



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2019; 8(6): 171-175
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www.thepharmajournal.com
Received: 10-04-2019
Accepted: 12-05-2019

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Review of literature with a case report: Severe ruminal impaction caused by different types of foreign bodies in the rumen of a post parturient boer goat

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Abstract

A 3yrs old Boer breed of goat presented with a complaint of anorexia, restlessness and repeated bloating since two days. Which had history of kidding 3 days back, on physiological examination rectal temperature was normal range but respiration rate and heart rate were slight deviated towards lower than normal range. Physical examination revealed congested oral and conjunctival mucus membrane. Hard palpable mass was observed during abdominal palpation in the rumen (anterior abdomen) and advised for explorative rumenotomy. On rumenotomy the rumen was filled with compacted foreign bodies (plastic material, i.e. plastic bags, stones, floor mat made up of coir (coconut fibre), along with few calcified mass,) with calcified masses which were weighing around 1.2 kg. The surgery was performed as per standard procedure. During post operative period animal was treated with parenteral antibiotics (OTC @5mg/ kg), NSAIDs (Meloxicam 0.5-1mg/kg) and fluids (DNS & RL) for 7 days and animal recovered uneventfully.

Keywords: Boer goat, plastic material, rumenotomy

Introduction

Bovine and ovine have many reports regarding foreign body in their rumen in the urban areas where the disposal of waste materials are not proper (Singh and Nigam, 1981; Vanitha *et al.*, 2010; Abu-Seida *et al.*, 2014; Ravindra *et al.*, 2014) [47, 51, 4, 42]. Bovines lacking of proper nutrition which in turn results in development of pica also been trigger animals to adopt ingestion of feed other than normal feed which may include indigestible wastes which gradually accumulates inside the rumen leads to multiple adverse effect upon health as per its lodging location inside alimentary tract (Cheel and Sethi, 1999; Calfee and Manning 2002: Ghurashi *et al.*, 2009; Ramaswa and Sharma, 2011) [14, 13, 19, 40]. In small ruminants impaction in goat-kids is rare and it should be recorded for future purpose to prevent such instances, reported by Ali *et al.*, (2009) [6].

While in small ruminants too when they develop pica, influenced by boredom or extended periods of confinement, nutritional or mineral imbalance, unfamiliar items used to be intake as food like plastic bags, cloth, leather, twine and rope ((Jones *et al.*, 1996; Gilroy and Bellamy, 1998; Abdel-Mageed *et al.*, 1991; Pugh, 2002) [28, 20, 2, 37].

Accumulated of foreign bodies inside rumen prevent absorption of volatile fatty acids and consequently reduces the rate of animal fattening (Igbokwe *et al.*, 2003) [25], Perforation of wall of reticulum leads to spread of ingesta and bacterial contaminants in the peritoneum and development of diffuse peritonitis (Anwar and Aslam, 2013) [8].

In Nigeria, case of a Sheep where rope was found as a foreign body (Igbokwe *et al.*, 2003) [25]. Reports of incidence of foreign body in sheep is more than goats due to nature of selective feeding (Baillie and Anzuino, 2006; Ali *et al.*, 2009; Semieka, 2010; Fromsa and Mohammed, 2011) [10, 6, 46, 17]. Caprine known as browser, which can differentiate its food items other indigestible foreign bodies unlike bovine as they does not have much well sensitive prehensile organ and leads to increase chance to ingest many unwanted non digestible items like metallic and plastic objects (Al-Majali *et al.*, 1995; Hailat *et al.*, 1995; Jones *et al.*, 1996; Hailat *et al.*, 1998; Desiye and Mersha, 2012; Ravindra *et al.*, 2014;) [7, 22, 28, 21, 15, 42]. Foreign materials are categorised in bovine as metallic origin and non metallic origin (Misk *et al.*, 2001) [32]. In sheep and goat commonest foreign bodies are indigestible pieces of rubbish, especially those made of plastic, including bezoars (Martins *et al.*, 2004; Remi-Adewunmi *et al.*, 2004; Baillie and

Anzuino, 2006; Bakhiat, 2008; Mohammed, 2004; Pitroda *et al.*, 2010; Jana and Jana, 2006)^[30, 43, 10, 11, 33, 36, 27]. Abattoir survey revealed that 77% of sheep and 20.7% of goats had indigestible garbage in Sudan (Mohammed, 2004)^[33]

Indigestible wastes cannot pass through the digestive tract, prevent proper fermentation and mixing of normal feed contents intraruminally, may occludes the rumen reticular orifice or reticular omasal orifice which may convert to fatal consequences (Pugh, 2002; Radostits *et al.*, 2007)^[37, 39].

