# Predictive value of laboratory criteria in intestinal strangulation

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*The clinical differentiation between simple and strangulation obstruction remains to be difficult in spite of numerous clinical, radiologic and biochemical laboratory determinations. Unfortunately, retrospective studies of this problem suggest that these indivudual parameters cannot be relied on for the detection or exclusion of strangulation. In the present study, we examined the peritoneal fluid and the blood levels of ammonia, amylase, lactic dehyrogenase, alkaline phosphatase, CPK, SGOT and SGPT in 7 dogs after simple small bowel obstruction and in 10 dogs with experimental small bowel strangulation. All dogs showed a linear increase in blood and peritoneal fluid parameters. Data suggests that, the determination of peritoneal fluid ammonia, amylase, CPK, SGOT and LDH content may be useful in the accurate diagnosis of bowel strangulation. [Turk J Med Res 1994; 12(1):25-28]*

**Key Words:** Intestinal obstruction, Strangulation

The right and early diagnosis of simple and strangulation obstruction of the small bowel has been and still is a problem for the surgeons (1,2).

Antimicrobial agents, cardiorespiratory management and improved nutritional support have decreased the mortality of simple boksel obstruction from 60% to 5-10 % in the last five decades (3). There is no reliable agreement on the diagnostic criteria of the strangulation obstruction (4,5,6). Sarr et all (7) found that, the ratio of preoperative recognition of intestinal strangulation was 51% and in simple mechanical obstruction this value was 69%. The most important clinical parameters of intestinal strangulation are abdominal pain, fever, tachycardia and leukocytosis (5,7,8). On the other hand the blood and the peritoneal fluid measurement are used for the recognition of the intestinal strangulation (9,10,11).

In the present study we have examined blood and peritoneal fluid levels of ammonia, amylase, creatin phosphokinase (CPK), serum glutamic oxaloacetic transaminase (SGOT), serum glutamic purivic transaminase (SGPT) and lactic dehidrogenase (LDH) from dogs after experimental simple intestinal obstruction and strangulation. We have searched for the importance of these results in the recognition of the simple obstruction and strangulation.

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## MATERIALS AND METHODS

This study was performed at the animal research laboratory of the Medical School of Ondokuz Mayıs University, Samsun, Turkey. Seventeen male and female dogs weighing 25-30 Kg were maintained and fed on standard food for 13 days before the present study. The dogs were divided into two groups, containing 10 and 7.dogs. They were fasted for 12 hours before their operations. Pentobarbital sodium 30 mg/Kg was used to induce anesthesia and each dog was intubated with a cuffed endotracheal tube. Before operation, a 21 gauge needle was placed in a femoral vein for blood sample collection. Normal saline intravenous fluid was given 3 ml/kg/hour through the experiment.

Using the sterile technique, a midline laparatomy incision was used and baseline samples of peritoneal fluid and blood were collected for determination of ammonia, amylase, SGOT, SGPT, CPK, alkaline phosphatase and LDH. Simple obstruction and strangulation model was adapted from De Laurier GA, et al (8). In Group I, a 40 cm segment of terminal ileum was isolated and ligated at each end with umblical tape in order to cause closed loop obstruction. The veins of

this segment were isolated and ligated, leaving the arterial supply intact. In Group Il, only a 40 cm segment of terminal ileum was isolated and ligated at each end with umblical tape in order to form simple obstruction. Venous drainage and arterial supply were left intact. A sump drain was placed in the abdominal cavity and the stopcock was attached to one end of the drain, leaving it out of the abdominal wall. The bowel was put back into the abdominal cavity and laparatomy wounds were closed by one layer 2/0 silk interrupted sutures.

At each interval the stopcock of the sump drain was opened and peritoneal fluid was obtained by aspirating from dependent areas with a 10 ml syringe. Subsequent samples of blood and pertioneal fluid for the determination of ammonia, amylase, SGOT, SGPT, CPK, alkaline phosphatase and LDH leves were obtained at 8,24 and 48 hours intervals. The differences between the groups were examined by the student t test.

