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Management of Nonocclusive Mesenteric Ischemia in Patients with Cardiac Failure

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ABSTRACT

Aim: This study aimed to evaluate the surgical procedures, outcomes, and prognostic factors in patients with ischemic heart disease who were operated on due to nonocclusive mesenteric ischemia (NOMI).

Material and methods: This research contains all patients diagnosed with congestive heart failure and NOMI between January 2011 to January 2020. The patients who had angiography or CT that showed occlusion of more than 50% in any of the main branches of the mesenteric artery or patients who presented with symptoms in correlation with a total occlusion were excluded from the study. Patients who underwent coronary heart surgery but were not diagnosed with congestive heart failure and those with atrial fibrillation also were excluded from the study. Patients divided into two groups, according to a medical database.

Results: A significant difference was found between the surviving and non-survivor groups in minutes, in terms of median time to segmenter intestinal resection (P = 0.042).

Conclusion: An early diagnosis and surgical segmental intestinal resection before peritonitis worsens can be the key to better prognosis for NOMI patients.

INTRODUCTION

Nonocclusive mesenteric ischemia (NOMI) was first defined by Ende and his collegues in patients with heart failure in 1958 [Ende 1958]. It accounts for 10-15% of all mesenteric ischemias. Even though NOMI has a very high mortality rate, we still don't know a lot about the precipitating factors [Yong 2017]. The gold standard for diagnosis is angiography, but many medical centers still use computed tomography (CT), and it is enough for diagnosis [Kammerer 2018; Woodhams 2010]. CT scans are available in many medical centers, but NOMI still is very mortal with rate of 90% for patients with heart failure [Al-Diery 2019]. We have higher chances of early diagnosis and surgical intervention by means of the widespread availability of radiological imaging and interventions [Caluwaerts 2019]. This study aimed to evaluate the surgical procedures, outcomes, and prognostic factors in patients with ischemic heart disease who were operated on due to nonocclusive mesenteric ischemia (NOMI).

MATERIAL AND METHODS

This retrospective study carried out after approval of the ethics committee of Sisli Hamidiye Etfal Research and Training Hospital on 22/02/2022 (No: KAD-FR-01, Acceptance No: 3404). The study results were accepted by hospital authority, and all the authors were admitted to the publication of the article. Informed consent was obtained from the relatives of each patient before the procedures after explaining the interventions, risks, and benefits as a policy of the health system in the country.

This research contains all patients diagnosed with congestive heart failure and NOMI in our hospital between January 2011 to January 2020. All patients were certainly diagnosed with NOMI, according to their symptoms, such as postprandial abdominal pain, abdominal distension, and peritonitis symptoms, laboratory data and radiological findings. The patients who had an angiography or CT that showed an occlusion of more than 50% in any of the main branches of the mesenteric artery or patients who presented symptoms in correlation with a total occlusion were excluded from study. Patients divided into two groups, according to medical database. The first group included the surviving patients, and the non-surviving patients constituted the second group. The first group defined patients who lived longer than 15 days after they were diagnosed with NOMI; the second group contained patients who died within 15 days after they were diagnosed with NOMI. Patients who underwent coronary heart surgery but were not diagnosed with congestive heart failure and patients with atrial fibrillation also were excluded from the study. We obtained data, such as age, gender and laboratory results of patients, from the medical records of those who underwent segmental resection. The blood gas serum lactate values, which is important in diagnosis and prognostic

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Table 1. Analysis of clinical and radiologic data between the surviving and non-surviving group

Clinical data	Group 1 (*N* = 5)	Group 2 (*N* = 7)	*P*
Women, n (%)	4 (80%)	3 (42.85%)	0.28
Age in years, mean ± SD	69.7±10.2	70.9±12.00	0.94
Serum lactate levels according to blood gas analysis, mmol/L, median (IQR)	3.82 (2.12-6.32)	3.71 (2.62-5.7)	0.84
Surgical intervention, n (%)	5 (100%)	3 (42.85%)	0.054
Duration in minutes until segmental intestinal resection in terms of median	190 (125.0-296.5)	308.5 (185.5-921.0)	0.042*
Increased SMV/SMA ratio, n (%)	2 (40%)	3 (42.85%)	0.97
Splenic vein thrombosis, n (%)	3 (60%)	4 (57.14%)	0.94
Mm in terms of SMV, mean ± SD	11.99±2.18	10.45±2.67	0.50

