



Original Research

Clinico-Pathological Studies on Traumatic Reticuloperitonitis in Cattle – A Review of 110 Cases*

K. Sasikala*, G. Vijayakumar, S. Sivaraman and G. A. Balasubramaniam¹

Department of Veterinary Clinical Medicine, Veterinary College and Research Institute,
Namakkal - 637 002, Tamil Nadu Veterinary and Animal Sciences University, Tamil Nadu,
INDIA

¹Department of Veterinary Pathology

*Part of the M.V.Sc thesis of the first author approved by TANUVAS, Chennai 600051

*Corresponding author: drvijaymvc@gmail.com

Rec. Date:	May 06, 2018 10:25
Accept Date:	Jul 22, 2018 17:56
DOI	10.5455/ijlr.20180506102514

Abstract

The objective of this study was to describe clinical, haemato-biochemical, radiographic, ultrasonographic and endoscopic changes in cows with traumatic reticuloperitonitis. Seventy two Jersey cross bred and thirty eight Holstein Friesian cross bred cows were diagnosed for traumatic reticuloperitonitis through ultrasonography were included in the study. On clinical examination animals had pyrexia, anorexia, arched back stance, atony of rumen and bloat. Leukocytosis with neutrophilia, significantly elevated aspartate aminotransferase and globulin values were noticed on haemato-biochemical examination. Radiography revealed presence of foreign body in the reticulum in 69.09 per cent of cases. Abnormal contour of reticulum surrounded by anechoic fluid with or without echogenic deposits were found on ultrasonographic examination. Reticuloscopy could not appreciate specific changes in reticulum. On histopathological examination reticulum showed focal hyperplasia with stray inflammatory cells. Ultrasonography was effective in diagnosing traumatic reticuloperitonitis in cows than other imaging techniques.

Key words: Cattle, Radiography, Ultrasonography, Traumatic Reticuloperitonitis

How to cite: Kaliappan, S., Govindarajan, V., Subramaniam, S., & Amirthalingam, B. (2018). Clinico-diagnostic Studies on Traumatic Reticuloperitonitis in Cattle - A Review of 110 cases. International Journal of Livestock Research, 8(12), 150-159. doi: 10.5455/ijlr.20180506102514

Introduction

Gastrointestinal foreign bodies are common surgical emergencies in veterinary medicine. Cattle as well as buffaloes are susceptible to foreign body syndrome because they do not discriminate against metallic objects in feed and do not completely masticate feed before swallowing (McCurin and Bassar, 2006). This condition is extremely common in developing countries possibly due to the unorganised small-scale





farming, nutritional deficiencies and improper management and feeding programs (Misk *et al.*, 1984). The present study was undertaken to study the clinical, haemato-biochemical, radiographic, ultrasonographic and endoscopic changes in cows with traumatic reticuloperitonitis.

Materials and Methods

Study Area and Study Period

The study was conducted in the Department of Veterinary Clinical Medicine, Veterinary College and Research Institute, Namakkal during 2015-16 period. Animals from Namakkal region and its surrounding areas were selected for the study.

Selection of Cases

Cows with the history of anorexia, marked drop in milk yield and pyrexia were screened for the study. Seventy two Jersey cross bred and thirty eight Holstein Friesian cross bred cows brought to Teaching Veterinary Clinical Complex (TVCC), Veterinary College and Research Institute, Namakkal diagnosed for traumatic reticuloperitonitis through ultrasonography were included in the study. Animals brought for routine checkup and deworming during this period served as a control group for clinical parameters, radiography, ultrasonography and endoscopic evaluation.

Clinical Examination

Clinical examination of the animal was undertaken as per standard methods (Rosenberger, 1979).

Haematology

Five milliliters of venous blood was collected in vacutainer tubes containing ethylene diamine tetra acetate (EDTA K₃) as anticoagulant for haematological investigation. The parameters including packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), white blood cell (WBC) and differential counts (DC) were done as per standard methods (Jain, 1986).

