CLINICAL, BIOCHEMICAL AND HAEMATOLOGICAL STUDIES ON OMASAL IMPACTION IN COWS

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ABSTRACT

This study was conducted on 12 Holstein cows in a private farm at Al-Gizza governorate. The cows were allocated into 2 groups. Group I included 6 apparently healthy cows and considered as a control. Groups II included 6 cows suffering from a clinical disease that was confirmed to be omasal impaction. The pulse, respiration and temperature were recorded for all cows. For both groups, blood and serum samples were collected for hematological and biochemical examinations, respectively. The results showed that cows with omasal impaction had complete anorexia, cessation of defecation, subacute abdominal pain with disinclination to move or lie down. The pulse rate was significantly increased ($P < 0.05$) with ruminal hypomotility. By rectal palpation, the rectum was empty in three cows and containing some constipated feces in the other three. The impacted omasum appeared as a large, round firm mass with checkered surface. The rumen contents were doughy to firm during palpation. Hematological examination showed significant leukocytosis with neutrophilia and lymphocytopenia ($P < 0.05$). Serum electrolyte analysis demonstrated that calcium, potassium, sodium and chloride were significantly decreased in cases of omasal impaction compared to the control animals, whereas no significant change in the phosphorus level was detected. Biochemical analysis demonstrated a significant decrease in the level of glucose and increase in AST, ALT, LDH, CPK, urea and creatinine levels in cows with omasal impaction compared to control. At necropsy, the impacted omasum was grossly distended with dry coarse particles and patches of necrosis were present on the omasal leaves

INTRODUCTION

In bovine, the omasum is a spherical to ovoid organ situated to the right of the midline in the middle third of the abdomen (**Nickel and others 1987**). It is one of the bovine's forestomachs and it is situated between the reticulum and the abomasum. Its main function is the absorption of water, dissolved minerals and short-chain fatty

acids (**Dirksen 1990, Kaske 1999**). **Edrise et al. (1986**) reported that in calves approximately 40 to 60 per cent of the water in the ingesta entering the omasum is absorbed, whereas **Holtenius and Bjoernhag (1989**) reported that in sheep and goats only 8 to 15% of the water is absorbed. **Trautmann and Schmitt (1935)** suggested that the omasum acted to reduce the size of particles of feed, but **Brownlee and Elliott (1960)** suggested that this mechanical function is of minor importance.

Although the omasum is involved in many disorders of the gastrointestinal tract, clinical signs due to omasal dysfunction are seldom observed, and primary diseases of the omasum, such as omasal impaction and omasitis, are rare (**Radostits et al., 2000, Dirksen 2002**). Because of its position under the costal part of the abdominal wall, the omasum is not easily accessible for clinical examination by palpation, percussion and auscultation (**Dirksen 1990**), and it cannot be palpated through the rectum

There are a few diseases of the omasum, the most common of them is the omasal impaction. In most cases the omasum is only secondarily involved in any other diseases of the digestion tract. Omasal impaction as a clinical entity is difficult to define and is usually diagnosed at necropsy when the omasum is enlarged and excessively hard. It seems unlikely that it could cause death and is frequently observed in animals dying of other disease. It is reputed to occur when feed is tough and fibrous; particularly alfalfa stalks (**Radosits et al., 2007)**.

In this study, the clinical signs of omasal impaction were recorded and the hematological and biochemical changes are demonstrated in cows affected with omasal impaction. The omasal impaction was confirmed after PM examination. Trials of treatment with repeated doses of mineral oil were also applied.

MATERIAL AND METHODS

Animals

Fifteen cows aged between 2-5 years were used in this study. The cows were classified into three groups. Group I involved 5 cows showing clinical signs of TRP. Group II involved 5 cows showing clinical signs of TP. Group III included 5 apparently healthy cows and were used as a control group. Routine clinical examination was carried out and body temperature, pulse and respiratory rate were recorded for each animal.

