VETERINARSKI ARHIV 85 (1), 1-9, 2015

Clinical and sonographical findings in buffaloes (*Bubalus bubalis*) with traumatic reticuloperitonitis

Ahmed Abdelaal[1], and Martina Floeck[2]*

[1]*Department of Animal Medicine, Faculty of Veterinary Medicine, Zagazig University, Egypt*

[2]*Clinic for Ruminants, Department for Farm Animals and Veterinary Public Health, University of Veterinary Medicine, Vienna, Austria*

ABDELAAL, A., M. FLOECK: Clinical and sonographical findings in buffaloes (*Bubalus bubalis*) with traumatic reticuloperitonitis. Vet. arhiv 85, 1-9, 2015.

ABSTRACT

Eighteen buffaloes with traumatic reticuloperitonitis were examined by means of sonography during a 2 year period. Ten healthy buffaloes served as a control group for clinical parameters and ultrasonographic assessment of the reticulum. The reticulum was examined with a 3.5 MHz convex transducer. The patients, as opposed to the control group, showed an increased rectal temperature, inappetence, reduced or absent ruminal motility, recurrent tympany, and positive metal detector and pain tests. Twelve buffaloes had single and 6 had multiple foreign bodies. Their sonographic appearance was hyperechogenic with comet tail artifacts (n = 13) or with acoustic shadows (n = 5). Acoustic shadows were only observed in foreign bodies located near the abdominal wall. They perforated the abdominal wall in 5 buffaloes presented with localised swellings and fistulas in the cranioventral abdomen. The foreign bodies were detected from the left side in 10 and from the right side in 8 cases. Perforation of soft tissues by foreign bodies was accompanied with inflammation in 14 and abscess formation in 4 cases.

Key words: clinical findings, ultrasonography, foreign bodies, buffaloes, localized swelling, abdominal fistula

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 metal materials in feed and do not completely masticate feed before swallowing (McCURIN et al., 2006). This condition is extremely common in developing countries possibly due to the unorganised small-scale farming, nutritional

*Corresponding author:

Martina Floeck, University of Veterinary Medicine, Department for Farm Animals and Veterinary Public Health, Clinic for Ruminants, Veterinaerplatz 1, A-1210 Vienna, Austria, Phone: +43 1 25077 5213; Fax: +43 1 25077 5209; E-mail: Martina.Floeck@vetmeduni.ac.at

ISSN 0372-5480
Printed in Croatia

deficiencies and improper management and feeding programs (MISK et al., 1984). Ingestion of foreign bodies in adult dairy cattle can result in a wide variety of infections and syndromes that may impair reticuloruminal motility (RADOSTITS et al., 2007). Traumatic reticuloperitonitis is caused by penetration of a metallic foreign body through the reticular wall, causing acute perireticular inflammation, adhesions and abscesses (ABDELAAL et al., 2009; FLOECK and BAUMGARTNER, 2001). Perireticular adhesions may involve the vagus nerve, resulting in impairment of reticular motility (REHAGE et al., 1995; BRAUN et al., 2009). Ultrasonography has been proposed as a noninvasive and helpful method for the assessment of contour and motility of the reticulum in healthy cows (BRAUN and GOETZ, 1994) and also for the diagnosis of traumatic reticuloperitonitis in bovines (BRAUN et al., 1993; BRAUN et al., 1994; FLOECK and BAUMGARTNER, 2001; ATHAR et al., 2010). Moreover, it has been proven that ultrasonography is the best ante-mortem tool for determination of the expansion of lesions resulting from perforating foreign bodies (FLOECK and BAUMGARTNER, 2001; ABDELAAL et al., 2009). In contrast, ultrasonography rarely identifies metallic objects by itself (BRAUN, 2003).

The purpose of the present study was to describe the clinical findings and the ultrasonographic character and location of perforating reticular metallic foreign bodies in buffaloes.

