Official Journal Issued by Faculty of Veterinary Medicine

Benha Veterinary Medical Journal

Journal homepage: https://bvmj.journals.ekb.eg/

Since 1990

Original Paper

Dietary abomasal impaction in weaned Egyptian calves

Abdelmonem, A. Abdallah

Department of Animal Medicine, Faculty of Veterinary Medicine, Zagazig University, 44519, Zagazig, Egypt

ARTICLE INFO

Keywords

Abomasum
Dietary
Dimensions
Distension
Ultrasound

Received 24/03/2020
Accepted 27/05/2020
Available On-Line 08/09/2020

ABSTRACT

Abomasal disorders can lead to severe and potentially life-threatening conditions for the affected calves. In this study, the dietary abomasal impaction was investigated in 12 weaned buffalo and cow calves aged 6-12 months admitted to the Veterinary Teaching Hospital, Faculty of Veterinary Medicine, Zagazig University, Egypt, five apparently healthy cow calves were also included as controls. The diagnosis was based upon case history, general clinical examination with special reference to the gastrointestinal system, and the abomasal measurements including length, width, and depth that taken for all cases under ultrasonographic guidance. Non-significant differences were found for the measured physical parameters in the clinical cases versus controls. Right ventral abdominal distension was reported in all cases, evacuation of dark greenish ruminal fluid using the stomach tube was reported also and to a lesser extent the oral feed regurgitation. Significant differences were found in all the abomasal dimensions in cases when compared to control ($P<0.0001$). Also, the ultrasonographic examination revealed the extension of the abomasum beyond its limits. The abdominal ultrasound as a quick, feasible and non-invasive tool showed relative accuracy in the diagnosis of abomasal impaction in weaned calves.

1. INTRODUCTION

Accumulation of dry solid ingesta in the abomasum with concurrently the failure of aboral transport resulted in what is called abomasal impaction, this condition is occasionally diagnosed in adult ruminant (Wittek et al., 2005a; El-Ashker et al., 2018). Abomasal impaction may be primary in origin due to feeding of poor-quality roughage mainly during winter season associated with decreased water consumption (Braun et al., 1990; Radostits et al., 2007). Secondary abomasal impaction may be due to traumatic reticulo-peritonitis that could be associated with abomasal adhesion with the ruminal or ventral abdominal walls (Wittek et al., 2005a), due to the distal function r pyloric stenosis caused byvagal indigestion (Rehage et al., 1995). In addition, it may be resulted from ingestion of sand, gravel or any other indigestible food materials (Mitchell, 1990; Cebra et al., 1996; Simkins and Nagele, 1997).

Affected cases usually showing inappetence to anorexia, reduced feces, variable dehydration, and moderate to severe abdominal with expiratory grunting sound with splashing sound heard on rumen auscultation with right ventral abdominal distension. No differences were found regarding the heart , respiratory rates and the rectal temperature in cases of abomasal impaction (Belge et al., 2017; El-Ashker et al., 2018).

In the literature, the biochemical findings were discrepant, in 38 adult cattle diagnosed with abomasal impaction (22 had pyloric antrum impaction and 16 had the abomasal body and pyloric antrum impaction) there were no significant differences between the different measured biochemical parameters (Wittek et al., 2005a). On the other hand, elevated total protein, creatinine, blood urea nitrogen and hypochloraemia were found in cattle suffering from abomasal impaction compared with normal reference range (Ashcroft, 1983). In buffalo calves, the packed cell volume (PCV) was higher in impacted versus controls, the same for indicators for metabolic alkalosis including PH, pCO2, $HCO3^-$ and the base excess, total protein, urea, creatinine, and total bilirubin. Also, hypochloremia, hypokalemia and lowered glucose levels were recorded in impacted calves rather than controls (El-Ashker et al., 2018).

Clinical and biochemical findings could be considered as ancillary tools in disease diagnosis, but none of them alone serve as a diagnostic gold standard for this condition, only the right-side exploratory laparotomy was diagnostic in cases undergone surgical interference (Wittek et al., 2005a; El-Ashker et al., 2018).