## RESULTS

In our study, we observed that none of the dogs in the groups were alive of 48 hours postoperatively. The levels of ammonia, amylase, SGOT, SGPT, CPK, alkaline phosphatase and LDH in blood and peritoneal fluid increased linearly at all dogs in the following hours. The levels of ammonia, amylase, SGOT, SGPT, alkaline phosphatase and LDH in blood and peritoneal fluid of the dogs in two groups were shown in Table 1.

When the two groups were compared, at the end of eight hours the increases of LDH, CPK, and alkaline phosphatase in blood were found significant ($p<0.05$), but after 48 hours the increases of ammonia, CPK and LDH were found statistically significant in the group I which we have formed strangulation ($p<0.05$). In the peritoneal fluids, at the end of eight hours the increases of amylase, SGOT and alkaline phosphatase were found statistically significant ($p<0.05$). But after 48 hours we observed that, the increases of all parameters were statistically significant in the strangulation group ($p<0.05$).

## DISCUSSION

The pathology which separates intestinal strangulation from simple mechanical obstruction is vascular occlusion. Firstly venous drainage breaks down, venous congestion develops, then arterial supply compresses and transmural intestinal infarction occurs (1,8). While some injury develops early phase on ischemic injury there is inflammation in submucosal and musculer layers (12,13). Some enzyes which are placed in mucosal and seromuscular layers firstly cause intercellular space and circulation at this stage, than because of the increase of intestinal wall permeability these enzymes enter into peritoneal space. The diamino oxidase (DAO), hexos aminidase, porcine ileal peptide and alkaline phosphatase are mucosal; COK, LDH, SGOT nad SGPT are seromusculer enzymes (14).

While Steawardson et al (5), considered that the classic signs of intestinal strangulation which is fever, tachycardia, leukocytosis and localised abdominal

**Table 1** The average values in blood & peritoneal fluid after strangulation (Gr. I) & simple obstruction (Gr. Il).

| | 0 Hour | | 8 Hour | | 24 Hour | | 48 Hour | |
|---|---|---|---|---|---|---|---|---|
| | I | Il | I | Il | I | Il | I | Il |
| Amylase (U/L) | | | | | | | | |
| Blood | 430 | 387 | 457 | 461 | 532 | 558 | 627 | 603 |
| P.Fluid | 267 | 184 | 426 | 235 | 526 | 283 | 845 | 391 |
| Ammonia (mg/dl) | | | | | | | | |
| Blood | 35 | 41 | 46 | 41 | 59 | 40 | 70 | 45 |
| P.Fluid | 126 | 107 | 412 | 242 | 510 | 297 | 832 | 371 |
| LDH (U/L) | | | | | | | | |
| Blood | 211 | 121 | 294 | 136 | 374 | 191 | 490 | 338 |
| P.Fluid | 21 | 37 | 195 | 60 | 315 | 89 | 493 | 220 |
| CPK (U/L) | | | | | | | | |
| Blood | 335 | 228 | 409 | 268 | 502 | 283 | 565 | 424 |
| P.Fluid | 53 | 65 | 280 | 112 | 411 | 247 | 790 | 351 |
| SGOT (U/L) | | | | | | | | |
| Blood | 22 | 15 | 49 | 30 | 62 | 49 | 110 | 97 |
| P.Fluid | 20 | 4 | 54 | 25 | 72 | 43 | 170 | 97 |
| SGPT (U/L) | | | | | | | | |
| Blood | 26 | 27 | 80 | 41 | 71 | 53 | 122 | 101 |
| P.Fluid | 10 | 10 | 28 | 20 | 73 | 27 | 130 | 40 |
| Alk.Phos (U/dl) | | | | | | | | |
| Blood | 60 | 40 | 84 | 50 | 98 | 92 | 156 | 135 |
| P.Fluid | 80 | 43 | 81 | 52 | 137 | 69 | 148 | 85, |

