

Coincidence of Intestinal Ischemia and Meckel's Diverticulum

Pormanczuk K^{1,2*}, Rodobolska W³, Cichecka M¹ and Majcherek J¹

¹Department of Vascular Surgery, Transplantology and Liver Surgery, 4th Military Clinical Hospital, Wrocław, Poland

²Department of Preclinical Sciences, Pharmacology and Medical Diagnostics, Faculty of Medicine, University of Science and Technology, Wrocław, Poland

³Faculty of Medicine, Medical University, Wrocław, Poland

*Corresponding author:

Kornel Pormanczuk,
Department of Vascular Surgery, Transplantology and Liver Surgery 4th Military Clinical Hospital, Department of Preclinical Sciences, Pharmacology and Medical Diagnostics, Faculty of Medicine, University of Science and Technology, Wrocław, Poland

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1. Abstract

In this study, we present a case of acute intestinal ischemia due to embolism of the superior mesenteric artery with coexisting Meckel's diverticulum. Both superior mesenteric artery embolism and complicated Meckel's diverticulum are a real threat to the patient's life. Because of similar, non-specific clinical symptoms making the correct diagnosis may be difficult and delay of proper surgical treatment can be fatal. We present the case of a 49-year-old man who appeared in the emergency department due to abdominal pain and vomiting lasting for 12 hours, accompanied by bloody diarrhea. An additional diagnostic difficulty was the fact that the patient habitually drank alcohol and underwent a few episodes of acute pancreatitis in the past. A performed contrast-enhanced CT of the abdomen revealed an arterial embolus in the mesenteric artery, bowel wall thickening, luminal dilatation of the small intestine and high suspicion of coexisting Meckel's diverticulum. Those ischemic intestinal findings resulted in quick open abdomen intervention. During the laparotomy, the presence of ischemic changes both in the small intestine and in the Meckel's diverticulum, was confirmed. Embolectomy of the superior mesenteric artery was performed, and due to the extent of small intestinal ischemia and the presence of the Meckel's diverticulum within the ischemic lesions, we decided to perform a "second

look" laparotomy 24 hours after the primary surgery.

2. Introduction

Acute intestinal ischemia may be caused by embolism of mesenteric artery (a clot in a previously unaffected artery), thrombosis of atherosclerotic SMA, functional spasm of mesenteric arteries (NOMI) or thrombosis of mesenteric veins [1]. 50% of intestinal infarctions are caused by primary mesenteric artery occlusion (embolism or acute arterial thrombosis). The most important risk factors generating sudden occlusion of the mesenteric artery include: cardiac arrhythmias (esp. atrial fibrillation), congestive heart failure, recent myocardial infarction, which may be associated with a cardiac thrombus [1, 4]. Of the three main visceral arteries (celiac trunk, superior mesenteric artery and inferior mesenteric artery), embolism most frequently occludes the superior mesenteric artery. By far the most common cause of embolism of the superior mesenteric artery are arrhythmia (mainly atrial fibrillation) and recent myocardial infarction. Contrary to previous observations, mesenteric artery embolism currently predominates in people with coronary artery disease. A clot in the superior mesenteric artery is usually located peripherally from the origin of the middle colic artery. This causes acute ischemia of the peripheral jejunum, the entire ileum and the right side of the colon. Only in 15% of cases is the embolism located at the very origin of the

superior mesenteric artery from the aorta, causing extensive ischemia of the entire small intestine and ascending colon. The most common symptom of embolism of the superior mesenteric artery is sudden, severe abdominal pain, initially located in the midabdomen and then spreading. Initially, the pain is paroxysmal and then constant. It is not relieved by strong painkillers and is disproportionately severe compared to the condition of the abdomen noted during physician's examination. Excessive intestinal peristalsis is observed in the initial period and causes violent diarrhea, often with blood. Peritoneal symptoms appear only in the event of intestinal infarction. Initially, increased peristaltic movements later disappear, and silence in the abdomen indicates an infarction of the intestinal wall. As ischemia increases, the patient's general condition deteriorates, hypotension, tachycardia and fever appear, and basic tests indicate leukocytosis above 20,000 LEU/ml. Obstruction of the superior mesenteric artery causes necrosis of the intestinal wall, which leads to perforation of the digestive tract and diffuse peritonitis. In such cases laparotomy has to be performed without hesitation.

