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Research Article

Diagnostic Significance of Ultrasonography in Complicated Traumatic Reticuloperitonitis in Egyptian Buffaloes (*Bubalus bubalis*)

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Abstract

Background: The complicated problems of traumatic reticuloperitonitis in Egyptian buffaloes could be efficiently diagnosed by using of ultrasonography and some other diagnostic methods. The affections in these cases included reticulum and spleen with extension to one or more of the following organs; heart, rumen, omasum, abomasums, liver, gall bladder or intestine. **Materials and Methods:** This study included two groups of animals, one of them kept as a control one (n = 20) and the other was a diseased (n = 30) group in Assiut Governorate, Egypt. All animals were subjected to clinical examination, whole blood profiling, blood serum biochemical assay, radiography and ultrasonographic examination. **Results:** The most common findings detected by ultrasonography could be summarized through a complete cessation of the reticular contractions, displacement of the reticulum from the diaphragm with a distance from 3 to ≥ 6 cm, the reticulum lost both of its even contour and its half-moon shaped structures and involvement of spleen. Reticular abscess and peritoneal effusions were imaged in all these diseased cases. Omasal impaction was diagnosed in buffaloes by the aids of ultrasounds with the other tools as a consequence of engulfing foreign metal and non-metal objects. **Conclusion:** Ultrasonography and radiography could concomitantly diagnose traumatic reticuloperitonitis and its complications.

Key words: Buffalo, omasal impaction, pericarditis, reticuloperitonitis, ultrasonography

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The problem of ingestion of sharp or blunt foreign bodies still the major problem facing the bovine producers all over Egypt and constitute the major part in economic losses by the farmer and reflected on national economy^{1,2}. Some progress has been made in the recent years in understanding clinical reasoning and clinical interference, special attention has been focused to principles of diagnostic thinking process and diagnostic methods. The ultrasonound applications in cattle included diagnosis of cardiac³, abdominal^{2,4-8} and musculoskeletal examinations⁹.

Radiography is an efficient technique for identifying metal foreign bodies, whereas, ultrasonography rarely identifies metallic objects including magnets. Radiography is best suited for the detection of metallic foreign bodies in and outside the reticulum and the position of the foreign body is the most reliable indicator for diagnosing traumatic reticuloperitonitis by radiography. On the other side, ultrasonography can visualize fibrinous inflammatory changes and reticular abscesses, which cannot be diagnosed by radiography^{10,11}.

Bovine medicine including diagnosis and therapy is considered the most important field in veterinary medicine in Egypt, because cattle constitute the major sector in animal population if compared with other animal species. Cattle and buffaloes submitted to veterinary medical teaching hospital represent about 90% from total cases of our patients².

Accordingly, the study focused on the applications of ultrasounds with the aids of other diagnostic tools, such as clinical findings, laboratory analysis and radiography for diagnosis of complicated cases of traumatic reticuloperitonitis and pericarditis (TRP-TP) in buffaloes. The present study provided full detailed description of the ultrasonographic findings associated with complicated.

MATERIALS AND METHODS

Animals: The present study was carried out on 40 buffaloes were classified into two groups, one of them (n = 20) kept as a control group, while the other (n = 30) kept as complicated traumatic reticuloperitonitis (TRP) diseased buffaloes. The control group was selected from healthy non-pregnant female buffaloes belonged to the herd of veterinary teaching hospital, which kept for teaching purpose and from the neighboring villages around Assiut city. The diseased buffaloes were submitted to veterinary teaching hospital, Faculty of Veterinary Medicine, Assiut University. All buffaloes were

treated in accordance with guidelines established by Faculty of Veterinary Medicine, Assiut University Committee on Animal Care.

Samples: Whole blood samples were collected on EDTA and stored at 4°C until analysis and blood serum samples were collected on plain vacutainer tubes and stored at -20°C until analysis¹².

Clinical examination: Clinical examination of the animals using clinical chart according to Rosenberger¹³ was done.

Complete Blood Count (CBC) assessment: A fully automated blood cell counter machine, Medonic CA620 Vet hematology analyzer-Sweden was used to determine various hematological parameters. Differential Leukocytic Count (DLC) was determined using four field meander method¹.

Biochemical assays: Spectrophotometric method using Phillips Pye Unicam spectrophotometer (U.V. Visible Mod. 800) was adopted to determine serum levels of AST (U L⁻¹)¹⁴, GGT (U L⁻¹)¹⁵, AP (U L⁻¹)¹⁶, total protein (g L⁻¹)¹⁷, albumin (g L⁻¹)¹⁸, globulin by subtraction of albumin from total protein, albumin/globulin ratio, cholesterol (mmol L⁻¹)¹⁹ and triglycerides (mmol L⁻¹)²⁰ by using commercial kits. All kits and reagents were obtained from spectrum reagents (Egyptian company for Biotechnology, Egypt).

Radiographical examination: The cranial abdominal region and caudal thorax were examined radiographically according to Braun *et al.*⁴ using fixed ceiling x-ray apparatus (40-60 kV and 45-55 mA sec⁻¹). The following criteria were recorded upon radiographical examination: Nature and location of foreign body (reticular, diaphragmatic, pericardial position), status of diaphragm (intact versus broken) and visualization of the cardiac area (good versus bad line of demarcation).

Ultrasonographical examination: Diseased and healthy buffaloes were examined ultrasonographically according to Braun²¹, Braun and Gotz²² and Braun *et al.*²³ by using a 3.5 MHz sector transducer of apparatus (FF Sonic, Model UF-4000, Tokyo, Japan) to detect either the normal organs in the control animals or the affected one in diseased buffaloes. The examined organs included heart, reticulum, rumen, abomasum, omasum, spleen, liver, gall bladder and intestine.