Ultrasonography considered as an optimal diagnostic tool for gastrointestinal disorders investigation in cattle (Braun, 2003), previous studies investigated its usefulness in the diagnosis of different abomasal disorders including left and right abomasal displacement also defects in abomasal emptying and abomasal lymphosarcoma (Braun et al., 1997; Ok et al., 2002; Braun, 2003; Braun et al., 2011; Li et al., 2018).

In Egypt, some studies discussed the abomasal disorders in Egyptian cattle and buffaloes (Misk et al., 2003; El-shafaey; 2007; Mohamed et al., 2019), also the clinical and biochemical findings in dietary impacted buffalo calves (El-Ashker et al., 2018). In this study, we aimed to investigate the additional values of the ultrasonographic examination and the clinical picture in the diagnosis of the dietary abomasal impaction in buffalo and cow calves.

2. MATERIAL AND METHODS

2.1. Animals

A survey was conducted on clinical cases admitted to the hospital of the faculty of veterinary medicine, Zagazig

University, in the period between October 2016 and September 2019. Seven buffalo calves and 5 cow calves suffering from dietary abomasal impaction were clinically and sonographically examined. The age ranged between 6 and 12 months, with a bodyweight ranged between 150 and 200 Kg. As a control group, five cow calves were recruited from the faculty farm with similar range of ages and weights.

2.2. Clinical examination

Each admitted calf subjected to a thorough clinical examination with special reference to the gastrointestinal system. Physical parameters including rectal temperature, respiratory and heart rate and mucous membranes (Rosenberger, 1990).The status of dehydration was recorded in diseased cases, having 5 scores starting from score 0 (no dehydration) until the very poor condition (score 4) as previously described (Wilson et al., 2000). Special examination of the gastrointestinal system encompassed observation of the abdominal contour, rumen palpation, percussion and auscultation, the stomach tube was applied orally to inside the rumen in a trial to evacuate the accumulated ruminal fluid (Cockcroft and Jackson, 2004).

2.3. Ultrasonographic examination

The abomasum was examined using ultrasound machine (Sonoscape, A5V, China) with 3.5 and 5 convex transducers, the scanning was done from the 5th to the 12th intercostal spaces (ICSs) and the flank on both sides starting at the ventral midline and progressing laterally and dorsally with the transducer was parallel to the ribs (Braun, 2016). The area was firstly clipped then coupled by coupling gel, the abomasum was scanned for its size, location and contents, abomasal dimensions were measured. The abomasal length was calculated by subtraction the distance between the cranial edge of the abomasum and the xiphoid process and the distance between the caudal edge of the abomasum and the xiphoid process, the distances from the ventral midline to the abomasal left and right margins is defined as the abomasal width (Wittek et al., 2005b).The depth was measured as maximal visible dorsal-ventral dimension (Wittek et al., 2005c). All these measures were evaluated using a measuring tape.

The rumen was scanned from 6th to 12th ICSs and the flank on both sides, the transducer was held parallel to the ribs and each ICS and the flank were scanned from dorsal to ventral (Braun and Gautschi, 2013), the location and size of the rumen were investigated.

2.4. Statistical analysis

Collected data analyzed using computer software (SAS Version 9.3; SAS, Cary, North Carolina, USA).The physical parameters and abomasal dimensions were not normally distributed in both diseased and control calves. The Wilcoxon rank-sum test (Mann–Whitney *U* test) was used to compare results of both impacted versus controls also between impacted buffalo versus cow calves. Statistical significance was set at $P < 0.05$.

3. RESULTS

Nine cases (75%, 5 buffalo and 4 cow calves) were admitted suffering from abomasal impaction in the period between October 2016 and January 2017, the rest 25% (2 buffalo and 1 cow calves) diagnosed between August and September 2019.

