



Predictive Value of CRP and Lactate Levels for Bowel Gangrene/Strangulation in Patients with Bowel Obstruction

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 13 Oct 2023	<p>Background: Bowel blockage is a frequent and potentially fatal illness that requires quick identification of consequences like gangrene and strangling of the bowel. In order to diagnose intestinal gangrene/strangulation in patients with bowel obstruction, this study evaluated clinical symptoms and laboratory markers, specifically C-reactive protein (CRP) and lactate levels. Methods: One hundred patients who presented with intestinal obstruction participated in prospective observational research that we conducted. Clinical signs were evaluated, including guarding, vomiting, abdominal distension, irreducible edema, and pain in the abdomen. For the purposes of measuring lactate and CRP, blood samples were taken. Radiological findings, intraoperative assessment, and histological examination were required as part of the diagnostic criteria for intestinal gangrene/strangulation. Results: Common clinical symptoms were stomach discomfort (98%), vomiting (67%), and abdominal distension (58%). In 40% of individuals, irreversible edema was observed. In 54% of instances, a history of constipation was mentioned. Gangrenous bowel was substantially related with elevated lactate and CRP levels ($p < 0.001$). In gangrenous bowel, mean lactate concentrations were 870.25 mmol/L compared to 536.62 mmol/L in viable bowel, and mean CRP concentrations were 141 mg/L compared to 68.23 mg/L in viable intestine. Conclusion: Bowel blockage is typically diagnosed based on clinical signs such as abdominal pain and unremitting swelling. Furthermore, in these individuals, high CRP and lactate levels are useful indicators for detecting intestinal gangrene/strangulation. The incorporation of these markers into clinical practice may help patients with intestinal obstruction receive early management and experience better results. To determine precise cutoff values for these markers in everyday practice, more study is required.</p>
CC License CC-BY-NC-SA 4.0	Keywords: C-reactive protein, Lactate, Bowel obstruction, Bowel gangrene, Strangulation.

1. Introduction

A difficult medical condition with substantial clinical ramifications is bowel blockage. When the usual movement of intestinal contents is obstructed, it can happen, which can cause pressure to build up, discomfort, and possible consequences. Many intestinal blockage instances can be treated conservatively, however other people risk a more dire outcome if intestine gangrene or strangulation develops. The blood supply to the intestines is compromised, which can cause tissue ischemia, necrosis, and probable perforation. If these serious complications are not rapidly identified and treated, the results can be disastrous.

Various etiologies, such as adhesions, hernias, tumors, and volvulus, among others, can lead to bowel obstruction. The clinician's main goal is to quickly identify patients who are at danger of gangrene or strangulation so that the proper therapies can be started, regardless of the underlying cause. Clinical evaluation, radiographic imaging, and laboratory tests are some of the modern diagnostic methods that

provide helpful information about the patient's condition. However, there is still a critical need for more precise and sensitive indicators that can quickly identify the presence of bowel gangrene or strangulation.

Lactate and C-reactive protein (CRP) have become promising options to meet this need. The liver produces CRP as an acute-phase reactant in response to inflammation. Elevated CRP levels are a promising diagnostic for detecting intestinal impairment since they are connected to a number of inflammatory diseases and tissue damage. A byproduct of anaerobic metabolism called lactate can build up in tissues that lack oxygen, such as those that have had ischemia. As a result, elevated lactate levels could indicate tissue hypoxia, which is a defining feature of intestinal gangrene and strangulation.

The practical difficulty of differentiating between a straightforward intestinal blockage and more serious diseases that necessitate quick surgical intervention is what spurred this study's development. Increased morbidity and mortality rates can result from intestinal gangrene or strangulation that is not treated right away. Currently, choices on patient management are made by doctors using a combination of clinical judgment, imaging studies, and laboratory results. However, there is still potential for improvement in the diagnostic procedure, and these procedures are not always conclusive.

In this study, we explore the potential role of CRP and lactate levels in patients with intestinal blockage as risk factors for gangrene or strangulation.

2. Materials And Methods

Study Design and Patient Selection: This prospective observational study was carried out over an 18-month period at a tertiary care facility. When patients arrived at the emergency room with clinical symptoms and radiological proof of intestinal blockage, we enrolled 100 of them in a row. Prior to taking part in the study, all patients gave their informed consent. The institution review board gave its approval after the study was carried out in conformity with the Declaration of Helsinki.

Data collection: Each patient's complete demographic and medical history was gathered at the time of admission. These included comorbidities, medical history, age, gender, and any presenting symptoms. Abdominal pain, distention, nausea, and constipation were the main clinical complaints noted.

Laboratory analysis: Within six hours of admission, blood samples were taken from each patient. A common laboratory test was used to detect the levels of serum C-reactive protein (CRP), and a lactate analyzer with a threshold value of mmol/L was used to measure the levels of serum lactate. These values were selected in light of prior research that suggested their connection to intestinal ischemia and necrosis.

Radiological Evaluation: To confirm the diagnosis of bowel obstruction and to determine the size and location of the obstruction, all patients received radiological imaging, commonly a computed tomography (CT) scan of the abdomen and pelvis. Radiological observations were recorded, including the presence of free air, thickening of the gut wall, and ischemia alterations.

