Research Article **ISSN: 2394 – 7403**

International Journal of Medicine and Health Profession Research

Journal home page: www.ijmhpr.com

https://doi.org/10.36673/IJMHPR.2020.v07.i02.A22

CLINICAL, HEMATOLOGICAL, BIOCHEMICAL AND SURGICAL FINDINGS IN CATTLE WITH TRAUMATIC RETICULOPERITONITIS

A. Akraiem*[1], Zaid. Abubaker[1], M. A. Khaled [1], A. Abd Al-Galil[2]

[1*]Department of Clinical Veterinary Science, Faculty of Veterinary Medicine, Omar Al-Mukhtar University, Libya.

[2]Department of Animal Medicine, Faculty of Veterinary Medicine, Banha University, Egypt.

ABSTRACT

The aim of the present study was to determine and characterize the clinical, hematological, biochemical parameters and outcome in cows suffering from Traumatic reticuloperitonitis (TRP). Forty-six cattle suffering from TRP and fifteen clinically healthy cows were included in this study. All the cases were submitted to the Veterinary Teaching Hospital (VTH), Omar Al-Mukhtar University, Libya during the period from 2009 to 2019. For each case, history, age, results of clinical examination, hematological and biochemical findings were recorded and analyzed. Clinical examination of cattle with TRP reveals anorexia, fever, drop of milk yield, reduced of rumen motility, an increase of heart rate and recurrent rumen tympany. Laboratory findings reveals significance increase of packed cell volume, total leucocyte counts, plasma fibrinogen and total protein in comparison to healthy cows, while a non-significant difference of total erythrocyte counts, urea and total bilirubin were recorded. Glutaraldehyde test showed reduced clotting time less than 6 min in 45% cattle with TRP. Ruminal fluid analysis reveals significance increase of pH value and MBRT. Forty three (93%) cattle were discharged home for further observation.12 months after discharge, 36 cows (78%) were at their home farm and utilized performed normally. It is suggested that clinical examination, hematological, biochemical and ruminal analysis could be useful in diagnosis and treatment of Traumatic reticuloperitonitis.

KEYWORDS

Traumatic reticuloperitonitis, Cattle, Hemato-biochemical, Surgical and Findinds.

Author for Correspondence:
Akraiem A,
Department of Clinical Veterinary Science,
Faculty of Veterinary Medicine,
Omar Al-Mukhtar University, Libya.
Email: idress.hamad@omu.edu.ly

INTRODUCTION

Traumatic reticuloperitonitis (TRP) is one of the most reasons for abdominal surgery in adult cattle in addition to abomasal displacement[1]. It considered a frustrating problem causing devastating economic losses due to treatment costs, a decrease of milk production, losses of body weight and death[2-5].

Traumatic reticuloperitonitis (TRP) is a disease that is highly correlated to the specific way of eating of cattle and to the special condition of the fore stomachs[5]. Swallowed metallic foreign bodies, such as nails, wire and other hardware fall directly into the reticulum and rumen[1-3]. The honey-comb shaped internal surface of the reticulum, the contraction of the reticulum and pressure of the foetus during the late pregnancy promote penetration of the reticular wall by sharp objects[1,6-8]. TRP often occurs in adult cattle but rarely happens in young cattle and small ruminants[34]. Peritonitis, inflammation of the peritoneal cavity, may be localized or generalized and may be chronic or acute[9,1,10]. The diagnosis of TRP was based on routine clinical, laboratory, radiographic and ultrasonography examination. The present study aimed to describe the clinical, laboratory and surgical findings and outcome in cattle suffering from TRP.

MATERIAL AND METHODS

Animals

Forty-six cattle suffering from TRP and fifteen clinically healthy cows were included in this study. All the cases were submitted to the Veterinary Teaching Hospital (VTH), Omar Al-Mukhtar University, Libya during the period from 2009 to 2019. The diagnosis of TRP is based on a complete anamnesis, physical examination, ultrasonography and confirmed by rumenotomy. The clinically healthy cows were defined as those with no history or clinical signs of any disease.