Serum Biochemistry

Five milliliters of venous blood was collected in vacutainer tubes without anticoagulant taking all precautions for avoiding haemolysis. Serum was separated and used for the estimation of aspartate aminotransferase by modified IFCC method (Bergmyer, 1986), total protein by modified Biuret method and albumin by Dumans method (Varley *et al.*, 1980) by using commercially available kits (Span diagnostics, Surat, Gujarat).



Rumen Fluid Analysis

All the animals under study were restrained in the chute and rumen fluid was collected by using rumen fluid extraction pump. The samples were analysed as described by Rosenberger (1979).

Radiography

All the animals under study were subjected to left lateral radiograph of caudoventral thorax and reticulum in standing posture as described by Krishnamurthy and Singh (2011) using Wipro GE 525 DX fixed X ray unit. The radiographic exposure of 90 – 110 kvp, 40 – 60 mAs and source image distance of 100 cm were employed. Cassette with 12x15 inch blue sensitive X ray film was used for radiography.

Ultrasonography

All the animals under study were subjected to ultrasonographic examination in standing position by using Esoate Mylab 40 Vet Ultrasound system and the reticulum was examined with 2.0 – 3.5 MHz transducer as described by Braun and Gotz (1994). In the present study instead of linear transducer, phased array transducer was used, as the change in transducer does not change the image accuracy.

Endoscopy

Reticuloscopy was performed using (Olympus™ GIF V70; Olympus Corporation, Japan) flexible video endoscopy with a diameter of 8 mm and a usable length of 150 centimeter that featured a channel for instruments (diameter 4 mm) and navigation system allowing the endoscope to be moved in two directions (upward 180° and downwards 100°). This procedure was done in all the animals by physical restraint in the chute without sedation. Endoscopic procedure of passing the endoscope up to oesophagus as described by Franz and Baumgartner (2002) and up to reticulum as described by Sasikala *et al.* (2017) was followed. The flexible video endoscope was passed through the ventral nasal meatus up to the pharynx. Upon reaching the pharynx triangular shaped epiglottis and symmetrically placed arytenoid cartilage of larynx could be visualized. The swallowing was triggered while touching the arytenoid cartilage with the tip of the endoscope so that it entered the oesophagus through the lateral laryngeal recess. The oesophageal mucosa lay closely against the endoscope, so that the mucosal folds were arranged like a star around the tip of the instrument. The closed cardia appeared as a slit. Upon insufflations of air and passage of the endoscope, the tip entered into the reticulo-rumen.

Endoscopic Biopsy

Biopsy forceps was passed through the working channel of the video endoscope and the tissue sample was collected. It was stored in 10 per cent formalin and subjected to the histopathological examination as described by Bancroft and Gamble (2008).

Statistical Analysis

The data obtained were statistically analyzed by Student's *t*-test as described by Snedecor and Cochran (1994).

Results and Discussion

Among these 110 cases all were female and between 4 - 7 years old and weighed 250 to 350 kg. Fifty eight of them had calved recently, twenty of them were pregnant and thirty two of them were non pregnant.

Clinical Signs

The clinical signs in cows with traumatic reticuloperitonitis are given in Table 1. Similar findings were reported by Constable *et al.* (2017), Francoz and Guard (2009), El-esawy *et al.* (2015) and Khalphallah *et al.* (2015).

Table 1: Clinical manifestations in cows with traumatic reticuloperitonitis (%)

S. No.	Clinical Signs	Number	Traumatic reticuloperitonitis (n=110)
1	Anorexia	102	92.72
2	Arched back	48	43.63
3	Bruxism	97	88.18
4	Marked drop in milk yield	106	96.36
5	Pyrexia	88	80
6	Recurrent tympany	37	33.63
7	Ruminalatony	73	66.36
8	Scanty faeces	92	83.63

Haemato-biochemistry: The results of the haemato-biochemistry are given in Table 2.