Bowel gangrene or strangulation was identified using a combination of clinical, radiographic, and surgical evidence as the diagnostic criteria. It was necessary to have radiological evidence of ischemia alterations, such as pneumatosis intestinalis or free air, in order to diagnose intestine gangrene or strangulation. Evidence of a compromised blood flow to the intestine segment during surgery, such as necrotic or dark intestinal appearance. Removable bowel segments that underwent histopathological analysis revealed ischemia and necrosis.

Utilizing statistical tools, such as SPSS, statistical analysis was carried out. Clinical traits, test results, and patient demographics were all summarized using descriptive statistics. While categorical data were provided as frequencies and percentages, continuous variables were expressed as means with standard deviations (SD) or medians with interquartile ranges (IQR). Depending on the situation, chi-square tests, Student's t-tests, or Mann-Whitney U tests were employed to evaluate various characteristics between patients who had and did not have intestinal gangrene or strangulation.

3. Results and Discussion

Table 1: Clinical Symptoms and History - The most common symptoms were abdominal pain (98%), vomiting (67%), and abdominal distension (58%); 40% of patients also had irreducible edema.

Additionally, 54% of patients had a history of constipation, and 60% reported guarding, both of which helped doctors diagnose intestinal obstruction.

Lab values are listed in Table 2. The potential of lactate levels as diagnostic markers was highlighted by the fact that gangrenous bowel had much higher lactate levels (870.25 mmol/L) than viable bowel (536.62 mmol/L). Additionally, there were substantial differences in CRP levels, with gangrenous bowel exhibiting significantly higher levels (141 mg/L) than viable bowel (68.23 mg/L).

Table 3: Age Distribution - The study population's age distribution showed 35 patients under 40, 45 between 40 and 60, and 20 above 60, giving a complete picture of the age distribution of bowel obstruction patients.

Table 1: Clinical Symptoms and History in Patients with Bowel Obstruction

Finding	Frequency/Percentage
Presence of Abdominal Pain	98%
Presence of Irreducible Swelling	40%
Incidence of Vomiting	67%
History of Not Passing Stools	54%
Presence of Abdominal Distension	58%
Presence of Guarding	60%

Table 2: Laboratory Values in Gangrenous and Viable Bowel

Laboratory Parameter	Mean Value (if applicable)
Mean Lactate Level in Gangrenous Bowel	870.25
Mean CRP Level in Gangrenous Bowel	141
Mean Lactate Level in Viable Bowel	536.62
Mean CRP Level in Viable Bowel	68.23

Table 3: Age Distribution in the Study Population

Age Group	Number of Patients
< 40 years	35
40-60 years	45
> 60 years	20

The results of this study provide insight into the clinical and laboratory features of intestinal obstruction patients. Its significance as a major symptom for diagnosis is underscored by the high incidence of abdominal pain (98%) among research participants, which is consistent with the typical clinical presentation of bowel blockage. Additionally supporting the clinical suspicion of intestinal obstruction and assisting in its identification are abdominal distension (58%) and guarding (60%) in patients.

Noteworthy is the existence of irreducible edema in 40% of patients, which may be a clinical sign of a more severe obstruction or the presence of bowel strangling. Irreducible edema may be a warning sign that necessitates additional investigation and even early surgical intervention.

Vomiting was noted in 67% of patients, indicating that this symptom is prevalent when there is a bowel obstruction. It's crucial to remember that vomiting lacks specificity and can occur in a range of gastrointestinal diseases. Therefore, for a precise diagnosis, it should be taken into account along with other clinical and laboratory results.

54% of patients had a history of constipation, which is in line with the obstructive character of the illness. When this discomfort is present along with other clinical indicators, intestinal blockage may be suspected.

The laboratory results in this study shed important light on the potential value of lactate and CRP levels as diagnostic indicators for identifying viable and gangrenous intestine in patients with intestinal obstruction. Patients with gangrenous colon had mean lactate levels that were substantially higher (870.25 mmol/L) than patients with viable bowel (536.62 mmol/L). Similar to this, mean CRP levels in the gangrenous bowel group (141 mg/L) were significantly higher than in the viable intestine group

(68.23 mg/L). These findings support the potential of high lactate and CRP levels as diagnostic markers in clinical practice by indicating that they may be symptomatic of intestinal ischemia and necrosis.

4. Conclusion

In conclusion, this study offers important new understandings into the clinical and laboratory traits of intestinal obstruction patients. Clinical symptoms in these patients frequently included stomach pain, irreversible swelling, vomiting, a history of not passing stools, abdominal distension, and guarding. These clinical signs and symptoms, particularly abdominal pain and unabating swelling, may be crucial early warning signs of intestinal obstruction.

Additionally, our study emphasizes the potential value of laboratory markers, particularly lactate and CRP levels, in identifying viable intestine in patients with bowel obstruction from gangrenous gut. The presence of gangrenous bowel was substantially related with elevated lactate and CRP levels, highlighting the potential of these biomarkers as diagnostic tools to support clinical decision-making and early intervention.

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