



Case Report

Recanalization of Acute Mesenteric Artery Occlusion by Percutaneous Transluminal Angioplasty Followed by Stent Implantation

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Abstract

Mesenteric ischemia is caused by stenosis of the mesenteric arteries and is associated with high morbidity and mortality. While surgical revascularization has been the standard treatment for symptomatic patients, recent advances in interventional devices and techniques have made endovascular treatment feasible and effective for this situation. However, there is limited data regarding the role of endovascular therapy in acute mesenteric ischemia. The goal of this manuscript is to report a case of percutaneous transluminal angioplasty with primary stenting for the treatment of an acute occlusion of the superior mesenteric artery and to discuss the role of endovascular treatment in acute mesenteric ischemia scenarios.

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AMI is an uncommon condition caused by the severe stenosis or occlusion of the mesenteric arteries. It usually manifests as important abdominal pain (frequently related to food intake) and constitutes a dramatic situation in the emergency room. A key goal of the therapy in acute mesenteric artery occlusions is to rapidly reestablish blood flow into the vessel and to assess the viability of the ischemic bowel segment.

The open surgery is considered to be the most appropriate therapy. However, endovascular treatment may be considered in some situations: acute mesenteric ischemia without evidence of peritoneal irritation (early stage ischemia), in patients with a very high operative risk infection of the peritoneal cavity with no available autologous vessel for grafting or compassionate treatment. The case presented in this manuscript shows the feasibility of the endovascular therapy to treat acute mesenteric artery occlusion in this dramatic situation.

Introduction

Endovascular techniques like Percutaneous Transluminal Angioplasty (PTA) followed (or not) by stent implantation have been used to treat arterial stenosis throughout the vascular system. Endovascular therapy has been increasingly applied in patients with Chronic Mesenteric Ischemia (CMeI) to avoid morbidities associated with open surgical repair since 1980 [1]. However, usually this treatment is realized in an elective manner in order to treat chronic and stable stenosis of the mesenteric artery. There is limited data regarding the role of endovascular therapy in Acute Mesenteric Ischemia (AMeI) [2].

The goal of this manuscript is to report one case of percutaneous transluminal angioplasty with primary stenting of the ostial and proximal segment of the superior mesenteric artery for the treatment of AMeI caused by the acute occlusion of the Superior Mesenteric Artery (SMA) and to discuss the role of endovascular treatment in acute mesenteric ischemia scenarios.

Case Description

We present a case of a 76 year-old female patient with a history of type 2 diabetes, obesity, hypertension, smoking, prior right coronary artery angioplasty followed by stent implantation, prior bilateral carotid endarterectomy and prior chronic occlusion of the left subclavia artery. For the last 4 weeks she had complained about an important abdominal pain which irradiated to her back was sometimes triggered by food intake and usually occurred during the afternoon. Nausea, vomiting and dizziness usually accompanied the abdominal pain. The episodes lasted for 20 to 30 minutes and were relieved spontaneously. She had lost about 5 kilograms over the last 4 weeks.

She had visited 4 different doctors and gone through different blood exams, endoscopy, colonoscopy, abdominal ultrasound and computed tomography without obtaining a specific diagnosis. Finally, CMeI was suspected and an abdominal angiotomography was performed. An important stenosis of the ostial and proximal portion of the mesenteric artery was observed (Figures 1 and 2). An Aortic and Mesenteric angiography was indicated in order to confirm diagnosis and

program appropriate treatment. However, two days before this exam she developed an intensive abdominal pain (similar to the prior episodes) that persisted after 60 minutes. She got to the hospital about 1 hour after the initial symptoms and hypotension (70/40mmHg) and bradycardia (44 bpm) were observed. No other alterations in neurological, cardiovascular or respiratory exam were observed. Signs of peritonitis were not present. No signs of ileus, pneumatosis intestinalis, bowel obstruction, perforation or wall thickening were found on plain abdominal radiographs.



Figure 1: Important stenosis of the ostial and proximal portions of the superior mesenteric artery identified by abdominal angiography.

The electrocardiogram performed did not show new abnormalities. AMeI was suspected and the endovascular team was called. An urgent angiography was performed and showed complete occlusion of the mesenteric artery and primary angioplasty of the mesenteric artery followed by stent implantation was performed (Figures 3,4 and 5).



Figure 2: Abdominal AngioCT showing an important stenosis of the Superior Mesenteric Artery.



Figure 3: Recanalization of the Superior Mesenteric Artery obtained by the use of a coronary balloncatheter.



Figure 4: Final Result obtained after the implantation of a coronary bare metal stent involving the ostial and proximal portions of the superior mesenteric artery.



Figure 5: Final result of the procedure after stent implantation in the superior mesenteric artery with great improve in blood flow to the bowel vessels.

