

## Coagulation Parameters in Cattle with Left Displacement of Abomasum

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### Summary

The aim of the present study was to determine some coagulation parameters in cattle with left displacement of abomasum (LDA). Ten cattle with LDA (study group) and 10 clinically healthy cattle (control group) were included in the study. Platelet (PLT) counts, activated partial prothrombin time (APTT), prothrombin time (PT), fibrinogen and clotting times were measured before surgical intervention. All cattle in the study group had no statistically significant differences for each parameter tested when compared with control group ( $P>0.05$ ). However, when the individual values of parameters of each cow were evaluated four cattle in the study group had abnormal APTT values ( $APTT \geq 58.1$  s). But showed no disorders that may be attributed to disseminated intravascular coagulation (DIC). The results of this study showed that DIC might not be a serious problem in cattle with LDA.

**Keywords:** *Left displacement of abomasums, DIC, Cattle*

## Sol Abomasum Deplasmanlı Sığırlarda Koagülasyon Parametreleri

### Özet

Bu çalışmanın amacı abomazum'un sola deplasmanı bulunan sığırlarda koagülasyon parametrelerinin saptanmasıdır. Abomazum'un sola deplasmanı bulunan 10 sığır çalışma grubunu, klinik olarak sağlıklı 10 sığır ise kontrol grubunu oluşturdu. Trombosit (PLT) sayısı, aktive edilmiş parsiyel trombosit zamanı (APTT), protrombin zamanı, fibrinojen ve pıhtılaşma zamanı cerrahi girişim öncesinde ölçüldü. Çalışma grubundaki sığırlarda tüm parametrelerde kontrol grubuna göre istatistiksel bir fark belirlenmezken ( $P>0.05$ ), çalışma grubundaki sığırlar bireysel olarak incelendiğinde 4 sığırdan anormal APTT değerleri ( $APTT \geq 58.1$  sn) belirlendi. Fakat dissemine intravasküler koagülasyon (DIC) ile ilişkilendirilecek herhangi bir bozukluğa rastlanmadı. Bu çalışmanın sonuçları, abomazumun sola deplasmanı bulunan sığırlarda DIC'in önemli bir problem olamayacağını göstermektedir.

**Anahtar sözcükler:** *Abomasumun sola deplasmanı, DIC, Sığır*

### INTRODUCTION

In healthy non-pregnant cow, normal anatomical position of abomasum is positioned below the rumen in the right of the ventral midline. Left displacement of abomasum (LDA) is a condition in which abomasum is trapped between the rumen and left abdominal wall. LDA occurs most commonly in large, high-producing adult dairy cows after parturition (1). Many papers have been described risk factors, pathogenesis, diagnosis, treatment and outcome of LDA up to date <sup>1-4</sup>.

There is increasing recognition that abnormalities in blood clotting and fibrinolysis occur in both subclinical and clinical forms in many diseases <sup>1</sup>. Disseminated intravascular coagulopathy (DIC) is a pathological process characterized by excessive fibrin deposition in microcirculatory system with ischemia, functional disorders, and a tendency for bleeding <sup>5,6</sup>. This extreme of the clotting disorder is may vary in severity from occurrence of petechial haemorrhages in mucous membranes to life



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threatening haemorrhages or infarction of organs. Ischemic damage to a wide variety of organs is possible with the gastrointestinal tract and kidneys being commonly affected<sup>1</sup>.

In large animals, DIC has been reported in many kind of disease such as endometritis, mastitis, salmonellosis, septic shock, traumatic reticulo-peritonitis, left and right displacement of abomasum, haemolytic anaemia, neoplasia, strangulating intestinal obstruction, neonatal diarrhoea, theileriosis and renal disease<sup>1,5,7-11</sup>. Coagulopathies and DIC can be diagnosed by measurement of some homeostasis parameters, however, no laboratory tests alone have been found to provide definitive diagnosis of DIC<sup>5,12</sup>.

Since the treatment of left displacement of abomasum is generally surgical, it was the aim of the present study to determine haemostatic parameters and DIC to prevent the complication of possible haemostatic dysfunction during the peri-operative period.

## MATERIAL and METHODS

Ten adult cattle with left displacement of abomasum (LDA) and 10 clinically healthy adult cattle constituted the material of this study. All of the cattle were Swiss Holstein. All were in post partum period and the age varied (2-3 years). All cattle were fed with a high concentrate diet. At referral, animals were ill for 2-15 days.

