical aspect and postoperative outcome of rumenostomy in the bubaline specie. Moreover, buffaloes present several morphophysiological and behavioral different characteristics from the bovine specie, which may affect differently their response to surgical trauma.

Based on those facts, the aim of the current study was to describe and assess a two-stage rumenostomy technique in buffaloes, as well as to evaluate intra and long-term postoperative complications and behavioral changes.

MATERIALS AND METHODS

Nine Murrah breed neutered buffaloes, mean age of 24 ± 6 months old, weighting 320 ± 25 kg, were assessed. The animals were confined in *Brachiaria humidicula* and natural grass paddocks on a holm area, receiving *ad libitum* water and mineral salt. The animals were selected following general clinical examination, parasitologic assays and complete hemogram.

Rumenostomy was carried out in two stages. On the first stage, 36-h and 12-h food and water fasting was performed, respectively. The buffaloes were tranquilized using acepromazine¹, (0.10 mg/kg, intramuscularly) and restrained in standing position in restraint chutes. Wide clipping and aseptic prepare were performed on the left paralumbar area. Local anesthesia was carried out using 2% lidocaine chloride without vasoconstrictor², employing the "inverted L" infiltration technique, associated to incision line subcutaneous and intramuscular block.

Subsequently, the incision line was delimited using the cannula cap as reference. A circular skin incision was performed on the center of the left paralumbar fossa and the skin was excised, beginning

8 cm ventrally to the transverse process of the lumbar vertebrae, at the midpoint between the coxae tuber and the 13th rib (Figure 1A and 1B). The external and internal obliques and the transverse abdominal muscles were dissected and retraced according on the direction of their fibers, following by incision of the peritoneum using Mayo straight round-tip scissors.

A part of the rumen was grasped using two Glock non-traumatic forceps and pulled out through the laparotomy site (Figure 1C). The exteriorized ruminal surface was attached to the peritoneum and skin using manufactured autoclaved polyamide (0.60 mm of diameter) in a simple continuous pattern, which started as four interrupted sutures applied dorsal, ventral cranial and caudally, taking 1 cm of skin margin. The ruminal serosa was progressively approximated to the peritoneal surface and skin margin as the suture was applied. Four reinforcement interrupted horizontal mattress sutures were placed 1 cm from the skin margins, taking bite only on the ruminal USP was used. Additional interrupted horizontal mattress sutures were placed for better apposition of the skin to the rumen serosa as necessary (Figure 1C, 1D e 1E). All sutures were performed using a "s" shaped triangular needle.

The animals were given flunixin meglumine³ (1.1 mg/kg, IM, SID, for 3 days), a single dose of an association of penicilins⁴ (30.000 UI/kg of benzathine penicillin, IM) and wound care included repellent topical ointment over the ruminal surface (Figures 1F, 2A e 2B).

The second surgical stage was carried out following 12 days post-op. The same patient preparation and restraint used in the first stage was adopted. A circular incision was performed accomplishing all layers of the rumen, followed by insertion of the ruminal cannula (Figure 2D). A four inches in diameter silinicone cannula for bovines⁵ was used (Figure 2E and F). Wound care was continued using the same protocol as used for the previous stage was adopted. Ointment was applied to the skin and ruminal surface, surrounding the cannula.

Clinical parameters, wound cicatrization and complications were assessed between surgeries and on the post-operative period of the second stage if present. Weight was measured for 30 days by the first surgical stage, as well as pain behavior. The animals were observed for six months following rumenostomy.