As per Schipper (2000)^[45] various influencing factors are involved like remodeling of livestock houses, wires, pins, feed sack bags, browsing of animal near newly constructing buildings, also often occur in recent postpartum animals, male shortly after or during extensive uses for breeding or semen collection (Desiye and Mersha, 2012)^[15].

Diagnosis of lodgement of foreign body inside the alimentary canal best choice is radiography (Spouge *et al.*, 1990; Hunt *et al.*, 2004; Semieka, 2010)^[48, 24, 46]. It is very difficult to diagnose by simple haemato biochemical analysis (Ali *et al.*, 2009; Raoofi *et al.*, 2011)^[6, 41]. Akinrinmade *et al.*, (2012)^[5] reported that in West African Dwarf goats complete blood count (PCV 26.22%, RBC 9.03 X 10⁶/μL, Hb 8.38g/dl and MCHC 32.20g/dl) were significantly lower than the normal animal without foreign body in its digestive tract. Foreign body positive case observed decrease in erythrocytes count, hemoglobin content (Abdel-Mageed and Abbas, 1991)^[2].

Athar *et al.*, (2010)^[9] recommended peritoneal fluid analysis can support haematology and clinical findings. William, (1956)^[52] recommended, Wither Pinch Test, where by pinching withers to cause depression of back and eliciting grunt, audible tympanic sounds in the left flank 2-3 seconds before primary ruminal contraction. Abdominal palpation on both sides of abdomen in small ruminants followed by use of stethoscope for evidence of grunt (Begg, 1950; Jackson and Cockcroft, 2002)^[12, 26].

Plastics are synthetic or semi synthetic solid materials made up of polyethylene, polyvinyl chloride, polystyrene mostly use by human for their own need and use (Ravindra *et al.*, 2014)^[42].

Anamnesis

A 3yrs old boer goat presented with a complaint of depressed, weak, anorexia, restlessness and repeated bloating since two days, had kidding 3 days back. Physiological examination revealed rectal temperature was normal; respiration rate and heart rate were lower than normal range. Physical examination revealed congested oral and conjunctival mucus membrane; ceased ruminal movement/ ruminal atony; scanty, hard faeces with red mucous over faecal pellets; dehydration; on abdominal palpation hard palpable mass was observed in the abdomen. The general body condition of the animal along with hard mass in the abdomen tentatively diagnosed presence of fetal parts in the uterus and condition of the animal suggestive of initiation of toxemia and advised for exploratory rumenotomy.

Materials and method

After taking consent form the owner surgical site prepared aseptically. Local anaesthetics were used 2% Lignocain hydrochloride (Lox 2%, Neon Laboratories Ltd.), after epidural injection, anaesthetics were infiltrated around the line of incision. Animal has placed in right lateral recumbency, laparotomy incision has placed in the left ventro lateral side oblique direction, and laparotomy has done as per standard procedure. On exploratory laparotomy, the uterus was normal

in its involuntary stage and rumen was found impacted, hard. The rumen brought out from the abdominal cavity followed by rumenotomy. On rumenotomy, observed that the rumen was compacted with plastic material, i.e. plastic bags, stones, floor mat made up of coir (coconut fibre), along with few calcified mass, which were weighing around 1.2 kg and ruminal content evacuated, proper cleaning of the ruminal debris, the rumen has closed Cushing's followed by Lemberts' sutures with Chromic Cat gut, size - 2 (Trugut, Sutures India) and followed by suturing of peritoneum and muscle layer by using Polygalactin 910 (Vicryl-1, Ethicon), subsequent subcutaneous layer with Polygalactin 910 (Vicryl-1, Ethicon), skin later closed by polyamide, size- 1(Trulone, Sutures India). On completion of surgery wound has dresses with 2% povidone iodine and bandaged applying povidone iodine ointment. During post operative period the animal was treated with parental antibiotics, oxytetracycline @5mg/kg body weight (Oxynex, Zudys AHL), NSAIDs Meloxicam 0.5-1 mg/kg body weight (Melonex, Intas Pharmaceuticals) and Inj. DNS 500ml (10-20ml/ kg body weight), Inj. RL 500ml (10-20ml/ kg body weight) for 7 days, oral administration of probiotic bolus to ensure restoration of ruminal microflora. The animal presented after 10 days post operation and suture were intact. Animals had started taking feed normally and animal recovered uneventfully.

