ORIGINAL RESEARCH

Estimation of specific biochemical markers for acute mesenteric ischemia in cases of Acute Abdomen

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Abstract

Background: To examine the value of several biomarkers in serum including lactate dehydrogenase (LDH), glutamate oxaloacetate transaminase (SGOT), creatinine phosphokinase (CPK), alkaline phosphatase and phosphorus sample for the early diagnosis of acute mesenteric ischemia.

Materials & methods: 50 patients collected were grouped as group A and group B, according to the presence or absence of ischemia as per finding of intra operative/angiography. Total 25 patients were the part of group A with intra operative finding of presence of mesenteric ischemia and patients strongly suspected to have acute mesenteric ischemia on imaging and confirmed by angiography if not operated. While equal number of patients (n=25) were recruited in group B with mesenteric ischemia and without intra operative/angiographic finding. In both the groups the levels of above enlisted enzymes were estimated.

Results: The distribution of LDH levels among the cases studied did not differ significantly between two study groups (P-value>0.05).The distribution of SGOT levels among the cases studied did not differ significantly between two study groups (P-value>0.05).The distribution of CPK levels among the cases studied differs significantly between two study groups (P-value<0.05). Significantly higher proportion of cases in Group A had raised CPK levels compared to group of cases from Group B (P-value<0.05).The distribution of ALP levels among the cases studied differs significantly between two study groups (P-value<0.01). Significantly higher proportion of cases in Group A had raised ALP levels compared to group of cases from Group B (P-value<0.01). The distribution of sr. phosphorous levels among the cases studied differs significantly between two study groups (P-value<0.05). Significantly higher proportion of cases in Group A had raised sr. phosphorous levels compared to group of cases from Group B (P-value<0.05).

Conclusion: The observation of all the serum markers done in the cases of acute abdomen have shown to be of help in early predicting of mesenteric ischemia. Serum marker levels also aids in determining the underlying severity of intestinal gangrene/ necrosis based on the levels at which it's raised.

Key words: Acute mesenteric, Ischemia, Biomarker

Introduction

Acute intestinal ischemia is a severe disorder with high mortality and morbidity rates; the causes have great pathophysiological diversity.[1]The clinicians can make diagnosis at an early stage and accurately due to the wide variability in clinical presentation. Mortality was found to be high, despite in past decades there are major advances in diagnosis and treatment. Superior mesenteric arterial occlusion due to an embolus and superior mesenteric venous thrombosis are common causes of acute mesenteric ischemia. Less common causes are non-occlusive, but especially in younger people vasculitis is known to be important.[2] Because the clinical presentation is complicated and the findings of the laboratory tests are non-specific, the valuable time may be lost due to low clinical suspicion. The condition of ischemia to transmural bowel infarction with peritonitis and septicemia of patients may get worsened because of delay in the diagnosis.[3, 4] For the assessment of possible acute mesenteric ischemia the different line of diagnostic modalities are being used.The current gold standard technique is multi-detector row computed tomographic angiography. Although in many cases by use of computed tomographic angiography may give an accurate diagnosis, early detection is a persistent problem. The new strategies for the diagnosis are needed, because earlier the diagnosis better the line of treatment. To increase clinical suspicion of acute mesenteric ischemia and would improve patient selection for radiological evaluation a simple biochemical test which is non-invasive is the

requirement.[3- 5]Therefore, this study was to examine the value of several biomarkers in serum including lactate dehydrogenase (LDH), glutamate oxaloacetate transaminase (SGOT), creatinine phosphokinase (CPK), alkaline phosphatase and phosphorus sample for the early diagnosis of acute mesenteric ischemia.