Intervention

The diagnostic procedure (angiography) was performed, through the left femoral artery, using a right coronary dedicated 6 FR guide catheter and demonstrated a total occlusion of the superior mesenteric artery. 100 IU of intravenous non-fractionated Heparin was administered prior to the angiography. We were able to transpass the occlusion with the use of a 0.014 BHW guidewire (Abbot®). The recanalization of the SMA was performed using a 4.0x20 mm Apex balloon (Boston Scientific®) to pre-dilate the occluded vessel. After the reopening of the vessel we implanted a 4.5x24 mm liberté coronary bare metal stent (Boston Scientific®) involving the ostial and proximal portion of the SMA. Then we performed a stent post dilatation using a 5.0x20 mm NC Quantum Apex® balloon (Boston Scientific®), which was insufflated up to 18 atm. We were able to obtain a good angiographic result and SMA flow at the end of the procedure (Figure 5). The door-balloon time was about 40 minutes.

Outcome

The patient's condition partially improved after the use of intravenous NaCl 0.9% (1.000 ml) and 1 mg of atropine administered just before the diagnostic procedure. But her hemodynamic stabilization was only obtained 10 minutes after MA reperfusion. After resolution of the abdominal pain and nausea, 200 mg of Aspirine and 300 mg of Clopidogrel were orally administered.

Evolution

After the procedure the patient improved clinically and hemodynamically without electrocardiographic alterations but with a slight elevation of white cells count for 2 days. She was discharged from the hospital 3 days after the percutaneous intervention, asymptomatic while performing mild activity in the hospital infirmary and having regular light meals. She remains asymptomatic and without any new cardiovascular events 1 year after the index intervention. She gained 5 kg in this one-year period.

Discussion

MeI is an uncommon condition caused by the stenosis or occlusion of the mesenteric arteries and is usually manifested as abdominal pain, frequently related to food intake. Most patients with MeI are older than 60 years of age. Women are affected three times more often than men. The presence of mesenteric arterial stenosis in the older is common. One study found 70% or higher stenoses of the mesenteric arteries in 17.5% of asymptomatic patients older than 65 years of age [3,4]. The occurrence of ischemia is a multifactorial event determined by the number of vessels with stenosis, the site of the lesions in these vessels (worse prognosis with distal lesions), the pace of lesion progression and the ability of the individual patient to develop collateral vessels [3]. Comorbidities like low blood pressure, Aortic lesions (like Aortic aneurisms) or post-intraabdominal surgeries can also affect mesenteric perfusion [4]. The chronic MeI of the patient described in this manuscript was due to the subocclusion of the superior mesenteric artery and she did not have serious stenosis of the other two mesenteric arteries.

When the blood supply to the bowel becomes inadequate, patient experiences postprandial pain also known as intestinal angina. Weight loss and a fear of eating develop and can lead to important malnutrition. Persistent nausea or diarrhea can be present. Incapacitating

gastroparesis may cause vomiting, postprandial heaviness, gastroduodenal bleeding and delayed gastric emptying [5]. Women who are heavy smokers are selectively affected. Without treatment at the early stage of gastroparesis the prognosis is extremely poor. Isolated cachexia often prompts costly investigations for malignancy [6]. As a result the diagnosis of CMI is often delayed.

Acute intestinal ischemia with infarction of the intestine and mesentery is a complication that is associated with a grim prognosis. Therefore, rapid diagnosis and treatment of a critical obstruction is mandatory for symptomatic patients. The case described in this manuscript developed abdominal pain that was not initially characterized as intestinal angina because it was not well related to food intake. The weight loss that the patient developed led to expensive investigation for malignant causes. Her visit to different doctors and the use of multiple exams, without reaching a correct diagnosis evidence the difficulties associated with the evaluation of these critical patients.

Some methods are indicated for the detection of stenosis or occlusion of mesenteric arteries. These include fasting and postprandial doppler ultrasonography, magnetic resonance angiography and most importantly, computed tomographic angiography (specially indicated in patients with good renal function). However, angiography remains the gold standard and also the first step of every endovascular procedure [3]. In this related case, the presence of an important obstruction in the mesenteric artery as the main cause of patient's symptoms was clearly observed in the angiogram.

Treatment is required for patients with symptomatic MeI. The goals of treatment are to ensure symptom resolution, to correct nutritional status and to prevent intestinal infarction. Prophylactic revascularization in patients with asymptomatic MI remains unclear. Unfortunately, nearly one-half of patients with asymptomatic lesions may experience acute intestinal ischemia as the first manifestation [7]. However, the natural history of mesenteric artery stenosis remains unclear and there is no formal indication to revascularize asymptomatic patients.