Clinical examination

Routine general clinical and laboratory examination were performed from each case at the time of admission in the VTH. The animals were clinically examined according to Rosenberger (1990), revealing respiratory rate, heart rate, rectal temperature, rumen motility, filling of the rumen, feces (quantity and consistency) and pain test reaction. Approximately 200ml of rumen fluid was collected and examined for pH value and methylene blue reduction time (MBRT)[11].

Laboratory analysis

The following blood samples were collected from each cattle (before surgery) by puncture of the jugular vein: 5ml of EDTA blood for haematological analysis, 5 ml of EDTA blood for the glutaraldehyde test and 10 ml of whole blood for serum biochemistry. The following haematological and biochemical parameters were determined: packed cell volume (PCV%), haemoglobin concentration (Hg), Red blood cell count (RBCs), white blood cell counts (WBCs), total protein, fibrinogen concentration, urea concentration and total bilirubin[12-15]. To carry out glutaraldehyde test 5ml of EDTA blood sample were centrifuged and 2ml of the collected plasma was put in a 10ml plastic injector, mixed with 2ml of glutaraldehyde solution and checked every 30 seconds to assess the time of coagulation[16].

Surgical treatment

Exploratory laparorumenotomy was done in all of the cattle suffering from TRP. The rumenotomy was performed according to Gotze technique[17]. Peritoneal adhesions (range and sit of adhesion) and quantity of the peritoneal fluid were assessed before the rumenotomy. The presence of penetrating foreign bodies and the abscess was carefully checked inside the reticulum and rumen. A dose of procaine penicillin 30,000IU/kg b.wt. Was intramuscularly administration to all affected cattle for five days. The surgical findings and outcome were analyzed. Owners of cattle discharged from the VTH were contacted to obtain additional follow- up information regarding long-term survival and outcome.

Statistical analysis

The data obtained were expressed as mean and standard deviation. Values were analyzed statistically between healthy cows and affected cattle using the independent t-test. P values ≤ 0.05 were considered significant.

RESULTS AND DISCUSSION

The present study was conducted on 46 cattle suffering from TRP and 15 healthy cows as controls. The mean age of cattle with TRP was 4.6 years and the age ranged from 3 to 14 years. Out of 46 cattle with TRP 44 were females and 2 were males. The duration of the illness ranged from 3 to 60 days with a mean of 6.8 ± 4.3 days. Most of them had been clinically ill between 3 to 14 days (58%). Out of

44cows with TRP, 36% were recently calved, 28% were pregnant and the rest of cows were non pregnant.

Clinical findings

The general demeanour was abnormal in the majority of the cattle with TRP (87%). Reduced appetite was recorded in 37(80%) of cattle with TRP, whereas complete anorexia was recorded in the remaining (20%) cattle. The clinical examination of cattle with TRP indicated abnormal general demeanours, anorexia, drop of milk yield, reduced rumen motility, reduction of rumination, mild to severe distention of the left abdomen and recurrent tympany. The clinical findings of cattle with TRP and healthy cows were presented in Table No.1. The rectal body temperature of affected cattle varied from 37.6 to 41.6^{o}C (39.4 ± 0.6). Hyperthermia was recorded in 19(44%) cattle. The heart rate in cattle with TRP ranged from 44 to 124bpm (84.4 ± 14.3). Tachycardia was present in 13(28%) cattle with TRP, bradycardia found in 4(10.8%) cattle. The respiratory rate in affected cattle ranged from 16 to 98 breaths per minute (29.80 ± 8.7) and it was decreased in 9(19.5%) cattle with TRP, while 6(13%) cattle showed an increased respiratory rate. The rectal temperature and heart rate in cattle with TRP were significantly higher than in healthy cows. hypomotility of rumen was recorded in the majority of cattle with TRP, whereas hypermotility of rumen was observed in 3 cattle. Foreign body pain test was positive in (62%) cattle with TRP, while negative or questionable in the rest of cattle. Signs of pain like arching of the back, grunting and reluctance to move were noticed in (23%). Out of 46 cattle with TRP, 26 cattle showed abdominal distension, among of them sever left flank distension was seen in 5 cattle, bilateral distension was seen in 3 cattle. Analysis of ruminal fluid (Table No.1) showed a significant increase of MBRT (more than 6 min) and pH level (7.8 ± 0.7) in cattle with TRP compared with controls.