Clinical examination

All cows were subjected to a thorough clinical examination as described by **Rosenberger (1979)**

Hematological examination

Five ml of blood sample was collected from each cow by venpuncture of jugular vein on heparinized tubes for haematological examination. Examinations included determination of total and differential leucocytic (WBCs) and total erythrocytic count **(Schalm *et al.*, 1975)**, PCV % (**Coles, 1986**), and Hb content (**Wintrobe *et al.*, 1976**).

Biochemical analysis

Ten ml of blood were withdrawn by puncturing the jugular vein, into test tube without anticoagulant, left to clot and the clear serum was obtained **(Kelly, 1984).** Biochemical analysis included the spectrophotometric determination of serum glucose level (**Lott, 1975**), serum total protein and fibrinogen level (**Henry *et al.*, 1974**), serum potassium and sodium level (**Henry *et al.*, 1974**), serum chloride (**Feldkemp, 1974**), serum urea (**Patton and Crouch, 1977**) serum creatinine (**Young, 1990**), serum calcium (**Tietz, 1970**), serum phosphorus **(Anderson and Cockayne, 1993**), AST and ALT (**Reitman and Frankel, 1957**), Serum lactate dehydrogenase (LDH) (**Cobaud and Warblwesk, 1958**) and serum creatinine phosphokinase (CPK) (**Froster, 1970**).

Statistical analysis

All data were represented by means ± SE. The obtained data were analyzed by using the student (t) test with the Sigma Stat 3.1 software (SPSS Inc., Chicago, IL, USA). The difference in means was considered statistically significant when $P < 0.05$

RESULTS AND DISCUSSION

The impaction of the omasum was clinically manifested by complete anorexia, cessation of defecation, an empty rectum and subacute abdominal pain with disinclination to move or lie down. The milk yield was severely reduced. Most of the affected cows (5 out of 6) were diagnosed at the advanced stage of pregnancy, probably because of the pressure of the gravid uterus on the internal organs, such as omasum and abomasums (**Radostits et al., 2007)**. These signs are similar to those recorded by **Turkar and Uppal (2007**)

Clinical examination revealed a significant increase (P<0.05) in pulse rate and insignificant increase in respiratory rate in cows with omasal impaction compared to control. The ruminal movement reduced with weakness in the ruminal contractility. However**, t**here were no marked changes in the rectal temperature in cows with impacted omasum compared to the control animals. By rectal palpation, the rectum was empty except some fecal balls and the impacted omasum appeared as a large, round firm mass with checkered surface. These findings are similar to those recorded by **Radostits et al. (2007); Turkar and Uppal (2007).**

Haematological examination demonstrated non-significant changes in the R.B.Cs count, hemoglobin concentration and hematocrite value in cows with impacted omasum compared to the control cows. However, there was a significant leukocytosis with neutrophilia and lymphocytopenia (P < 0.05) in cows with impacted omasum compared to the control cows whereas, there was no marked change in the monocytes. Neutrophilia might have resulted from chronic irritation of the forestomach wall by impacted feed materials, leaving the wall exposed to secondary infection, which resulted in inflammation **(Hailat et al., 1996**). Decreased lymphocytes could be due to release of corticosteroid as a result of stress **(Jain 1986**). Moreover**, Mohamed et al. (2004)** mentioned that the hematology of a cow with omasal leiomyoma showed leukocytosis and neutrophilia suggesting the presence of chronic inflammatory disease which resulted from the impaction of the omasum.

Serum electrolytes analysis showed that calcium, potassium, sodium and chloride were significantly decreased in cases of omasal impaction compared to the control animals, while there was no marked change in the phosphorus level. The hypokalaemia observed in the diseased cows could be attributed to fasting and adaptive response to continued hypoadrenocortical activity. An intracellular shift of potassium might have occurred subsequent to generation of metabolic alkalosis (**Kaneko et al., 1997**). Chloride is a major extracellular anion which maintains water and osmotic pressure and regulates acid-base balance in conjunction with sodium. In present study, hypochloraemia might be due to the long-standing anorectic status of the animals (**Radostits et al., 2007**).