Table 2: Haemato-biochemistry in apparently healthy cows and cows with traumatic reticuloperitonitis

S. No.	Parameters	Apparently Healthy Cows (n=20)	Traumatic reticuloperitonitis (n=20)
		Mean ± SE	Mean ± SE
1	Haemoglobin (g/dl)	11.20 ± 0.09	11.35 ± 0.19
2	Packed cell volume (%)	34.35 ± 0.46	34.80 ± 0.70
3	Red Blood cell count (10 ⁶ /cumm)	6.47± 0.08	6.57 ± 0.06
4	White blood cell count (10 ³ /cumm)	6.58± 0.11	19.99 ± 0.84**
5	Neutrophils (10 ³ /cumm)	2.24± 0.05	15.81 ± 0.56**
6	Lymphocytes (10 ³ /cumm)	4.31 ± 0.07	4.13 ± 0.37
7	Monocytes (10 ³ /cumm)	0.13± 0.06	0.23 ± 0.16
8	Eosinophils (10 ³ /cumm)	0.07 ± 0.04	0.22 ± 0.15
9	Aspartate amino transferase (AST) (units/L)	100.45± 2.85	179.60 ± 2.68**
10	Total protein (g/dL)	6.28± 0.23	7.92 ± 0.21
11	Albumin (g/dL)	2.98 ± 0.05	2.70± 0.07
12	Globulin (g/dL)	3.30±0.22	5.22 ± 0.18**

** - Highly significant ($p \leq 0.01$)

Leukocytosis with neutrophilia, significantly elevated aspartate aminotransferase and globulin values were predominant findings. El-sebaie *et al.* (1999) reported leukocytosis with neutrophilia in animals suffering from traumatic reticuloperitonitis, which might be due to inflammatory condition (Khan *et al.*, 1997). Hyperglobulinemia in cattle had been observed in cattle suffering from traumatic reticuloperitonitis (Braun *et al.*, 1998; Hiroven and Pyorale, 1998; Fecteau, 2002). Leukocytosis with granulocytosis and increased activities of aspartate aminotransferase were in agreement with the previous studies. These elevations were often a reflection of cellular destruction and inflammatory response to foreign bodies.

Rumen Fluid Examination

Rumen fluid examination results are given in Table 3.

Table 3: Rumen fluid analysis in apparently healthy cows and cows with traumatic reticuloperitonitis

S. No.	Parameters		Apparently healthy cows (n=20)	Traumatic reticuloperitonitis (n=20)
1	Colour		Yellowish to brown	Yellowish to brown
2	Consistency		Slightly viscus	Watery
3	Odour		Aromatic	Aromatic
4	SAT (min)		4.33 ± 0.21	2.95 ± 0.54**
5	pH		6.48 ± 0.11	6.93± 0.29
6	MBRT (min)		2.50 ± 0.22	8.28± 0.38**
7	Titratable acidity (units)		17.50 ± 1.11	17.20 ± 0.13
8	Protozoa	Size	Medium and Small	Small
		Density	+++	+
9	Iodophilic activity		+++	+

** - Highly significant ($p \leq 0.01$)

Reduced sedimentation activity time, increased methylene blue reduction time and sluggish rumen protozoal motility was noticed in all the cases. Reddy *et al.* (2014) recorded viscous rumen fluid, pH 7.0 and 'single +' protozoal concentration with sluggish motility in cattle with traumatic reticuloperitonitis / pericarditis. Similar changes were noticed in the present study.

Radiography

Lateral survey radiograph of caudoventral thorax and reticular region in apparently healthy animal showed a clear, intact diaphragm separating the thoracic and abdominal cavity. Radiography in traumatic reticuloperitonitis cows revealed presence of foreign body in the reticulum in 69.09 per cent (76/110) of cases (Fig. 1).