Materials and methods

Animal's history and selection. Eighteen female buffaloes, which were referred to the Veterinary Teaching Hospital, Zagazig University, Egypt between January 2009 and December 2010 with suspicion of traumatic reticuloperitonitis, were included in this study. Ten of them had recently calved, 5 were pregnant and 3 were not pregnant. Ten healthy female buffaloes from the teaching herd of the Zagazig University served as a control group for clinical parameters and ultrasonographic assessment of the reticulum. Five were pregnant and 5 were not pregnant. The animals studied were between 3 and 7 years old and weighed 450 to 600 kg.

Clinical examination. A thorough clinical examination was performed in all buffaloes according to the methods described by ROSENBERGER (1990). Pain tests were applied by wither pinch technique, side stick method and turning in acute angle. Positive pain tests were indicated by grunting sound audible by placing a stethoscope on the trachea while the tests were being applied.

Metal detector. A metal detector (Hauptner-Herberholz, Germany) was used as a diagnostic tool for the presence of metallic foreign bodies.

Ultrasonographic examination. The reticulum and surrounding structures were examined using a 3.5 MHz convex transducer (Pie-Medical 240, Parus ultrasound machine, Maastricht, Netherlands). Ultrasonography was performed on non-sedated,

standing animals in the cranioventral abdomen caudal to the xiphoid cartilage, and the right and the left paramedian regions up to the level of the elbows, between the 3rd and 7th intercostal spaces, as described by BRAUN and GOETZ (1994). The examined area was prepared by clipping the hair and application of coupling gel. The amplitude and frequency of reticular motility were assessed for 4 minutes. The character, location and site of foreign bodies were determined. The nature of the tissues surrounding the foreign bodies was assessed.

Confirmatory tests. Confirmatory rumenotomy was performed in 16 cases and percutaneous removal of foreign bodies was applied in two cases.

Statistical analysis. Frequency distributions and means (sd) of the measurements were calculated using SPSS for Windows version 10.0.1.

Results

Clinical findings. The clinical findings in buffaloes with perforating foreign bodies are shown in Tables 1 and 2. Localised swellings in the cranioventral abdomen were noticed in 3 cases (Fig. 1) and fistulas in the same region in 2 cases (Fig. 2)

Ultrasonographic findings. The results of the sonographic examinations of the reticulum of both diseased and control buffaloes are presented in Table 3. Biphasic contractions of the reticulum were detected in all buffaloes in the control group and also in 12 patients.

Fig. 1. Female buffalo with a localized swelling in the left cranioventral abdomen

Fig. 2. Female buffalo with a fistula in the right cranioventral abdomen. Note the perforating foreign body, visible in the center of the swelling.

The metallic perforating foreign bodies appeared as hyperechogenic structures. They produced reverberation or comet tail artifacts (Figs. 3 and 4) in 13 (72.22 %) and acoustic shadows (Figs. 5 and 6) in 5 cases (27.77 %) which were near the abdominal surface. The foreign body was detected in the right cranioventral abdomen in 8 (44.44 %) and in the left cranioventral abdomen in 10 cases (55.55 %). The foreign body penetrated the reticular wall and surrounding tissues in 13 (72.22 %) (Figs. 3, 4 and 7) and the abdominal wall in 5 cases (27.77 %) (Figs. 5 and 6). Out of 13 buffaloes the foreign body was found between reticulum and the peritoneum in 8 (Fig. 3), between the reticulum and the spleen in 2 (Fig. 7) and between the reticulum and the abomasum in 3 cases (Fig. 4). Twelve animals (66.66 %) had single (Figs. 3 and 7) and 6 (33.33 %) multiple foreign bodies (Fig. 4).

Inflammatory reactions surrounded the foreign body in 14 (77.77 %) while abscesses surrounded the foreign body in 4 cases (22.22 %). Inflammatory reactions appeared as anechoic to hypoechogenic fluid, interspersed with echogenic debris or threads representing inflammatory cells or fibrin (Figs. 3, 6 and 7). Abscesses appeared as circumscribed structures with echogenic wall and hypoechogenic content (Figs. 4 and 5).