Statistical analysis: Data were analyzed using statistical software program. All data were presented as Mean \pm Standard Deviation (SD). Significance was declared at $p < 0.05$. Means and standard deviation shown in the figures were calculated from the original data. *Post hoc* Dunnett t-tests treat one group as a control and compare the diseased group against it²⁴.

RESULTS

History and clinical findings: The complicated TRP buffaloes showed severe reduction in feed intake associated with stunting growth and loss of body weight. They had tucked up

appearance, abduction of the forelimbs and tensed abdomen. They sometimes associated with recurrent tympany and showed bilateral symmetrical distension of the flank regions. Gait varied between reluctant to move, staggering gait or recumbency. Mucous membranes including conjunctiva were severely congested with tears and episcleral capillaries were severely engorged. Brisket oedema and true jugular pulsation may have been detected or not. Mine detector may have been positive or negative. Body temperature, heart rate and respiration in complicated TRP cases were variable. Ruminal stasis was observed. Abnormal heart sounds (Machinery murmurs or muffling sound) were heard in some cases with tachycardia or bradycardia (Fig. 1).

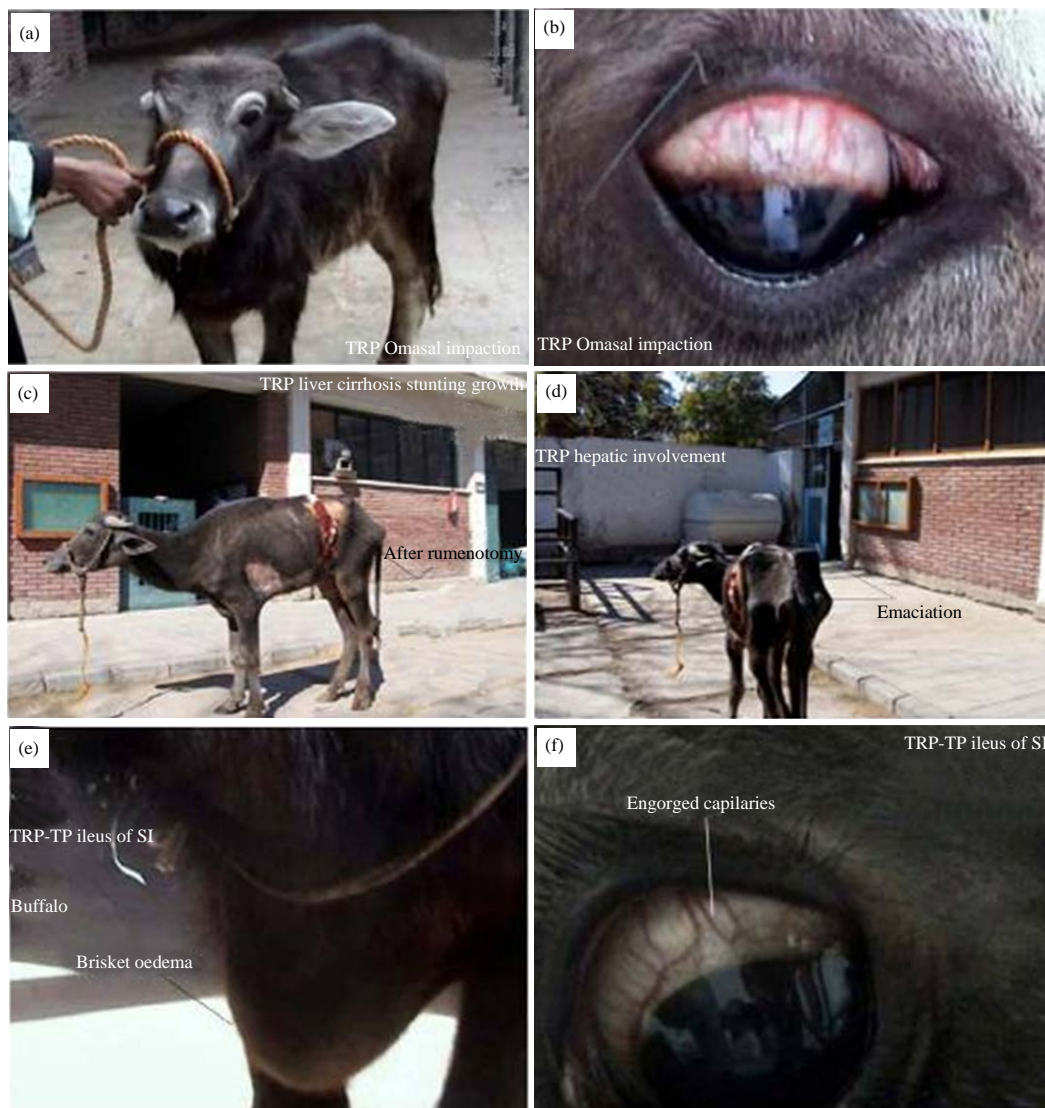


Fig. 1(a-f): (a-b) TRP and omasal impaction in buffalo with congested conjunctiva and engorged eye capillaries, (c-d) TRP and hepatic involvement in buffalo with emaciation and stunting growth and (e-f) TRP-TP and intestinal ileus in buffalo showed brisket oedema and severely engorged eye capillaries and TRP-TP: Traumatic reticulo-peritonitis and pericarditis