Materials & methods

The present study was conducted for assessing value of several biomarkers in serum sample for the early diagnosis of acute mesenteric ischemia. Inclusion criteria for present study included Patient of acute abdomen provisionally diagnosed with acute mesenteric ischemia attending outpatient department or emergency willing for exploratory laparotomy/laparoscopy and were willing to participate in study are includedPatients included in the present study were of age group above 18 years and both genders diagnosed to be acute mesenteric ischemia. The patients underwent the history taking as well as local and physical examination. For the acute abdomen diagnosis the tests done were complete blood count, total leukocyte count, differential leukocyte count, the levels of urea, creatinine, electrolytes in serum and level of sugar in plasma, along with bleeding time, clotting time, ECG, chest & abdomen X-Rays, abdominal USG Doppler were used. Blood sample will be collected for biochemical estimation of serum enzymes viz: Lactate Dehydrogenase (LDH), Glutamate Oxaloacetate Transaminase (SGOT), Creatinine Phosphokinase (CPK-MB), Alkaline Phosphate (ALP), inorganic phosphorus.The patients collected were grouped as group A and group B, according to the presence or absence of ischemia as per finding of intra operative/angiography. Total 25 patients were the part of group A with intra operative finding of presence of mesenteric ischemia and patients strongly suspected to have acute mesenteric ischemia on imaging and confirmed by angiographyif not operated. While equal number of patients (n=25) were recruited in group B with mesenteric ischemia and without intra operative/angiographic finding. In both the groups the levels of above enlisted enzymes were estimated. A specially designed proforma is filled for each patient.These proforma have general information about the patient and their findings. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Chi-square test and student t test were used for evaluation of level of significance.

Results

The mean ± SD of age of cases studied in Group A and Group B was 49.76 ± 17.06 years and 39.48 ± 19.18 years respectively.Of 25 cases studied in Group A, 16 (64.0%) were males and 9 (36.0%) were females. Of 25 cases studied in Group B, 21 (84.0%) were males and 4 (16.0%) were females.Of 25 cases studied in Group A, 20 (80.0%) had raised LDH levels and 5 (20.0%) did not have raised LDH levels. Of 25 cases studied in Group B, 13 (52.0%) had raised LDH levels, 3 (12.0%) had slightly raised LDH levels and 9 (36.0%) did not have raised LDH levels. The distribution of LDH levels among the cases studied did not differ significantly between two study groups (P-value>0.05).Distribution of diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of LDH was 80.0%, 36.0%, 55.6%, 64.3% and 58.0% respectively.Of 25 cases studied in Group A, 12 (48.0%) had raised SGOT levels, 1 (4.0%) had slightly raised SGOT levels and 12 (48.0%) did not have raised SGOT levels. Of 25 cases studied in Group B, 8 (32.0%) had raised SGOT levels, 1 (4.0%) had slightly raised SGOT levels and 16 (64.0%) did not have raised SGOT levels. The distribution of SGOT levels among the cases studied did not differ significantly between two study groups (P-value>0.05).Of 25 cases studied in Group A, 12 (48.0%) had raised CPK levels, 13 (52.0%) did not have raised CPK levels. Of 25 cases studied in Group B, 5 (20.0%) had raised CPK levels, 3 (12.0%) had slightly raised CPK levels and 17 (68.0%) did not have raised CPK levels. The distribution of CPK levels among the cases studied differs significantly between two study groups (P-value<0.05). Significantly higher proportion of cases in Group A had raised CPK levels compared to group of cases from Group B (P-value<0.05).Distribution of diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of CPK was 48.0%, 68.0%, 60.0%, 56.7% and 58.0% respectively.Of 25 cases studied in Group A, 13 (52.0%) had raised ALP levels, 1 (4.0%) had slightly raised ALP levels and 11 (44.0%) did not have raised ALP levels. Of 25 cases studied in Group B, 3 (12.0%) had raised ALP levels, 1 (4.0%) had slightly raised ALP levels and 21 (84.0%) did not have raised ALP levels. The distribution of ALP levels among the cases studied differs significantly between two study groups (P-value<0.01). Significantly higher proportion of cases in Group A had raised ALP levels compared to group of cases from Group B (P-value<0.01).Distribution of diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of ALP was 56.0%, 84.0%, 77.8%, 65.6% and 70.0% respectively.Of 25 cases studied in Group A, 9 (36.0%) had raised sr. phosphorous levels and 11 (64.0%) did not have raised sr. phosphorous levels. Of 25 cases studied in Group B, 2 (8.0%) had raised sr. phosphorous levels and 23 (92.0%) did not have raised sr. phosphorous levels. The distribution of sr. phosphorous levels among the cases studied differs significantly between two study groups (P-value<0.05). Significantly higher proportion of cases in Group A had raised sr. phosphorous levels compared to group of cases from

