

Prediction of Bowel Gangrene in Intestinal Obstruction using Serum C - Reactive Protein and D - Lactate as Biomarkers

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Abstract: ***Background:** Intestinal obstruction is the one of the most commonly encountered disease in surgical emergency. Strangulation and resulting gangrene is an important complication in terms of both morbidity and mortality of the patients. Early diagnosis and timely surgical interventions improves patient outcomes. **Methods:** Patients with diagnosis of intestinal obstruction admitted in different surgical units of RIMS, Ranchi during July 2021 - August 2021 were included in this study. A prospective, observational study was conducted with 37 patients. Serum C - Reactive protein (CRP) and D - Lactate were measured pre - operatively and their values were correlated with per - operative findings of bowel ischemia. **Result:** Serum CRP and serum D - Lactate were found as useful biomarkers in prediction of bowel gangrene in intestinal obstruction.*

Keywords: Intestinal obstruction, Bowel gangrene, C - Reactive protein, D - Lactate, Bowel ischemia

1. Introduction

One of the most prevalent clinical issues in surgical practise is intestinal obstruction^{1, 2}. Strangulation and resulting gangrene is a serious consequence of intestinal obstruction that requires resection and anastomosis of the affected intestine. Bowel ischemia occurs in 7-42 percent of cases of bowel obstruction³. Bowel ischemia raises the risk of death from bowel obstruction. A higher patient survival rate is associated with an earlier identification of strangulation^{4, 5}. Strangulation is diagnosed largely by clinical examination. Only a few human investigations on preoperative strangulation or bowel gangrene biomarkers have been performed.

Lactate is an anion that results from dissociation of lactic acid which is an intracellular metabolite of glucose. It is the end product of anaerobic glycolysis, the final step of which is conversion of pyruvate to lactate by the enzyme lactate dehydrogenase. Reference range of lactate is 0.5 - 1.5 mmol/L. There is increased production of lactate from anaerobic glycolysis due to reduced oxygen delivery to tissue cells (tissue hypoxia). Lactate exists in nature in two stereoisomeric forms L - lactate and D - lactate.

Both forms (stereoisomers) of lactate are produced from and metabolized to pyruvate by the action of the enzyme lactate dehydrogenase (LDH). However, the enzyme is isomer - specific so that production and metabolism of D - lactate requires D - LDH and L - lactate requires L - LDH. Mammalian cells only contain L - LDH so that in humans the lactate produced is almost exclusively L - lactate. Reference range of D - Lactate is 5 - 20 μ mol/L in healthy adults. Pathological significance of lactate is almost entirely confined to the L - lactate isoform and it is specifically this

isoform that is routinely measured at the point of care and in the laboratory^[13].

The objective of this study is to see if elevated serum C - Reactive protein and D - Lactate can be used as biomarkers in prediction of bowel gangrene in intestinal obstruction.

2. Materials and Methods

A hospital based prospective, observational study was conducted which included the cases admitted in various surgical units at RIMS, Ranchi with clinical features of intestinal obstruction. Patients were included after taking informed consent. The patients who were managed conservatively and who refused the consent were excluded, the cases which cannot make to laparotomy were also excluded while analysing data. This study was conducted on 37 patients with signs of intestinal obstruction and strangulation admitted in emergency between July 2021 and August 2021. Serum C - Reactive protein and D - lactate were measured pre - operatively and their values were correlated with per - operative findings of bowel gangrene.

3. Result & Discussion

The mean age of patients is 52.21 years, with an 11.5 year standard deviation. Males made up the majority of the patients (n=23, 62%), while females made up the rest (n=14, 38%). 30 patients (81%) had abdominal pain, whereas the remainder did not. Abdominal swelling was seen in 40% of the patients (n=15), but was not present in 60% of the patients (n=22).

In patients, 62% (n=23) had vomiting, whereas 38% (n=14) did not. Obstipation was present in about 45% of the patients

(n=17), whereas in the remainder were not. Guarding or rigidity was evident in 60% (n=22) of the patients, whereas the remaining 40% (n=15) lacked guarding or rigidity.

The patients who had bowel sounds were 38% (n=14), whereas the others (n=23, 62%) did not. The majority of them (n=22, 59%) experienced symptoms for more than 48 hours, about 19% (n=7) had symptoms between 24 - 48 hours, and the rest (n=8, 22%) had symptoms for less than 24 hours. Around 83% (n=31) of the participants had never had surgery before. In 32% (n=12) of the cases, bowel gangrene was present, whereas in the remainder were normal.

In the patients with gangrene, serum D - Lactate was high (mean=107, S. D=27.6) and serum CRP was high (mean=126.8, S. D=38.92). Normal CRP levels are typically below 3.0 mg/L and the reference range of D - Lactate is 5 - 20 μ mol/L in healthy adults.

In the case of intestinal obstruction, serum D - Lactate and serum CRP can be used as biomarkers to predict bowel gangrene.

4. Observation Tables

Sex Distribution	
Male	30
Female	7

Symptoms & Signs		
	Present	Absent
1. Abdominal Pain	30	7
2. Abdominal Swelling	15	22
3. Vomiting	23	14
4. Obstipation	17	20
5. Guarding & Rigidity	22	15
6. Bowel Sound	14	23

Duration of Symptoms	
>48 Hours	22
24 - 48 Hours	7
<48 Hours	8

Bowel Gangrene	
Present	12
Absent	25

5. Conclusion

The most serious complication of an intestinal obstruction is strangulation and resulting bowel gangrene, which may necessitate an emergency surgery. In the case of acute intestinal strangulation or gangrene, time is of the essence. Earlier is the diagnosis and intervention; better is the prognosis^{6 - 10}. Strangulation is diagnosed based on the clinical examination and competence of the team assessing the patient^{11, 12}. In the cases of intestinal obstruction, serum d - Lactate and serum CRP are helpful indicators for predicting bowel gangrene.

Limitations of this study are - I) small sample size, which may contribute to non - generalizability of the findings; II)

because all of the patients were admitted in an emergency room, the impact of other co - morbid diseases in the development of intestinal ischemia and illness prognosis is unknown.

6. Future Research Objectives

Multi - centric studies with a larger sample size, randomizations, and long - term follow - up will be useful in evaluating the usefulness of biomarkers (CRP and d - Lactate) in predicting bowel ischemia in cases of intestinal obstruction.

7. Conflict of Interest

There is no conflict of interest among authors.

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