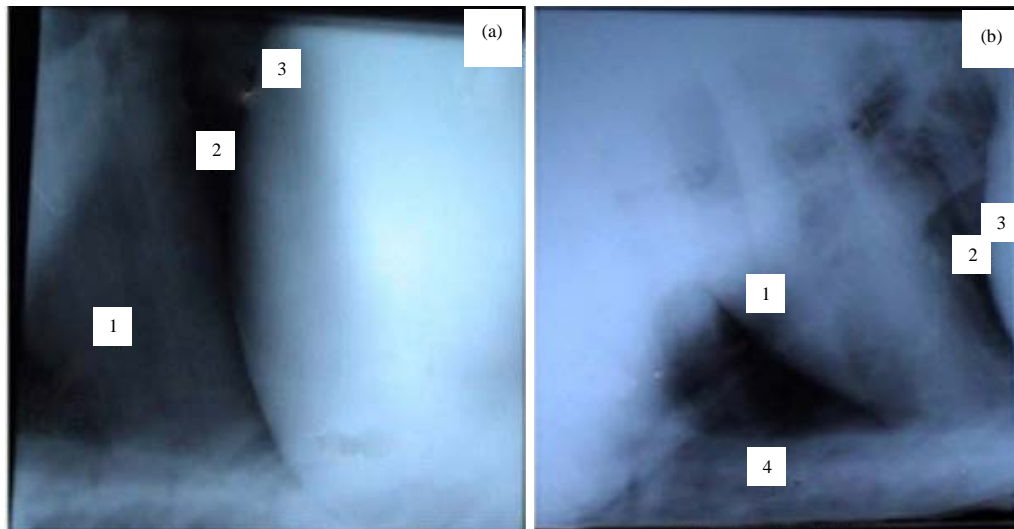


Fig. 2(a-b): Lateral radiographic view of (a) Cranial abdomen and (b) Thorax of a 3 years non-pregnant female buffaloes showed normal radiographic appearance of reticulum, heart and diaphragm, 1: Heart, 2: Diaphragm, 3: Reticulum and 4: Sternum

Table 1: Mean Values \pm Standard Deviation of blood picture and serum biochemical indices in control and diseased buffaloes

	Control (n = 20)	Complicated TRP cases (n = 30)
RBCs (T L^{-1}) ($\times 10^6$)	7.54 \pm 2.98	6.28 \pm 1.79
PCV (%)	38.00 \pm 3.24	32.60 \pm 2.62
Hb (g L^{-1})	118.00 \pm 4.5	120.70 \pm 12.6
T. WBCs (G L^{-1}) ($\times 10^3$)	6.71 \pm 1.63	19.69 \pm 2.96*
Neutrophils (%)	26.40 \pm 9.13	25.00 \pm 3.63
Lymphocytes (%)	60.80 \pm 7.73	52.34 \pm 5.26
Monocytes (%)	7.80 \pm 4.63	20.66 \pm 4.9*
Eosinophiles (%)	3.60 \pm 2.07	0.29 \pm 0.1
Band cells (%)	1.40 \pm 0.52	1.71 \pm 1.2
Total proteins (g L^{-1})	94.70 \pm 10.7	95.90 \pm 6.2
Albumin (g L^{-1})	55.00 \pm 8.4	30.20 \pm 4.2*
Globulin (g L^{-1})	45.70 \pm 4.6	65.70 \pm 9.9*
A/G ratio	1.38 \pm 0.59	0.46 \pm 0.10
GGT (U L^{-1})	14.95 \pm 5.23	20.10 \pm 2.42
AP (U L^{-1})	36.11 \pm 8.40	63.56 \pm 6.25*
AST (U L^{-1})	32.92 \pm 4.77	97.42 \pm 11.81*
Cholesterol (mmol L^{-1})	10.68 \pm 1.10	9.61 \pm 1.04
Triglycerides (mmol L^{-1})	3.62 \pm 0.2	3.48 \pm 0.33

*Significant ($p < 0.05$), TRP: Traumatic reticuloperitonitis, RBCs: Total red blood corpuscles, PCV: Packed cell volume, Hb: Haemoglobin concentration, T. WBCs: Total white blood cells count, A/G ratio: Albumin/globulin ratio, AST: Aspartate aminotransferase, AP: Alkaline phosphatase and GGT: Gamma-glutamyl transferase

Blood picture and serum biochemical analysis:

Complicated TRP buffaloes showed (Table 1) leucocytosis ($19.69 \pm 2.96 \text{ G L}^{-1}$) with increased monocytes ($20.66 \pm 4.9\%$). Serum biochemical analysis of these animals showed a significant increase ($p < 0.05$) in serum levels of AST ($97.42 \pm 11.81 \text{ U L}^{-1}$) and AP ($63.56 \pm 6.25 \text{ U L}^{-1}$). They also showed a significant decrease ($p < 0.05$) in serum albumin ($30.2 \pm 4.2 \text{ g L}^{-1}$) and a significant increase in serum globulin ($65.7 \pm 9.9 \text{ g L}^{-1}$).

Radiographic findings: Radiographic finding of reticulum in control buffaloes showed that the reticulum was free from any metal objects. The diaphragm was imaged as a clear black well-identified line between two radio-opaque structures, reticulum and heart. The heart appeared as radio-opaque with clear margins, normal size and a characteristic shape (Fig. 2).

Radiography was helpful in the diagnosis of TRP-TP cases in this diseased group. This study described two major cases; the 1st case in which radiography showed normal heart and diaphragm with obstruction of the ruminoreticular orifice with ropes, nails and wires. It was later diagnosed as omasal impaction based on ultrasonography and rumenotomy. The heart and diaphragm were normally appeared (Fig. 3). The 2nd case was a characteristic case, in which radiography showed deformity in the heart shape as it was circular in shape with an increase in its thickness. Adhesions were imaged between the diaphragm and both of reticulum and heart. The diaphragm was not well-defined (Fig. 4).

After rumenotomy: Rumenotomy confirmed the diagnosis of omasal impaction as one of the complicated TRP cases after radiography and ultrasonography was made. It was reported removal of plastic bags from the rumen and removal of nails and group of small wires from reticulum. Ruminal atony was observed with obstruction of the rumino-reticular orifice.