* *P*< 0.05; SD, standard deviation

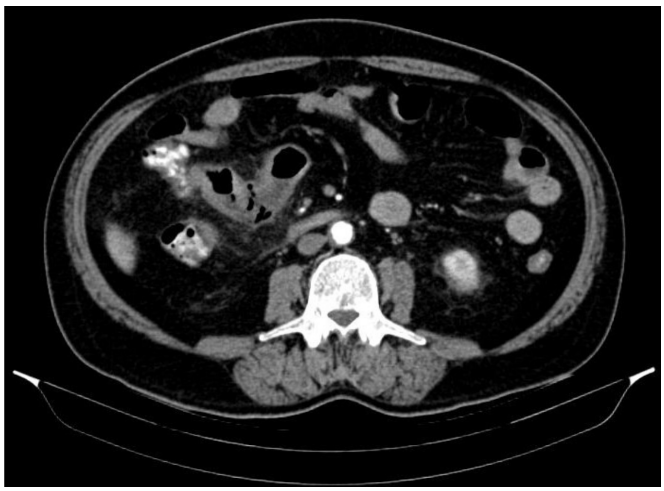

Figure 1. Dilated intestines

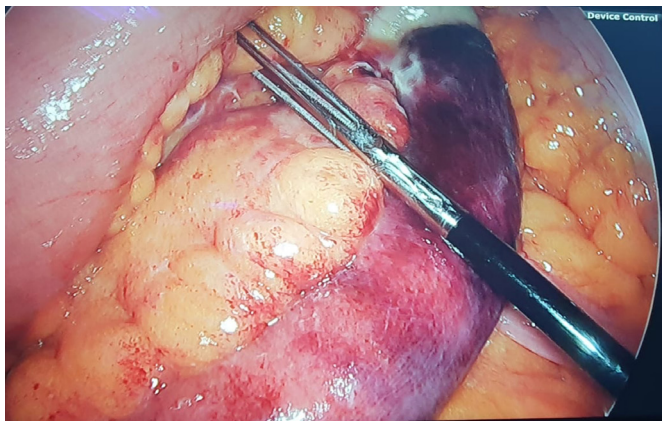

Figure 2. Resection needed intestinal segments

evaluation, also were obtained.

The splenic vein and superior mesenteric vein (SMV) diameters, SMV/superior mesenteric artery (SMA) ratio at the SMA origin level were evaluated in angiography and CT imaging, and whether segmental intestinal resection was performed or not, and the time elapsed between diagnosis and surgical intervention in the patients were noted from the records.

For statistical analysis, the differences were compared using unrelated samples. T test (parametric) and Mann-Whitney U tests (nonparametric) for continuous variables and Fisher's exact test for variables in the category. Continuous data are shown as mean ± standard deviation (SD) or as median and interquartile range (IQR), depending on data distribution. All statistical analysis was made with (SPSS Inc., Chicago, IL, USA) SPSS 23.0 for Windows. A *P*-value of <0.05 was considered to be statistically significant.

RESULTS

Fourteen patients were diagnosed with NOMI, which was confirmed by clinical evaluation and diagnostic angiography or CT. Five patients survived. Two patients were excluded from the study because more than 50% stenosis was detected in the main branches of the mesenteric artery in angiography. Analysis of clinical information and laboratory data is shown in Table 1. (Table 1)

A significant difference was found between the surviving and non-survivor groups in minutes, in terms of median time to segmenter intestinal resection (*P* = 0.042).

DISCUSSION

NOMI is a set of symptoms characterized diagnostically by severe intestinal necrosis that most commonly affects the SMA region without splanchnic arterial occlusion and unfortunately still has a mortality rate of 90% [Gnanapandithan

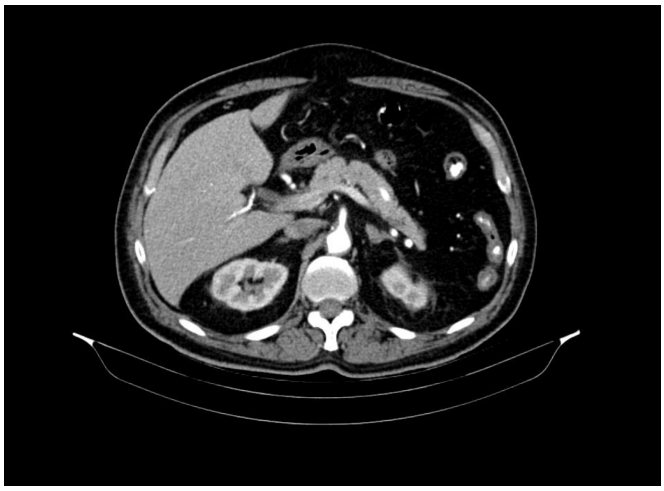

Figure 3. Nonocclusive SMA

2020]. Although the gold standard for diagnosis is selective angiography, the diagnostic process has been accelerated with the widespread use of CT [Woodhams 2010]. However, due to the rapid progression of the disease, early diagnosis is difficult. Despite developments in surgical interventions, the high risk of mortality and morbidity continues. Although different results were obtained in prognostic evaluations based on age and gender differences in studies conducted to show the differences depending on mortality and morbidity, many studies did not detect any difference between these parameters [Sato 2018]. In our study, there was no significant difference between the surviving and non-surviving groups in the prognostic factors like age and gender. In research about NOMI, the SMV diameter in millimeters, splenic vein thrombosis, or the SMV/SMA ratio have been reported as factors determining the success of surgery [Locke 2000]. We found no significant difference in these radiological parameters.

According to the American Gastroenterology Association, peritoneal irritation signs need for surgical intervention. In this context, NOMI also can be considered as an acute abdomen, and surgical treatment should be considered in the first place [Nakao 2011].

It is reported that independent of the CT findings, it should always be our priority to resect the necrotic parts of the intestine by laparotomy [Nakamura 2019]. Prognostic evaluations and vital parameters are linked to the duration of medical treatment in some studies. Moreover, multidisciplinary surgical approaches might have negative outcomes on the treatment process, and there is still not enough evidence whether it improves the surgery's success rate or the duration [Miyazawa 2020]. In our study, segmental intestinal resection was performed in all patients of the first group. Statistically, the most important parameter determining the prognosis is the time taken to perform the surgical resection.

CONCLUSION

In conclusion, making an early decision can be life-saving for NOMI patients. This can be done by screening the patients for NOMI criteria with an angiography or a CT. An early diagnosis and surgical segmental intestinal resection before peritonitis worsens can be the key to better prognosis for NOMI patients. Larger studies are needed to further discussions.

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