A comparison of physical parameters and results of the gastrointestinal examination were summarized in Table 1. Non-significant differences regarding rectal temperature (P=0.89), respiratory and heart rates (P=0.11, P=0.32, respectively) were found between diseased and control groups.

Table 1 Clinical findings in abomasal impacted and control calves

Parameters	Diseased (n=12)	Controls (n=5)
Rectal temperature °C	38.6 (38.2-39.1)	38.7 (38.3-39.2)
Heart rate/ min	94 (80-105)	96.5 (88-111)
Respiratory rate/ min	18 (15-22)	20.5 (16-24)
Stomach tube finding	Evacuation of large amount of greenish fluid in 5 cases	little gas
Rumen auscultation	Hypomotile to atonic/splashing sound	Contractile 2-3/2 min
Defecation	Dry, scanty (dark green to black) or constipation	Semisoft green
Expiratory grunt	Present (7/12)	Absent
Dehydration score	No (0) to mild (1)	Moderate (2,3) to severe (4)
Oral feed regurgitation	Only in 2 cases	No

Numbers for rectal temperature, heart and respiratory rates expressed as median and ranges (Minimum-Maximum).

Common clinical findings of the abomasal impaction were reported including anorexia, ruminal hypomotility to stasis on auscultation with fluid splashing sound, moderate to severe dehydration was recorded with dry scanty dark green to black feces or complete constipation. Abdominal distension mainly from the right ventral part was present in all impacted cases (Fig 1 a & b). Five cases (42%, 3 buffalo and 2 cow calves) showed a large volume of a dark greenish fluid the evacuated from the rumen after stomach tube application and slight forward tilting of the calves. On the other hand, two buffalo calves (17%) were admitted with a complaint of oral feed regurgitation, also expiratory grunt sound was recorded in seven impacted cases (58%, 5 buffalo and 2 cow calves).

Significant differences (increased values) were found for all abomasal dimensions including length, width, and depth measured in impacted cases in comparison to controls (P<0.0001). Results of these abomasal variables were reported as medians and ranges in Table 2.

Table 2 Abomasal dimensions in diseased versus control calves.

Parameters	Diseased calves		Controls calves
	Buffalo (n=7)	Cow (n=5)	(n=5)
Length (cm)	12.2 (10.5-12.5)	11.6 (10.2-11.9)	7.75 (6.8-8)
Width to left of midline (cm)	10.7 (10.5-11.2)	10.3 (9.9-10.3)	8.15 (7.2-8.5)
Width to right of midline (cm)	10.7 (10.3-11.2)	9.9 (9.7-10.8)	7.9 (7.1-8.3)
Total width (cm)	21.2 (20.1-22.4)	20.2 (19.8-21.1)	16 (14.3-16.8)
Max. dorso-ventral dimension (depth/cm)	9.6 (9.4-10)	8.9 (8.7-9.3)	6.9 (6.2-7.1)

Numbers expressed as median and ranges (Minimum-Maximum).

Ultrasonographic findings were correlated with the increased abomasal dimensions, the abomasum was visualized beyond its limits in 10 cases (83%) and this led to lifting and displacing of rumen from its site. In Fig.2 when the probe moved in the left side ventrodorsally, the abomasum could be imaged with its hypoechogenic feed contents until the mid-flank region where the echogenic ruminal wall started to appear. In six cases (50%), the gall bladder was distended as imaged from the right 9th to 11th ICSs (Fig. 3).

Figure 1 (a and b) Abdominal distension from the right ventral part (white arrow) in a cow heifer and a buffalo calf.