Discussion

Incidence of Ingestion of indigestible foreign materials by ruminants is a common worldwide problem and has been reported from different area of Ethiopia in both cattle and small ruminant (Tiruneh and Yesuwork, 2010; Fromsa and Mohammed, 2011; Negash *et al.*, 2015; Fasil, 2016)^[50, 17, 35, 16].

It is the first report of being presented in boer goat of foreign body ingestion, plastic bags, stones, floor mat made up of coir (coconut fibre) which caused severe impaction and made almost morbid condition of that goat, Baillie and Anzuino, (2006)^[10]; reported hair ball (foreign body in angora breed of goat in England, also reported discrete incidence of foreign body of plastic in different breed of goat and sheep.

In present case also come in agreement with Desiye and Mersha, (2012)^[15], recent postpartum animals have higher chance to ingest unwanted non digestible items.

In India as like Ethiopia, the goats are generally left for browsing by their own which increase the chance of ingestion of unwanted materials (Roman and Hiwot., 2010)^[44], and agreement with by Jana and Jana (2010)^[27] that stray large ruminant animals which are not fed properly, deficient and malnutrition animals show more tendency for ingestion of polythene, other unwanted materials and subsequent impaction.

Radiography is the choice for diagnosis for foreign body syndrome but due to exposure to radiation to the patient and staff and difficult under field condition to arrange, limited the use. Ultrasonographic examination can considered best in hand useable machine for diagnosis of the disease along with clearly differentiate from the pregnant animal, thus can take immediate decision for treatment (Abdelaal and Maghawry, 2014)^[1]. In present case, was unable to get ultrasound machine as well as assistance of radiography leads to depend on abdominal palpation and auscultation. This case was complicated as had parturient 3 days ago, there was chance of retaining of fetus, thus the incision site has place ventrolateral obliques position, so can reach to the rumen as well as the uterus.

In small ruminants, impaction is mostly of subclinical form (Hailat *et al.*, 1998) [21]. Impacted animal have ruminal disturbances and distended rumen with scanty faeces or no faeces (Abdullahi *et al.*, 1984) [3]. In present case except few almost showed similar sign and symptoms of foreign body affection clinical signs included inappetence, foamy salivation, dull, progressive weight loss, debilitation, reduction in milk production, scanty faeces, dry consistency covered by mucous, firm distended hard, bloated rumen that can be palpated in the left flank, recumbency (Igbokwe *et al.*, 2003; Ali *et al.*, 2009) [25, 6]. In present case has observed multiple times of recurrent tympany agreement with Radostatis *et al.*, (1994) [38] as one of the main sign of gastrointestinal disorders related to foreign body in ruminants. Present case also had anorexia and it is opined that, decreased appetite might be due to physical presence of the foreign body mass and stretching of the cranial sac of the rumen leads to constant stimulation in ventromedial hypothalamus and satiety center (Ghurashi *et al.*, 2009; Houpt and Reece, 2004) [19, 23].

Size, weight and position of the impacted material in the rumen is crucial to develop clinical impaction as large and heavy impacted materials in the rumen do not cause clinical impaction until impacted material reach to rumino-reticular orifices and occlude it partially or blocked completely by its pressure or presence (Meyer *et al.*, 1992; Kumar and Dhar, 2013; Igbokwe *et al.*, 2003) [31, 29, 25]. In the rumen accumulation of foreign bodies mixed with ruminal, i.e, plastic bags and other undigested materials weighing about 1.5- 4.5 kg, partially occluding the rumen, even part of rumen papillae stunted and sloughed off (Abdel-Mageed and Abbas, 1991) [2], similar to present findings.