Meckel's diverticulum is a congenital diverticulum of the small intestine resulting from incomplete obliteration of the omphalomesenteric duct in fetal life. This is the most common congenital defect of the small intestine. It occurs in approximately 2% - 4% the population [2], with a male-to-female ratio of 3:1 [2, 3]. Meckel's diverticulum is usually located approximately 60 cm from the ileo-cecal valve (range between 15 - 120 cm) [7, 8]. The diverticulum is usually asymptomatic, but its complicated course may lead to life-threatening consequences. The lifetime risk of related complications is estimated at 4% [7]. It may cause bleeding from the gastrointestinal tract because of ectopic mucosa, which can be found in 43% of symptomatic diverticulum with gastric, pancreatic and even carcinoid tissue [3]. Except bloody diarrhea symptoms of inflammation or even volvulus of the diverticulum may appear, which may lead to segmental necrosis of the small intestine wall, perforation of the gastrointestinal tract, and ultimately to diffuse peritonitis. The symptoms of complicated Meckel's diverticulum, such as abdominal pain, gastrointestinal bleeding or torsion of the Meckel's diverticulum leading to segmental necrosis of the small intestine wall and perforation of the digestive tract, are as unusual as the symptoms of acute intestinal ischemia due to mesenteric artery embolism.

3. Diagnosis

Appropriate diagnosis of superior mesenteric artery embolism is difficult. It should always be suspected when sudden, severe abdominal pain with diarrhea and blood in the stool occurs in a patient with ischemic heart disease and/or atrial fibrillation. Routine diagnostic blood tests are not useful in diagnosing acute intestinal ischemia due to embolism of the superior mesenteric artery. A general standing X-ray of the abdominal cavity can only confirm the features of gastrointestinal obstruction or perforation of the gastrointestinal tract. Ultrasonography in acute intestinal ischemia is not useful due to the distention of the intestinal loops with gases and the deep location

of the visceral vessels in the abdominal cavity. Contrast-enhanced CT is the most important examination - it not only shows the presence of embolism in the superior mesenteric artery, but also allows for its precise location, indicating the extent of intestinal ischemia [6]. Computed tomography may also reveal the presence of Meckel's diverticulum; however, it is not always clearly visible in the case of advanced ischemic lesions of the small intestine, distention of the intestinal loops and swelling of their walls.

4. Treatment

The basic condition for effective surgical treatment is the early suspicion of embolism of the superior mesenteric artery and its urgent confirmation by computed tomography [1, 3, 6]. This determines the possibility of quickly restoring intestinal circulation before necrosis of the intestinal wall occurs. If ischemic changes have already occurred in the intestinal wall, an uncertain assessment of intestinal viability requires a "second look" operation, i.e. laparotomy 24, 36 or even 48 hours after the primary embolectomy of the superior mesenteric artery [3, 5]. If there are necrotic changes in the intestine, it is necessary to remove the necrotic sections. In case of demarcated necrosis of the intestinal wall, a segmental intestinal resection should be performed, but the stumps of the small intestine can be closed blindly with a stapler and left in the abdominal cavity for even 48 hours without reconstruction of the digestive tract [5]. "Second look" laparotomy allows for the possible cutting of ischemic sections of the small intestine and their final anastomosis within blood-well-supplied tissues.

5. Case Presentation

A 49-year-old patient with symptoms of nausea, vomiting and abdominal pain for approximately 12 hours was admitted to the emergency department. Due to the periodic episodes of epigastric pain reported by the patient for several years, associated with his alcohol abuse (the patient claimed that for several years he has been drinking about 0.5 liters of vodka every 2-3 days, which is approximately 1.0 to 1.5 liters of vodka a week) pancreatic irritation or even acute pancreatitis was suspected. Because of lack of a typical history (no information about the presence of Meckel's diverticulum or a previous history of cardiac arrhythmias) only basic blood tests were performed, which did not reveal leukocytosis or inflammation. Finally the contrast-enhanced CT scan in arterial and venous phases revealed the presence of fresh embolic material in the superior mesenteric artery (Figure 1) and the suspicion of Meckel's diverticulum among the dilated intestinal loops (Figure 2), which was an indication for urgent angiosurgical intervention. Because the suspicion of concomitant bowel necrosis, a laparotomy, not an endovascular treatment, was performed. During the laparotomy the presence of ischemic changes in the small intestine and Meckel's diverticulum was confirmed (Figure 3). Embolectomy of the superior mesenteric artery was performed and due to the above-mentioned ischemic changes in the small intestine, it was decided to perform a "second look" laparotomy 24 hours after the primary surgical treatment. During the planned re-laparot-

omy appropriate blood supply to the small intestine was confirmed, including blood flow to the Meckel's diverticulum. The diverticulum did not show any inflammatory signs. Due to the wide base of the

Meckel's diverticulum and no palpable ectopic tissue at the base of the diverticulum, its resection was not performed (Figure 4).

