

Original Research Article

The role of pre operative serum LDH and D-dimers in predicting intestinal necrosis

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ABSTRACT

Background: To study the role of serum LDH and D-Dimers in predicting intestinal necrosis, to correlate with bowel viability preoperatively and to determine the aetiology for intestinal necrosis due to Mesenteric Ischaemia or any other causes.

Methods: A prospective study conducted in 100 patients admitted in the Dept of General Surgery, Victoria Hospital, Bangalore Medical College for a period of one year.

Results: In our study out of 100 patients 44 patients had elevated serum LDH which is 44% and among those 44 patients, 39 patients found to have bowel gangrene which is about 88%. Out of 100 patients 9 patients had elevated D-dimer levels which are 9% and among those 9 patients, 6 were suspected of mesenteric ischaemia and all patients had bowel gangrene which 100%.

Conclusions: The pre operative estimation of serum LDH levels in patients presenting with features of acute abdomen helps in identifying the patients with risk of intestinal ischemia and gangrene at the earliest, facilitating early intervention and helping in reduction of morbidity and mortality due to bowel gangrene. Detection of serum D-dimer could not help to differentiate patient with mesenteric ischaemia from those with other causes of bowel necrosis but certainly all cases of mesenteric ischaemia had elevated D-dimer levels. The application of serum LDH and D-dimers in acute abdomen or suspected cases of bowel necrosis will give an important clue regarding the pathology and severity of the disease.

Keywords: D-dimers, Intestinal obstruction, Intestinal necrosis, Mesenteric ischaemia, Serum LDH

INTRODUCTION

Bowel gangrene is a major abdominal catastrophe associated with high mortality rate. This increased mortality is attributed to difficulty in diagnosing the condition early, the late presentation of the patient to the hospital and non availability of precised diagnostic tool for assessing bowel gangrene.¹ Intestinal obstruction accounts for 20% of all surgical emergencies around the world. Intestinal obstruction can result from variety of

causes. When strangulation superimposes and blood supply to the bowel is compromised, it may lead to bowel gangrene. The most common cause of bowel gangrene secondary to mechanical obstruction is strangulated hernia in India and post operative adhesions in developed countries. The other causes being Volvulus, Intussusceptions, Hollow viscus perforation, Mesenteric Ischaemia.² The diagnostic evaluation should focus on the following goals: (a) distinguish mechanical obstruction from ileus (b) determine the etiology of the

obstruction (c) discriminate partial from complete obstruction and (d) discriminate simple from strangulating obstruction.³

The usual diagnostic intervention employed being X rays, USG and contrast enhanced CT in which CECT being the best of investigations. A number of studies have confirmed the utility of diagnostic laparoscopy in patients with acute abdominal pain. The purported advantages include high sensitivity and specificity, ability to treat a number of the conditions causing an acute abdomen laparoscopically, decreased morbidity and mortality, decreased length of stay and decreased overall hospital costs. Diagnostic accuracy is high and reports show the accuracy ranges between 90% and 100%.⁴

The haemostatic system acts to coordinate the delicate balance between bleeding and clot formation. Formation of a blood clot, or thrombus, is essential to prevent bleeding in the event of vascular injury; however, inappropriate thrombus formation can cause significant morbidity and mortality. Arterial and venous systems can develop thrombi, which may cause local obstruction with associated ischaemic symptoms but may also break off or embolize into the circulation and become lodged in distant vessels. This process is called thromboembolisation.⁵ D-dimer is one of the terminal fibrin decomposition products and recent researches found the measurements of the plasma D-dimer levels might be a useful tool for the early diagnosis of Acute Mesenteric Ischaemia.⁶ Early diagnosis of bowel ischaemia remains very difficult, primarily because the early clinical symptoms of this disease are non-specific and initially subtle.⁷

Despite the significant morbidity and mortality associated with this disease, the D-dimer can be used as a tool to identify bowel gangrene due mesenteric ischaemia and will be the focus along with the lactate dehydrogenase which is an enzyme found abundant in Intestinal mucosa and when the Intestinal mucosa undergoes tissue hypoxia/ischaemia, it is released into the serum and its serum level increases.⁸

Lactate dehydrogenase transfers hydrogen using NAD+ as hydrogen acceptor thus catalyzing the oxidation of L-lactate to pyruvate. LDH activity is present in all the cells of the body predominantly in cytoplasm of the cell.⁹ Hence serial estimation of the serum LDH helps us to identify whether the obstruction goes on for gangrene or not.¹⁰ This study was conducted to emphasise the significance of early estimation of rise in LDH levels and D-dimers followed by early intervention which helps in reducing the morbidity and mortality caused by bowel gangrene.