Laboratory analysis

The mean and standard deviation of haematological and biochemical parameters in cattle with TRP and in healthy cows is presented in Table No.2. In the present study, hematological and biochemical analyses showed that the haemoglobin level, total erythrocyte count were within the normal range among all the tow group of animals. The affected cattle showed a significant increase of packed cell volume, total leucocyte counts, plasma fibrinogen and total protein concentration in comparison to healthy cows, while a non-significant difference of total erythrocyte counts, urea and total bilirubin were recorded. Glutaraldehyde test showed reduced clotting time less than 6 min in 67% cattle with TRP. Compared with the controls cows as shown in Table No.2 a significant difference in the mean value of Glutaraldehyde test was recorded.

Surgical finding and outcome

All cattle with TRP included in this study underwent laparotomy and rumenotomy. Abdominal exploration revealed adhesions between reticulum and bod wall/ diaphragm in all cattle. In 41(89%) cattle the perforation occurred in the anterior ventral region of the reticulum. Sever adhesions were recorded in 5 cattle. Increased peritoneal fluid was observed during laparotomy in all cattle with TRP. The presence of metallic foreign bodies consisting of nails and wire of different size were found in all cattle. Non - metallic foreign bodies like plastic material and ropes were found in the rumen in 16 cows. Reticular abscesses were observed in 5 cattle. Abscesses were found on the medial wall of the reticulum near the reticulo-omasalorifice. Forty three (93%) cattle were discharged home for further observation. Among of them 38 cattle recovered completely and five cattle showed recurrent tympany, reduced appetite and or abnormal heart rate on the five days post-surgery. Three cattle died during the 72 hours after surgery. 12 months after discharge, 36 cows (78%) were at their home farm and utilized performed normally. Three of the remaining seven cows were called due to disorders not related to the previous treatment (fertility disorders, mastitis). The other cows were culled from the herd as they not return to their normal productivity.

Discussion

In this study, clinical, laboratory and surgical findings and outcome were investigated in a series of cases of TRP. In the present study, the higher

