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A STUDY ON ASSESSMENT OF SERUM LACTATE LEVELS IN INTESTINAL OBSTRUCTION

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ABSTRACT :

Background: Intestinal obstruction is one of the commonest clinical problems encountered in surgical practice.Strangulation is one of the grave complications of intestinal obstruction that requires emergency laparotomy. During ischemia the cells will start anaerobic dissimilation and the serum lactate rises D-lactate is not produced in mammalian tissue, but it is detected in a situation of an abnormal proliferation of enteral bacterial flora due to mucosal injury following mesenteric ischemia.

Methods: Data collected from Department of General surgeryof Sree Mookambika Institute of Medical sciences, kanyakumari, tamil nadu, from march 2023 to september 2024. Inclusion criteria are Patients of age group > 12 years and both sex, Patients with clinical suspicion of acute intestinal obstruction. Exclusion criteria are Patients with co-existing medical illness such as chronic kidney disease, diabetes mellitus, any cardiac ailment and coagulopathies as they lead to false positive results, Patients with any intraoperative finding apart from simple or strangulated bowel obstruction.

Results: In this study operative findings, hernia and adhesions were the most common findings. Out of 50 patients, 72% had strangulation and bowel gangrene as intra operative findings and the rest were simple obstructions. The mean serum lactate value in the patients were 5.16 mmol/L ranging between 1.70 to 8.60 mmol/L.

Conclusion: A positive correlation between elevated serum lactate and strangulation bowel obstruction had been established via this study. Further studies incorporating various biomarkers and their correlation with clinical presentation and radiological findings should be sought**.**

Keywords: Serum lactate, Intestinal obstruction.

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INTRODUCTION:

Intestinal obstruction is one of the commonest clinical problems encountered in surgical practice.Strangulation is one of the grave complications of intestinal obstruction that requires emergency laparotomy.Ischemia, that complicates 7 to 42% of bowel obstructions, significantly increases mortalities associated with bowel obstruction. Time is an essence, with an earlier diagnosis of strangulation favoring increased patient's survival

The diagnosis of strangulation is primarily clinical with a sudden onset of paini.e. continuous rather than colicky, the early appearance of shock, and the presence of fever, tachycardia, marked abdominal tenderness, guarding, rebound tenderness and a tender abdominal mass are all in favor of the diagnosis of strangulation.

Various biochemical markers such as serum tumor necrosis factor α, C reactive protein, interleukin 6, lactate, intestinal fatty acid binding protein(I-FABP), creatine kinase B, isoenzymes of lactate dehydrogenase have been studied

Therefore, studies investigating the role of biomarker in predicting strangulation in patients of acute bowel obstruction are needed.

Lactic acid is the normal endpoint of the anerobic breakdown of glucose in the tissues.L-lactate and D-lactate are the two optical isomeric forms of lactate L – lactate is the final end product of anaerobic glycolysis. During this process it is formed out of pyruvic acid by the enzyme lactate dehydrogenase (LDH). During ischemia the cells will start anaerobic dissimilation and the serum lactate rises D-lactate is not produced in mammalian tissue, but it is detected in a situation of an abnormal proliferation of enteral bacterial flora due to mucosal injury following mesenteric ischemia.

AIM AND OBJECTIVES OF THE STUDY:

The aim of this prospective observational study is to evaluate the role of Serum Lactate as a marker of strangulation in bowel obstruction

MATERIALS AND METHODS:

Data was collected from patients attending the Department of General surgery Sree Mookambika Institute of Medical sciences, kanyakumari, tamil nadu, 50 cases admitted in General Surgery intensive care unit with clinical suspicion of intestinal obstruction for a period of 6 months (February 2023 to July 2024)

Inclusion criteria are Patients of age group > 12 years and both sex,Patients with clinical suspicion of acute intestinal obstruction.
Exclusion criteria are Patients with co-existing medical illness such as chronic kidney disease, diabetes mellitus, any cardiac ailment and coagulopathies as they lead to false positive results,Patients with any intraoperative finding apart from simple or strangulated bowel obstruction