Ultrasonographic findings: Ultrasonography was a very important diagnostic tool in diagnosis of complicated TRP affections in buffaloes. These cases were mainly confirmed by

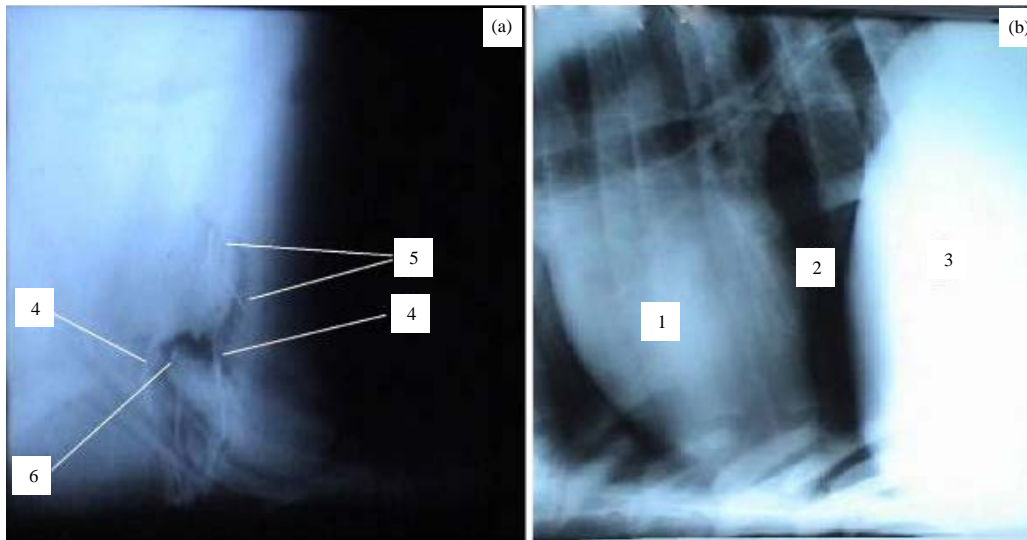


Fig.3(a-b): Lateral radiographic view of (a) Cranial abdomen and (b) Thorax of 4 years pregnant buffalo with complicated TRP case (TRP and omasal impaction) showed ropes occluding the rumino-reticular orifice and contained nails (n = 3) and wire (n = 1) in numbers. Heart was normal radio-opaque, of normal size and of clear margins, Diaphragm was easily identified, TRP: Traumatic reticulo-peritonitis, 1: Heart, 2: Diaphragm, 3: Reticulum, 4: Ropes, 5: Nails and wire and 6: Ruminoreticular orifice

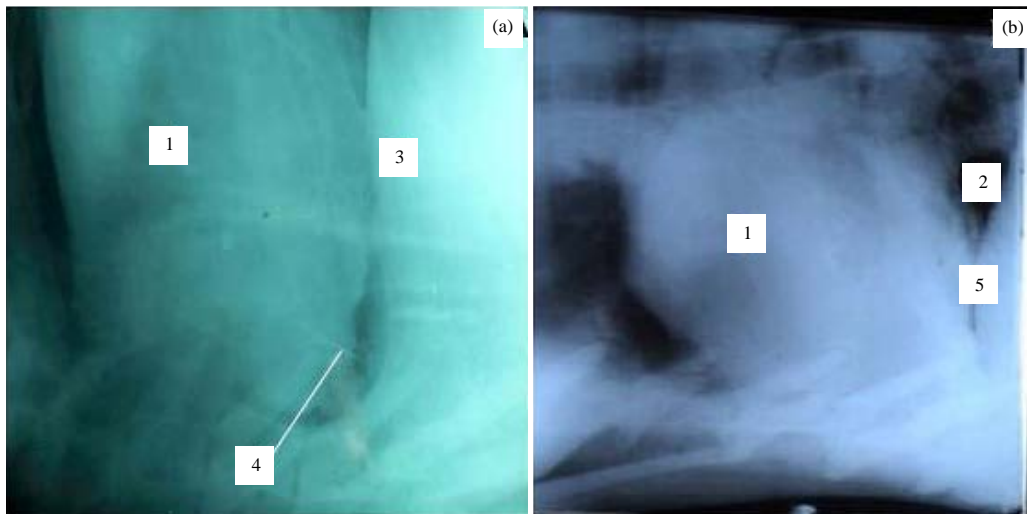


Fig.4(a-b): Lateral radiographic view of (a) Cranial abdomen and (b) Thorax of 5 years pregnant buffalo with complicated traumatic TRP. It showed perforated needle in the reticulum with deformity in the heart shape as it appeared as circular shape with increasing in its thickness. Adhesions were imaged between the diaphragm and both of reticulum and heart, TRP: Traumatic reticulo-peritonitis, 1: Heart, 2: Diaphragm, 3: Reticulum, 4: Perforated needle and 5: Adhesions between heart and diaphragm

radiography and sometimes rumenotomy. Rumenotomy sometimes was not carried out due to severely affected heart and regression of the systemic status of the animal. The affections included reticulum and spleen with extension of the affections to one or more of the following organs, such as heart, omasum, liver, gall bladder or intestine.

Reticulum was usually displaced from diaphragm for a distance from 3 to ≥ 6 cm. Reticular contractions in the complicated traumatic buffaloes were usually completely reduced to 0/3 min. All complicated cases were characterized ultrasonographically by deformity in the reticular wall, loss of both of its contour and its half-moon shaped structure.

