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The importance of quick diagnosis in acute abdomen

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Abstract

Abdominal pain is a very common complaint among patients in Emergency Rooms. It can usually be associated with a gastrological problem. Acute Mesenteric Ischemia is one of the rarest causes of acute abdomen and has an incidence of 0.09–0.2% of all acute surgical admissions. An occlusive type of AMI may be treated using a relatively safe endovascular method called aspiration thrombectomy. This report presents a case of a 74-year-old male patient with a broad vascular treatment history, who was admitted to the Emergency Room with severe abdominal pain, nausea, and vomiting.

Keywords: abdomen, acute; acute mesenteric arterial thrombosis; occlusive mesenteric arterial ischemia; thrombectomy; aspiration thrombectomy

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Introduction

Acute mesenteric ischemia (AMI) is one of the rarest causes of acute abdomen. It is a serious emergency described by sudden stoppage of intestinal blood flow that commonly leads to bowel infarction. It usually affects the elderly with an increased risk of cardiac events. The most common cause of AMI is acute mesenteric embolism, contributing to 40–50% of the cases [1]. Most emboli originate from a cardiac output [2]. The second most common reason for AMI is thrombotic occlusion of a previously stenotic mesenteric artery which was reported in 20 to 35% of cases [1]. Symptoms of AMI are usually non-specific, such as abdominal pain, nausea, and vomiting.

Despite considerable advances in medical diagnosis and treatment over the past four decades, AMI still has a poor prognosis with an in-hospital mortality rate of 50–93% [3–6]. The absence of peritoneal symptoms delays diagnosis and treatment, in that case, early recognition and rapid treatment are crucial for a positive outcome. Delayed diagnosis leads to intestinal infarction and necrosis that cannot be reversed by blood flow restoration.

Conventional treatment for AMI has been surgical laparotomy with an open thrombectomy. Although with a constant development of percutaneous procedures, there are alternative methods. One of them is an aspiration thrombectomy, in which the thrombus is removed by suction, and the other is a mechanical

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thrombectomy, during which the embolus is fragmented and removed by different automated devices [7].

Penumbra's Indigo™ Aspiration System is a computer-aided mechanical aspiration thrombectomy device used to remove emboli and thrombi from vessels of the peripheral arterial and venous systems. Indigo™ CAT 8 catheter has a separator, which enables the operator to control the suction and aspirate thrombus from the vessel. It allows for effective and safe thrombus removal with reduced blood loss.

Case report

A 74-year-old male was admitted to the ER due to severe abdominal pain, nausea, and vomiting. These symptoms occurred 3 days before the admission. The patient had a broad medical history which included mild aortic valve incompetence, moderate mitral and tricuspid regurgitation; chronic heart failure; hypertension; type 2 diabetes; severe thrombocythemia; atherosclerosis of the lower limbs; necrosis of the big toe in the right foot; and thrombosis of the splenic artery and celiac trunk which led to chronic mesenteric ischemia. He had been under treatment for thrombocythemia for many years. He was diagnosed with osteomyelofibrosis which was caused by thrombocythemia and treated with hydroxycarbamide. He also had surgery for prostate cancer.

On physical examination on deep palpation, there was severe abdominal pain without peritoneal symptoms. Many laboratory tests were performed, but what drew the attention was high C-reactive protein (43.51 mg/L; ref: 0–5), WBC (28.4 thous./μL; ref: 4.3–10), PLT (879 thous./μL; ref: 150–400 thous./μL), D-dimer (1680 ng/mL FEU) and creatinine (1.90 mg/dL; ref: 0.60–1.30). The urine test did not show any deviations from the norms – the renal origin of the symptoms was ruled out.

The CT scan was performed and it did not show free fluid or free gas in the abdominal cavity, therefore it ruled out a gastrological origin of the pain in question. However, a radiologist found a segmental thrombus present in the area of the celiac trunk entrance (Fig. 1) which passes into the lumen of the splenic and hepatic arteries, narrowing them by 75%. The patient also presented a CT scan from two years before, which showed a calcified atherosclerotic plaque that covers part of the entrance of the celiac trunk (Fig. 2). After imaging tests, the patient was qualified for endovascular thrombectomy.

Endovascular treatment

Surgery started with a puncture of the left brachial artery under ultrasound guidance and local anesthesia.