In the present case, the animal had very shallow respiration and heart rate was below than normal, it doesn't agree with the agreement of (Mozaffari, 2009; Ghurashi *et al.*, (2009) [34, 19] except temperature, it might be due to extensive requirement of energy for maintenance and production, gluconeogenesis is incapable of compensate the demand along with ruminal dysfunction leads to drastic escalation of energy requirements. Also might be due to long standing case of foreign body inside rumen which shifted from initial lodging area and blocks the rumen reticular as in generally rumen rumen got empty 24 hour before kidding due to inappetence before kidding and ultimately leading to such grave condition and without prompt surgical intervention leads to fatality. Ghurashi *et al.*, (2009) [19] assume that there are no direct relationship between presence of the foreign body in the rumen and respiratory and heart rates, as impaction in the rumen of the goats did not affect the respiratory and heart rates significantly. Respiratory and heart rates get affected when physical pressure exerted by the foreign body on the chest.

In this present case as per sign and symptom was directing towards the exploratory rumenotomy agreement with Ali *et al.*, (2009) [6]. Symptomatic treatments include Oral administration of magnesium sulphate may loosen impaction but recurrence is there thus rumenotomy is essential to save the life in severe cases (Suthar, 2011; Pugh, 2002; Ali *et al.*, 2009) [49, 37, 6]

Conclusion

It is conclude that due to pica which induce due to extensive energy and mineral demand increase during the peripartum period and encourage ruminates to intake those unwanted

materials. As the animal increase its frequency to intake foreign materials, gradually they starts accumulate inside the rumen and became too much adhere with the wall of rumen which even destroy the papillae of rumen. The increase in the incidence of foreign bodies are mainly the urban areas, mostly due to improper disposal of waste materials which attracts half fed or hungry animals towards the heaps of it and leads to rapid ingestion by dumb animals. Improper disposal of indigestible materials like plastic, cloth, metal, rope and stone cause serious health risks for free-grazing ruminants and amongst all the foreign bodies plastic bags constituted the majority, the use of biodegradable paper bags could be encouraged along with community should get education in the principals of re-use, recycling (Najesh *et al.*, 2015)[35]. Also it can be conclude that, continuous development of industries, houses and other infrastructures reducing the grazing land for animals, whatever left that too polluted by different garbage materials, thus intentionally or unintentionally animal have to fed those unwanted items. Ultimately its effecting the socio-economic loss of the owner by reducing the production and productivity even loss of the owner by losing the animal in its peak production period, increasing the cost of the treatment upon the heal sector of animal. To save those animals farmer should be educate regarding intensive rearing of animals at least in urban areas and about proper nutrition of the animal, leads to increase in production and productivity. Lastly, prevention is always better than treatment.