Serum biochemical analysis showed that the glucose level was significantly reduced while AST and ALT were significantly increased in cows with the impacted omasum compared to the control animals. There was no any significant change in the

level of the total serum proteins. These changes were agreeable to those obtained by **Turkar and Uppal (2007**). The significantly higher levels of AST and ALT in diseased cattle are considered valuable indicators for hepatic damage. Absorption of toxic products from the rumen or alimentary tracts, starvation and constipation leading to cellular disturbances of liver parenchyma could have resulted in increased levels of plasma AST and ALT. The hypoglycemia of affected cattle might be attributed to anorexia of the affected animals. However, it was demonstrated in previous study that the stress of digestive disorders might have resulted in hyperglycaemia due to the glycogenolytic effect of released adrenocorticosteroids (**Kaneko et al., 1997**). The metabolic pattern of the animal becomes disturbed owing to higher levels of blood glucose and animals may utilize glucose rather than VFA for metabolism.

Urea and creatinine levels were significantly increased ($P < 0.05$) in cows with omasal impaction compared to the control animals. The increased urea and plasma creatinine level could be correlated with anorexia, starvation, decreased rumeno-reticular activity and dehydration, as these conditions leads to renal insufficiency (**Turkar and Uppal, 2007)**

Lactate dehydngenase (LD) and creatinine phosphokinase (CPK) were significantly increased ($P < 0.05$) in cows with omasal impaction compared to the control animals. The increased activities of these enzymes might be attributed to affection of liver, heart and skeletal muscles.

During the trials of treatment with mineral oil**,** the number of cows that responded to the medical treatment was three cows (50%) while the other three cases (50%) did not respond to the medical treatment and were salvaged. This finding is parallel to those obtained by **McDonald and Witzel (1968**) who reported that omasal impaction can be treated medically by repeated dosing with mineral oil and laxatives.

At necropsy, the impacted omasum was grossly distended with dry coarse particles and patches of necrosis were present on the omasal leaves, and the peritonitis was evident (Figure 1). These PM lesions were consistent to those mentioned by **Radostits et al. (2007)**.

In conclusion, omasal impaction in cattle was associated with anorexia, constipation and reduction of milk yield. Most cases occur during the advanced stage pregnancy. It is accompanied by leucocyosis, neutrophilia and lymphocytopenia. It is

also associated with increased activity of AST. ALT. LDH and CPK with hypoglycemia, hyponatremia, hypokalemia, hypochloremia.

Table (1): Clinical examination of apparently healthy cows and those with omasal impaction:

Groups / Variable	Healthy cows (control) (n=6)	Omasal impaction (n=6)
Rectal temperature	38.7 ± 0.5	38.9 ± 0.5
Ruminal amplitude	Normal 3/2 min.	Weak 2/2 min.
Respiratory rate /min	36.5 ± 2.7	38.3 ± 2.6
Pulse rate /min	72.6 ± 3.4	81.3 ± 3.5*
Feces characters	Semi-solid dark green flat cakes	Dry and firm
Rectal palpation	Rumen occupies the left half of abdomen	Large, round firm mass with checkered surface

The values are represented by mean ± S.E.
* Indicates significant difference from healthy group at $P < 0.05$

Table (2): Haematological parameters in apparently healthy cows and those with omasal impaction :

Parameter / Category		Healthy cows (control)	Omasal impaction
R.B.Cs (10^6 / μl)		7.5±0.3	7.30 ± 0.6
Haemoglobin (gm/dl)		9.8±0.5	9.6 ± 0.4
Haematocrite (%)		34.6±2.5	33.5 ± 2.0
W.B.Cs (10^3/μl)		8.7 ± 0.5	12.4 ± 0.5*
Differential count	Neutrophils (10^3/μl)	3.2 ± 0.6	8.4 ± 0.8*
	Lymphocytes (10^3/μl)	4.8 ± 0.3	3.1 ± 0.3*
	Monocytes (10^3/μl)	0.5 ± 0.1	0.5 ± 0.1