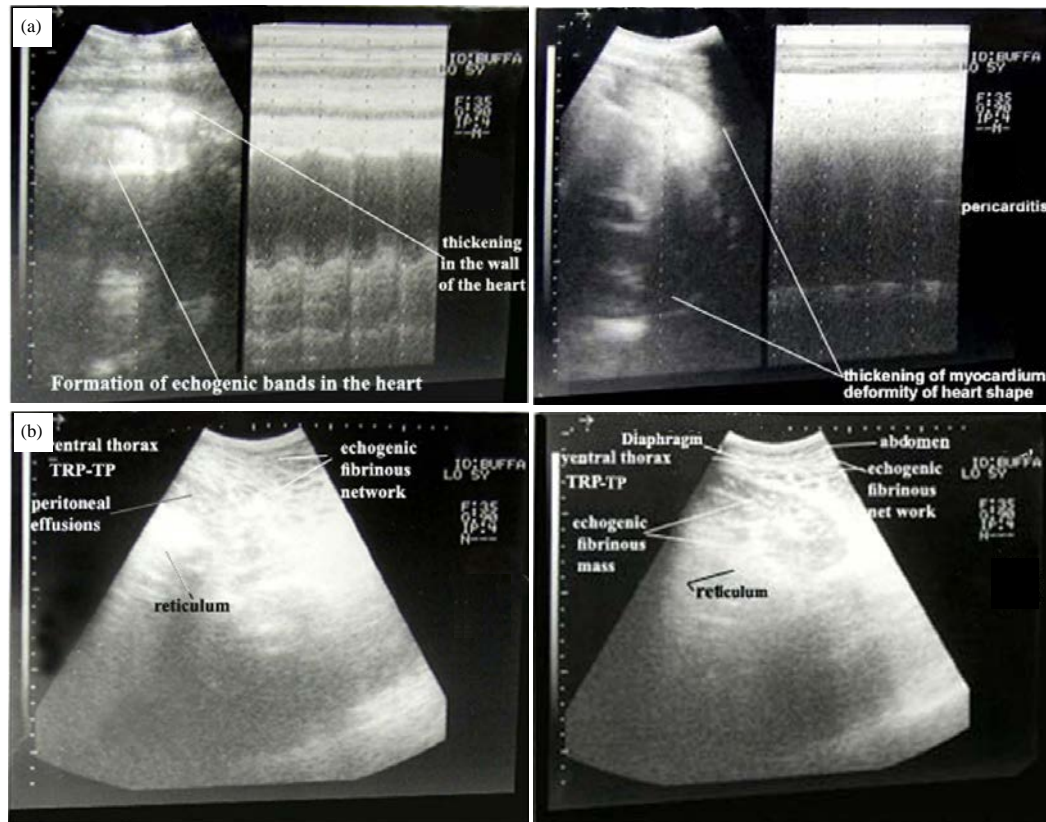


Fig. 5(a-b): (a) Ultrasonogram in a buffalo with TRP-TP showed deformity in the heart shape with thickening in the wall of the heart and (b) When it was imaged from the left ventral thorax it also showed echogenic fibrinous net work included with aggregation of echogenic fibrinous deposits interspersed with hypoechoic fluids caudoventral to the reticulum, TRP-TP: Traumatic reticulo-peritonitis and pericarditis

Reticular abscesses and peritoneal effusions were clearly imaged in all these cases. Peritoneal effusions appeared as accumulation of echogenic fibrinous deposits surrounded by hypoechoic fluids without echogenic margins ventrally to the reticulum and dorsally to the ventral abdominal wall (Extended from reticular serosa to abdominal wall). Reticular abscess was imaged as well-distinct echogenic capsules with hypoechoic or anechoic contents and commonly situated caudoventral to the diaphragm.

Some TRP-TP cases in this group were either with reduced (Bradycardia) or accelerated (Tachycardia) cardiac contractility on m-mode grey scale ultrasonography. Some other complicated cases had normal heart and regular contractility but they had an extension of the affections to the other organs such as omasum, liver or intestine.

The study reported a very characteristic form of severe TRP-TP in complicated cases with hepatic and splenic involvement, where radiography showed circular shaped heart and free reticulum. In this condition, ultrasonography

showed enlargement of the heart, deformity in its characteristic shape, thickening in its wall, deposition of echogenic fibrinous aggregations and hypoechoic fluids in the ventricles, atria and valves and formation of fibrinous band within the heart tissue (Fig. 5a). An echogenic fibrinous network with aggregation of echogenic fibrinous deposits interspersed with hypoechoic fluids was imaged caudoventral to the reticulum and/or the craniodorsal blind sac of the rumen. An echogenic fibrinous mass was visualized between the reticulum and the diaphragm (Fig. 5b), so that the reticulum was displaced from the diaphragm for a distance about 7 cm.

Ultrasonography with the aid of the other diagnostic tools particularly radiography could diagnose some of complicated TRP cases that included traumatic reticulo-peritonitis and pericarditis (TRP-TP) with splenic and intestinal involvement (Fig. 6). It was also very helpful in diagnosis of complicated TRP cases that included TRP (Fig. 7a) with involvement of spleen and liver (Hepatic abscess), meanwhile heart was

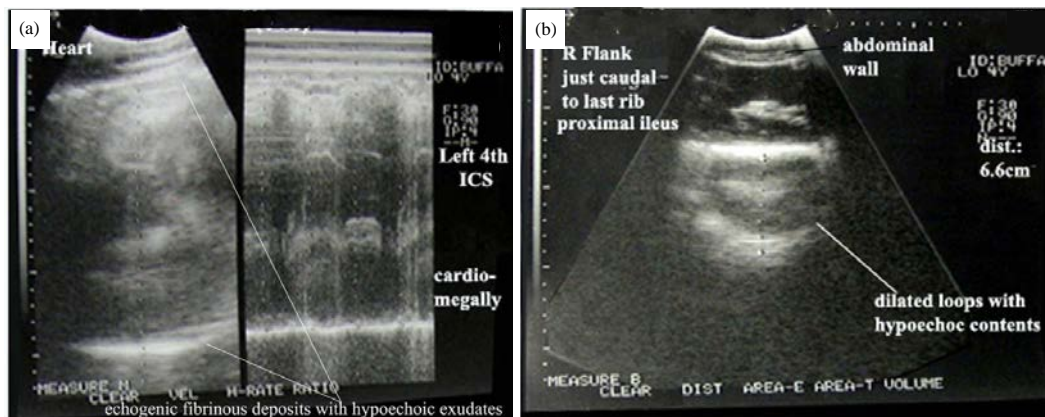


Fig.6(a-b): Ultrasonogram in buffalo with pericarditis and proximal ileus of small intestine. It showed irregular contractions of the heart with thickening in the wall of myocardium and increase in the heart size, (a) Accumulation of echogenic fibrinous deposits with hypoechoic fluids (pus) around the myocardium were also imaged, (b) It also showed C.S. in small intestine with visualization of dilated loops with hypoechoic contents (fluids) and two echogenic walls with reduction of the peristaltic movement of the small intestine