Aim and objective of the study was to study the role of Serum LDH and D-dimers in predicting Intestinal necrosis. To rule out etiology for Intestinal necrosis either due to Mesenteric Ischaemia or due to any other causes.

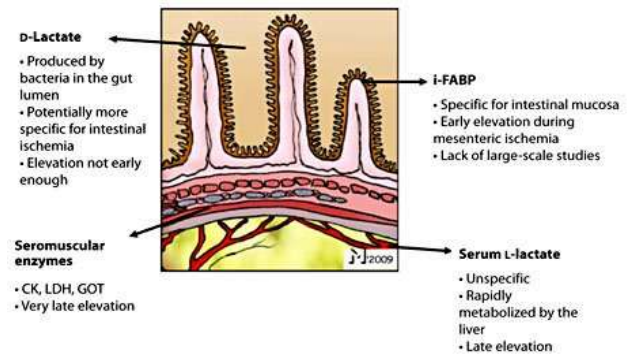


Figure 1: The origins and characteristics of serum markers for mesenteric ischemia.¹¹

METHODS

Type of study

A prospective study was conducted in the Dept of General Surgery, in hospitals attached to Bangalore Medical College, Bangalore.

Study period

Conducted for a period of one year from January 2017 to January 2018.

Study population

Patients presenting with clinical features of acute intestinal ischemia, in both outpatient basis and emergency in Victoria hospital and hospitals attached to Bangalore medical college and research institute, Bangalore.

Inclusion criteria

- All the patients presenting with features of acute abdomen with suspected obstruction/ strangulation/ hollow viscus perforation/mesenteric ischaemia and who are subjected to exploratory laparotomies were included in the study
- Patients with hernia in obstruction/strangulation
- Patients with suspected volvulus/intussusceptions/TB

Exclusion criteria

- Patients presenting with other adynamic obstruction.
- Previous h/o trauma/Ascites/Malignancy
- Congenital causes
- Patients <18 years.

A total number of 100 patients with suspected Intestinal obstruction/necrosis were included. Complete history was taken and physical general and local examination was done. Routine investigations like CBC, TLC, DLC, blood urea, serum creatinine, blood sugar, BT, CT, serum electrolytes, ECG, X-ray chest and abdomen were done

to make a diagnosis of acute abdomen. Blood sample was collected for biochemical estimation of following serum enzymes.

- Serum lactic dehydrogenase (LDH)
- Serum D-dimer.

These patients were divided into three groups based on the operative assessments. First group showing no evidence of strangulation/necrosis. Second group showing necrosis due to mesenteric ischaemia. Third group with strangulation/necrosis due to any other causes.

All three groups are compared and analysed based on levels of serum LDH and D-Dimers.

Statistical analysis

Patients are divided into three groups based on the operative assessments. First group showing no evidence of strangulation/necrosis. Second group showing necrosis due to mesenteric ischaemia.

Third group with strangulation/Necrosis due to any other causes. All three groups are compared and analysed based on levels of serum LDH and D-Dimers. Quantitative normally distributed variables were presented as means and standard deviation (SD) and non-normally distributed variables as medians and 25th – 75th quartile ranges.

RESULTS

In our study major cause of acute abdomen in patients undergoing surgery being hollow viscus perforation (51%) followed by adhesions and bands (19%). Males (82%) being predominantly affected one.

Majority was of 41-51 years age group and severity of disease and complications were addressed more as the age advances.

Table 1: Age wise distribution of cases in comparison with biochemical markers.

Age (in years)	Number of cases	Elevated LDH	Elevated D-Dimers	Number of cases of gangrenous bowel
10-20	1	1	0	0
21-30	11	5	0	4
31-40	15	6	0	5
41-50	34	15	2	14
51-60	21	10	2	9
61-70	14	5	4	5
71-80	4	2	1	2
>80	0	0	0	0
Total	100	44	9	39

Table 2: Etiological distribution of cases in comparison with biochemical markers and intra operative findings.

Etiology	No. of cases	Number of cases with elevated LDH	Number of cases with elevated D-dimers	Number of cases with gangrenous bowel
Adhesions/Bands	19	7	0	6
Obstructed/Strangulated hernia	Inguinal	11	8	7
	Incisional	2	0	0
	Umbilical	5	0	0
Mesenteric ischaemia	6	6	6	6
Volvulus	2	2	0	2
Intussusception	4	4	0	3
Hollow viscus perforation	51	17	2	15

Table 3: Severity of Intestinal necrosis in comparison with the levels of serum LDH.