Group B (P-value<0.05).Distribution of diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of serum phosphorus was 36.0%, 92.0%, 81.8%, 58.9% and 64.0% respectively.

Table 1: The distribution sample size studied across two study groups.

Group Code	Description	No. of cases	% of cases
Group A	Intra operative finding of presence of mesenteric ischemia /and or on imaging , confirmed by angiography (conventional/CT angiography/MR angiography)if not operated	25	50.0
Group B	Do not have intra operative/angiographic finding of mesenteric ischemia	25	50.0

Table 2: Inter-Group distribution of Serum Lactic Dehydrogenase (LDH).

LDH Values	Group A		Group B		P-value
	N	%	n	%	
Raised	20	80.0	13	52.0	0.060 (NS)
Slightly Raised	0	0.0	3	12.0	
Not Raised	5	20.0	9	36.0	
Total	25	100.0	25	100.0	

NS: Non-Significant

Table 3: Inter-Group distribution of serum glutamic oxaloacetic transaminase (SGOT)

SGOT	Group A		Group B		P-value
	N	%	n	%	
Raised	12	48.0	8	32.0	0.504 (NS)
Slightly Raised	1	4.0	1	4.0	
Not Raised	12	48.0	16	64.0	
Total	25	100.0	25	100.0	

NS: Non-Significant

Table 4: Inter-Group distribution of serum creatinine phosphokinase (CPK)

CPK	Group A		Group B		P-value
	N	%	n	%	
Raised	12	48.0	5	20.0	0.040*
Slightly Raised	0	0.0	3	12.0	
Not Raised	13	52.0	17	68.0	
Total	25	100.0	25	100.0	

*: Significant

Table 5: Inter-Group distribution of serum alkaline phosphatase (ALP) level

ALP	Group A		Group B		P-value
	n	%	n	%	
Raised	13	52.0	3	12.0	0.009*
Slightly Raised	1	4.0	1	4.0	
Not Raised	11	44.0	21	84.0	
Total	25	100.0	25	100.0	

*: Significant

Table 6: Inter-Group distribution of serum phosphorus level.

Sr. phosphorus	Group A		Group B		P-value
	n	%	n	%	
Raised	9	36	2	8	0.037*
Not Raised	16	64	23	92	
Total	25	100.0	25	100.0	

Discussion

The levels of enzymes viz. LDH, CPK-MB, ALP and SGOT along with level of phosphorus were estimated in the patients of mesenteric ischemia. The levels of these enzymes were measure in 50 patients to compare value of biochemical marker in the cases