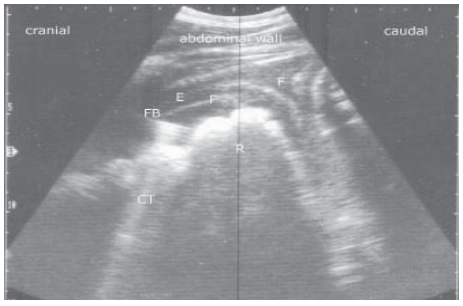

Fig. 3. Longitudinal sonogram of a foreign body perforating the cranioventral reticular wall of a buffalo. Note the hyperechoic appearance and the comet tail artifacts originating from the foreign body. The reticular wall appears corrugated and is surrounded by hypoechoic fluid interspersed with fibrinous strands. FB = foreign body, CT = comet tail artifact, F = fibrin, E = exudates, R = reticulum.

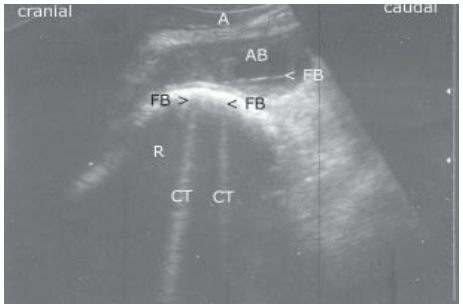

Fig. 4. Longitudinal sonogram of 3 foreign bodies perforating the ventral reticular wall. Two of them are imaged in cross section and one in longitudinal section. One of the foreign bodies is seen inside a hypoechoic circumscribed abscess between reticulum and abomasum. A = abdominal wall, FB = foreign body, CT = comet tail artifact, Ab = abscess.

Table 1. Clinical findings in 18 buffaloes with perforating foreign bodies

	Number	Percent
Reduced appetite	18	100.00
Positive metal detector	18	100.00
Positive pain tests	18	100.00
Recurrent tympany	15	83.33
Defecation		
Normal defecation	3	16.66
Scanty hard feces	8	44.44
Scanty soft feces	6	33.33
Diarrhea	1	5.55
Rectal temperature		
Normal (38.46 ± 0.29 °C)	3	16.66
Elevated	15	83.33
Ruminal motility		
Normal (3.1 ± 0.56/2minutes)	3	16.66
Reduced	8	44.44
Absent	7	38.88
Pain reactions*	8	44.44
Signs of toxaemia**	5	27.77
Localized swelling	3	16.66
Fistula through abdominal wall	2	11.11

* Pain reactions included stiffness in gait, abducted elbows and arched back. **Signs of toxaemia included depression, dullness, congested mucous membranes, increased heart rate (68.4 ± 9.02/minute), and respiratory rate (24.8 ± 6.28/minute) and decrease in capillary refill time (less than 2 seconds).

Table 2. Different vital parameters in control and diseased buffaloes

Vital parameters	Control 10 cases	Buffaloe with FB (18 cases)		
		Value	Number of animals	Indication
Temperature °C	38.46 ± 0.29	38.5 ± 0.1	3	Normal
		39.6 ± 0.31	15	Elevated
Heart rate/min	68.4 ± 9.02	67.53 ± 7.9	13	Normal
		95.5 ± 9.8	5	Elevated
Respiratory rate/min	24.8 ± 6.28	26.69 ± 2.9	13	Normal
		50.4 ± 10.1	5	Elevated
Ruminal motility/2 min	3.1 ± 0.56	3.3 ± 0.57	3	Normal
		1.7 ± 0.5	8	Reduced
		0	7	Absent

Table 3. Ultrasonographic evaluation of the reticulum in 18 buffaloes with perforating foreign bodies in comparison with the control group

