

# SIGNIFICANCE OF BLOOD LACTATE LEVEL DETERMINATION IN THE DIAGNOSIS OF ACUTE INTESTINAL OBSTRUCTION IN ELDERLY PATIENTS

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**The aim of the investigation** was to assess the significance of determining blood lactate level in the diagnosis of acute intestinal obstruction in elderly patients.

**Materials and Methods.** The data of blood lactate level determination in 82 elderly patients were studied. The first group included 39 elderly patients with acute intestinal obstruction, and the control group — 43 patients with various somatic pathologies. To determine the blood lactate level we used photocolorimetric method of lactate-oxidase reaction on a portable apparatus Accutrend® Plus (Roche Diagnostics, Switzerland) using original test strips Accutrend® Lactat (Roche Diagnostics, Switzerland).

**Results.** Acute intestinal obstruction was arrested conservatively in 12 patients of the first group, the lactate level being 3.32 [2.51; 3.96] mmol/L. 27 patients of group 1 were operated on. In 16 of them no critical intestinal ischemia requiring bowel resection was found. The mean values of this parameter in this category of patients before surgery were 5.14 [4.64; 5.63] mmol/L. Abdominoscopy showed 11 patients to have necrosis of the part of jejunum. Blood lactate level before surgery appeared to be 8.23 [7.36; 8.96] mmol/L. The blood lactate concentration in control patients was 1.89 [1.25; 2.30] mmol/L. In pair comparison of mean values of the indices under study in control patients and in different categories of patients the differences were significant ( $p < 0.05$ ).

**Conclusion.** When determining surgical indications in elderly patients with acute intestinal obstruction it is reasonable to consider the results of blood lactate test along with clinical and instrumental data. The higher the values of this parameter, the higher the possibility of intestinal necrosis to develop ( $r = 0.46$ ;  $p = 0.037$ ).

**Key words:** acute intestinal obstruction; blood lactate; elderly patients.

The key pathogenetic link in determining the severity of the patients with acute intestinal obstruction (AIO) is ischemia of the intestinal wall [1–4]. Concomitant somatic pathologies in elderly patients contribute to the progressing onset of fatal outcomes of intestinal circulatory disorders [2, 5]. The timely preoperative diagnosis of ischemia minimizes the risk of necrosis of part of the intestine [6, 7]. Currently, determining blood lactate (BL) level is used for the diagnosis of the degree of microcirculatory changes [8]. This laboratory test is also effective for the early diagnosis of bowel-wall ischemia [7]. However, elderly patients, together with microcirculatory changes developing in AIO, have common chronic vascular insufficiency due to concomitant diseases [9]. Unfortunately, in the available literature, we did not find any reports on the study of the diagnostic role of LC level in elderly patients with AIO. This has become the basis of our study.

**The aim of the investigation** was to assess the

clinical significance of determining blood lactate level in the diagnosis of acute intestinal obstruction in elderly patients.

**Materials and Methods.** We carried out a prospective clinical study, which included 82 elderly patients (WHO classification, 2012), who were treated in the Dzerzhinsk Emergency Hospital of the Nizhny Novgorod region from January, 2012 to September, 2013. There were 17 men and 65 women. The median age was  $69.8 \pm 27$  years.

Two groups of patients were formed: study group 1, control group 2 to perform a comparative data analysis.

The study was carried out in accordance with the Declaration of Helsinki (adopted in June 1964 (Helsinki, Finland) and revised in October 2000 (Edinburgh, Scotland)) and approved by the Ethic Committee of Nizhny Novgorod State Medical Academy. A written informed consent was received from each patient.

Group 1 consisted of 39 patients with AIO, including 8 men and 31 women. The median age was  $68.3 \pm 1.9$

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years. The diagnosis of AIO was established on the grounds of examination, plain X-ray analysis and abdominal ultrasonography findings, general laboratory and biochemical blood tests indices being taken into consideration.

Surgery timing and pattern, as well as the course of the early postoperative period were analyzed. Particular attention was paid to the intraoperative macrovisual manifestations of the intestinal circulatory disorders (color, the presence of motility and vascular pulsation) and the pathomorphological findings of the operational material in case of resection of part of the intestine. 37 patients had had abdominal surgery in the history. The mean length of time from the onset of the disease was  $20.5 \pm 3.5$  h.

The prevailing somatic pathologies in the group 1 patients were disseminated atherosclerosis (37), ischemic heart disease (28), cardiac arrhythmias (9), hypertension (21), chronic obstructive pulmonary disease (16), type II diabetes mellitus (11).

Group 2 included 43 patients who were treated for somatic pathologies, 9 men and 34 women among them. The median age was  $71.1 \pm 2.4$  years. The criterion for the inclusion of patients into group 2 was their equivalence by age, gender and concomitant pathology to the group 1 patients.

To determine the BL level we used a photocolometric method of lactate oxidase reaction at the portable apparatus Accutrend® Plus (Roche Diagnostics, Switzerland) with the application of the original test-strips Accutrend® Lactat (Roche Diagnostics, Switzerland). The patients' venous blood was studied, taken into standard test tubes with Li-heparin as a stabilizer (vacutainers to study plasma with the volume of 2 ml).