Fig 1: Animal Prepared for Surgery



Fig 2: Ruminal Content after Surgery



Fig 3: 10th Day Post Operation

Reference

1. Abdelaal AM, EL-Maghawry S. Selected studies on foreign body impaction in goats with special reference to ultrasonography. *Vet. World.* 2014; 7:522-27
2. Abdel-Mageed AB, Abbas B, Oehme FW. The pathogenesis of foreign body-pica syndrome in goats. *Agri. Pract.* 1991; 2:31-35.
3. Abdullah US, Usman GSH, Mshelia TA. Impaction of rumen with indigestible garbage in cattle and sheep reared within urban and suburban environment. 1984; 13:89-95.
4. Abu-Seida AM, Al-Abbadi OS. Recurrent Rumen Tympany Caused by Trichobezoars in buffaloes: A Series Report. 2014; 44:147-151.
5. Akinrinmade JF, Akinrinde AS. Hematological and serum biochemical indices of West African Dwarf goats with foreign body rumen impaction. 2012; 27(1):83-87.
6. Ali AM, Mohammad MO, Dariosh V. Unusual and Severe Ruminant Impaction in a Goat-Kid: Clinical and Radiological Findings. *IJVS.* 4(1, 2):115-119
7. Al-Majali A, Hailat N, Nouh S *et al.* Displacement of abomasum in cattle: Diagnosis and treatment. *Al-Tabib Al-Baitari* 1995; 11:61-64. 5.
8. Anwar K, Khan I, Aslam A. Prevalence of indigestible rumen and reticulum foreign bodies in Achai cattle at different regions of Khyber Pakhtunkhwa. *ARPN Journal of Agri. and Bio. Sci.* 2013; 8(8):580-586.
9. Athar H, Mohindra J, Slingh K, Singh T. *Intas Polyvet* 2010; 119(2):180-183.
10. Baillie S, Anzuino K. Hairballs as a cause of anorexia in Angora goats. *Goat Vet Soc. J.* 2006; 22:53-55.
11. Bakhiet OA. Studies on the rumen pathology of Sudanese desert sheep in slaughter house. 2008; 3:294-298.
12. Begg H. *Vet. Rec.* 1950; 62:797-805.
13. Calfee T, Manning TO. Non healing subcutaneous wounds in the cats and proposed surgical managements techniques. *Clin. Tech. Small Anim. Pract.* 2002; 17(4):162-167.
14. Cheel LW, Sethi DS. Diagnostic and therapeutic approach to migrating foreign bodies. *Ann. Otol. Rhinol. Laryngol.* 1999; 108(2):177-180.
15. Desiye T, Mersha C. Study on Rumen and Reticulum Foreign Bodies in Cattle Slaughtered at Jimma Municipal Abattoir, South West Ethiopia. *American-Eurasian Journal of Scientific Research.* 2012; 7(4):160-167.
16. Fasil N. Assessment of Sheep and Goat Foreign Bodies in Rumen and Reticulum in the Jigjiga Municipal Abattiar. *J. Adv. Dairy. Res.* 2016; 4:157.
17. Fromsa, A, Mohammed N. Prevalence of indigestible foreign body ingestion in small ruminants slaughtered at Luna export abattoir, East Shoa, Ethiopia. *Journal of Animal and Veterinary Advances.* 2011; 10(12):1598-1602.
18. Fromsa A, Mohammed N. Prevalence of indigestible foreign body ingestion in small ruminants slaughtered at Luna export abattoir, East Shoa, Ethiopia. *Journal of Animal and Veterinary Advances,* 2011; 10(12):1598-1602.
19. Ghurashi MA, Seri HI, Bakheit AH, Ashwag EA. Effect of Surgical Removal of Foreign Body from Goat's Rumen with Special Reference to Prevalence of Foreign Body in Goats in Southern Darfur. 2009; 3(2):664-668.
20. Gilroy BJ, Bellamy J. Gravel impaction in a 2-year-old Morgan gelding. *The Can Vet J* 1998; 39(11):706.
21. Hailat N, Al-Darraji A, Lafi S. Pathology of the rumen in goats caused by plastic foreign bodies with reference to its prevalence in Jordan. *Small Ruminant Res.* 1998; 30(2):77-83.
22. Hailat N, Lafi S, Al-Rawashdeh. Significant changes in some blood parameters in severely emaciated sheep associated with rumen impaction by plastic objects. *J Egypt Vet Med Assoc.* 1995; 55:353-358.
23. Houpt KA, Reece WO. Behavioral physiology. *Dukes' physiology of domestic animals.* 12th ed. 2004, 952-961.
24. Hunt GB, Worth A, Marhevsky A. Migration of wooden skewer foreign bodies from the gastrointestinal tract in eight dogs. *J.Small Anim. Pract.* 2004; 45(7):362-364.
25. Igbokwe IO, Kolo MY, Egwu GO. Rumen impaction in sheep with indigestible foreign bodies in the semi-arid region of Nigeria. *Small Ruminant Res.* 2003; 49(2):141-146.
26. Jackson PG, Cockcroft PD. *Clinical Examination of Farm Animals. Part V: Goats.* Oxford, UK: Blackwell Science. 2002, 281-299.
27. Jana Debaris, Jana Mourami. XII Annual conference of IAAVR and Round Table Conference on Ruminology. 2006; 11:81-85.
28. Jones TC, Hunt RD, King NW. *Veterinary Pathology,* 6th ed., USA., 1996, 1060-1061.
29. Kumar V, Dhar P. Foreign body impaction in a captive Sambar. 2013; 6(1):49-50.
30. Martins AMCRPF, Leme MCM, Portugal MASC, Baldassi L, Margatho LFF. Presenca de Corpos Estranhos no Aparelho Digestorio do Bovinos. *Arquivos do Instituto Biologico* 2004; 71(1):83-87.
31. Meyer Y, Coles EH, Rich LJ. *Veterinary Laboratory Medicine. Interpretation and Diagnosis* W.B. Saunders Co., Philadelphia. 1992, 327-329
32. Misk NA, Semieka MA, Ali S, El- M. Varieties and sequellae of ingested foreign bodies in buffaloes and cattle. *Assiut Vet. Med. J.* 2001; 46(91):250-273.
33. Mohammad HA. M.V. Sc Thesis Sudan Veterinary Science and Technolgy, 2004.
34. Mozaffari AA, Olomi MM, Vosough D. Unusual and Severe Ruminant Impaction in a Goat-Kid: Clinical and Radiological Findings. 2009; 4:115-119.
35. Nejash S, Sibhat B, Sheferaw D. A postmortem study on indigestible foreign bodies in the rumen and reticulum of ruminants, eastern Ethiopia. *Onderstepoort Journal of Veterinary Research.* 2015; 82(1):01-05.
36. Pitroda AH, Tiwar DK, Dar M, Patil DB, Parikh PV. Ultrasonographic Diagnosis and Treatment of Rumen Impaction in a Goat. 2010; 11:251-252
37. Pugh DG. *Sheep and goat medicine.* 1st Ed. B. Saunders Company. London, 2002, 69-72.
38. Radostatis OM, Blail DC, Gug GC. *Veterinary Medicine* 8th ed Bailliv Tindall, London 1994, 270-278.
39. Radostits OM, Blood CC, Hinchclif KW, Constable PD. *Veterinary medicine a text book of disease of cattle, horse, sheep, pig and goat.* 10th ed England, London. Saunders Elsevier, 2007, 112-522.
40. Ramaswa MY, Sharma R. Plastic bags—threat to environment and cattle health: Aretrospective study from Gondar city of Ethiopia. 2011; 2:7-12.
41. Raooft A, Namjoo A, Karimi AH, Esfahani MA. A study of clinical signs, hematological changes and pathological findings of experimental ingestion of soft foreign body (plastic rope) in goats. 2011; 105:351-354.

