

Prognostic factors in acute mesenteric ischemia and evaluation with Mannheim Peritonitis Index and platelet-to-lymphocyte ratio

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ABSTRACT

BACKGROUND: Acute mesenteric ischemia (AMI) is a disease that has a very high mortality rate and for which the diagnosis is frequently delayed. The aim of the present study was to assess the predictive value of the Mannheim Peritonitis Index (MPI) and platelet-to-lymphocyte (P/L) ratio in the prognosis of AMI.

METHODS: The files of 34 patients diagnosed with AMI between September 2014 and April 2016 were retrospectively examined. The patients were divided into 2 groups based on survival. The parameters of MPI and P/L ratio, demographic data, and duration of hospitalization were recorded and compared.

RESULTS: In all, 19 (55.9%) patients were male, and 15 (44.1%) were female. Total of 19 patients (55.9%) were discharged with a complete recovery, while 15 (44.1%) died. MPI mean value was 21.13 ± 7.55 and 16.00 ± 5.24 in those who died and survived, respectively ($p=0.026$). P/L ratio was 288.48 ± 233.01 and 373.82 ± 389.62 in those who survived and died, respectively ($p=0.045$).

CONCLUSION: MPI and P/L ratio are simple and reliable methods to predict the prognosis of AMI.

Keywords: Mannheim Peritonitis Index; mesenteric ischemia; platelet/lymphocyte ratio.

INTRODUCTION

Acute mesenteric ischemia (AMI) is a clinical condition with a mortality rate as high as 70%, despite diagnosis and treatment.^[1] This condition is seen in 1% to 2% of patients admitted with abdominal pain, though it becomes more common with increasing age, and incidence may be up to 18% in individuals aged 65 years or more.^[2] The primary causes of such a high mortality rate are thought to be delayed diagnosis and various comorbid diseases seen in the elderly. While many blood analyses, such as lactate dehydrogenase, transaminases, D-dimer, D-lactate, and creatinine phosphokinase have been suggested for diagnosis of AMI, as yet, none is sufficiently specific or sensitive.^[3] Diagnosis can usually be made based

on computerized tomography (CT) and mesenteric CT angiography.^[4] However, the mortality rate remains high, despite surgical intervention following diagnosis.^[1]

The Mannheim Peritonitis Index (MPI) is a special scoring system of parameters such as age; gender; duration, severity, and extent of peritonitis; presence of malignancy; and organ failure.^[5-7] Scoring systems such as the Peritonitis Index of Altona and the Acute Physiologic Assessment and Chronic Health Evaluation can also be used for peritonitis.^[6,7] Several studies have demonstrated the importance of these scoring systems in cases of peritonitis due to causes such as diverticulitis or colonic perforation. However, studies investigating the predictive value of these indices for peritonitis that develops due to conditions such as bacterial translocation, necrosis, or perforation in AMI, are limited in the literature.^[8]

The platelet-to-lymphocyte (P/L) ratio has been recognized in recent studies as a marker that, interestingly, can predict mortality in many inflammatory events, ranging from coronary artery disease to malignancy.^[9,10] While many studies have been conducted using the parameter of mean platelet volume (MPV) in AMI, the number of studies demonstrating the importance of P/L as a marker in prognosis is very limited. However, these studies have reported that high P/L value was associated with increased mortality.^[10]

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Submitted: 12.10.2016

Accepted: 06.12.2016

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2017;23(4):301-305

doi: 10.5505/tjtes.2016.00701

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Table 1. Mannheim Peritonitis Index

Risk factor	Weightage, if any
Age >50 years	5
Female genders	5
Organ failures	7
Malignancy	4
Preoperative duration of peritonitis >24 hours	4
Origin of sepsis not colonic	4
Diffuse generalised peritonitis	6
Exudates	
Clear	0
Cloudy, purulent	6
Faecal	12

The aim of the present study was to investigate the predictive value of MPI together with P/L ratio, a hematological marker, with respect to prognosis in patients with AMI.