The statistical analysis was performed using the statistical software pack for Excel 2003, Statistika 6.0 (StatSoft, Inc., 2001). The distribution pattern was determined with the application of the Shapiro–Wilk criterion. The data in the text were presented as  $M \pm \sigma$ , where  $M$  is the arithmetic mean of the indices for  $n$  patients in each group with  $\sigma$  being the standard deviation on the assumption of normal distribution of the indices values. The nonparametric data were described as the median, upper quartile (25<sup>th</sup> percentile) and lower quartile (75<sup>th</sup> percentile) in the Me format [25; 75]. To determine the differences between the independent groups, the nonparametric Mann–Whitney test (U criterion) was used. The Dunn criterion (criterion Q) was used for pair comparison of independent samplings. In order to study the relationship between two features,

the Spearman rank correlation method was used. Correlation was considered to be significant provided  $r \geq 0.4$ ;  $p < 0.05$ . The critical level of significance ( $p$ ) when testing statistical hypotheses was set to be 0.05.

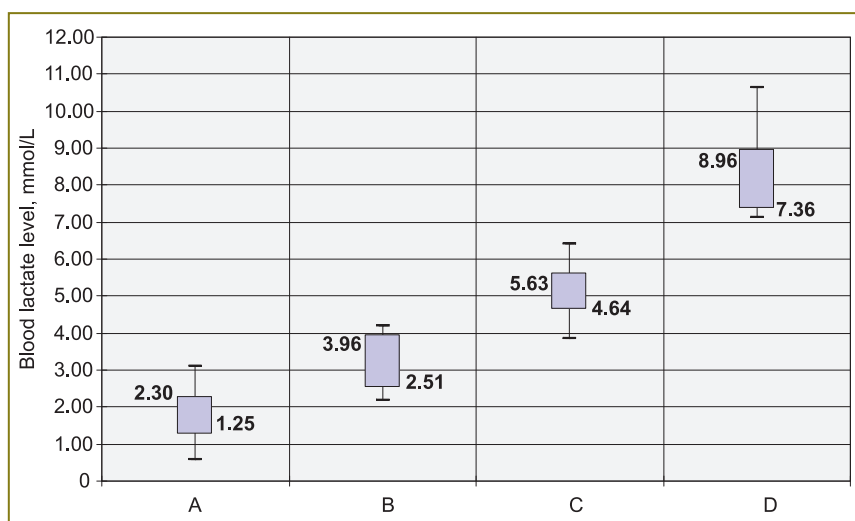
**Results and Discussion.** The BL level was 1.89 [1.25; 2.30] mmol/L in group 2 (control) (See the Figure). This index is slightly higher than the reference values presented in literature [7, 8]. In our opinion, this is associated with altered tissue perfusion in elderly patients due to somatic pathology, particularly to such diseases as diabetes and atherosclerosis.

AIO was arrested conservatively in 12 patients of the first group (spasmolytics, cleansing enemas, nasogastric intubation). Their BL level came to 3.32 [2.51; 3.96] mmol/L.

27 patients of group 1 were operated on for AIO. Laparotomy, commissure dissection, nasointestinal intubation were performed in 16 of them. Critical ischemia of the intestinal wall, requiring intraoperative bowel resection was not found. The BL values before surgery were 5.14 [4.64; 5.63] mmol/L in these patients.

11 patients operated on due to macrovisual signs at the abdominal cavity revision were found to have necrosis of the part of the jejunum with its extension from 4 to 8 cm, bowel resection was performed. It should be noted that necrosis of the intestinal wall was confirmed in all the patients by the histomorphological study of the operation material. The blood lactate concentration before surgery exceeded 7 mmol/L (8.23 [7.36; 8.96] mmol/L on average) in these patients.

In pair comparison of the indices under study in the control group patients and in the study group patients, the differences in some categories turned out to be statistically significant ( $p_1=0.044$ ,  $p_2=0.038$ ;  $p_3=0.032$ ).



Blood lactate indices in patients of groups 1 and 2: A — in group 2 patients ( $n=43$ ); B — in group 1 patients who underwent conservative treatment of AIO ( $n=12$ ); C — before surgery in group 1 patients who did not have necrosis of part of the intestines ( $n=16$ ); D — before surgery in group 1 patients who were found to have necrosis of part of the intestines ( $n=11$ )

The correlation analysis showed that the higher the value of BL in elderly patients with AIO, the higher the possibility of intestinal necrosis to develop ( $r=0.46$ ;  $p=0.037$ ). Similar results are shown in the article by Sh.V. Timerbulatov et al. [7], but in their study, the authors did not use stratometric sampling of patients in different age groups.

The BL values were reduced to the level of 2.52 [1.96; 2.74] mmol/L over 48–72 h after surgery against the background of intensive therapy aimed at fighting endogenous intoxication and toxemia, water-electrolytic and metabolic balance correction, elimination of tissue hypoxia and recovery of intestinal motor activity. It seems to be conditioned by gradual elimination of the microcirculatory disorders of the intestinal wall in the early postoperative period.

**Conclusion.** When determining surgical indications in elderly patients with acute intestinal obstruction it is reasonable to consider the results of blood lactate test along with clinical and instrumental data. The higher the values of this index, the higher the possibility of intestinal necrosis to develop ( $r=0.46$ ;  $p=0.037$ ).

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