Ultrasonographic findings		Buffaloes with perforating foreign bodies		Control group n = 10
		Number	Percent	
Frequency of reticular contractions/4 minutes	Reduced*	11	61.11	3.6 ± 0.55
	Increased**	1	5.55	
	Absent	6	33.33	
Amplitude of reticular contractions/cm	Reduced***	12	66.66	First: 7.21 ± 0.39
	Absent	6	33.33	Second: 14.63 ± 0.32
Contour of reticulum	Undulating	10	55.55	Smooth, echogenic and half moon shape
	Corrugated	8	44.44	

* Reticular contractions were 1.8 ± 0.75/4 minutes; ** Reticular contractions were 7/4 minutes; *** Amplitude of reticular contractions/cm was 4.08 ± 1.28 (1st contraction) and 9.5 ± 1.5 (2nd contraction)

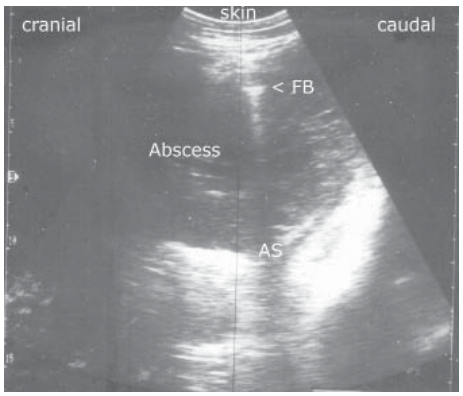

Fig. 5. Longitudinal sonogram of the swelling in Fig. 1. It appears as a circumscribed structure containing hypoechoic fluid representing an abscess. The foreign body is hyperechoic and produces an acoustic shadow. Percutaneous exploration confirmed the diagnosis. FB = foreign body, AS = acoustic shadow.

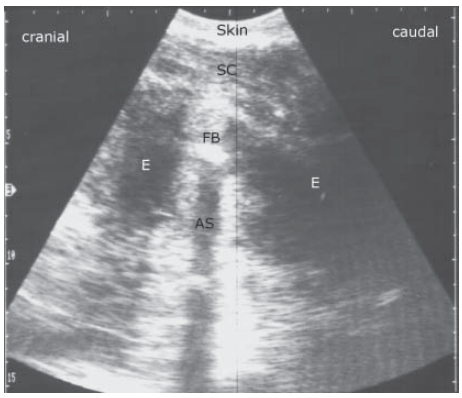

Fig. 6. Longitudinal sonogram of the fistula in Fig. 2. The hyperechoic foreign body is surrounded by hypoechoic exudates. Percutaneous exploration confirmed the diagnosis. SC = subcutaneous tissues, FB = foreign body, AS = acoustic shadow, E = exudates.

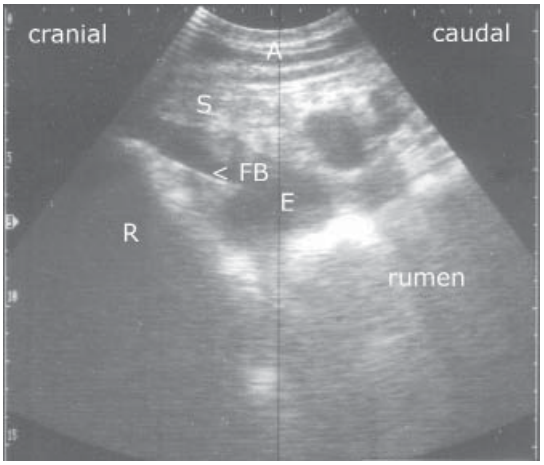

Fig. 7. Longitudinal sonogram of a foreign body perforating the caudoventral reticular wall. The linear foreign body is surrounded by hypoechoic fluid. A = abdominal wall, FB = foreign body, E = exudates, S = spleen, R = reticulum.