MATERIALS AND METHODS

The files of patients with diagnosis of AMI who had been operated on by the general surgery clinic of Adnan Menderes University Faculty of Medicine between September 2014 and April 2016 were retrospectively investigated and included in this study. A review was performed using the MPI (Table 1), and patients with missing data were excluded. The patients were divided into 2 groups: those who died and those who

survived. Data regarding the duration of hospitalization, time from admission until operation, type of operation performed, and demographic details were recorded and statistically compared.

Statistical Analysis

Descriptive statistics of continuous variables are provided as mean±SD and frequency (percent). The variables were assessed after prerequisites of normality and homogeneity of variance were evaluated (Shapiro-Wilk and Levene’s tests). Independent t-test for 2 samples (Student’s t-test) was performed, and Mann Whitney U-test was used when prerequisites were not met. For comparisons of 3 or more groups, one-way analysis of variance and the Tukey honest significant difference test were utilized. When the prerequisites were not met for those groups, Kruskal-Wallis test and Bonferroni-Dunn multiple comparison tests were used. The relationships between categorical variables were analyzed using Fisher’s exact test and chi-square test. When the expected frequencies were less than 20%, an assessment using the Monte Carlo simulation was performed to include these frequencies in the analysis. Significance level was expressed as α=0.05 and α=0.01. Data were assessed using the SPSS Statistics for Windows, Version 17.0 (SPSS, Inc., Chicago, IL, USA) software package.

RESULTS

A total of 34 patients diagnosed with AMI were included in the study. Of those patients, 19 (55.9%) were male, and 15 (44.1%) were female. In all, 19 patients (55.9%) were discharged with a complete recovery, while 15 (44.1%) died. Mean age was 70.6±14.07 years and 64.63±15.54 years in

Table 2. Comparison of MPI and P/L ratios and durations

Patients	n	Mean	Standard Deviation	Standard Error Mean	p
Age					
Survived	19	64.63	15.54	3.56	0.255
Died	15	70.60	14.07	3.63	
Mannheim score					
Survived	19	16.00	5.24	1.20	0.026*
Died	15	21.13	7.55	1.95	
P/L ratio					
Survived	19	288.48	223.01	89.39	0.045*
Died	15	373.82	389.02	57.58	
Time to laparotomy (hours)					
Survived	19	1.11	0.74	0.17	0.296
Died	15	0.80	0.94	0.24	
Duration of hospitalization (days)					
Survived	19	11.05	10.03	2.30	0.43
Died	15	8.40	9.05	2.34	

*p<0.05. MPI: Mannheim peritonitis index; P/L: Platelet-to-lymphocyte.

those who died and survived, respectively. Mean MPI value was 21.13 ± 7.55 and 16.00 ± 5.24 in those who died and survived, respectively ($p=0.026$). P/L ratio was 288.48 ± 233.01 and 373.82 ± 389.62 in those who survived and died, respectively ($p=0.045$). When the 2 groups were compared regarding length of time from admission to operation (hours) and duration of hospitalization (days), no statistically significant differences were found ($p=0.43$) (Table 2).

Six (17.6%) of the patients had undergone exploratory laparotomy and only 1 of them could be kept alive, with administration of anticoagulant therapy; in the remaining 5 cases, no intervention could be performed due to total small intestinal necrosis. Eleven (32.4%) cases had undergone segmental small intestine resection and anastomosis, while 10 (29.4%) cases had undergone segmental small intestine resection, but ileostomy was preferred in order to avoid risk to anastomosis. Two (5.9%) patients had undergone subtotal small intestine resection, 2 (5.9%) patients had undergone segmental small intestine resection and right colectomy, 1 (2.9%) patient had undergone embolectomy, and 2 (5.9%) had undergone other procedures. When the 2 groups (those who died and

those who survived) were compared with respect to surgical intervention, a significant survival advantage was observed in the groups who had undergone segmental small intestine resection and segmental small intestine resection with ileostomy compared with other groups ($p=0.03$) (Table 3).