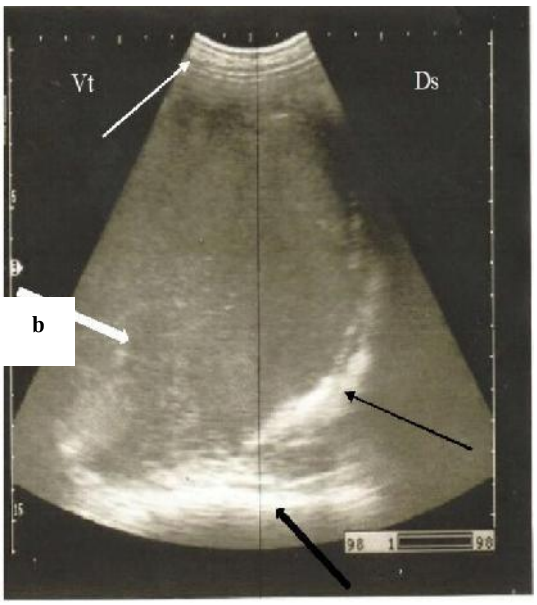

Figure 2 The impacted abomasum as viewed ventrodorsally, the left lateral extension of the abomasum was imaged until the mid-left flank region where the ruminal wall started to appear, white arrow: abdominal wall, thick white arrow: abomasal contents, black arrow: the abomasal wall, thick black arrow: ruminal wall, Vt: Ventral, Ds: Dorsal.

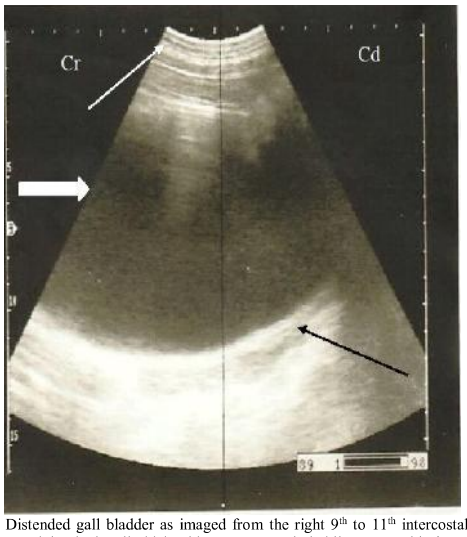

Figure 3 Distended gall bladder as imaged from the right 9th to 11th intercostal spaces, white arrow: abdominal wall, thick white arrow: anechoic bile content, black arrow: gall bladder wall, Cr: Cranial, Cd: Caudal

4. DISCUSSION

In the present study, we aimed to highlight the added value of the guided ultrasound abomasal dimensions in the diagnosis of dietary abomasal impaction in weaned calves. The abomasal impaction in adult cattle was previously reported to be of primary origin (Wittek et al., 2005a) or secondary to ingestion of sand or gravel in dairy cows and heifers (Mitchell, 1991; Cebra et al., 1996; Melendez et al., 2007; Simsek et al., 2015) also in beef cows (Hunter 1975; Simkins and Nagele, 1997). However, fewer studies reported the diagnostic criteria for the primary or dietary abomasal impaction in calves.

The physical parameters including rectal temperature, respiratory and heart rates did not support case diagnosis, this agreed with previous studies (Wittek et al., 2005a; Braun et al., 2008; Simsek et al., 2015; El-Ashker et al., 2018).

In this study abdominal distension and ruminal hypomotility to stasis were recorded in impacted calves as reported in adult dairy, beef cattle and buffalo calves (Simkins and Nagele, 1997; Simsek et al., 2015; El-Ashker et al., 2018), the poor quality roughage provide inadequate energy and protein for the ruminal bacteria that lead to ruminal indigestion and abomasal impaction (Simkins and Nagele, 1997), this is, in turn, resulted in scanty and dry fecal matter to complete constipation, this also was agreed with previous studies (Ashcroft, 1983; Melendez et al., 2007).

Oral feed regurgitation that was reported in two impacted calves could be explained due to the increased abomasal size that resulted in lifting or pushing up of the ventral ruminal sac to the level of the cardia, so with reverse esophageal peristalsis, the regurgitation of feed could happen. The evacuation of dark greenish fluid from the rumen using the stomach tube could be owed to the impacted feed material in the abomasum that blocks the passage of the ruminal fluid also the HCL to be absorbed from the intestine also such accumulated feed with high solid contents may lead to resorption of more water that will finally be accumulated in the rumen, this, in turn, could explain the varying degrees of dehydration the were present on clinical examination of the impacted calves, the fluid ruminal content, empty small intestine on post-

mortem examination and antemortem dehydration were previously reported (Ashcroft, 1983; Simsek et al., 2015).