Fig. 1: Lateral radiography in cows: Foreign body in the reticulum (Arrow)

Radiography was helpful in identifying the morphological changes in the region of cranial, ventral or caudal reticular wall, allowed identification of radio-opaque foreign bodies and gas / fluid interfaces typical of intra-abdominal abscess (Berrie *et al.*, 2015). However in the present study, radio-opaque foreign bodies could be appreciated radiographically only in 69.09 per cent (76/110) of animals with traumatic reticuloperitonitis. Khalphallah *et al.* (2015) reported that radiography failed to identify inflammatory changes that occurred on the reticular serosa or failed to show any abnormalities in the heart / reticulum. Radiography was the best method for visualizing the metallic foreign bodies in and outside the reticulum and the position of the foreign body was not a reliable indicator of the condition (Braun *et al.*, 1993). Visualization of foreign body within the reticulum in some of the cases in the present study was in concurrence with reports of Braun *et al.* (1993).

Ultrasonography

Apparently Healthy Animals

Reticulum could be visualized upon positioning the ultrasound transducer on ventral midline. Reticulum appeared as half-moon shaped structure with smooth contour. The layers of the ventral abdominal wall appeared as band-shaped structures of various echogenicities. The musculophrenic vein appeared as anechoic band while sternal part of the diaphragm and the peritoneum appeared as an echogenic band (Fig. 2). In the present study, the different layers of the reticulum usually could not be imaged and the honey-comb like structure of the mucosa was not seen clearly and these findings were similar to the reports of previous authors (Abouelnasr *et al.*, 2012). The reticular motility was characterized by 4 to 5 biphasic contractions during a four minute period and the content of the reticulum could not be visualized. These findings were in agreement with observations of earlier reported authors (Braun and Gotz, 1994).

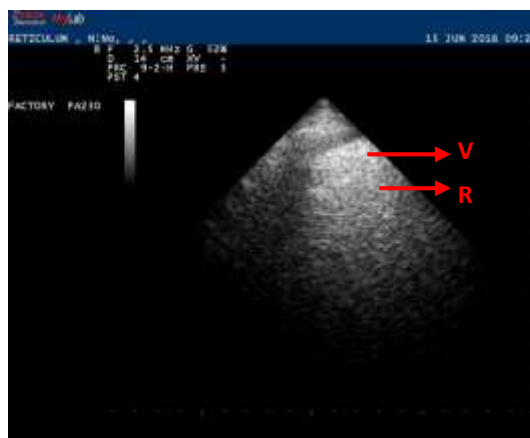


Fig. 2: Ultrasonogram of normal reticulum – Anechoic musculophrenic vein (V) and Hyperechoic reticulum (R)

Traumatic reticuloperitonitis Cows

In this study, ultrasonography revealed the presence of anechoic fluid with echogenic fibrin strands and adhesions to the reticulum / rumen or abdominal organs (Fig. 3) in 73.63 % of cases and anechoic fluid with echogenic fibrin strands and without adhesions to the surrounding organs in 26.37 % of cases (Fig. 4).



Fig. 3: Ultrasonogram (R – Reticulum, Ru – Rumen and H – Hyperechoic adhesions in the reticulum)



Fig. 4: Ultrasonogram: Anechoic fluid with echogenic fibrin strands in the peritoneum

Numerous echogenic fibrin strands interspersed with anechoic exudates between reticulum, rumen or other organs were the main ultrasonographic features in peritonitis (Abdelaal *et al.*, 2009). The ultrasonographic features in the present study were in concurrence with the reports of Abdelaal *et al.* (2009). Absence of reticular motility was noticed in 80.90 % of cows and reduced reticular motility was noticed in 19.10 % cows. Reticular wall was thick and corrugated in all the cases on ultrasonography. Similar findings were reported by El-Sheikh *et al.* (2012) and Baydar *et al.* (2016). Reduced or absent biphasic reticular

contractions and deposition of inflammatory materials on its serosal surface were the classical ultrasonographic findings in traumatic reticuloperitonitis (Mohamed and Oikawa, 2007)

Endoscopy and Biopsy

Both in the healthy and traumatic reticuloperitonitis cows, reticulum was dark coloured (light brown to pinkish) with honeycomb shape. Reticuloscopy could not appreciate specific changes in reticulum. But on histopathological examination reticulum showed focal hyperplasia with stray inflammatory cells (Fig. 5) were in concurrence with Maxie (2016).