Figure 1. A segmental thrombus present in the area of the celiac trunk entrance

Figure 2. A CT scan from two years before. Calcified atherosclerotic plaque at the entrance to the celiac trunk

A 5F sheath, Terumo® guidewire, and pigtail catheter were introduced to the descending aorta. After the Lunderquist® guidewire, the sheath was replaced with an 8F/45 cm. The intraoperative initial arteriography in the lateral position revealed an occlusion in the celiac trunk, but also a narrowing at the entrance to the superior mesenteric artery (SMA) (Fig. 3), which was not visible in the CT scan before the operation.

The SMA was catheterized using the V14 guidewire. Then, a CAT8 catheter from Penumbra's Indigo™ Aspiration System was placed over the entrance to the

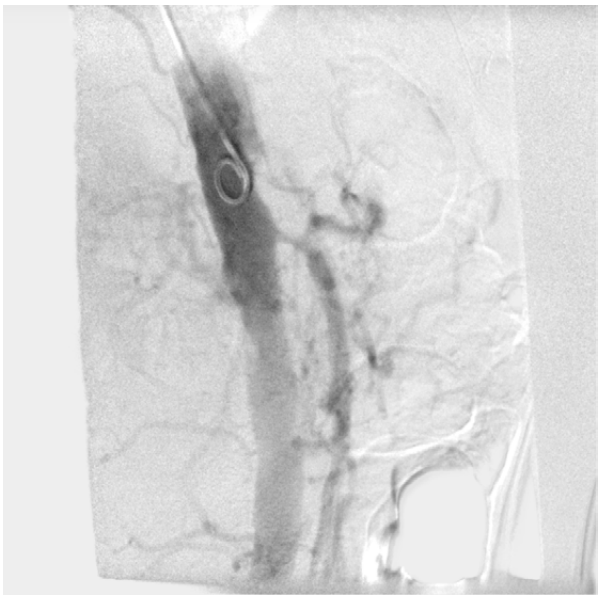

Figure 3. A narrowing at the entrance to the superior mesenteric artery revealed during an intraoperative angiography

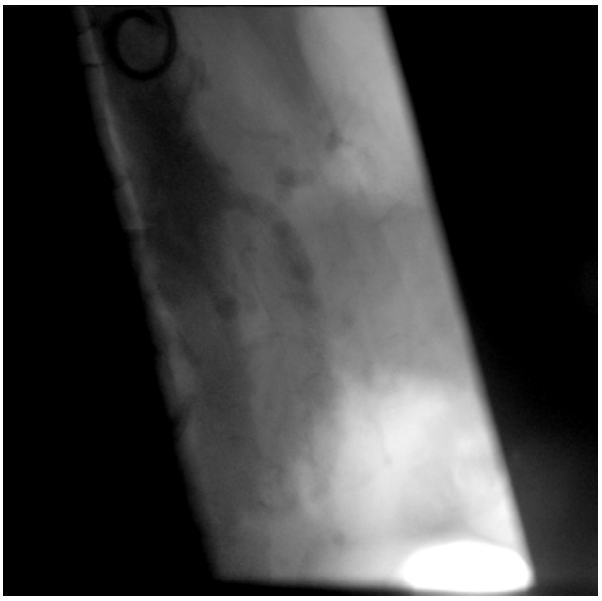

Figure 4. Control arteriography. Proper flow in the SMA

SMA. The guidewire was replaced with a separator and the thrombus was aspirated from the SMA. Control arteriography performed at the end of the operation showed proper flow in the SMA (Fig. 4).

There were attempts to overcome an occlusion in the celiac trunk but they turned out to be unsuccessful. The patient had normal liver laboratory results and no symptoms from either the spleen or liver.

The same day, a couple of hours after the endovascular treatment, the patient did not present any symptoms he complained about, and did not feel any abdominal pain. The patient was kept under observation for 8 days in the ward where antibiotics were ordered and inflammatory markers were monitored which would have suggested developing intestinal necrosis. Five days after the operation the patient was consulted by a hematologist due to the severe thrombocythemia (PLT 1223 thous./μL). During his stay, a CT scan was performed and it showed normal flow through the SMA (Fig. 5). Considering good laboratory tests, no symptoms, and good control CT scan results, the patient was sent home with a prescription for dual antiplatelet treatment (DAPT).