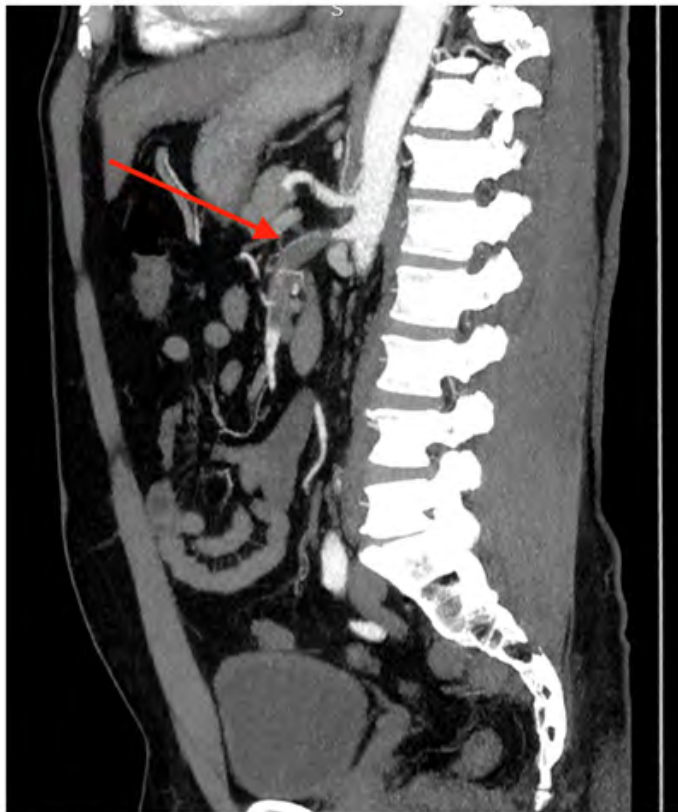


Figure 1: A CT scan presenting a long clot in the mesenteric artery (red arrow).



Figure 2: A CT scan presenting bowel wall thickening and luminal dilatation of the small intestine.

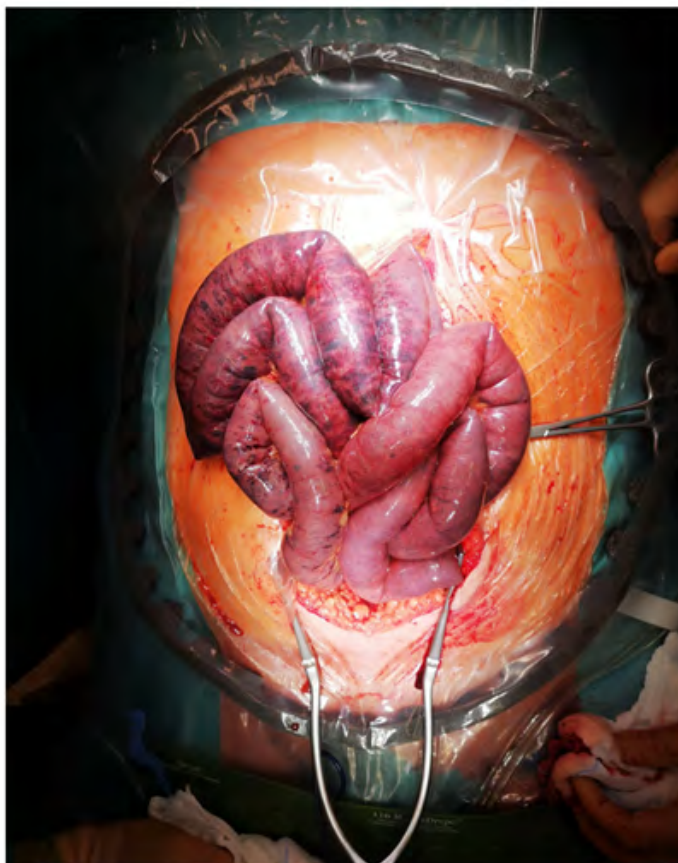


Figure 3: Ischemic changes in the small intestine.