When the relationship of type of surgery and MPI score was analyzed, the exploratory laparotomy group had the highest score, while the embolectomy group had the lowest score ($p=0.001$). Regarding P/L ratio, no statistically significant difference was found between groups based on surgical intervention ($p=0.594$).

DISCUSSION

AMI is a condition characterized by intestinal infarction, and is more often seen in the elderly and those with atherosclerotic disease.^[1] It is not very common, but demonstrates significantly high mortality, and requires immediate diagnosis and therapeutic intervention.^[11] Early diagnosis is difficult; however, delayed diagnosis increases mortality. Therefore, several studies have been and are currently being conducted to better predict mortality and aid in prognosis for this condition.

Table 3. Surgical methods

		Died		Total	p
		Survived	Died		
Gender					
Female	n	9	6	15	0.667
	%	47.4	40.0	44.1	
Male	n	10	9	19	0.03*
	%	52.6	60.0	55.9	
Surgery					
Ex lap	n	1	5	6	0.03*
	%	5.3	33.3	17.6	
Segmental small intestine resection	n	8	3	11	0.03*
	%	42.1	20.0	32.4	
Embolectomy	n	0	1	1	0.03*
	%	0.0	6.7	2.9	
Subtotal small intestine resection	n	1	1	2	0.03*
	%	5.3	6.7	5.9	
Segmental small intestine resection + right colectomy	n	1	1	2	0.03*
	%	5.3	6.7	5.9	
Segmental small intestine resection + ileostomy	n	7	3	10	0.03*
	%	36.8	20.0	29.4	
Other (Segmental small intestine resection and segmental small intestine resection + ileostomy)	n	1	1	2	0.03*
	%	5.3	6.7	5.9	
Total	n	19	15	34	0.03*
	%	100.0	100.0	100.0	

* $p<0.05$.

The MPI scoring system takes patient age, gender, presence of organ failure or malignancy, and parameters such as onset and extensiveness of peritonitis into consideration in determination of risk.^[7] Studies have generally estimated that in peritonitis case to which a score between 21 and 29 was assigned, the mortality rate would be as high as 65%.^[12] Some studies have predicted a mortality rate above 80% for peritonitis cases with MPI score above 29.^[13] In our study, mean MPI value was 16.00 ± 5.24 in those who survived, while value of 21.13 ± 7.55 was found in those who died, and the difference was statistically significant. Krylov et al.^[14] suggested in their study that mortality rate was lower and that a less radical surgical option may be appropriate in patient groups with MPI value of ≤ 21 , while mortality rate was higher and radical surgery should be performed in groups with a value of ≥ 21 . Sharma et al.^[15] reported that MPI was a very good predictor of mortality and that its prognosis for patients with peritonitis could be relied upon. While there is a very limited number of studies evaluating the relationship between AMI and MPI, a study conducted by Yıldırım et al.^[16] of 46 patients with AMI reported that patients with MPI of ≥ 26 had a higher mortality rate, and that the use of this index on initial admission would contribute to prognosis. Since our study also found that patients with MPI value of ≥ 21 had a statistically significantly higher mortality rate, we recommend that this index be used during the initial admission evaluation of patients presenting to emergency departments with AMI and that it can be used reliably to estimate prognosis.

P/L ratio has been studied in many inflammatory events, ranging from coronary artery disease to malignancies, and its value in prediction of prognosis has been well demonstrated.^[9,10] A study conducted by Kahramanca et al.^[17] reported that P/L ratio was a good marker to estimate prognosis and debridement of Fournier's gangrene. It has also been shown to be an important marker for malignancy, and a study conducted by Stotz et al.^[18] reported that elevated P/L value was a negative factor regarding curative resection in gastrointestinal stromal tumor. Since embolism and thrombosis associated with infarction are seen in AMI, it is thought that platelets might not be innocent within this pathogenetic process and studies have been conducted to investigate their potential role.^[19] Many studies have examined the association between MPV and mesenteric ischemia, and MPV has been reported to have value in the determination of prognosis.^[20] Studies of P/L ratio, however, are limited in the literature. A study conducted by Toptas et al.^[10] reported that elevated P/L ratio, along with elevated levels of other hematological markers, would be an important marker in the diagnosis of AMI, as well as prediction of prognosis and mortality. Our study results included a statistically significant difference in survival according to P/L ratio. Therefore, as in other inflammatory diseases, we suggest that a prognosis in AMI may be determined reliably with P/L ratio, an inexpensive and simple test that can be analyzed within the scope of a hemogram.