The conventional treatment for MeI consists of open endarterectomy or bypass surgery, which has a 15% to 47% morbidity rate and a 0% to 17% mortality rate with a high long-term artery patency (60-79%), and a high five-year survival rate (more than 60%) [8-12]. Thus surgical treatment is the reference standard: the immediate and long-term success rates are high. Although the invasiveness of conventional surgery is a disadvantage in several patients with MI, specially in those who have a high operative risk. Stenoses of mesenteric arteries are usually focal and are located at the ostium or proximal part of the vessel - two characteristics that make them accessible to endovascular treatment. Endovascular intervention is safer in the short term, with 0% to 11% mortality and 0% to 18% morbidity [13].

A meta-analysis of 16 studies (published between 1995 and 2006) comprising 328 patients with MeI who were treated using endovascular techniques shows that endovascular treatment is safe and is associated with very low morbidity and mortality rates. Stenting increases the immediate success rate and also increases the long-term risk of restenosis which is fairly well tolerated. Although the long-term patency rate is lower than reported with conventional surgery the low morbidity rate gives endovascular treatment a place of choice in the management of MI, particularly in higher-risk patients and in acutely ill patients [13]. However, there is limited data involving the use of angioplasty followed (or not) by stent implantation in acute scenarios.

Acute Mesenteric Ischemia (AMeI) requires emergent conventional surgery to revascularize the artery and above all to visually assess the viability of the ischemic bowel segment. In general there is no formal role for endovascular treatment and surgical treatment should be indicated. Endovascular treatment may be considered in some specific situations: in cases of acute mesenteric ischemia without evidence of peritoneal irritation (indicating early stage ischemia) in the presence of a very high operative risk in cases associated with peritoneal infection, in cases with no available autologous vessel for grafting or for compassionate treatment [14-16].

In a recent systematic review Ierardi et al., found that AMeI was predominantly caused by arterial emboli from cardiac arrhythmias (40-50%), thrombosis at preexisting lesions (25%) and other non-occlusive causes. The Superior Mesenteric Artery (SMA) was the commonest site of thromboembolic occlusion because of its oblique origin from the aorta. Abdominal pain, vomiting and nausea were the most common presenting symptoms [2].

The study of Arthurs, et al., represented the largest series of patients with AMI treated with endovascular therapy in one center. They retrospectively evaluated 70 patients with AMeI in whom endovascular revascularization was the preferred treatment (81%). The primary technique was thrombolysis infusion which was used in 48% of the population. Thirty-two percent of patients were treated with primary PTA and stenting. Aspiration thrombectomy in conjunction with thrombolysis was performed in 12% of patients. Successful endovascular treatment was achieved in 87% of cases, and the mortality rate was 36%, compared with 50% ($P < 0.05$) in patients treated with traditional therapy.

Acute renal failure, myocardial and cerebral infarctions, bowel ischemia and short bowel syndrome are the most common complications reported in literature within acute percutaneously revascularized patients. Potential complications related to the endovascular procedure included access-related bleeding (e.g. hematoma, pseudoaneurysm) and vessel trauma that can lead to arterial dissection or atheroembolization. The use of distal embolic protection devices may mitigate the risk of bowel necrosis as a consequence of distal embolization but there is a lack of data concerning their efficacy in the mesenteric circulation [2].

The clinical case described in this manuscript shows that angioplasty and stenting of the mesenteric vessels, if performed early, can prevent intestinal infarction and obviate the need for laparotomy. This was also evidenced in other previous studies [17-19]. Other studies are necessary to assess long-term outcomes and to establish the best treatment option to be considered in rapid diagnosed patients with AMeI. However, the low incidence of this acute condition makes such a trial extremely unlikely. This way the description of successful and unsuccessful cases and series of cases might still be very useful.

Conclusion

Chronic and Acute Mesenteric ischemia are caused by stenosis of the mesenteric arteries and are both associated with high morbidity and mortality. While surgical revascularization has been the standard treatment for symptomatic patients, recent advances in interventional devices and techniques have made endovascular treatment feasible and effective for both situations. Percutaneous transluminal angioplasty with stent placement is now recognized as a minimally invasive means of obtaining good long-term results with acceptable recurrence rate.

In the acute scenario critical ischemia is a dramatic situation in the emergency room. A key goal of the therapy in acute mesenteric artery occlusion is to rapidly reestablish flow into the proximal arterial segments and to assess the viability of the ischemic bowel segment. The open surgery is still considered to be the most appropriate therapy. However, endovascular treatment may be considered in some situations: acute mesenteric ischemia without evidence of peritoneal irritation (early stage ischemia), in patients with a very high operative risk in patients with peritoneal infection patients with no available autologous vessel for grafting and for compassionate treatment. The case presented in this manuscript proves the feasibility of the endovascular therapy to treat acute mesenteric artery occlusions.

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