



Diagnostic and Therapeutic Management of Ruminal Impaction in Ruminants

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ABSTRACT

Background: Ruminal impaction is a serious gastro-intestinal condition affecting the cattle causing ruminal block by the accumulation of indigestible materials like compacted feed, non-metallic objects, plastic bags, mango kennels, etc. This condition interferes with the rhythmic ruminal flow, leading to abdominal distension and can be fatal if not addressed promptly.

Methods: Cows within the age group of 6 months to 8 years were presented at VCC, Rajendranagar, from a period of 2 yrs (2022-2024), with the distinct clinical signs of bloat, sub-normal temperature, cessation of rumination, atony, pale mucus membranes and thick mucus-coated pelleted dung. A total of 32 cows with similar symptoms were subjected to thorough clinical and physical examination, haemato-biochemical and serum biochemistry examinations. Ruminal fluid was evaluated for pH, colour, odour and the methylene blue reduction time (MBRT).

Result: The haematological tests revealed normocytic normochromic anaemia, with decreased values of PCV. The pH levels, total leucocyte count and MBRT values recorded were elevated. The serum biochemistry revealed significantly decreased values of albumin, globulin, total proteins and albumin/globulin ratio, hypocalcemia with elevated BUN levels in some animals. The lactate levels dropped below 5mmHg in few cases. The results suggested Ruminal impaction in the presented cows. Rumenotomy was performed under regional anaesthesia with inverted L block with 2% lignocaine hydrochloride on left paralumbar fossa. Among the 32 affected cows, 5 succumbed to its deteriorating health conditions and died, while the others showed slow and gradual recovery, with complete recovery within a week.

Key words: Bloat, Cows, Rumenotomy, Ruminal impaction.

INTRODUCTION

Ruminal impaction is one of the most common and important gastro-intestinal disorder of the cattle that degrades the body condition and there by, the economy of the farmer by a reduction in milk yield or loss of the animal (Athar, 2010). In animal, ingestion of indigestible materials may cause animal distress, production and reproduction health loss (Priyanka M, 2018). Most common indigestible foreign bodies causing impaction are plastic bags, hair balls, mango kennels, stones and pellets. The polythene and other foreign materials are non-degradable by nature, causing hindrance in the orifice of rumen/reticulum (Ramaswamy, 2011).

Ruminal impaction is more common in cattle compared to other ruminants due to lack of oral discrimination leading to ingestion of foreign bodies (Radostits, 2000). The cessation of the rhythmic flow and stagnation eventually leads to damage in the ruminal microflora, emaciation and chronic recurrent tympany, that may eventually cause death, if remained untreated (Athar, 2010).

MATERIALS AND METHODS

The present work consists of 32 clinical cases presented at the Veterinary Clinical Complex and Department of Veterinary Clinical Medicine, Rajendranagar. Cows ranging from 6 months to 8 years of age, were studied over a period from 2022 to 2024, on the basis of main complaint, patient's regular diet, duration of the discomfort, history of recurrence and were subjected to various detailed clinical examinations,

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haemato-biochemical alteration (Hb, PCV, WBC's, RBC's, Albumin, Globulin, A: G ratio, BUN, urea, Creatinine, Glutaraldehyde values) and serum biochemistry. The presence of the foreign body was determined by external abdominal palpation, rectal examination and rumenotomy. 5 mL of blood was collected from the jugular vein of each cow into the EDTA blood collection tubes for haematological examination and glutaraldehyde test. Blood samples were centrifuged at 3000 rpm. Two ml of collected plasma was put in a 10 ml plastic injector, mixed with 2 ml of glutaraldehyde solution and was checked every 30 seconds to assess coagulation. The time of coagulation was recoded accordingly. Ruminal fluid was collected and examined for

colour, odour, consistency, pH and MBRT tests (Dirksen, 1969). All the vital parameters along with ruminal motility was measured and recorded daily. Rumenotomy was carried out in the affected animals to remove the foreign bodies. Clinical, laboratory and surgical parameters were recorded and analysed, with constant post-operative follow up for 3 months.