Figure 4: The Meckel's diverticulum 24 hours after the small intestine revascularization.

6. Discussion

Both acute intestinal ischemia due to embolism of the superior mesenteric artery and complicated Meckel's diverticulum may cause similar, non-specific clinical symptoms. These include abdominal pain, nausea and vomiting, and often bloody diarrhea [1, 2, 3]. The lack of information about cardiac arrhythmias or a history of myocardial infarction does not direct the clinician's attention to embolism of the superior mesenteric artery. The rare occurrence of Meckel's diverticulum in the population, which is usually clinically silent [2], and the history of alcohol dependence syndrome with episodes of acute pancreatitis in the past are the main causes not to suspect a complicated course of Meckel's diverticulum. Although acute intestinal ischemia is considered a rare disease, in older patients it is more common than acute appendicitis or ruptured abdominal aortic aneurysm [1]. Contrast-enhanced abdominal tomography in both phases: arterial and venous allows proper visualization of the superior mesenteric artery embolism and the presence of Meckel's diverticulum, although its presence may not be clear when assessing small intestinal loops dilated as a result of ischemic changes [1, 6]. Computed tomography of the abdominal cavity and allows for preliminary planning of surgical treatment. It enables to evaluate whether the patient needs laparotomy to assess bowel viability and damage control or if the patient should undergo an attempt of endovascular revascularization of the superior mesenteric artery without an initial laparotomy [1]. In our case the open surgical embolectomy was the quickest way to restore blood flow and the chance assess the urgent need of resection the Meckel's diverticulum. Often, due to the difficulty of clearly assessing the blood supply to the small intestine, a "second look" laparotomy is necessary to verify the return of blood supply to the intestine [5]. In our case, thanks to a fast diagnosis and efficient surgical treatment, we managed to restore the blood supply to the small intestine and avoid intestinal resection. Resection of Meckel's diverticulum was abandoned due to the return of its appropriate blood supply and the fact that it did not present any inflammatory symptoms nor a palpable ectopic tissue and its base was wide, however Park J. J. et Al. recommend the diverticulectomy when: 1) the patient is younger than 50 years, 2) the sex is male, 3) the the diverticulum length is greater than 2 cm and 4) there is ectopic or abnormal tissue in the Meckel's diverticulum [3]. On the other hand, it seems to be an unresolved question if it should be resected after successful revascularization of the small intestine without any complications, while Lequet J. et Al. suggest that surgical management of asymptomatic Meckel's diverticulum should be decided case - by - case [7]. Finally, the patient recovered and was discharged from the hospital 7 days after admission with the confirmed diagnosis of asymptomatic Meckel's diverticulum and a recommendation of anticoagulation therapy until full cardiological evaluation.

References

1. Kärkkäinen JM. Acute mesenteric ischemia: A challenge for acute care surgeon. *Scand J Surg*. 2021; 110(2): 150-158.
2. Evola G, Caramma S, Caruso G, Schillaci R, Reina C, Reina GA. Intestinal obstruction and ischemia by necrotic annular Meckel's diverticulum: Case report and review of the literature. *Int J Surg Case Rep*. 2021; 105897.
3. Park JJ, Wolff BG, Tollefson MK, Walsh EE, Larson DR. Meckel diverticulum: The Mayo Clinic experience with 1476 patients (1950 - 2002). *Ann Surg* 2005; 241:529-533.
4. Schermerhorn ML, Giles KA, Hamdan AD, Wyers MC, Pomposelli FB. Mesenteric revascularization: Management and outcomes in the United States 1988 - 2006. *J Vasc Surg*. 2009; 50(2): 341-348.
5. Freeman AJ, Graham JC. Damage control surgery and angiography in cases of acute mesenteric ischemia. *ANZ J Surg* 2005; 75(5): 308-314.
6. Ginsburg M, Obara P. Expert Panels on Vascular Imaging and Gastrointestinal Imaging. ACR appropriateness criteria imaging of mesenteric ischemia. *J Am Coll Radiol*. 2018; 15(11S): S332-S340.
7. Lequet J, Menahem B, Alves A, Fohlen A, Mulliri A. Meckel's diverticulum in the adult. *J Visc Surg*. 2017; 154: 253-259.
8. Yamaguchi M, Takeuchi S, Awazu S. Meckel's diverticulum. Investigation of 600 patients in Japanese literature. *Am J Surg*. 1978; 136: P247-249.