This study demonstrated that the guided ultrasound abomasal dimensions including length, width and depth were significantly different between impacted cases versus controls, also the sociographically assessed impacted abomasum were extended beyond their limits. The abomasum volume, location, and emptying rate were previously studied in nine male suckling calves (Wittek et al., 2005b), in this study, the ultrasonographic evaluation of the abomasum was effective in measuring the aforementioned parameters in the examined calves before and after suckling different milk volumes or oral electrolytes.

In adult cows, the abomasal dimensions were previously described in 50 healthy cows in Switzerland (Braun et al., 1997), also the intra-abomasal injection of D-xylose was used to compare the abomasal empty rates between cows in different lactation stages and between cows suffered left abomasal displacement (LDA) and after surgical correction of LDA and the abomasal volvulus (Wittek et al., 2005c).In those studies, the ultrasonography was proved to be a valuable ancillary technique for the assessment of the abomasum dimensions in healthy or animals suffering abomasal disorders. Recently, the effect of the intramuscular injection of metoclopramide on the abomasal emptying rate in were studied in twenty healthy non-pregnant cows (Mohamed et al., 2019), the ultrasound-guided abomasal dimensions were considered as effective indicators between controls and injected cows.

5. CONCULSION

Based on the study results, the abomasal ultrasonographic examination including the different measured abomasal dimensions in cases of dietary abomasal impaction in weaned calves could serve as an important diagnostic tool with a great added value to the clinical findings in such disease conditions. The results of this study need to be confirmed through further researches with larger sample size and post-treatment follow up of the abomasal dimensions under the guidance of the abdominal ultrasound.