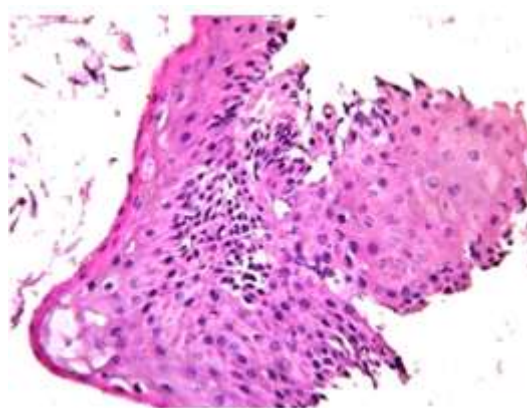


Fig. 5: Histopathology: Focal and stray inflammatory cells in the reticulum (H&E stain; 40x)

Conclusion

Ultrasonography was effective in diagnosing traumatic reticuloperitonitis in cows. It was complementary to clinical, radiographic and endoscopic techniques.

Acknowledgement

The authors are very thankful to the Dean, Veterinary College and Research Institute, Namakkal for the facilities provided during the study.

Conflict of Interest

None of the authors have any conflict of interest to declare.

References

1. Abdelaal A M, Floeck M, Maghawry M and Baumgartner W. 2009. Clinical and ultrasonographic differences between cattle and buffaloes with various sequelae of traumatic reticuloperitonitis. *Journal of Veterinary Medicine*, 54, 399-406.
2. Abouelnasr, K. S., E. Mosbah, G. I. Karrouf and A. E. Zaghloul, 2012. Comparative ultrasonographic findings of traumatic reticulitis, perireticular abscess and diaphragmatic hernia in buffalo (*Bubalus Bubalis*). *Journal of American Science*, 8, 590-595.