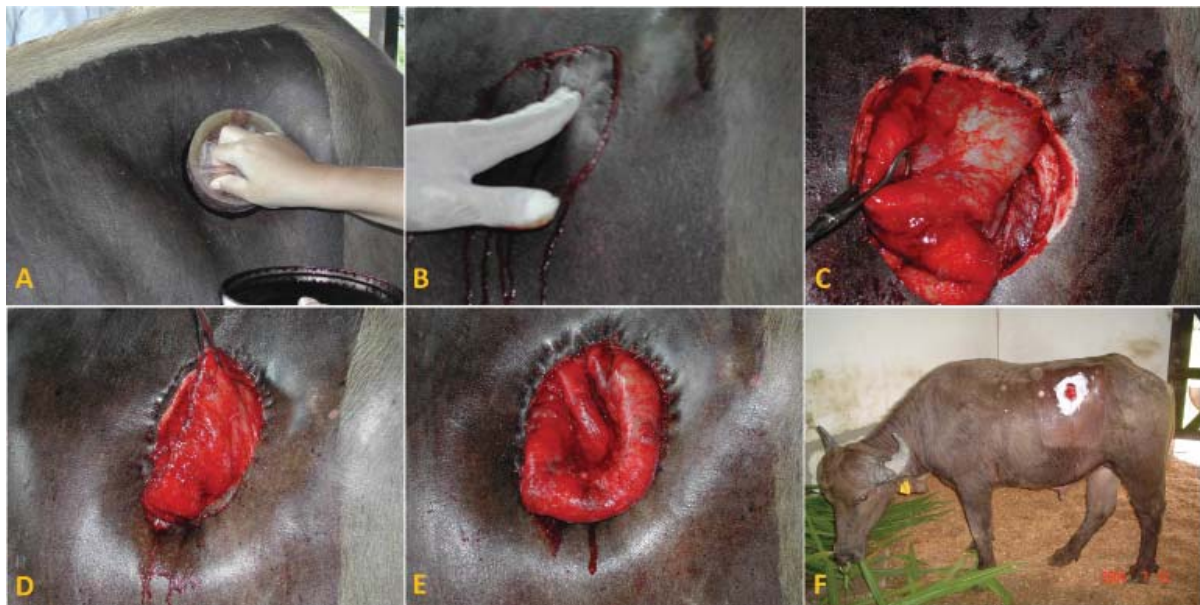


Figure 1. Intra-operative images of the first of two stages of the two-stage rumenostomy in buffaloes. Demarking the incision line with the cannula cap (A), cicular skin dieresis on the left paralumbar space (B). Access to the rumen through the skin defect and flank musculse; grasping the left dorsal portion of the rumen, beginning of the rumenopexy (C). Progression of the attachment of the rumen to the peritoneum (D). End of the suture showing the exposed ruminal surface (E). Early post-operative image of the first surgical stage, showing the patient's posture and use of repellent intment on the exposed ruminal surface (F).



Figure 2. Images of the evolution of the surgical wound following the accomplishment of the first stage and end of the two-step rumenostomy in buffaloes. Surgical wound following 24 h of rumenopexy (A); following four days of surgery (B); right before the second surgical stage (C). Exeresis of the exposed part of the rumen; mild hemorrhage is seen (D); following cannula placement (E); the patient in the early post-operative period (F).

RESULTS

The sedation, anesthesia and restraint used in the current study was fairly adequate for the accomplishment of the procedure. However, two animals (22%) fell in the restraint chute during surgery on the first surgical stage.

Although some technical difficulty was found for applying sutures to the flank abdominal muscles due to their thickness on the bubaline specie, no major complication occurred during suture.

The exposed part of the rumen became ischemic in all patients, which enhanced cannula positioning and

prevented hemorrhage. The silicone-based cannula was also important for proper adjustment to the stoma.

Complete cicatrization and adhesions among the rumen and the abdominal wall were observed. There was no leakage of the ruminal fluid to the abdominal cavity and no cases of peritonitis occurred.

Except for the spontaneous recumbence in two animals, no early post-surgical complications occurred. The long-term follow-up revealed few cases of dropping of the cannula and small amounts of leakage of ruminal content and myiasis in an animal (11%). The animals were able to be used for assays on nutrition and no other complications were noted.

DISCUSSION

Although restraint in standing position was fairly adequate in the current study, lateral recumbence was also stated as a successful restraint for surgical approach. However some risk of contamination and difficulty in placing the cannula is advised [6].

Acepromazine was cited for tranquilization and penile exposure in another trial, however with no cases of recumbence in the restraint chute [1]. Low-dose xylazine should be considered if recumbence is not desired [7].

No technical difficulty in passing the sutures through the flank muscles was reported before in species subjected to rumenostomy [2,3,9,11], as seen in the buffaloes on the current study. However, no major complications occurred during such surgical maneuver.

The flexibility of the silicone-based cannula used in the current trial was important for placing the apparatus through the stoma. The use of flexible cannulas provides better anatomical adjustment and is efficient for retrieval of ruminal content with minimal risk of local necrosis and peritonitis [11].

Ruminal content leakage is reported as one of the major complications of rumenostomy.

Besides affecting the hygienic aspect, ruminal leakage impacts the animal's welfare [11]. Even though there were few cases of leakage of ruminal fluid and dropping of the cannula in the current study, the animals were kept in good body score during all the study, revealing no major impact over the ruminal physiology.

Myiasis was also found in other trial [10]. In the current study, myiasis occurred in one animal, which was attributed to extensive managing.

The two-stage rumenostomy technique provided both cannula adjustment and wound cicatrization. Loss of cannulas, subcutaneous emphysema, wound dehiscence and surgical site infections are the most common post-surgical complications of rumenostomy in ruminants [8]. Nevertheless, none of such complications occurred in the current study regarding the bubaline specie.

CONCLUSION

The two-stage rumenostomy was feasible in buffaloes and provided minimal impact over the animal's welfare, while being adequate for the accomplishment of assays on nutrition on the bubaline specie.

SOURCES AND MANUFACTURERS

¹Acepran 1%®, Vetnil. SP, Brazil.

²Lidovet®, Brasvet. RJ, Brazil.

³Desflan®, Ourofino. SP, Brazil.

⁴Pencivet® Plus PPU, MSD Saúde Animal. SP, Brazil.

⁵Cânula para rúmen 4" - silicone, KEHL® SP, Brazil.

Ethical approval. The current study was approved by the Committee for Ethics and Animal Use in Research conducted of the "Universidade Federal Rural da Amazônia".

Declaration of interest. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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