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Blood samples are taken at the time of presentation in the emergency within 20 minutes of their arrival.By eliciting comorbid history and its duration.Blood sample will be collected and sent to the Department of Biochemistry for separation of sera by centrifugation and storage in sterile vials at -20 degree Celsius and measurement of serum lactate levels are done.Normal serum lactate value is less than 2mmol/L.Cut off value for strangulation is 4mmol/L.Values between 2-4mmol/L indicates strong suspicion.Assessment and comparison of serum lactate levels in various outcomes of intestinal obstruction is done

Statistical analysis was done using the statistical package for social sciences (SPSS).Different statistical methods were used as appropriate. Mean ± SD was determined for quantitative data and frequency for categorical variables. The independent t- test was performed on all continuous variables. The normal distribution data was checked before any t-test. The Chi-Square test was used to analyze group difference for categorical variables. In logistic regression models, age was adjusted for estimation of each or all the independent effects of hypertension, ischemic heart disease and diabetes mellitus . A p-value < 0.05 was considered significant.

RESULTS:

SERUM LACTATE LEVEL

The mean serum lactate level in the patients are 5.16 mmol/L (S.D=1.708) ranging between 2-9 mmol/L.

Characteristic	Serum lactate mmol/L
Mean	5.16
Median	5.30
Mode	6
Std. Deviation	1.708
Minimum	2
Maximum	9

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CLASSIFICATION OF PATIENTS BASED ON SERUM LACTATE VALUES

Based on the serum lactate levels, 72% of them were classified as strangulation, 6% of them as normal and 22% of them with strong suspicion.

Classification	Frequency	Percent
Normal	3	6.0
Strangulation	36	72.0
Strong Suspicion	11	22.0
Total	50	100.0

COMPARISON OF SERUM LACTATE CLASSIFICATION WITH ACTUAL STRANGULATION

Chi-square analysis shows that serum lactate levels significantly differ in groups with and without strangulation.

		STRANGULATION Present		Total	Chi-Square p-value
		NO	YES		50.00 P=0.00653 Highly Significant
Classification	Normal	3	0	3	
	Strangulation	0	36	36	
	strong suspicion	11	0	11	
Total		14	36	50	

COMPARISON OF SERUM LACTATE VALUES BETWEEN DIFFERENT GROUPS

Kruskal-Wallis Test for comparison of serum lactate values across the three groups with normal,

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strangulation and strong suspicion shows that the results are significant with a chi-square value of 30.23 with p=0.00123 (highly significant).

		Normal	Strong Suspicion	Strangulation
Patients		3	11	36
Mean		1.8333	3.4091	5.9722
Median		1.8000	3.6000	5.6000
Mode		1.70[a]	3.50[a]	5.60
Std. Deviation		.15275	.61230	1.17731
Minimum		1.70	2.10	4.60
Maximum		2.00	3.90	8.60

DISCUSSION:

Acute intestinal obstruction possess strangulation as a grave complication and requires prompt diagnosis. This is easier said than done, especially in an emergency setting. Acute intestinal obstruction with reported mortality rates have found association with delay in surgical management with progression to strangulation in many cases.

Most of the lactate found in the human body is L – lactate. Van Noord studied 49 patients with chronic gastrointestinal ischemia and found that L – lactate elevation was significantly increased as compared with the nonischaemic group. Markogiannakis et al had also reported finding in favour of serum lactate as predictor of ischemia and strangulation.

In this study a group of 50 cases of intestinal obstruction with no comorbidities had been taken for

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assessment of various outcomes of obstruction and their relation to levels of serum lactate. Out of the 50 cases, 96% were small bowel obstruction and 4% were large bowel obstruction with a mean age of distribution 54.44 years. About 36% of the sample, had previous history of surgery of which 6% had postoperative adhesions causing obstruction or strangulation. With regard to operative findings, hernia and adhesions were the most common findings. Out of 50 patients, 72% had strangulation and bowel gangrene as intraop findings and the rest were simple obstructions. The mean serum lactate value in the patients were 5.16 mmol/L ranging between 1.70 to 8.60 mmol/L. The cut off values of strangulation, simple obstruction and those subacute cases managed conservatively were 4.3,3.4 and less than 2.3 respectively. Based on these values, 72% were classified as strangulation,22% with strong suspicion and 6% of them were normal. Kruskal-Wallis test for comparison of serum lactate values across the three groups with normal, strong suspicion and strangulation shows that the results are significant with a chi-square value of 30.23 with p=0.00123(highly significant).