3. Bancroft J D and Gamble M. 2008. Theory and practice of histological techniques. 6th edn., Churchill Livingstone, London. pp. 75-82.
4. Baydar E, Kulualp K, Eroksuz Y, Karapinar T and Eroksuz H. 2016. Traumatic reticuloperitonitis in a flock of sheep. *Journal of Applied Animal Research*, 44, 311-314.
5. Bergymer H U. 1986. Approved recommendation of IFCC method for measurement of catalytic concentration of enzymes. Part 2. IFCC methods for aspartate amino transferase. *Journal of Clinical Chemistry and Clinical Biochemistry*, 24, 497-510.
6. Berrie K, Tadesse E, Mossie B and Anteneh B. 2015. Study on rumen and reticulum foreign body in slaughtered cattle at Gondar Elfora abattoir. *World Journal of Biology and Medical Sciences*, 2, 133-150.
7. Braun U and Gotz M. 1994. Ultrasonography of the reticulum in cows. *American Journal of Veterinary Research*, 55, 325-332.
8. Braun U, Fluckiger M and Nageli F. 1993. Radiography as an aid in the diagnosis of traumatic reticuloperitonitis in cattle. *Veterinary Record*, 132, 103-109.
9. Braun U, Iselin U, Lischer C and Fluri E. 1998. Ultrasonographic findings in five cows before and after treatment of reticular abscesses. *Veterinary Record*, 142, 184-189.
10. Constable P D, Hinchcliff K W, Done A H and Grunberg W. 2017. *Veterinary Medicine. A textbook of the diseases of cattle, horses, sheep, pigs and goats*. 11th edn., W.B. Saunders Elsevier, Philadelphia. pp. 482-490.
11. El-esawy E E, Badawy A M and Ismail S F. 2015. Ultrasonographic diagnosis and clinical evaluation of the foreign body complications in the compound stomach of cattle and buffaloes. *Journal of Advanced Veterinary Research*, 5, 109-120.
12. El-sebaie A, Misk N, Semieka A, Semieka M and Hofmann W. 1999. Vagus-indigestion (functional gastric stenosis, Hoflund syndrome) in the water buffalo. *Praktische Tierarzt*. 80: 336-344.
13. El-Sheikh A E, Selim, H and Ahmed, A.E. 2012. Studies on chronic diarrhea associated with acute traumatic reticuloperitonitis in cows and buffaloes. *New York Science Journal*, 5, 11-14.
14. Fecteau G, 2002. Peritonitis. In: *Large Animal Internal Medicine*. 4th edn., B. P. Smith., Mosby-Elsevier, St. Louis, Philadelphia. pp. 748-53.
15. Francoz D and Guard C L. 2009. Diseases of the alimentary tract. In: *Large animal internal medicine*. 4th edn., B. P. Smith, Mosby-Elsevier, St. Louis, Philadelphia. pp. 849-850.
16. Franz S and Baumgartner W. 2002. A retrospective study of oesophageal endoscopy in cattle and oesophagoscopy for diagnosis of mucosal disease. *The Veterinary Journal*, 163, 205-210.
17. Hiroven J and Pyorale S. 1998. Acute phase protein in dairy cows with surgically treated abdominal disorders. *The Veterinary Journal*, 155, 53-61.
18. Jain N S. 1986. Haematological techniques. In: *Schalm's Veterinary Haematology*. 4th edn., Lea and Febiger, Philadelphia. pp. 20-86.
19. Khalphallah A A, El-Sebaie A H and Raghieb M F. 2015. Approach for diagnosis of complicated traumatic reticuloperitonitis in cattle using ultrasonography. *Journal of Advanced Veterinary Research*, 5, 157-164.
20. Khan Z, Muhammed G, Umar A and Khan S A. 1997. Preliminary composition of plasma fibrinogen concentration, leukocyte number and ESR as non-specific indicator of inflammatory condition in buffalo (*Bubalus bubalis*). *Veterinary Research Communication*, 21, 265-271.
21. Krishnamurthy D and Singh A P. 2011. Contrast techniques. In: Singh, J (ed): *Veterinary radiology. Basic principles and radiographic positioning*. CBC publishers, New Delhi. pp. 184-189.
22. Maxie M G. 2016. *Jubb, Kennedy and Palmer's: Pathology of domestic animals*. 6th edn., Elsevier, St. Louis, Missouri. pp. 35-43.
23. McCurin D M and Bassler J M. 2006. *Clinical Text Book for Veterinary Technicians*. 6th ed., Elsevier, Saunders, pp: 224-244.
24. Misk N A, Nigam J M and Rafat J F. 1984. Management of foreign body syndrome in Iraqi cattle. *Agricultural Science and Practice*, 5, 19-21.



25. Mohamed T and Oikawa S. 2007. Ultrasonographic characteristics of abdominal and thoracic abscesses in cattle and buffaloes. *Journal of Veterinary Medicine*, 54, 512–517.
26. Reddy B S, Reddy L S, Sivajothi S and Reddy B S. 2014. Traumatic reticuloperitonitis in cattle: A clinical study. *International Journal of Scientific World*, 2, 13-15.
27. Rosenberger, G. 1979. Clinical examination of cattle. 2nd edn., Verlag Paul Parey, Berlin and Hamburg, Germany. pp. 184-212.
28. Sasikala K, Vijayakumar G and Balasubramaniam G A. 2017. Endoscopic Evaluation of Reticulum in Cattle - A Preliminary Study. *Indian Veterinary Journal*, 94 (05), 79 – 80.
29. Scott P. 2013. Chronic peritonitis in adult cattle. *Livestock*, 18: 102-108.
30. Snedecor G W and Cochran W G. 1994. Statistical methods. 8th edn., Iowa State University Press, Ames, Iowa.
31. Varley H, Grawlock A H and Bell M. 1980. Practical Clinical Biochemistry. Vol. I. 5th edn., William Heinmann Medical Books Ltd., London, pp. 186.