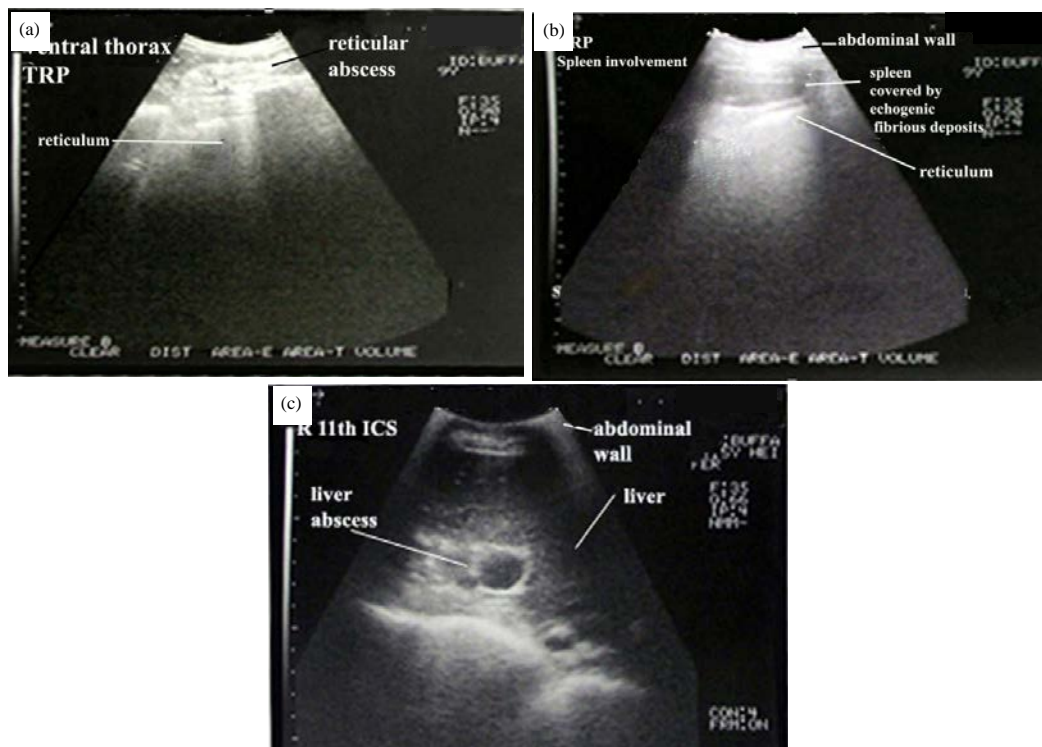


Fig. 7(a-c): Ultrasonogram in a buffalo with TRP, spleen involvement, reticular abscess and liver abscess, (a) It showed aggregation of echogenic fibrinous deposits interspersed with hypoechoic fluids caudoventral to the reticulum and (b) Spleen was surrounded by fibrinous echogenic deposits and (c) Liver abscess was imaged as an echogenic capsule with hypoechoic contents, TRP: Traumatic reticulo-peritonitis

not affected (Fig. 7b). The liver abscess was imaged as an echogenic capsule with hypoechoic contents. The involved

spleen was completely covered with fibrinous echogenic deposits and surrounded with hypoechoic fluids associated

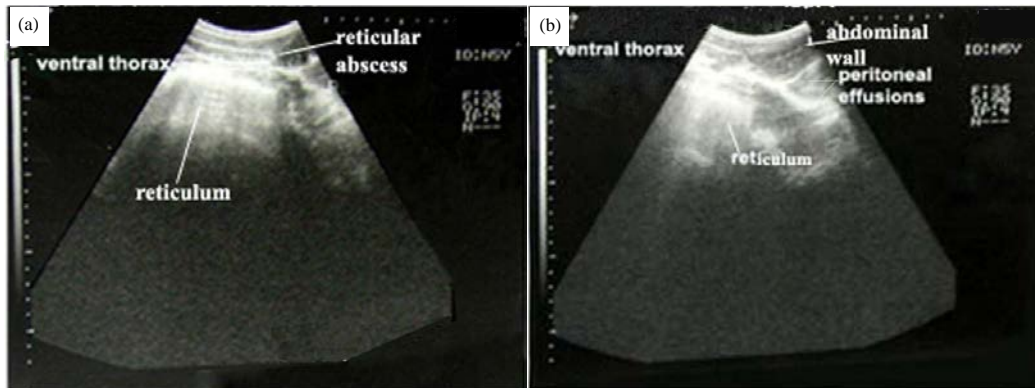


Fig.8(a-b): Ultrasonogram in a buffalo with TRP and omasal impaction was imaged from the left ventral thorax showed, (a) Peritoneal effusions and (b) Reticular abscess, TRP: Traumatic reticulo-peritonitis

Table 2: Common ultrasonographic findings associated with complicated traumatic reticuloperitonitis in buffaloes

Parameters	Ultrasonographic findings
Half-moon shaped of reticulum	Lost
Even contour of reticulum	Lost
Reticular contraction	0/3 min
Reticulum-diaphragm distance	Usually from 3 to ≥ 6 cm It was not highly displaced in some cases such as omasal impaction
Reticular abscess	Clearly imaged
Peritoneal effusions	Clearly imaged
Heart	Commonly affected
Spleen	Involved
Rumen, omasum, abomasums, liver, intestine and Kidney	Involved (One of them or more may be a affected)

with echogenic fibrinous deposits led to adhesions between spleen and abdominal wall and between spleen and reticulum and/or craniodorsal blind sac of the rumen (Fig. 7c).