incidence of traumatic reticuloperitonitis in female cattle may be related to the longer keeping of females than males. The mean age of cattle with TRP was in accordance with Brauen *et al*[1], Hjerpe[5], Leuenberger[18] and Roth[19]. In this study, 36% cases were observed within six weeks after calving, these findings are similar to previous studies[1,10,5,18,20]. In the present study, we reported the most common clinical findings in cattle suffering from TRP. Similar to the previous reports, the typical clinical findings of cattle with TRP were anorexia, fever, drop of milk yield, reduced of rumen motility, an increase of heart rate, recurrent rumen tympany and left side abdominal distention[1-3,21-23]. Most of these clinical findings are related to abdominal pain due to reticular adhesion and peritoneal inflammation[24,2-4]. Although hyperthermia was recorded in the majority of cattle with TRP. Increased temperature values might be attributed to peritonitis or septicemia accompanying concurrent parturition diseases, such as metritis and mastitis[1,7,10,4]. However, there was a marked increase in heart rate in 13 (28%) affected cattle and 4(10.8%) cattle presented bradycardia. Increase heart rate is common in cases of abdominal pain and circulatory failure[1,2,18]. The increased respiratory rate is probably due to the increased pressure of the dilated rumen on the diaphragm[2,10]. In the current study, in all the cattle with TRP, reduced or total absence of rumen motility and rumination were recorded. Similar findings were observed by Braun *et al*[1], Constable *et al*[2] and Dirksen[10]. Reduced ruminal motility might be attributed to abdominal pain caused by the different types of penetrating foreign bodies[9,1,2,10,25]. In the present study, 56,5 %of cattle with TRP showed slight to mild abdominal distention of left flank, which is in agreement with the findings of[9,1,18,26-28]. Although bilateral abdominal distention and bradycardia are thought to be a characteristic sign of vagal indigestion, it was observed in 4 cows[3,26]. Pain test used in this study was helpful in prediction of traumatic reticuloperitonitis as an appositive result were recorded in 62% cattle while negative or questionable in the rest of cattle. Similar findings were observed by Braun *et al*[9,1] and Dirksen[3]. The reduction time of methylene blue (RTMB) and pH ruminal fluid were significantly increased in cattle with TRP. Similar results were reported by Braun *et al*[1]. The glutaraldehyde test showed reduced clotting time less than 6 min in 67% cattle with TRP. Similar results were recorded by Brauen *et al*[9,1] and Doll *et al*[16]. In the haematological results, a significant increase of Packed cell volume and leukocyte count were reported in cattle with TRP as compared to a healthy cow. A similar observation was recorded by Radostits *et al*[26] and Roth and King[19]. The observed increase in PCV might be attributed to dehydration associated with fluid loss due to the reduction of fluid and water intake in cattle with TRP[1,26,19]. In the present study, an increased level of leukocyte counts in affected cattle might be due to peritonitis and inflammatory conditions. Similar to the previous findings in other studies that reported dehydration and leukocytosis[1,29,5,14,30,28,31,32]. On the other hand, there was no significant difference in the mean value of erythrocyte count and haemoglobin concentration between the affected cattle and controls. Similar findings were reported by Braun *et al*[9,1]. In the present study, serum biochemical results showed a significant increase in total protein and fibrinogen concentration in cattle with TRP as compared with healthy cows. In this study, the increased value of total protein might be due to hemoconcentration and response to inflammation[24,33-35,26,36]. The increased mean value of plasma fibrinogen in cattle with TRP might be due to the severe inflammation and tissue damage following foreign body penetration[1,33,10]. Laparotomy and rumenotomy were performed in 46 cattle suffering from traumatic reticuloperitonitis. Exploration of the abdominal cavity revealed abdominal adhesions of varying degree between the reticulum and abdominal wall/ diaphragm and increased peritoneal fluid in all cases. Similar surgical findings were observed by Braun *et al*[1], Jagos[37] and Maddy[38]. In the majority of cattle, the metallic foreign bodies were penetrating the reticular mucosa. overall, 43(93%) cases were released as cured after surgery. 3(7%) cattle died during the 72 hours after surgery. 43 cattle out of 46 cases were followed up to evaluate long-term survival rate and complications. 12 months after discharge, 36 cows (78%) were at their home farm and utilized

performed normally. Three of the remaining seven others were called due to disorders not related to the previous treatment (fertility disorders, mastitis). Short-term survival rate and long- term survival rate is nearly with that given in previously published reports[1,10,39,18,26,40]. However, the definition of outcome or duration of follow-up may be different from one study to another and making difficult comparisons.

Table No.1: Clinical and ruminal fluid parameters of apparently healthy cattle (control) and those with TRP

S.No	Parameters	Control (n=15)	Cattle with TRP (n= 32)
1	Body temp. (^oC)	38.2±0.13	39.4±0.6*
2	Respiratory rate /min.	28. 8 ±2.3	29.2 ±8.7
3	Pulse rate/min.	72.00 ±6.2	3*.14 ±84.4
4	Rumen movement (/2 min)	2.7±0.6	1.2 ±0.2*
5	Ruminal fluid pH	6.9 ±0.7	7.8 ±0.7*
6	(min)MBRT	4.5± 0.6	8.7 ± 2.6.6*

Means with different superscripts indicate significant difference at (P <0.05)