LDH Levels	Simple	Intestinal necrosis		
		Mild	Moderate	Severe
Normal	56	0	0	0
50-200	5	14	8	0
200-400	0	7	3	0
400-700	0	2	1	2
700-1000	0	0	0	1
>1000	0	0	0	1

Table 4: Severity of intestinal necrosis in comparison with the levels of D-Dimers.

D-Dimer Levels	Simple	Intestinal necrosis		
		Mild	Moderate	Severe
Normal	58	0	0	0
50-200	3	0	0	0
200-400	0	0	2	0
>400	0	0	0	4

Table 5: Various co morbidities and risk factors associated with disease.

Co Morbidities	Strangulated/ischaemic necrosis
Hypertension	16
IHD	9
Diabetes	11
Smoking	26
Previous surgeries	4

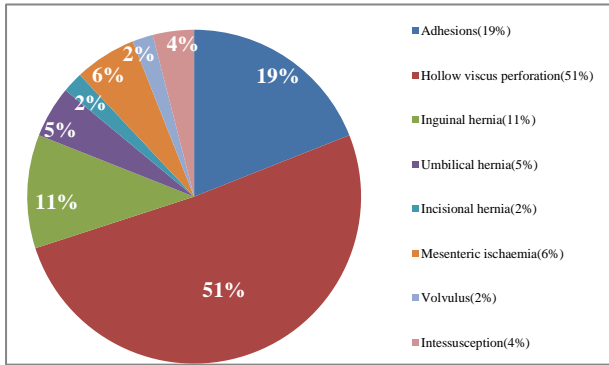


Figure 2: Etiology of acute abdomen.

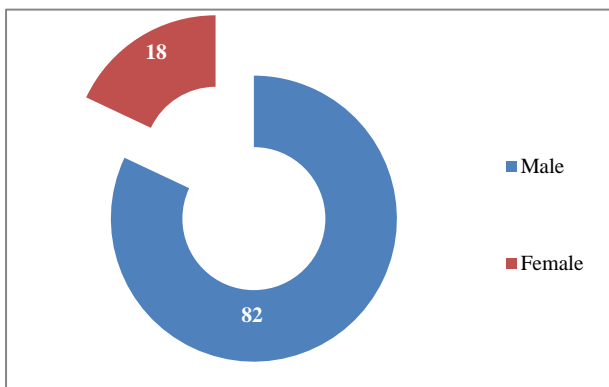


Figure 3: Gender distribution.

35% of the cases presented to hospital after 72 hours following onset of symptoms which further enhances in the severity and progression of underlying disease.

Out of 100 patients who are being taken up for surgery, 39 patients had intestinal necrosis which were divided into mild, moderate and severe based on the length of intestine undergoing necrosis.

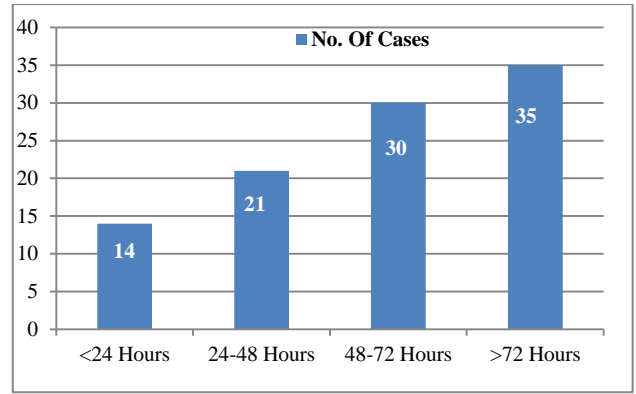


Figure 4: The time of presentation and number of cases.

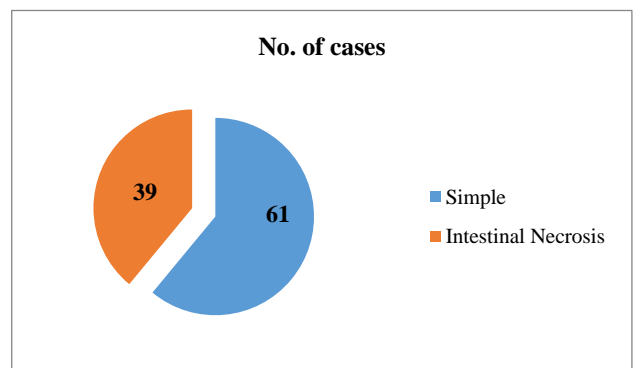


Figure 5: Distribution of intra operative findings of all cases undergoing surgery.