One of the most interesting cases that were reported in this study was omasal impaction. Its diagnosis was based mainly on ultrasonography, radiography and rumenotomy. This condition included TRP, severely impacted omasum. It occurred as a sequellae to TRP, where the rumen contained plastic bags with presence of nails and wires in the reticulum. The animal had clinical history of severely reduced feed intake 2 months ago with normal gait without signs of pain or tympany. The authors speculate that the clinical findings included abdomen without any distension and healthy heart. These findings were not specific for omasal impaction. Ultrasonography with other diagnostic aids reached an accurate final diagnosis of the omasal impaction. Radiography showed normal heart and well-defined diaphragm with obstruction of the ruminoreticular orifice with ropes, nails and wires (Fig. 3). Rumenotomy showed floating nails and wires in the reticulum, presence of small parts of rubber bags and plastic bags in the rumen, obstruction of the rumeno-reticular orifice and reticulo-omasal orifice. The ultrasonographic examination of this case was carried out two times, one was before and the other was after radiography and rumenotomy.

Ultrasonographic findings showed TRP, reticular abscess, peritoneal effusions and omasal impaction. Ultrasonogram was imaged for the omasum from the cranial part of right median region, from the ventral midline caudal to the xiphoid process and about 5 cm to the right from the ventral midline. The ultrasonographic findings were similar either before or after rumenotomy due to failure to evacuate the severely hard impacted omasum during rumenotomy that indicated bad prognosis.

The omasal impaction was described ultrasonographically as complete reduction of the reticular contraction to 0/3 min, peritoneal effusions were imaged as echogenic fibrinous bands between reticulum and ventral abdominal wall and diaphragm with visualization of reticular abscess that imaged as echogenic capsule and hypoechoic contents (Fig. 8). The impacted omasum was visualized caudoventral to the reticulum as thick circular structure with distinct thick echogenic wall. The omasal contents were moderately echogenic. The diameter of the impacted omasum was about 5-6 cm (Fig. 9). Normally, the omasal contents were not imaged. The impacted omasal mass relatively prevented the abomasums visualization. The most common characteristic findings that were visualized by ultrasonography in cases of complicated TRP cases were summarized in Table 2.

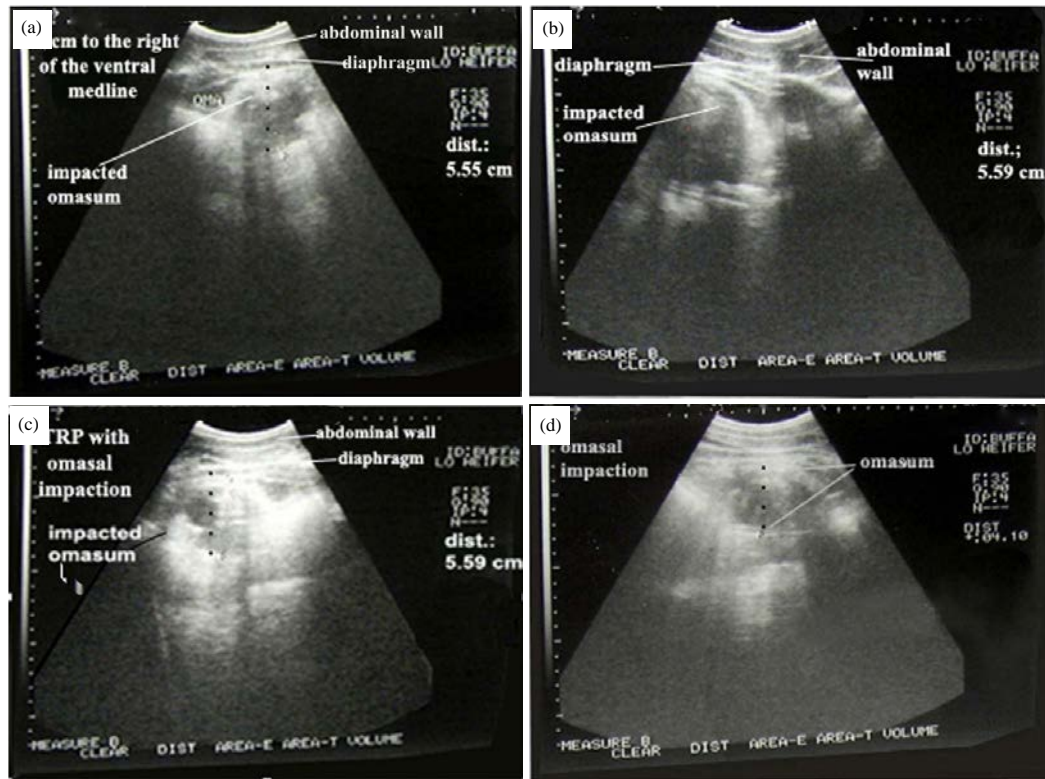


Fig. 9(a-d): Ultrasonogram in a buffalo with TRP (a-b) Omasal impaction was imaged from the cranial part of right median region and (c-d) From the ventral midline caudal to the xiphoid process and about 5 cm to the right from the ventral midline showed the omasum with its thick circular echogenic distinct echogenic line, there is a thickness in its wall. Visualization of its contents that were moderately echogenic. The diameter of the impacted omasum was about 5-6 cm and TRP: Traumatic reticulo-peritonitis

DISCUSSION

Bovine medicine is considered the most important field in veterinary medicine in Egypt, because cattle represented the major sector in animal population if compared with other animal species. Cattle and buffaloes submitted to our Veterinary Teaching Hospital in Assiut University constituted about 90% from total cases of our patients².