Discussion

Clinical findings. All buffaloes with perforating foreign bodies showed reduced appetite and positive pain tests. The majority of animals had recurrent tympany, elevated body temperature, reduced or absent reticular motility and scanty feces. These signs were almost similar to those of acute local peritonitis in buffaloes described by SALEH et al. (2008) and ABDELAAL et al. (2009). Pain reactions and signs of toxaemia were uncommon in buffaloes. This may be due to the natural tolerance of such animals to pain (MISK et al., 1984).

Ultrasonographic findings. The ultrasonographic examinations of the healthy buffaloes in the control group revealed biphasic contractions, as reported in cattle by BRAUN and GOETZ (1994) and in buffaloes by ATHAR et al. (2010). The abnormal frequency and amplitude of reticular contractions could be seen in buffaloes with perforating foreign bodies, as described by ABDELAAL et al. (2009). A perforating foreign body results in peritonitis and adhesions between the reticulum and the surrounding tissues (peritoneum, spleen and abomasum) with subsequent reduction of reticular motility (BRAUN et al., 1993; BRAUN et al., 1994; FLOECK and BAUMGARTNER, 2001). One buffalo had increased reticular contractions. BRAUN et al. (2009) found reticular hypermotility in cows with vagal indigestion secondary to traumatic injury by perforating foreign bodies. The changes to the contours of the reticulum, either undulating or corrugated, depend on

the severity of the inflammatory changes (BRAUN et al., 1993). Inflammatory fibrin and abscesses have been detected as a result of inflammation and secondary infection after foreign body perforation of soft tissues (ABDELAAL et al., 2009).

The metallic foreign bodies appeared as hyperechogenic structures and produced reverberation or comet tail artifacts, as described in humans by HILL et al. (1997) and HORTON et al. (2001). BLOND and BUCZINSKI (2009) stated that comet tail artifacts originate from small reflective surfaces as gas bubbles or metallic objects. In the present study comet tail artifacts were seen in animals with foreign bodies far away from the abdominal surface and acoustic shadows in patients with superficial foreign bodies.

Conclusion

A thorough ultrasonographic examination of the reticulum is not only useful for detection of a traumatic reticuloperitonitis, but also can detect the foreign body itself. Therefore, it permits decision-making regarding treatment options.

Acknowledgements

The authors would like to thank the Department of Surgery, Faculty of Veterinary Medicine, Zagazig University, Egypt for their surgical advice.

References

ABDELAAL, A. M., M. FLOECK, S. EL MAGHAWRY, W. BAUMGARTNER (2009): Clinical and ultrasonographic differences between cattle and buffaloes with various sequelae of traumatic reticuloperitonitis. Vet. Medicina 54, 399-406.

ATHAR, H., J. MOHINDROO, K. SINGH, A. KUMAR, C. S. RANDHAWA (2010): Clinical, haematobiochemical, radiographic and ultrasonographic features of traumatic reticuloperitonitis in bovines. Indian J. Anim. Sci. 80, 608-612.

BLOND, L., S. BUCZINSKI (2009): Basis of ultrasound imaging and the main artifacts in bovine medicine. Vet. Clin. Food Anim. 25, 553-565.

BRAUN, U. (2003): Ultrasonography in gastrointestinal disease in cattle. Vet. J. 166, 112-124.

BRAUN, U., M. GOETZ (1994): Ultrasonography of the reticulum in cows. Am. J. Vet. Res. 55, 325-332.

BRAUN, U., M. GOETZ, O. MARMIER (1993): Ultrasonographic findings in cows with traumatic reticuloperitonitis. Vet. Rec. 133, 416-422.

BRAUN, U., M. FLÜCKIGER, M. GOETZ (1994): Comparison of ultrasonographic and radiographic findings in cows with traumatic reticuloperitonitis. Vet. Rec. 135, 470-478.

BRAUN, U., S. RAUCH, M. HAESSIG (2009): Ultrasonographic evaluation of reticular motility in 144 cattle with vagal indigestion. Vet. Rec. 164, 11-13.

