Severely calcified superior mesenteric artery stenosis treated with intravascular lithotripsy. A case report

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Case Report

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Background: Objective: To describe a case report of severely calcified superior mesenteric artery stenosis treated with intravascular lithotripsy in a symptomatic patient.
Introduction: Clinical manifestations of chronic mesenteric ischemia (CMI) may present widespread symptoms such as postprandial abdominal pain and weight loss when there is a 60% to 75% reduction in blood flow. Superior mesenteric artery (SMA) stenosis is a common finding in elderly patients with atherosclerosis.
Case report: 83-year-old female patient with chronic postprandial abdominal pain, diagnosed with severely calcified superior mesenteric artery stenosis by computed angiotomography, required hospitalization and treated with intravascular lithotripsy, plain old balloon angioplasty and stenting, being discharged 24 hours later.
Conclusion: Intravascular lithotripsy is a novel approach for severely calcified visceral arteries and could be considered as a combination therapy with traditional endovascular treatment modalities. More controlled studies are needed to demonstrate the efficacy and safety of this new technology.

Keywords: Intravascular lithotripsy, shockwave, superior mesenteric artery stenosis.

Clinical manifestations of chronic mesenteric ischemia (CMI) may present widespread symptoms such as postprandial abdominal pain and weight loss when there is a 60% to 75% reduction in blood flow. Superior mesenteric artery (SMA) stenosis is a common finding in elderly patients with atherosclerosis. The risk factors for atherosclerosis include smoking, diabetes, high blood pressure, obesity, kidney disease, and high cholesterol. [1]

Most patients with chronic mesenteric ischemia due to atherosclerotic disease do not exhibit symptoms because of the extensive collateral network within the mesenteric vasculature that can form to compensate for reduced flow. Patients who manifest symptoms of chronic mesenteric ischemia may reveal an epigastric bruit in approximately 50 percent of patients due to turbulent flow related to arterial stenosis. Weight loss is present in approximately 80 percent. [2]

For patients with suggestive symptoms, guidelines from both the Society for Vascular Surgery and the American College of Radiology recommend computed tomographic (CT) angiography of the abdomen and pelvis as the best imaging study since it reliably identifies or excludes the presence of atherosclerotic vascular disease as the most likely etiology and simultaneously rules out other abdominal pathologies as the source of symptoms. [3]

Case report

An 83-year-old female presented to the emergency department with abdominal pain lasting 6 hours, located in the epigastrium, colic type, severe intensity, postprandial onset and weight loss of 15 kilograms in 6 months. The patient reports a history of diabetes mellitus, high blood pressure, diverticular disease, and smoking. She was received by the emergency department and considering a history of diverticular disease and chronic abdominal pain, they requested an abdominal CT scan. The CT scan reported no abdominal visceral alteration, but moderate calcification of the aortic root is detected, reason why an computed tomographic angiography of the abdomen and pelvis is done, reporting superior mesenteric artery with high density calcified plaque 12 mm long that causes severe stenosis (70-99%) (fig. 1). The option of receiving endovascular treatment is discussed with the patient and family, which they accept and the surgical protocol is initiated.

Planned procedure is arranged in hemodynamics room, vascular access was performed with US-guided right common femoral artery puncture, Aortography and Superior Mesenteric Angiography is done, reporting Celiac trunk stenosis and critical stenosis of the Superior Mesenteric Artery (fig. 2). Intravascular lithotripsy is performed with a shockwave device in 5 cycles of 30 pulses each. In a second step, plain old balloon angioplasty (POBA) is performed (fig. 3). Finally, a 5.0 x 28 mm stent was placed (fig. 4) and selective angiography was performed (fig. 5). Vascular access is closed with Angio-seal device without complications. Patient is discharged from the hemodynamics room and remains under 24-hour surveillance in hospitalization. The patient presented an adequate clinical course without abdominal pain and tolerated oral diet 6 hours after the