All animals examined by abdominal ausculto-percussion using a flick of the finger over an area between the upper third of the 9 and 12<sup>th</sup> ribs of the abdominal wall for ping sound. Rectal examinations were performed to rule out gas-filled rumen or an empty rumen that may cause rumen ping. Laboratory analysis for ketones (milk and urine) was also done for all animals. Laparoscopy was used for confirmation of diagnosis. After diagnosis all cattle were underwent laparoscopic surgery and discharged same day. Follow up of cattle were performed with telephone calls. Blood samples were withdrawn from vena jugularis into a vacutainer containing K-EDTA for hematologic examination and into a vacutainer containing 3.8% sodium-citrate for coagulation tests. Plasma harvested following immediate centrifugation at 2000g for 5 minutes. Platelet counts were

performed by MS9 Vet (Melet Schloesing Lab, France) automated cell counter. Activated partial prothrombin time (HemoStat aPTT-EL®), prothrombin time (HemoStat Thromboplastin-SI®) and fibrinogen (HemoStat Fibrinogen®) were all performed on citrated plasma by coagulometer (Humaclot Junior, Human GmbH, Germany). Clotting time was measured by performing a skin puncture and after wiping away the first drop a plain capillary tube is filled with blood. The tube is broken every 30 seconds until a fibrin clot is detected.

Student-t test was used for statistical analysis. P<0.05 was considered statistically significant.

## RESULTS

Mean±SE values for APTT, PT, fibrinogen, platelet counts and clotting time in study group and control group and their statistical significance were showed in *Table 1*.

**Table 1.** The mean±SE of evaluated parameters in the study group and control group and their statistical significance

**Tablo1.** Çalışma ve kontrol grubundaki parametrelerin ortalama±standart hataları ile istatistiksel önemleri

Parameter	LDA	Control group	P value
APTT (s)	52.51±2.22	47.69±1.29	P>0.05
PT (s)	20.74±1.08	22.32±0.51	P>0.05
Fibrinogen (mg/dL)	352.92±26.21	338.53±13.35	P>0.05
Platelet count (10 <sup>3</sup> /mm <sup>3</sup> )	418.4±27.61	394.70±17.10	P>0.05
Clotting time (s)	4.35±0.51	3.60±0.19	P>0.05

No cattle in study group showed abnormal results of PT, fibrinogen, platelet counts and clotting time values. However, when the individual values of parameters of each cow were evaluated four cattle in the study group had abnormal APTT values (APTT ≥58.1 s). All cattle were survived after laparoscopic surgery.

## DISCUSSION

Left displacement of abomasum is a condition that affects high-yielding cattle most frequently. Overstretching of the abomasal wall, tissue necrosis, thrombosis, vagus nerve damage in the cases of abomasum displacement may lead the release of procoagulants and/or thromboplastins and stimulate DIC<sup>11</sup>. A recent study<sup>11</sup> showed that

five of 20 cattle with either left or right displacement of the abomasum had DIC. Since the treatment of left displacement of abomasum is usually surgical, the coagulation status of the cattle should be known before surgery to prevent the complication of possible haemostatic dysfunction.

Diagnosis of DIC can be made by the results of a various tests <sup>1</sup>. The most commonly evaluated parameters are platelet count, PT, APTT, fibrinogen and FDPs <sup>13,14</sup>. Several other tests may aid in diagnosis of DIC such as Factor V, VII and AT III. However determining individual coagulation factor levels rarely provides more information than PT or APTT <sup>14</sup>. No laboratory test reflects DIC alone <sup>5</sup> but several haemostatic abnormalities in an animal with thrombotic or hemorrhagic tendencies and multiple abnormalities in a coagulogram strongly suggest the presence of DIC <sup>15</sup>.

Activated prothrombin time (APTT) measure the functionality of the intrinsic clotting system and may be prolonged due to the increased consumption of clotting factors during DIC <sup>5,6</sup>. In a previous study <sup>11</sup> APTT was found to be the most encountered coagulation profile abnormality in cattle with LDA and RDA. Ogurtan et al.<sup>16</sup> reported that APTT showed no significant changes in cows with LDA. In this study, in line with Irmak and Turgut <sup>11</sup>, prolongation of APTT was observed in four out of 10 cattle. It was reported that diagnosis of DIC should be done when three of following 5 coagulation tests found abnormal: prolonged prothrombin time (PT), activated partial thromboplastin time (APTT), presence of fibrin degradation products (FDP), low plasma fibrinogen concentration, and thrombocytopenia <sup>17</sup>. In the present study, absence of a disorder that may be attributed to DIC during perioperative period supported that finding.

Prothrombin time (PT) reflect the function of the extrinsic clotting system and may be prolonged due to the increased consumption of clotting factors during DIC <sup>5,6</sup>. Irmak and Turgut <sup>11</sup>, determined one prolonged PT in a cow with right abomasal displacement. In that study however, no prolonged PT is detected in cattle with LDA as reported by Ogurtan et al.<sup>16</sup> previously. The findings of this study are concordant with those studies.

Fibrinogen is an important substrate for clot formation, and low plasma concentrations of fibrinogen, and in animals with DIC, blood

coagulation can impair <sup>1</sup>. Hypofibrinogenemia has been reported mostly in diseases resulted in impaired hepatic function <sup>1,18</sup>. As parallel with Irmak and Turgut <sup>11</sup>, hypofibrinogenemia was not found in cattle with LDA in the present study.