The study has shown that serum lactate levels were significantly raised in strangulated bowel obstruction as compared with simple bowel obstruction.

The main strength of this study lies in the fact that it is a prospective study with applicability in an emergency setting in a developing country, where availability of computed tomography (CT) and other costly biomarkers is beyond the reach of poor patients. Also, this study included both small and large bowel obstruction.

CONCLUSION:

A positive correlation between elevated serum lactate and strangulation bowel obstruction had been established via this study. Further studies incorporating various biomarkers and their correlation with clinical presentation and radiological findings should be sought. Such studies would help in reducing the time interval to surgery in cases of acute intestinal obstruction with strangulation as well as decreasing unwarranted laparotomy in those cases of intestinal obstruction without strangulation, that can be managed conservatively depending on other parameters and clinical findings. These biomarkers can be made readily available in the emergency setting after due consideration given to their clinical relevance at the institutional level. This study does add to the current literature regarding the need of decision-making policy for management of acute intestinal obstruction incorporating the role of biomarkers for predicting strangulation at the time of presentation.

LIMITATIONS:

- Study participants were less in number
- Patients of paediatric age group were not a part of this study
- Only serum lactate had been studied as a marker which is naturally inferior when compared to a study with combination of other parameters
- D-lactate had not been studied due to the high cost of the kit
- Radiological, postoperative outcome, length of hospital stay and follow up were not assessed by

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markers with regard to diagnosis of strangulation.

BIBLIOGRAPHY

1. Markogiannakis H, Messaris E, Dardamanis D, Pararas N, Tzertzemelis D, Giannopoulos P, Larentzakis A, Lagoudianakis E, Manouras A, Bramis I. Acute mechanical bowel obstruction: clinical presentation, etiology, management and outcome.World J Gastroenterol 2007 Jan21;13(3):432-437.
2. Morris DD, Moore JN, Crowe N. Serum tumor necrosis factor activity in horses with colic attributable to gastrointestinal tract. Am J Vet Res 1991 Oct;52(10):1565- 1569.
3. Hilal K, Koçdor MA, Astarcioğlu H, Fadiloğlu M. Serum tumor necrosis factor-α, glutamate and lactate changes in two different stages of mechanical intestinal obstruction. Turk J Gastroenterol 2003 Jun;14(2):115-119.
4. Block T, Nilss on TK, Björck M, Acosta S. Diagnostic accuracy of plasma biomarkers for intestinal ischaemia. Scand J Clin Lab Invest 2008; 68(3):242-248.
5. Yamamoto T, Umegae S, Kitagawa S, Matsumoto K. The value of plasma cytokine measurement for the detection ofstrangulation in patients bowel obstruction.
6. Dis Colon Rectum 2005 Jul;48 (7) :14 51-1459.
7. Grotz MR, Deitch EA, Ding J, Xu D, Huang Q, Regel G. Intestinal cytokine response after gut ischemia role of gut barrier failure. Ann Surg 1999 Apr;229(4):478- 486.
8. Isaksson K, Weber E, Andersson R, Tingstedt B. Small bowel obstruction: early parameters predicting the need for surgical intervention.
   Eur J Trauma Emerg Surg 2011 Apr;37(2): 155-159.
9. van Noord D, Mensink PB, de Knegt RJ, Ouwendijk M, Francke J, van Vuuren AJ, Hansen BE, Kuipers EJ. Serum markers and intestinal mucosal injury in chronic gastrointestinal ischemia.
   Dig Dis Sci 2011 Feb;56(2):506-512.
10. Çevikel MH, Özgün H, Sükrü B, Demirkiran AE, Aydin N, Sari C, Erkus M. C- reactive protein may be a marker of bacterial translocation in experimental intestinal obstruction. ANZ J Surg 2004 Sep;74(10):900-904.
11. Firoozamand E, Fairman N, Sklar J, Waxman K. Intravenous interleukin-6 levels predict need for laparotomy in patients with bowel obstruction. Am Surg 2001 Dec;67(12):1145-1149.
12. Lange H, Jackel R. Usefulnes s of plasma lac tate concentrations in the diagnosis of acute abdominal disease. Eur J Surg 1994 Jun-Jul;160(6-7):381-384.
13. Murray MJ, Gonze MD, Nowak LR, Cobb CF. Serum D-lactate levels as an a id to diagnosing acute intestinal ischemia. Ann J Surg 1994 Jun;167(6):575-578.
14. Kurimoto Y, Kawaharada N, Ito T, Morikawa M, Higami T, Asai Y. Experimental evaluation of lactate concentration following mesenter ic ische mia. Surg Today 2008;38 (10):926-930.
15. Smith SM, Eng HK, Buccini F. Use of D lactic acid measurement in the diagnosis of bacterial infections. J Infect Dis 1986 Oct;154 (4):658-664.
16. Perlmutter DH, Boyle JT, Campos JM, Egler JM, Watkins JB. D-lactic acidosis in children: an unusual metabolic complication of small bowel resection. J Pediatr 1983 Feb;102(2):234-238.
17. Stolberg L, Rolfe R, Gitlin N, Merrit J, Mann L, Linder J. D-lactic acidosis due to abnormal