Figure 5. A CT scan after endovascular treatment. Proper flow in the SMA

Discussion

This case report highlights the importance of accurate diagnosis in acute and severe abdominal pain. The literature shows that the percent of patients with acute abdomen presented in ED is about 9.8% of all ED patients and about half of them (47.3%) may need surgical intervention. The most common causes of admission were non-specific abdominal pain (NSAP), acute appendicitis, and intestinal obstruction [8]. The mortality is age-related and varies from 12.3–19.7% [9]. When it comes to acute mesenteric ischemia the incidence is low, estimated at 0.09–0.2% of all acute surgical admissions [4], but the mortality rate increases to the range of 50–93% [3–6]. According to the meta-analysis by Sumbal R. et. al. [10] many factors can be associated with higher mortality among patients with AMI. Of those listed by the researchers, the present patient presented the following factors: age > 60 years, diabetes, and high creatinine.

Reports exist that there is a 50% chance of survival if a diagnosis of AMI is made within 24 hours, however, those chances drop to 30% if the diagnosis takes time after the 24-hour window [11]. Therefore, it requires

a prompt diagnostic and surgical intervention. The non-typical symptoms that are presented by patients make the diagnosis difficult and are represented by mostly abdominal pain, nausea, and vomiting, such as occurred in the present patient. After analyzing the Computed Tomography Angiography (CTA) study performed 2 years ago, it must be concluded that chronic intestinal ischemia was already present at that time. Given this, the current symptoms should be considered an exacerbation of the symptoms of chronic ischemia, caused most likely by thrombocythemia and atherosclerosis in the abdominal aorta, rather than the appearance of symptoms of acute intestinal ischemia. This explains the less rapid increase in symptoms compared to those of acute intestinal ischemia. As one can find in the Guidelines of the World Society of Emergency Surgery there are no laboratory studies that are sufficiently accurate to identify the presence or absence of ischemic or necrotic bowel, although elevated l-lactate and D-dimer may assist [4]. These guidelines also recommend performing the CTA as soon as possible for any patient with suspicion of AMI.

Any evidence of necrosis precludes the endovascular methods of revascularization because the resection of the necrotic intestine is required. However, that procedure has about a 60–74% mortality rate according to many sources [6, 12–14]. A delay in the surgery is an important, increasing mortality factor [8], therefore, fast and accurate diagnosis is the key to implementing proper treatment of AMI.

There are not many recommendations for managing ischemia of the intestines, but there is a significant difference in mortality between open revascularization and endovascular intervention (respectively 39.3% vs. 24.9%). The length of recovery after the procedure was also significantly longer in the patient group undergoing open revascularization (12.9 vs. 17.1 days) [15]. According to the systematic review by El Farargy et al., one can notice that the requirement for bowel resection was lower in patients undergoing endovascular treatment compared to patients who had open surgery (23.1% vs. 42%), furthermore, acute renal failure was less associated with endovascular treatment than open surgery (11.8% vs. 17.5%) [16]. Those two articles may suggest that endovascular treatment in AMI has many advantages over open revascularization. However, a selection for endovascular intervention may be associated with the treating surgeon's experience or broadly understood clinic facilities (ex. hybrid angiosuite), which may be a limitation of this method.

It can be concluded from the quoted statistical data that among many more common reasons for ED admissions caused by acute abdominal pain there is a serious condition, which is characterized by a very high mortality rate. Further research is required to determine whether the usage of endovascular thrombectomy could improve the outcomes of many more patients suffering from occlusive AMI who need vascular repair.

Article information and declarations

Ethics statement: The present study did not require ethical approval.

Author contributions: Conceptualization — J.J.K. and J.W.; validation — A.K.; formal analysis — G.B and J.J.K.; investigation — J.W.; resources — J.J.K, G.B. and P.T.; writing — original draft preparation — J.W., A.K., J.K.; writing — review and editing — J.J.K and G.B.; supervision — J.J.K, G.B. and P.T.; project administration — J.W. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest: The authors declare no conflict of interest.

Supplementary material: Figure 1. A segmental thrombus present in the area of the celiac trunk entrance; Figure 2. A CT scan from two years before. Calcified atherosclerotic plaque at the entrance to the celiac trunk; Figure 3. A narrowing at the entrance to the superior mesenteric artery revealed during an intraoperative angiography; Figure 4. Control arteriography. Proper flow in the SMA. Figure 5. A CT scan after endovascular treatment. Proper flow in the SMA.

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