The animal was stabilised for surgery, feed was withheld for 12-24 hours and water restriction for 8-12 hours pre-operatively, to prevent vomiting and aspiration during anaesthesia. The animal was placed in standing recumbent position and left flank was shaved and cleaned aseptically (Fig 1). The regional anaesthesia with inverted L block by infiltrating 2% lignocaine hydrochloride to desensitize the flank area and waited for 10 minutes. A 20 cm dorso-ventral vertical incision parallel to the last rib and ventral to the transverse process of lumbar vertebrae was made. The subcutaneous tissue, internal and external oblique muscle, transverse muscle and peritoneum was carefully incised. The rumen was then secured to the skin using stay sutures to avoid contamination due to spillage of the ruminal content into the abdominal cavity. The dorsal sac of the rumen was incised for the exploratory diagnosis.

RESULTS AND DISCUSSION

Most common clinical signs observed among the affected cows included ruminal tympany, sub-normal temperature, cessation of rumination, atony, pale mucus membranes, difficulty to defaecate (TENESMUS), thick mucus-coated pelleted dung, depression, anorexia, restlessness, doughy consistency of rumen, dehydration, distended left para lumbar fossa and emaciation in protracted cases. Tympany was moderate to severe with varying degrees of respiratory distress.

The average of the results obtained are as depicted below.

I. Complete blood picture (CBP) and Glutaraldehyde test values.

Parameter	Reference	Diseased group
RBC	5.5-10 × 10 ⁶ /uL	3.72±0.50
Hb	9-15 g/dL	7.2±0.3
PCV	25-46 %	48.7±3.5
WBC	6-8 ×1000 /uL	11.7±0.5
Glutaraldehyde test	Negative (above of 15 minute)	Negative (above of 15 minute)

II. Ruminal pH and MBRT test.

Parameter	Reference	Diseased group
Ruminal fluid pH	7.1-7.5	8.2±0.3
MBRT	4 - 5	16.82±1

III. Serum Biochemistry values.

Parameter	Reference	Diseased group
Calcium	2.3-2.8 mmol/L	1.7±0.06
Lactate	5-8 mmHg	3.2±0.5
Total protein	6-8 g/dL	4.28±0.4
Albumin	3-4 g/dL	2.11±0.6
Globulin	0.2-0.6 mg/dL	0.3±0.8
A:G ratio	0.15-0.30 mg/dL	0.15±0.04
Creatinine	44-194 umol/L	52±0.5
Phosphorous	1.8-2.6 mmol/L	2.2±0.8
Urea	3.6-8.9 mmol/L	6.30±0.2

The haematological examination revealed mild decrease in the Haemoglobin concentration and erythrocytic count, accompanied by leucocytosis and elevated PCV values. There was no significant difference in the mean value of glutaraldehyde coagulation test. Dehydration was a consistent finding in all the affected cows.

A significant decrease in the ruminal motility and faecal quantity, with increased values of MBRT and pH of the ruminal fluid in affected cows was recorded pre-operatively. The biochemical evaluation revealed hypocalcaemia, hypolactatemia, hypoproteinaemia and hypoalbuminemia, without any significant changes in the A/G ratio. Serum globulin, phosphorous, urea and creatinine values were unremarkable and well within the normal range.

Findings from the exploratory rumenotomy included a majority of plastic materials, clump of non-metallic foreign bodies, coins, rope fibres, mango kennels, few stones and hairballs, which were gently removed (Fig 2a, 2b). Rumen and surrounding area were sterilised using isotonic saline solution and closed by double lambert suture using vicryl No. '0'. The replacement of rumen in the abdomen to its original position and the closure of the peritoneum and muscles by simple continuous suture using No.2 vicryl, was done in the respective order and skin sutures using No. 2 nylon and bandaged to heal (Fig 3).

Among the 32 affected cows, 5 succumbed to its deteriorating health conditions and died due to complications, while the others showed slow and gradual recovery, with complete recovery within a week post-operation. Post-operative treatment included parenteral administration of Ceftriaxone @ 10 mg/kg b. wt., IV Meloxicam @ 0.5 mg/kg b.wt., IM, fluid therapy for the five consecutive days and daily antiseptic dressing was performed with himax ointment and Neosporin-H ointment near the incision site to avoid fly's infestation and delayed healing. Rumenotomies were administered in addition to Intravenous fluid therapy for 5 days to correct the dehydration. Initial feed management included withholding any feed and water for the first 24 hours to prevent post-operative bloat or overdistention. Gradual reintroduction of feed mixed with probiotics and small quantities of appropriate high-quality roughage was monitored for

complete revival of appetite. Bi-weekly monitoring was scheduled to detect any post-operative complications like peritonitis, abscess formation, increased heat, swelling, or discharge from the wound, lethargy or decreased appetite and signs of infection. Suggestively, for extreme protracted or chronic cases of ruminal impaction, Rumen transfaunation can be performed from a healthy donor cattle, to reintroduce the ruminal fauna and to restore the ruminal microbial population, assisting in faster recovery of appetite.