proved to have acute mesenteric ischemia vs. those not having acute mesenteric ischemia and to evaluate their role as a mesenteric ischemia predictors. These 50 patients grouped equally into group A which comprised 25 patients with intra operative finding of presence of mesenteric ischemia and patients strongly suspected to have acute mesenteric ischemia on imaging and confirmed by angiography(conventional/CT angiography/MR angiography)if not operated and same number of patients were in group B without mesenteric ischemia findings intra-operatively or by angiography. In the cases of bowel ischemia the levels of all enzymes were compared between the groups, playing a significant role as markers in serum. The age of the most of the patients was more than 50 years in group A in current study, and the male to female ratio for about 60% of mesenteric ischemia patients was 2.5:1.The results are similar to some other studies, which reported the ratio of male to female to be 2.1:1, and the age was >50years in mesenteric ischemia cases.[1- 3] Of 25 cases studied in Group A, 13 (52.0%) did not have co-morbidity, 2 (8.0%) had diabetes, 6 (24.0%) had hypertension, 3 (12.0%) had both diabetes and hypertension and 1 (4.0%) had heart disease. The increased levels of enzyme lactate dehydrogenase in this study, distributed among the cases studied did not differ significantly between two study groups (P-value>0.05). Distribution of diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of LDH was 80.0%, 36.0%, 55.6%, 64.3% and 58.0% respectively are similar to the findings study conducted by Lange H, Jackel R[6] revealed an inference of 100% sensitivity and 42% specificity for increased LDH in patients presenting with acute abdomen who later are found to have ischemia and gangrene. But some studies in which cases of acute pancreatitis were not included have reported sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of 88%,68%, 73%, 85% and 78% respectively.[5] From present study LDH can be consider as a good screening tool for mesenteric ischemia, as in many other diseases of intestine origin and non-intestine origin as well the levels of these enzymes were found to be increased for e.g. gastric perforation, pancreatitis, perforated appendicitis, and malignancy.[7, 8] In present study the elevated serum SGOT levels among the cases studied did not differ significantly between two study groups (P-value>0.05). Distribution of diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy was 52.0%, 64.0%, 59.1%, 57.1% and 58.0% respectively in current study while others reported the values to be 68%, 80%, 77%, 71% and 74% respectively and sensitivity and specificity of 70%-80% for elevated serum SGOT in mesenteric ischemia patients.[5, 9] In this study,elevated levels of alkaline phosphates significantly higher proportion of cases in Group A had raised ALP levels compared to group of cases from Group B (P-value<0.01). Diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of ALP were 56.0%, 84.0%, 77.8%, 65.6% and 70.0% respectively,with the matching results of other studies whose sensitivity as well as specificity ranged from 70-80%, and sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of ALP are 72%,68%, 69%, 70% and 66 % respectively in other studies.[5, 10, 11] In this study significantly higher proportion of cases in Group A had raised CPK levels as compared to group of cases from Group B (P-value<0.05). Diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of CPK are 48.0%, 68.0%, 60.0%, 56.7% and 58.0% respectively where as other studies reported higher sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of 76%, 84%,82%,77% and 80%,sensitivity and specificity of up to 70% and 80%.[5, 9] In present study for elevated serum inorganic phosphorus the distribution of sr. phosphorous levels among the cases studied differs significantly between two study groups (P-value<0.05). Significantly higher proportion of cases in Group A had raised sr. phosphorous levels compared to group of cases from Group B (P-value<0.05). Distribution of diagnostic efficacy measures such as sensitivity, specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of serum phosphorus was 36.0%, 92.0%, 81.8%, 58.9% and 64.0% respectively where as other studies in which they reported higher sensitivity and lower specificity 76% to 80% and 68% to 70%,positive predictive value (PPV), negative predictive value (NPV) and accuracy of 71%,73% and 72% respectively.[5, 12]

Conclusion

The observation of all the serum markers done in the cases of acute abdomen have shown to be of help in early predicting of mesenteric ischemia. Serum marker levels also aids in determining the underlying severity of intestinal gangrene/ necrosis based on the levels at which it's raised. Serum markers are also helpful especially in cases with impaired renal function and allergic reaction where contrast CT scan become contraindication.However, detection of serum LDH and serum SGOT could not help to differentiate patient with Mesenteric Ischemia from those with other causes of acute abdomen due to the fact that serum LDH could be elevated in cases of acute pancreatitis and sepsis and serum SGOT in liver dysfunction and other cardiac conditions but certainly cases of Mesenteric Ischemia had elevated serum LDH and serum SGOT levels. Thus giving a clue that underlying pathology could be Acute Mesenteric

Ischemia in significantly elevated serum LDH and serum SGOT levels as these are very difficult to diagnose clinically.

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