Table No.2: Some hematological and biochemical parameters of apparently healthy cattle (control) and those with rumen impaction

S.No	Parameters	Control (n=15)	Cattle with TRP (n = 32)
1	RBCs(($\times 10^6$ /µl)	8.1±0.5	7.8 ±0.13
2	PCV %	28. 6 ±2.5	39.7±2.6*
3	Hb (mg/dl)	9.2 ±0.4	8.9 ±0.3
4	WBCs($\times 10^3$/µl)	8.6 ±0.4	13.7 ±2.3*
5	Total protein (g/1)	63.3± 0.5	86.4± 1.7*
6	Fibrinogen (g/1)	9.2 ± 0.7	5.3 ± 0.2*
7	Bilirubin (µmol/l)	4.3 ± 0.2	4.6 ± 0.7
8	Urea (mmol/l)	3.9 ± 0.3	4.3 ± 0.2
9	Glutaraldehyde test (median)	Above of 15 min.	3.7 min.*

Means with different superscripts indicate significant difference at (P <0.05).

CONCLUSION

Traumatic reticuloperitonitis (TRP) is one of the most reasons for abdominal surgery in adult cattle in Libya which associated were anorexia, fever, drop of milk yield, reduced of rumen motility, an increase of heart rate and recurrent rumen tympany. Haemato-biochemical findings in cattle with TRP revealed dehydration, leukocytosis, hyperfibrinogenemia and hyperproteinemia. It is suggested that clinical examination, hematobiochemical and ruminal analysis could be useful in diagnosis of Traumatic reticuloperitonitis.

ACKNOWLEDGEMENT

The authors are sincerely thankful to Department of Clinical Veterinary Science, Faculty of Veterinary Medicine, Omar Al-Mukhtar University, Libya for providing the facilities to carry out this research work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Braun U, Warislohner S, Torgerson P and Gerspach C. Clinical and laboratory findings in 503 cattle with traumatic reticuloperitonitis, *BMC Veterinary Research,* 14(1), 2018, 66.
2. Constable P D, Hinchcliff K W, Done S H, Grünberg W. Diseases of the alimentary tract-ruminant, Veterinary medicine, A textbook of the diseases of cattle, horses, sheep, pigs and goats, *St. Louis, Elsevier,* 11th Edition, 2017, 436-621.
3. Dirksen G. Krankheiten von Haube und Pansenbeimruminanten Rind. In: Dirksen G, Grunder H D, Stober M, editors. Innere Medizin und Chirurgiedes Rindes, *Berlin: Parey Buchverlag,* 2002, 396-455.
4. Francoz D, Guard C L. Traumatic reticuloperitonitis (hardware disease, traumaticreticulitis), *In: Smith B P, Large Animal Internal Medicine, St. Louis: Elsevier Mosby,* 2015, 805-817.
5. Hjerpe C A. Studies on acute bovine traumatic reticuloperitonitis I-III, *J. Am. Vet. Med. Assoc,* 139, 1961, 227-235.
6. Braun U. Ultrasonography in gastrointestinal disease in cattle, *Vet. J,* 166(2), 2003, 112-124.
7. Braun U. Traumatic pericarditis in cattle: Clinical, radiographic and ultrasonographic findings, *Vet. J,* 182(2), 2009, 176-186.
8. Kahn C M. The Merck veterinary manual, *Merck and Co, Inc, USA,* 9th Edition, 2005, 186-188.
9. Braun U, Gotz M and Marmier O. Ultrasonographic findings in cows with traumatic reticuloperitonitis, *Vet. Rec,* 133(17), 1993, 416-422.
10. Dirksen G. Krankheiten von Haube und Pansenbeimruminanten Rind, In: Innere Medizin und Chirurgie des Rindes, 5. Aufl, Hrsg. G. Dirksen, H D. Grunder M. Stober, *Parey Buchverlag, Berlin,* 2006, 396-454.
11. Dirksen G. Is the "methylen blue-reductionprobe" usable as quick-test for clinical examination of rumen fluid? *Dtsch. Tierarztl. Wschr,* 76, 1969, 305-309.
12. Coles E H. Veterinary clinical pathology, *W.B. Saunders Comp, Philadelphia, London, Toronto, Tokyo, Sydney, Hong Kong,* 4th Edition, 1986, 17-19.
13. Jain N C. Schalm's veterinary haematology, Lea and friesian cows, *Vet. Res,* 99, 4th Edition, 1986, 456-457.
14. Latimer K S, Mahaffey E A, Prasse K W. Duncan and prasse's veterinary laboratory medicine: Clinical pathology, *Ames, Iowa State Press,* 4th Edition, 2003, 68-77, 152-160.
15. Schalm O W, Jain N C, Correll E J. Veterinary haematology, 3rd Edition, 1975, 122.
16. Doll K, Schillinger D and Klee W. Der Glutaraldehyd-Test beim Rind - seine Brauchbarkeitfur Prognose und Diagnose innerer Entzun-dungen. Zbl, *Vet. Med. A,* 32(8), 1985, 581-593.
17. Dirksen G, Grunder H D, Stober M. Verdauungsapparat. In: Dirksen G, Grunder H D, Stober M, Die klinische Untersuchung des