Early diagnosis and appropriate treatment are important in AMI.^[1] Treatment options include methods ranging from radiological intervention to surgical methods.^[21] Early diagnosis and appropriate treatment intervention reduce mortality. Among surgical options used in the present study, the most preferred method was segmental small intestine resection. In approximately half of these cases, ileostomy was preferred, since we did not consider the anastomosis line to be safe. Embolectomy could be performed in only 1 case after the diagnosis had been made under appropriate conditions and at the proper time. When we compared the P/L ratio of cases, we found no statistical differences with respect to surgical method. Therefore, we think that this marker is important only in determining prognosis and does not contribute to the selection of surgical method or the subsequent process. Exploratory laparotomy cases had the highest MPI score, while the embolectomy case had the lowest, and this was statistically significant. In almost all of the exploratory laparotomy cases, the diagnosis was delayed, near total necrosis was observed during laparotomy, and the patients died before intervention could be performed. The embolectomy case, on the other hand, was a rare case in which early diagnosis and intervention were performed, and no peritonitis had developed. We think that the difference originates here, and therefore suggest that diagnosis be made as soon as possible, followed by the most appropriate intervention.

In conclusion, P/L ratio, which is reliable and simple to obtain, can be used together with MPI upon admission, and may help the surgeon and emergency physician predict prognosis in individuals thought to have AMI, an uncommon but high-mortality disease.

No financial support was received for this study.

Conflict of interest: None declared.

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ORİJİNAL ÇALIŞMA - ÖZET

Akut mezenter iskemide prognostik faktörler ve Mannheim peritonit indeksi ve trombosit/lenfosit oranı ile değerlendirilmesi

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AMAÇ: Akut mezenter iskemide (AMI), tanısı geç konan ve mortalitesi oldukça yüksek bir hastalıktır. Mannheim peritonit indeksi (MPI) ve trombosit/lenfosit (T/L) oranının akut mezenter iskeminin prognozu üzerine etkisini araştırmak.

GEREÇ VE YÖNTEM: Akut mezenter iskemide tanısı konan 34 hastanın dosyaları, Eylül 2014–Nisan 2016 tarihleri arasında geriye dönük olarak tarandı. Hastalar hayatını kaybeden ve kaybetmeyen diye iki gruba ayrıldı. Hastaların MPI ve T/L oranları, demografik verileri, yatış süreleri kaydedilip karşılaştırıldı.

BULGULAR: Hastaların 19'u erkek (%55.9), 15'i kadın (%44.1) olarak saptandı. Toplam 15 hasta hayatını kaybederken (%44.1), 19 hasta (%55.9) sağlıklı taburcu edildi. Mannheim peritonit indekslerine bakıldığında ise hayatını kaybeden hastalarda ortalama değer 21.13±7.55 bulunurken, hayatını kaybetmeyen hastalarda 16.00±5.24 olarak saptandı (p=0.026). Trombosit/lenfosit oranlarına bakıldığında hayatını kaybetmeyen grupta 288.48±233.01 saptanırken hayatını kaybeden grupta ise 373.82±389.62 olarak bulundu (p=0.045).

TARTIŞMA: Akut mezenter iskemide tablosunda, prognozu ön görmede MPI ve T/L oranları basit ve güvenilir yöntemlerdir.

Anahtar sözcükler: Mannheim peritonit indeksi; mezenter iskemide; trombosit/lenfosit oranı.

Ulus Travma Acil Cerrahi Derg 2017;23(4):301–305 doi: 10.5505/tjtes.2016.00701