The values are represented by mean + S.E.
* Indicates significant difference from healthy group at $p < 0.05$

Table (3): Levels of serum electrolytes in apparently healthy cows and those with omasal impaction:

Category Parameter	Healthy cows (control)	Omasal impaction
Calcium (mg/dl)	9.8±0.2	8.1±0.2*
Phosphorus (mg/dl)	4.5±0.3	4.2±0.2
Potassium (mEq/L)	4.6±0.01	3.6±0.30*
Sodium (mEq/L)	142.5±1.4	135.5±2.5*
Chloride (mEq/L)	99.2±3.0	85.0±1.3*

The values are represented by mean ± S.E.
* Indicates significant difference from healthy group at $P < 0.05$

Table (4): Some biochemical parameters in apparently healthy cows and those with omasal impaction:

Category Parameter	Healthy cows (control)	Omasal impaction
Total proteins (gm/dl)	7.0 ±0.2	7.20±0.3
Glucose (mg/dl)	55±13.8	42.0±13.0*
AST (IU/L)	46.0±4.1	68.5±6.0*
ALT (IU/L)	18.4 ± 0.5	28.5±1.3**
Urea (mg/dl)	32.2±8.7	36.0±10.5*
Creatinine (mg/dl)	1.2 ± 0.4	2.3±0.1*
LD (IU/L)	456.5±4.5	475.6±8.0*
CPK (IU/L)	65.6± 4.1	78.4±2.6*

The values are represented by mean ± S.E.
* Indicates significant difference from healthy group at $P < 0.05$
** Indicates significant difference from healthy group at $P < 0.01$

Figure (1): PM examination showing impaction of the omasum with dry coarse particles.

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دراسات اكلينيكية ودموية وبيوكيميائية على لكمة الورقية فى الابقار

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اجريت هذه الدراسة على عدد 12 بقرة هولشتين فى مزرعة خاصة بمحافظة الجيزة. قسمت هذة الابقار الى مجموعتين. احتوت المجموعة الاولى على ستة بقرات سليمة ظاهريا واستخدمت كمجموعة ضابطة بينما احتوت المجموعة الثانية على ستة بقرات تعانى من اعراض اكلينيكية لمرض لكمة الورقية. تم قياس النبض والتنفس ودرجة الحرارة لكل الابقار كما تم تجميع عبنات دم وسيرم من كل الابفار لاجراء فحوصات دموبة وبيوكيميائية. اوضحت النتائج ان الابقار التى تعانى من لكمة الورقية تعانى من فقدان فى الشهية وامساك والام تحت الحادة فى البطن وعدم الرغبة فى الحركة او الرقود على الارض. مع ارتفاع معنوى قى معدل النبض وتناقص فى حركة الكرش. وبجس هذه الابقار لوحظ خلو المستقيم من البراز فى ثلاث بقرات ووجود براز جاف فى الثلاث بقرات الاخرى. وظهرت الورقية الملكومة كبيرة فى الحجم ومستديرة ومزخرشة. كما تبين ان محتوات الكرش عجينة الملمس. اظهرت صورة الدم وجود زيادة معنوية فى عدد كرات الدم الحمراء والنيوترفيل ونقص فى الخلايا الليمفاوية. كما اظهر تحليل السيرم وجود نفص معنوى فى الكالسيوم والبوتاسيوم والصوديوم والكلوريد فى الابقار التى تعانى من لكمة الورقية مقارنة بالمجموعة الضابطة فى حين لم يوجد تغيير معنوى فى مستوى الفوسفور. اظهر الفحص البيوكيميائى زيادة معنوية فى مستوى الجلوكوز و AST و ALT و LDH وCPK واليوريا والكرياتنين فى الابقار التى تعانى من لكمة الورقية مقارنة بالمجموعة الضابطة. عند الفحص بعد الوفاة وجد ان الورقية ممتلئة بمحتويات جافة وغلسظة مع تنكرز الورقية.