tenderness to be helpful in the diagnosis of strangulation; Shalia et al (1), found absence of fever in 70%, and absence of leukocytosis or tachycardia in more than 40% in patients with strangulation. Bizer et al (2), did not find fever, tachycardia or localised abdominal tenderness to be helpful in rulling out strangulation among over 70 years old patients with mechanical small bowel obstruction. Sarr et al (7), combining the classical finding and laboratory tests found the correct diagnosis in 79% of patients. These results turned the investigators towards finding spesific laboratory tests for strangulation of small bowel. The main circulation markers which are examined for this aim are amylase, alkaline phosphatase, LDH, CPK, SGOT, inorganic phosphatase and hexosaminidase (2,15). Sarr et al (7), examining the level of blood amylase, SGOT, SGPT, alkaline phosphatase and CPK in simple obstruction and strangulation proved that only CPK-BB izoenzyme has the predictive values, but other routine laboratory evaluations proved to be of no dlscrimnant benefit. Shalia et al (1), has examined increase of SGOT 46%, LDH 37%, amylase 10% among the patients. Graeber et al (16) proved that CPK increase has the diagnostic value in strangulation, but LDH increase hs not. Thomson (17), in his study examined that the CPK increase in strangulation obstruction was shown only on 54% patients.

In our study we have examined the increase in the level of blood amylase SGOT, SGPT, CPK and alkaline phosphatase at the dogs which were applied the simple obstruction and strangulation. But when we compared both groups the increases of CPK and LDH levels in the strangulation group were statistically important. These results are in agreement with other reports (16,17).

Peritoneal fluid evalation has been applied since the beginning of this century, later an this method has been used to prove the strangulation, but any important difference couldn't be found between simple obstruction and strangulation groups in the bacteriological and hematological studies (9). In the recent studies the increase of LDH, alkaline phosphatase, lactic acid and ammonia levels in peritoneal fluid of strangulation obstructions has been shown by many investigators (8,10,11). As a result of our study the increase levels of amylase, SGOT, CPK, LDH and ammonia of the dogs which were applied strangulation were seen statistically important.

In conclusion we think that blood CPK, LDH and pertoneal fluid amylase, SGPT, CPK and LDH levels must be examined for diagnosis of strangulation in intestinal obstructions. These results indicate agreement with the other studies. But even when we apply together the clinical and laboratory methods, preoperative differentiation of simple obstruction and strangulation is very difficult.

In the recent years laparoscopic methods in small bowel obstructions were begun to be used. Laparoscopic evaluation in strangulation supplying early and correct diagnosis, may be a method which decreases the mortality (18). That's why same new studies must be done.

İntestinal strangulasyonda
laboratuar kriterleri

*Basit ve strangülasyonlu barsak obstrüksiyonuklinik ayırımı, çok sayıda klinik, radyolojik ve biyokimyasal tekiklere rağmen hala zordur. Ne yazık ki bu konu ile ilgili retrospektif çalışmalar bu parametrelerin her biri stragülasyonun saptanması veya ekarte edilmesinde tek başına güvenilir değildi". Bu çalışmada, basit intestinal obstrüksiyon oluşturulan 7 köpek ile deneysel ince barsak strangülasyonu oluşturulan 10 köpekte periton sıvısı ve kandaki amonyak, amilaz, laktik dehidrogenaz, alkalen fosfataz, CPK, SGOT ve SGPT düzeylerini ölçtük. Bütün köpeklerde kan ve periton sıvısında bu parametrelerde lineer bir artış izlendi. Elde ettiğimiz veriler periton sıvısında amonyak, amilaz, CPK, SGOT ve LDH tayinlerinin barsak strangülasyonunun kesin tanısında yararlı olabileceğini düşündürmektedir. [Turk J Med Res 1994; 12(1): 25-28]*

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