FLOECK, M., W. BAUMGARTNER (2001): Ultrasonographic diagnosis of traumatic reticuloperitonitis and pericarditis in cattle. Wien. tierärztl. Monatsch. 12, 347-354.

HILL, R., R. CONRON, P. GREISSINGER, M. HELLER (1997): Ultrasound for the detection of foreign bodies in human tissue. Ann. Emerg. Med. 29, 353-356.

HORTON, L. K., J. A. JACOBSON, A. POWELL, D. P. FESSELL, C. W. HAYES (2001): Sonography and Radiography of Soft-Tissue Foreign Bodies. Am. J. Roentgenol. 176, 1155-1159.

MISK, N. A., J. M. NIGAM, J. F. RAFAT (1984): Management of foreign body syndrome in Iraqi cattle. Agr. Pract. 5, 19-21.

McCURIN, D. M., J. M. BASSER (2006): Clinical Text Book for Veterinary Technicians. 6th ed. Elsever Saunders, pp. 224-244.

RADOSTITS, O. M., C. C. GAY, K. W. HINCHCLIFF, P. D. CONSTABLE (2007): Diseases of the alimentary tract. In: Veterinary Medicine. A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs and Goats. Diseases of the alimentary tract. 10th ed., Saunders Elsevier, Philadelphia, USA, pp. 189-382.

REHAGE, J., M. KASKE, N. STOCKHOFE-ZURWIEDEN, E. YALCIN (1995): Evaluation of the pathogenesis of vagus indigestion in cows with traumatic reticuloperitonitis. J. Am. Vet. Med. Assoc. 15, 1605-1611.

ROSENBERGER, G. (1990): Die Klinische Untersuchung des Rindes. 3rd ed. Paul Parey, Berlin, München.

SALEH, M. A., H. Z. RATEB, N. A. MISK (2008): Comparison of blood serum proteins in water buffaloes with traumatic reticuloperitonitis and sequelae. Res. Vet. Sci. 85, 208-213.

Received: 19 November 2013
Accepted: 28 March 2014

ABDELAAL, A., M. FLOECK: Klinički i ultrazvučni nalaz kod traumatske upale kapure i potrbušnice u azijskih vodenih bivola (*Bubalus bubalis*). Vet. arhiv 85, 1-9, 2015.

SAŽETAK

Osamnaest bivola s traumatskom upalom kapure i potrbušnice pretraženo je ultrazvukom u razdoblju od dvije godine. Deset zdravih bivola poslužilo je kao kontrolna skupina za kliničke pokazatelje i ultrazvučnu procjenu stanja kapure. Kapura je bila pretražena konveksnim pretvornikom od 3,5 MHz. Za razliku od kontrolne skupine, životinje s traumatskom upalom pokazivale su povišenu rektalnu temperaturu, gubitak apetita, smanjeni ili izostali motilitet buraga, povratnu nadutost te pozitivni nalaz pretragom na bolnost i prisutnost metala. U dvanaest bivola ustanovljeno je jedno strano tijelo, a u njih šest više stranih tijela. Ustanovljena je hiperehogenost s artefaktima nalik repu kometa (n = 13) ili s akustičnim sjenama (n = 5). Akustične sjene bile su uočene samo kod stranih tijela smještenih uz trbušnu stijenku. Ona su probila trbušnu stijenku u pet bivola kod kojih je ustanovljena lokalizirana oteklina i fistula na kranioventralnom dijelu trbuha. Strana tijela bila su dokazana na lijevoj strani u 10, a na desnoj strani u osam bivola. Perforacija mekih tkiva stranim tijelima bila je popraćena upalom u 14 i nastankom apscesa u četiri životinje.

Ključne riječi: strana tijela, bivoli, klinički nalaz, ultrazvuk, lokalna oteklina, abdominalna fistula