6. REFERENCES

1. Ashcroft, R. 1983. Abomasal impaction of cattle in Saskatchewan. The Canadian Veterinary Journal 24, 37-380.
2. Belge, A., Koklu, S., Atasoy, A., Derincegoz, O.O., Akin, I., Kilic, N. 2017. A Case of Abomasal Impaction and Ruminal Trichobesoar in A Calf. Journal of Faculty of Veterinary Medicine, Erciyes University/Erciyes Üniversitesi Veteriner Fakültesi Dergisi 14(2), 145-158.
3. Braun, U., Steiner, A., Kaegi, B. 1990. Clinical, haematological and biochemical findings and the results of treatment in cattle with acute functional pyloric stenosis. The Veterinary record 126, 107-110.
4. Braun, U., Wild, K., Guscetti, F. 1997. Ultrasonographic examination of the abomasum of 50 cows. Veterinary Record 140, 93-98.
5. Braun, U. 2003. Ultrasonography in gastrointestinal disease in cattle. The Veterinary Journal 166, 112-124.
6. Braun, U., Rauch, S., Schade, B., Sydler, T., 2008. Clinical findings in a cow with severe abomasal sand impaction. Tierärztliche Praxis. Ausgabe G, Grosstiere/Nutztiere 36, 241-244.
7. Braun, U., Schnetzler, C., Dettwiler, M., Sydler, T., Meyer, S., Gerspach, C. 2011. Ultrasonographic findings in a cow with abomasal lymphosarcoma: case report. BMC Veterinary Research 7, 20.
8. Braun, U., Gautschi, A. 2013. Ultrasonographic examination of the forestomachs and the abomasum in ruminal drinker calves. Acta veterinaria scandinavica 55(1):1-8.
9. Braun, U. 2016. Ultrasonographic examination of the reticulum, rumen, omasum, abomasum, and liver in calves. Veterinary Clinics: Food Animal Practice 32, 85-107.
10. Cebra, C., Cebra, M., Garry, F. 1996. Gravel obstruction in the abomasum or duodenum of two cows. Journal of the American Veterinary Medical Association 209, 1294-1296.
11. Cockcroft, P., Jackson, P. 2004. Clinical examination of the abdomen in adult cattle. In Practice 26, 304-317.
12. El-Ashker, M.R., Salama, M.F., El-Boshy, M.E., El-Fadle, E.A.A. 2018. Significance of clinical observations and biochemical alterations in buffalo calves with dietary abomasal impaction. BMC Veterinary Research 14(2):1-7.
13. El-shafaey. 2007. Diagnosis and Management of Abomasal Disorders in Cattle. Master, Mansoura University.
14. Hunter, R. 1975. Sand impaction in a herd of beef cattle. Journal of the American Veterinary Medical Association. 166(12):1179
15. Li, X.-W., Xu, Q.-S., Zhang, R.-H., Yang, W., Li, Y., Zhang, Y.-M., Tian, Y., Zhang, M., Wang, Z., Liu, G.-W. 2018. Ultrasonographic findings in cows with left displacement of abomasum, before and after reposition surgery. BMC Veterinary Research 14, 44.
16. Misk, N.A., Semieka., M.A., Ahmed, F.A. 2003. Studies on omasal and abomasal disorders in cattle and buffaloes The Journal of the Egyptian Medical Association 63, 331-350.
17. Mitchell, K. 1991. Dietary abomasal impaction in a herd of dairy replacement heifers. Journal of the American Veterinary Medical Association 198, 1408-1409.
18. Mohamed, M.H., Abdelaal, A.M., Abdelrazek, W.M., Omran, H.F. 2019. Evaluation the Effect of Metoclopramide on Abomasal Emptying Rate in Healthy Non-pregnant Mixed Breed Cattle by Ultrasound. Benha Veterinary Medical Journal 36, 57-64.
19. Ok, M., Arican, M., Turgut, K. 2002. Ultrasonographic findings in cows with left and right displacement of abomasum. Revue de Médecine Vétérinaire 153, 15-18.
20. Radostits, O.M., Gay, C., Hinchcliff, K.W., Constable, P.D. 2007. A textbook of the diseases of cattle, horses, sheep, pigs and goats. Veterinary Medicine 10, 367-370.
21. Rehage, J., Kaske, M., Stockhofe-Zurwieden, N., Yalcin, E. 1995. Evaluation of the pathogenesis of vagus indigestion in cows with traumatic reticuloperitonitis. Journal of the American Veterinary Medical Association 207, 1607-1611.
22. Rosenberger, G. 1990. Clinical examination of cattle. Berlin, Hamburg: Paul Parey.
23. Simkins, K., Nagele, M. 1997. Omasal and abomasal impaction in beef suckler cows. Veterinary record 141, 466-468.
24. Simsek, A., Sekin, S., Icen, H., Kochan, A., Celik, O., Yaman, T. 2015. Abomasal impaction due to sand accumulation in two cows. Large An. Rev 21, 125-127.
25. Wilson, L., Smith, J., Smith, D., Swanson, D., Drake, T., Wolfgang, D., Wheeler, E. 2000. Characteristics of veal calves upon arrival, at 28 and 84 days, and at end of the production cycle. Journal of Dairy Science 83, 843-854.
26. Wittek, T., Constable, P.D., Morin, D.E. 2005a. Abomasal impaction in Holstein-Friesian cows: 80 cases (1980–2003). Journal of the American Veterinary Medical Association 227, 287-291.
27. Wittek, T., Constable, P.D., Marshall, T.S., Crochik, S.S. 2005b. Ultrasonographic measurement of abomasal volume, location, and emptying rate in calves. American journal of veterinary research 66, 537-544.
28. Wittek, T., Schreiber, K., Fürll, M., Constable, P.D. 2005c. Use of the D□xylose absorption test to measure abomasal emptying rate in healthy lactating Holstein□Friesian cows and in cows with left displaced abomasum or abomasal volvulus. Journal of Veterinary Internal Medicine 19, 905-913.