Platelet count in blood should be evaluated in any animals with a suspicion of hemorrhagic diathesis. The abnormality consistent with DIC is thrombocytopenia. However other haemostatic system components should be evaluated along with platelet count for the diagnosis of DIC. Since low platelet counts determined by automated analyzers as clustering of platelets can cause low values, caution should be exercised when evaluating results <sup>1</sup>. In the present study platelet counts were within normal reference limits both in study and control group.

In the present study, capillary tube method was used to determine clotting time. In this method bovine blood should clot within 15 minutes. Both study and control group was under this reference time and also not statistically significant.

In the present study, clinical signs, laboratory findings were not consistent with DIC. When the individual values of parameters of each cow were evaluated four cattle in the LDA group had abnormal APTT values (APTT  $\geq$  58.1 s), but showed no disorders that may be attributed to disseminated intravascular coagulation (DIC). No PT, fibrinogen, platelet count and clotting time abnormality was seen individually in both study and control group. The present authors agree with the statement that several haemostatic abnormalities in an animal with thrombotic or hemorrhagic tendencies and multiple abnormalities in a coagulogram strongly suggest the presence of DIC <sup>15</sup>.

In conclusion, the results of this study showed that DIC might not be a serious problem in cattle with LDA.

## REFERENCES

- Radostits OM, Gay CC, Hinchcliff KW, Constable PD:** Veterinary Medicine, A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs, and Goats. 10th ed. Elsevier Limited, pp. 439-470, 2007.
- Breukink HJ:** Abomasal displacement, etiology, pathogenesis, treatment and prevention. *Bovine Pract*, 26, 148-153, 1991.
- Geishauser T:** Abomasal displacement in the bovine- a review on character, occurrence, aetiology and pathogenesis. *J Vet Med A*, 42, 229-251, 1995.

4. **Van Winden SCL, Kuiper R:** Left displacement of the abomasum in dairy cattle: Recent developments in epidemiological and etiological aspects. *Vet Res*, 34, 47-56, 2003.
5. **Carlson GP:** Disease of hematopoietic and hemolymphatic systems. In, Smith BP (Ed): Large Animal Internal Medicine. CV Mosby, Philadelphia, pp. 1198-1213, 1996.
6. **Schiefer B, Searcy G:** Disseminated intravascular coagulation and consumption coagulopathy. *Can Vet J*, 16, 151-159, 1975.
7. **Braun U, Bearth G, Dieth V, Corboz L:** A case of disseminated intravascular coagulation (DIC) in a cow with endometritis and fetal death. *Schweiz Arch Tierheilkd*, 132, 239-245, 1990.
8. **Çöl R, Uslu U:** Haematological and coagulation profiles during severe tropical theileriosis in cattle. *Turk J Vet Anim Sci*, 30, 577-582, 2006.
9. **Gokce HI, Gokce G, Cihan M:** Alterations in coagulation profiles and biochemical and haematological parameters in cattle with traumatic reticuloperitonitis. *Vet Res Commun*, 31, 529-537, 2007
10. **Irmak K, Sen I, Cöl R, Birdane FM, Guzelbektes H, Civelek T, Yilmaz A, Turgut K:** The evaluation of coagulation profiles in calves with suspected septic shock. *Vet Res Commun*, 30, 497-503, 2006.
11. **Irmak K, Turgut K:** Disseminated intravascular coagulation in cattle with abomasal displacement. *Vet Res Commun*, 29, 61-68, 2005.
12. **Jain NC:** Essentials of Veterinary Haematology. Lees and Febiger. Philadelphia, 97-100, 1993.
13. **Gulland FMD, Werner L, O'Neill S, Lowenstine LJ, Trupkiewitz J, Smith D, Royal B, Strubel I:** Baseline coagulation assay values for northern elephant seals (*Mirounga angustirostris*), and disseminated intravascular coagulation in this species. *J Wildlife Dis*, 32, 536-540, 1996.
14. **Sellon DC:** Disorders of the hemopoietic system. In, Reed MS, Bayly WM, Sellon DC (Eds): Equine Internal Medicine. Saunders, St. Louis, Missouri, pp. 721-768, 2004.
15. **Bick RL:** Disseminated intravascular coagulation. Objective criteria for diagnosis and management. *Med Clin North Am*, 78, 511-543, 1994.
16. **Ogurtan Z, Ok M, Izci C, Ceylan C:** Activated partial thromboplastin time and prothrombin time in cows with left displacement of abomasum. *Indian Vet J*, 80, 429-431, 2003.
17. **Estrin MA, Wehausen CE, Jessen CR, Lee JA:** Disseminated intravascular coagulation in cats. *J Vet Intern Med*, 20, 1289-1290, 2006.
18. **Çam Y, Çetin E, Iça A, Atalay Ö, Çetin N:** Evaluation of some coagulation parameters in hepatic coccidiosis experimentally induced with *Eimeria stiedai* in Rabbits. *J Vet Med B*, 53, 201-202, 2006.