Rindes, *Berlin, Hamburg: Paul Parey,* 1990, 288-400.
18. Leuenberger W, Martig J and Schneider E. Unter-suchungenzur diagnose und therapie der reticulitistraumatica des rindes, *Teil. Schweiz Arch. Tierheilk,* 120, 1978, 213-229.
19. Roth L and King J M. Traumatic reticulitis in cattle: A review of 60 fatal cases, *J. Vet. Diagn. Invest,* 3(1), 1991, 52-54.
20. Semieka M A. Radiography of unusual foreign body in ruminants, *Veterinary World,* 3(10), 2010, 473-475.
21. Garry F. Evaluating motility disorders of the bovine forestomach, *Vet. Med, US,* 85(6), 1990, 634-642.
22. Ward J L and Ducharme N G. Traumatic reticuloperitonitis in dairy cows, *J. Am. Vet. Med. Assoc,* 204(6), 1994, 874-877.
23. Williams F. Einigediagnostische hilfenzur feststellung der traumatischen retikuloperitonitis und perikarditisbeim rind, *Dtsch. Tierarztl. Wschr,* 81, 1974, 558.
24. Cavedo A M, Latimer K S, Tarply H L and Bain P J. Traumatic reticuloperitonitis (hard ware diseases in cattle veterinary clinical pathology clerkship program, *University of Georgia, Athens,* 2004, 1-4. In http: // www. Vet. Uga. Edu/ Vpp/ clerk / lave toindex.
25. Henniger R W and Mullowney P C. Anterior abdominal pain in cattle, *Compend. Contin. Educ. Pract. Vet,* 6, 1984, 453-463.
26. Radostits O M, Gay C C, Hinchcliff K W and Constable P D. Diseases of the alimentary tract, In: Veterinary Medicine, A textbook of the diseases of cattle, horses, sheep, pigs and goats, *Saunders, London,* 10th Edition, 2007, 293-382.
27. Samad A, Awaz K B and Sarkate L B. Diagnosis of bovine traumatic reticulo-peritonitis I: Strength of clinical signs in predicting correct diagnosis, *J. Appl. Anim. Res,* 6(1), 1994, 13-18.
28. Smith D F, Becht J L and Whitlock R H. Traumatic reticuloperitonitis, In: Veterinary gastroenterology, *Anderson N V, Lea and Febiger, Philadelphia, London,* 1992, 715-719.
29. Brown J M, Kingery B W and Rosenquist B D. The hematology of chronic bovine reticuloperitonitis, *Am. J. Vet. Res,* 20, 1959, 255-264.
30. Ramprabhu R, Dhanapalan P, Prathaban S. Comparative efficacy of diagnostic tests in the diagnosis of traumatic reticuloperitonitis and allied syndromes in cattle, *ISR J Vet Med,* 58(-3), 2003, 68-72.
31. Tharwat M, Ahmed A F, El-Tookhy O S. Chronic peritonitis in buffaloes andcattle: clinical, hematological, ultrasonographic findings and treatment, *J. Anim Vet Adv,* 11(15), 2012, 2775-2781.
32. Thrall M A, Weiser G, Allison R W, Campbell T W. Interpretation of leukocyte responses in disease, Veterinary hematology and clinical chemistry, *Ames: Wiley-Blackwell,* 2nd Edition, 2012, 127-139.
33. Dubensky R A and White M E. The sensitivity, specificity and predictive value of total plasma protein in the diagnosis of traumatic reticuloperitonitis, *Can. J. Comp. Med,* 47(3), 1983, 241-244.
34. Gokce H I, Gokce G and Cihan M. Alterations in coagulation profiles and biochemical and hematological parameters in cattle with traumatic reticuloperitonitis, *Vet. Res. Com,* 31(5), 2007, 529-537.
35. Hirvonen J, Pyorala S. Acute-phase response in dairy cows with surgically-treated abdominal disorders, *Vet J,* 155(1), 1998, 53-61.
36. Roussel A J, Whitney M S, Cole D. Interpreting a bovine serum chemistry profile: Part 1, *Vet. Med,* 92(6), 1997, 551-558.
37. Jagos P. The characteristics of foreign bodies in traumatic inflammations of cattle, *Acta Vet. (Brno),* 38, 1969, 545-552.
38. Maddy K T. Incidence of perforation of the bovine reticulum, *J. Am. Vet. Med. Assoc,* 124(923), 1954, 113-115.