History and clinical findings of the complicated cases matched with Radostits *et al.*²⁵, Smith and Slenning²⁶ and Hawkins²⁷. Braun *et al.*⁶ stated that the typical signs included an arched back, a tucked up or tense abdomen, a rectal temperature over 39°C, abnormal ruminal findings such as reduced or absent ruminal motility or ruminal tympany, positive response of pain tests, faeces containing indigested material and a shorter than normal glutaraldehyde test.

The present study showed that the blood picture indices in case of complicated TRP cases showed monocytic leucocytosis. Smith and Slenning²⁶, Hawkins²⁷ and

Latimer *et al.*²⁸ stated that in the whole blood picture, leucocytosis with left shift was suggestive of localized TRP. Neutrophilia in the absence of leucocytosis was indicative of diffuse TRP. The whole blood picture in cattle with TRP can vary depending on whether the peritonitis is acute or chronic and localized or diffuse.

The serum biochemical analysis of the diseased cases showed a significant increase ($p < 0.05$) in serum levels of AST and AP. They also showed a significant decrease ($p < 0.05$) in serum albumin, a significant increase ($p < 0.05$) in serum globulin, normal total proteins and reduction of A/G ratio. Some literatures demonstrated that in TRP, there was a highly significant increase in blood globulin and fibrinogen levels and decreases in albumin and plasma protein: fibrinogen ratio (PP:F)⁶. The changes in haematological values and biochemical parameters, such as elevation of blood fibrinogen, AST and AP were indicative of inflammatory changes in the body and not restricted only to TRP-TP, but also they can supply important indicators for the inflammatory changes²⁹.

Radiographic examination in buffaloes with complicated TRP cases was efficient for identifying metal foreign objects e.g., nails and needles. It could give indications about the nature of the traumatic cause and the changes affected the shape and opacity of heart. Unlike ultrasonography, radiography failed to either identify inflammatory changes that occurred on the reticular serosa, reticular abscesses or the non metal objects like rags and bags or assess reticular motility. At the same time ultrasonography failed to visualize the foreign objects inside or outside the reticulum. Similar results were reported in previous studies in cow^{4,5,22}.

Ultrasonography is considered a useful diagnostic tool with cooperation with radiography in monitoring the diseased condition in buffaloes with complicated TRP cases, in which whether the affection included the heart or not. In case of TRP-TP, characteristic images of both radiography and ultrasonography were reported. Radiography showed circular shaped heart with adhesions between diaphragm and both of heart and reticulum. Ultrasonography showed clear thickening in the pericardium and fibrinous bands in the myocardium with severe reduction of myocardial contractility, meanwhile the reticulum had network of fibrin aggregations. Omasal impaction was reported as complicated TRP without pericarditis and showed characteristically radiographic and ultrasonographic findings.

The reticulum in complicated TRP cases was usually displaced from diaphragm for a distance from 3 to ≥ 6 cm with complete reduction of the reticular contractions to 0/3 min. They also had a deformity in the reticular wall, loss of its contour and loss of its half-moon shaped structure. The reticular abscess and peritoneal effusions were visualized in all these cases. These results were supported by Braun *et al.*⁵, Braun and Gotz²², Braun *et al.*¹⁹ and Senna *et al.*³⁰.

The present study reported that spleen was involved in all of the diseased cases. Ultrasonographically, the involved spleen was completely covered with fibrinous echogenic deposits and surrounded with hypoechoic fluids associated with echogenic fibrinous. The other reports mentioned that spleen, particularly its distal portion is often affected in cattle with traumatic reticuloperitonitis. Fibrinous changes are frequently seen as echogenic deposits of varying thickness, often surrounded by fluid, between the spleen and reticulum or rumen. The spleen may be covered with fibrinous deposits⁵.

Some of complicated cases that included TRP with intestinal involvement were diagnosed in this study by using ultrasonography and the other diagnostic tools particularly radiography. It showed proximal ileus of the small intestine.

This observation agreed with what was mentioned about the site of ileus in cows³¹ about site of ileus in cows. Braun *et al.*³¹ reported that in cattle with ileus, the small intestine is dilated in at least one area and has a diameter of more than 3.5 cm. Moreover, the motility of the small intestine is usually reduced or absent. When only one or a few, usually markedly dilated, loops of small intestine are seen, ileus of the duodenum is most likely. More than five loops of small intestine are seen in one area usually indicate ileus of the jejunum or ileum. The number of dilated loops of small intestine increases if the localization of the ileus is more distal. The loops become more dilated with ileus of the proximal small intestine.

Some complicated TRP cases included hepatic involvement in which hepatic abscess was clearly visualized as well as that was mentioned in cows³². The ultrasonographic appearance of the hepatic abscess was highly variable, as the abscess varied from anechoic to hyperechoic, from homogenous to heterogenous and were with or without capsule³².

This present study succeeded in diagnosis of omasal impaction through a full circle of diagnostic techniques that started from the clinical findings, ultrasonography, radiography, rumenotomy and then re-examination by ultrasonography till reach the final diagnosis of omasal impaction. It caused obstruction of rumino-reticular orifice and reticulo-omasal orifice and thereby anterior functional stenosis with hypomotility (Anterior form of vagus indigestion) resulted and was successfully diagnosed in this study. The ultrasonographic description of this condition in Egyptian buffaloes was firstly reported in this study. This condition included TRP with peritoneal effusions led to ruminal atony and usually associated with bradycardia. The impacted omasum was visualized caudoventral to the reticulum as thick circular structure with distinct thick echogenic wall. The omasal contents were image as moderately echogenic. The impacted omasal mass relatively prevented the visualization of the abomasums. The omasal contents were not usually imaged and this agreed with Braun *et al.*⁵.

CONCLUSION

Ultrasonography and radiography could concomitantly diagnose traumatic reticuloperitonitis and its complications. The present study established certain ultrasonographic findings that were characteristic for complicated cases of TRP in buffaloes. Omasal impaction was successfully diagnosed by using ultrasonography and radiography.

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