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flora.N Engl J Med 1982 Jun 3;306(22):1344-1348.
18. Mayne AJ, Handy DJ, Preece MA, George RH, Booth IW. Dietary management of D-lactic acidosis in short bowel syndrome. Arch Dis Child 1990 Feb;65(2):229-231.
19. Günel E, Cağlayan O, Cağlayan F. Serum D-lactate levels as a predictor of intestinal ischemia-reperfusion i njury. Pediatr Surg Int 1998 Nov;14(1-2):59-61.
20. Mahmut B, Ahmet B, Ahmet K, Akçay F, Selçuk SA. Serum D-lactate and nitric oxide (NO) levels in acute intestinal ischemia. Tr J Med Sci 1999;29:37-40.
21. DeLaurier GA, Cannon RM, Johnson RH Jr, Sisley JF, Baisden CR, Mansberger AR Jr. Increased peritoneal fluid lactic acid values and progressive bowel strangulation in dogs. Am J Surg 1989 Jul;158(1):32-35.
22. Acosta S, Nilsson TK, Bjorck M. D-dimer testing in patients with suspected acute thromboembolic occlusion of the superior mesenteric artery. Br J Surg 2004 Aug;91(8):991-994.
23. Boguse vicius A, Grinkevicius A, Male ckas A, Pundzius J. The role of D-dimer in the diagnosis of strangulated small-bowel obstruction. Medicina (Kaunas) 2007;43(11):850-854.
24. Khurana S, Corbally MT, Manning F, Armenise T, Kierce B, Kilty C. Glutathione S -transferase: a potential new marker of intestinal ischemia. J Pediatr Surg 20 02 Nov;37(11):1543-1548.
25. Gearhart SL, Delaney CP, Senagore AJ, Banbury MK, Remzi FH, Kiran RP, Fazio VW. Prospective assessment of predictive value of alpha glutathione S-transferase for intestinal ischemia. Am Surg 2003 Apr;69(4):324-329.
26. Demir IE, Ceyhan GO, Friess H. Beyond lactate: is there a role for serum lactate measurement in diagnosing acute mesenteric ischemia? Dig Surg 2012;29(3):226-235
27. Lin YP, Lee J, Chao HC, Kong MS, Lai MW, Chen CC, Chen SY, Luo CC. Risk factors for intestinal gangrene in children with small-bowel volvulus.
28. Pediatr Gastroenterol Nutr 2011 Oct; 53(4):417-422.
29. Poeze M, Froon AH, Greve JW, Ramsay G. D-lactate as an early marker of intestinal ischaemia after ruptured abdominal aortic aneurysm repair. Br J Surg 1998 Sep;85 (9):1221-1224.
30. Evennett NJ, Petrov MS, Mittal A, Windsor JA. Systematic review and pooled estimates for the diagnostic accuracy of serological markers for intestinal ischemia. World J Surg 2009 Jul; 33(7):1374-1383.