39. Fraser C M. Conservative treatment of traumatic reticulitis, *Can. Vet. J,* 2(2), 1961, 65-68.
40. Warislohner S. Reticulo peritonitis traumaticabeim Rind-eine Analyse von 503 Krankengeschichten, *Dr. Med. Vet Thesis. Zurich: University of Zurich,* 2017.
41. Braun U, Iselin C, Lischer C and Fluri E. Ultrasonographic findings in five cows before and after treatment of reticular abscesses, *Vet. Rec,* 142(8), 1998, 184-189.
42. Gotze R. Die Fremdkorperoperationbeim Rindepraxisreifdurchextraperitoneale Pansennaht, *Dtsch Tierarztl Wschr,* 42, 1934, 353-357, 374-9.29. Andres J. Zurmodernen diagnose, prophylaxe und therapie der reticulitistraumatica des Rindes, *Schweiz Arch Tierheilk,* 94, 287-295.
43. Jones T C, Hunt R D and King N W. Veterinary pathology, *USA,* 6th Edition, 1996, 1060-1061.
44. Kirbas A, Ozkanlar Y, Aktas M S. Acute phase biomarkers for inflammatory response in dairy cows with traumatic reticuloperitonitis, *ISR J Vet Med,* 70(2), 2015, 23-29.
45. Nazifi S, Ansari-Lari M, Asadi-Fardqi J, Rezaei M. The use of receiver operating characteristic (ROC) analysis to assess the diagnostic value of serum amyloid a, haptoglobin and fibrinogen in traumatic reticuloperitonitisin cattle, *Vet J,* 182(2), 2009, 315-319.
46. Ocal N, Gokce G, Gucu A I, Uzlu E, Yagci B B, Ural K. Pica as a predisposing factor for traumatic reticuloperitonitis in dairy cattle: Serum mineral concentrations and hematological findings, *J. Anim. Vet. Adv,* 7(6), 2008, 651-656.

Please cite this article in press as: Akraiem A *et al*. Clinical, hematological, biochemical and surgical findings in cattle with traumatic reticuloperitonitis, *International Journal of Medicine and Health Profession Research,* 7(2), 2020, 101-108.