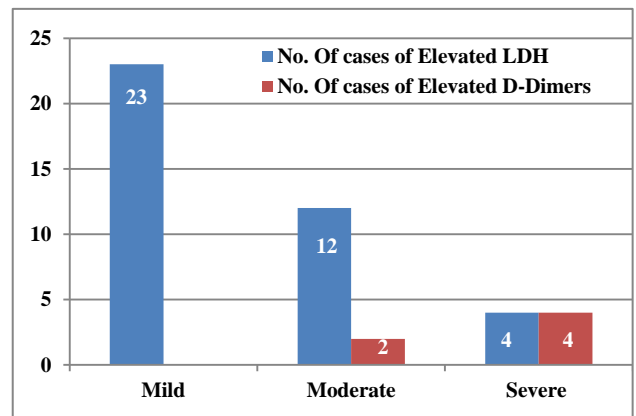


Figure 6: Comparison of severity of the disease with the number of cases having elevated LDH and D-Dimer.

26 patients out of 100 were smokers and 16 patients had underlying Hypertension when they presented to us with acute abdomen.

DISCUSSION

Acute abdomen is one of the most common surgical emergencies encountered in surgical practise. As

abdomen considered to be the Pandora's box due to its variety of conditions and pathologies, it is often very difficult to understand and analyse the pathology and come to final conclusions specially when an acute abdomen being presented due to Acute Mesenteric Ischaemia which is usually a diagnosis of exclusion. When it is related to intestinal pathology, its often required to take help of radiological interventions such as X rays, Ultrasonography or CT. Contrast enhanced CT being the better modality of investigation to diagnose the condition and to assess the underlying severity of disease. But often CECT cannot be utilised as patients presents late to the hospital and sepsis, shock with multiorgan failure has already set in especially Kidneys wherein the contrast enhanced radiological investigations are contraindicated. So the severity can be assessed only after taking up the patient for surgery and evaluating the intraoperative findings. Thus need of other investigating tool is very much required in pre operative assessment and severity of underlying pathology so as to be well prepared for the consequences and risks of intra and post surgery which can be conveyed to patients and his/her relatives preoperatively. In this regards the use of simple and cost effective investigations like serum LDH and D-Dimers in all the patients presenting with acute abdomen which can be done pre operatively, not only give a important clue regarding the underlying pathology and severity of intestinal necrosis but also can plan the surgery accordingly and can convey the expectant patients intra and post operative surgical events to the patients and the relatives.

In our study out of 100 patients 44 patients had elevated serum LDH which is about 44% and among those 44 patients, 39 patients found to have bowel necrosis which is about 88%. As compared to the study done by Rajaashok et al an elevated level of LDH is found in 80% of patients who had bowel necrosis and according to Muchas an elevated level of LDH is found in 86% of patients who had bowel necrosis.^{2,7}

Out of 100 patients 9 patients had elevated D-Dimers which is 9% and among those 9 patients, 6 were suspected Mesenteric Ischaemia and all had bowel gangrene which 100% and out of 3 patients 2 had other causes of acute abdomen in sepsis with elevated D-dimers probable due to sepsis induced DIC and 1 patient was known cardiac patient. As compared to the study done by Da-Li Sun et al which showed 95% sensitivity of use of D-dimers in application of bowel necrosis following Mesenteric Ischaemia.¹

CONCLUSION

The pre operative estimation of serum LDH levels in patients presenting with features of acute abdomen helps in identifying the patients who undergo intestinal ischaemia and gangrene at the earliest. Its levels also help in determining the underlying severity of intestinal gangrene/ necrosis based on the levels at which its raised

which help in making an early intervention possible and helps in reducing the morbidity and mortality due to bowel gangrene. Detection of serum d-dimer could not help to differentiate patient with Mesenteric Ischaemia from those with other causes of acute abdomen due to the fact that D-dimers could be elevated in cases of sepsis related DIC and other cardiac conditions but certainly all cases of Mesenteric Ischaemia had elevated D-dimer levels. Thus giving a clue of underlying pathology could be Acute Mesenteric Ischaemia in significantly elevated D-Dimer levels as its very difficult to diagnose clinically. Through this study it is very well conveyed that the application of simple investigating tools like estimating serum LDH and D-dimers in acute abdomen and suspected cases of underlying bowel necrosis will give an important clue regarding the pathology and severity which can be a adjunct tool along with other radiological investigations.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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