42. Ravindra Reddy Y, Asha Latha P, Sandeep Reddy S. Review on metallic and non-metallic foreign bodies a Threat to livestock and environment. *Int. J. Food Agri. Vet. Sci.* 2014; 4(1):6-14.
43. Remi-Adewunmi BD, Gwang EO, Oswinowo AO. Abattoir survey of foreign body rumen impaction small ruminants. *Nigerian Veterinary Journal.* 2004; 25:32-38.
44. Roman Tiruneh, Hiwot Yesuwork. Occurrence of rumen foreign bodies in sheep and goats slaughtered at the Addis Ababa Municipality Abattoir Ethiop. *Vet. J.*, 2010; 14(1):91-100
45. Schipper IA. *Lecture outline of Preventive Veterinary Medicine 6th ed.*, Surgeet Publishing. 2000, 166-167.
46. Semieka MA. Radiography of unusual foreign body in ruminants. *Vet. World:* 2010; 13:473-475.
47. Singh AP, nigam JM. Radiography of the foreign bodies in the bovine. *Bovine Practice.* 1981; 2(6):7-13.
48. Spouge AR, Weisbrod GL, Herman SJ, Chamberlain DW. Wooden foreign body in the lung parenchyma. *Am. J Roentgenol* 1990; (154):999-1001.
49. Suthar DN, Jhala SK, Bhatt RH, Patel JB, Joy N. Surgical management of ruminal impaction due to non-penetrating foreign body syndrome in Kankrej cattle. 2011; 5(5):477-480.
50. Tiruneh R, Yesuwork H. Occurrence of rumen foreign bodies in sheep and goats slaughtered at the Addis Ababa Municipality Abattoir. *Ethiopian Veterinary Journal.* 2010; 14(1):91-100.
51. Vanitha V, Nambi AP, Gowri B, Kavitha S. Rumen impaction in cattle with indigestible foreign bodies in Chennai., 2010; 6:138-140.
52. Williams EI. *Vet. Rec.* 1956; 67:907-911.