The term used to describe ruminal impaction due to indigestible foreign bodies is 'NON-PENETRATING FOREIGN BODY SYNDROME' (Raidurg, 2010). This is more common in cattle scavenging in areas with the predisposing factors like urbanization, industrialization, type of grazing system, mineral deficiencies, that play an important role for ingestion of plastic waste materials (Priyanka, 2018). The ingestion of these materials can hinder physiological and chemical processes such as fermentation, which can lead to indigestion and microflora disruption. In addition to this, plastic ingestion over time may lead to a build-up of toxins in the animal, which in turn could affect meat and milk quality intended for human consumption (Akraiem, 2016). Rumenotomy is advocated for treatment of severe/long standing cases of ruminal impaction which are unresponsive to conservative treatment (Martin, 2021; Kumar *et al.*, 2019; Zahra *et al.*, 2022 and Rajput *et al.*, 2017).

Regarding the values of various physical and clinical examinations, the increased respiratory rate is probably due to the increased pressure of the dilated rumen on the diaphragm due to impaction (Kuiper, 1986). The most common clinical signs such as complete anorexia, cessation of rumination and ruminal motility, weakness, decreased milk production, scanty faeces and recurrent rumen tympany were in accordance with studies conducted by (Reddy, 2004 and Ramaswamy, 2011). The presence of such non-degradable impacted material may partially or



Fig 1: Exploratory rumenotomy.



Fig 2: Plastic materials, clump of non-metallic foreign bodies, coins, rope fibres, mango kennels, few stones and hairballs removed after Rumenotomy.



Fig 3: Replacement of rumen in the abdomen to its original position and the closure by simple interrupted sutures with Vicryl No. 2.

completely block of the rumino-reticular orifices, obstructing the ruminal flow, thereby, hindering the process of fermentation and mixing of contents, leading to indigestion and depraved appetite (Vanitha, 2010).

The hematological findings recorded elevated values of PCV and Hb concentration, which can be attributed to the extreme dehydration caused secondary to impaction, (Jain NC, 1986 and Braun, 2007), while leucocytosis can be attributed to other systemic compensatory chronic inflammatory processes (Boodur, 2010). The reduction time of methylene blue (MBRT) and pH ruminal fluid were significantly increased in the affected animals. Alkaline pH of ruminal fluid and MBRT are important diagnostic tool in field conditions for the early diagnosis of foreign body impaction and detection of plastic ingestion in the cattle (Dirksen, 1994). Biochemical parameters including hypocalcemia, hypoproteinemia and hypoalbuminemia can be explained by the depraved appetite, anorexia and stress due to impaction. The glutaraldehyde coagulation test values remain unremarkable in most of the cases, but is a significant tool for diagnosis of protracted cases of ruminal impaction as it gives positive results in case of adhesions within the abdominal cavity (Priyanka, 2018).

At present, rumenotomy is one of the most widely used surgical technique for both diagnosis and treatment of ruminal impaction due to plastic materials in ruminants (Biswal, 2016). Affected cows returned to normal appetite and feeding from the next day post-operative. Rumenotomies and probiotics assisted in complete recovery within 7 days post-operative.

Preventive measures for ruminal impaction include rearing in farming conditions with sufficient natural feedstuff and keeping away from dumping yards and urban garbage while grazing. Good prognosis with elimination of foreign bodies was observed.

CONCLUSION

Ruminal impaction due to plastic materials is one of the major but often neglected health issues of stray ruminants in urban areas of many developing countries, not only due to the cheap and omnipresent availability of such plastic products, but also due to its improper disposal and lack of solid disposal techniques. Apart from improving basic animal husbandry practices and disposal of plastic waste, intervention by government particularly on slaughter policies of unproductive animals, establishment of fodder banks/ grazing centres/watering facilities for animals, starting public health awareness programs, implementing strict laws for proper disposal of plastic waste, etc., are needed to be established, along with more detailed research on the pathophysiology, diagnosis, and treatment of ruminal impaction due to other foreign materials in animals.

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Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

All animal procedures for experiments were approved by the Committee of Experimental Animal care and handling techniques were approved by the University of Animal Care Committee.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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