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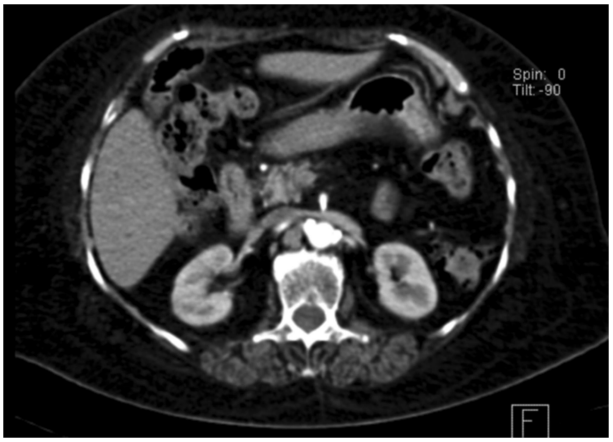

Figure 1: Superior mesenteric artery with high density calcified plaque 12 mm long that causes severe stenosis (70-99%)

procedure. Home discharge was decided 24 hours after procedure with anticoagulant management and follow-up by outpatient consultation.

Discussion

If chronic mesenteric ischemia is diagnosed there are two therapeutic options: surgical revascularization or percutaneous transluminal angioplasty (PTA) with or without stenting. Intravascular lithotripsy (IVL) has emerged as a novel therapy for the treatment of vascular calcification.

Figure 2. Critical stenosis of the Superior Mesenteric Artery

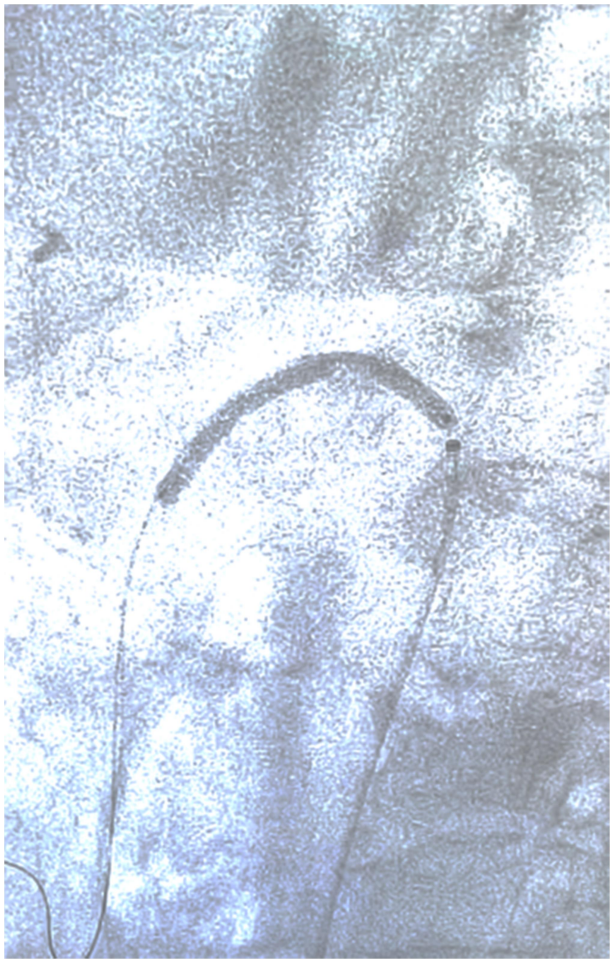

Figure 3. Plain old balloon angioplasty (POBA)

IVL is based on the established therapeutic strategy of using acoustic pressure waves to treat renal calculi, with specific modifications in delivery to address vascular calcium. These adaptations include the incorporation of lithotripsy emitters (source of acoustic pressure waves) on the shaft of a balloon angioplasty catheter that deliver localized pulsatile acoustic pressure waves circumferentially to modify vascular calcium [4].

In the treatment of severely calcified lesions, IVL offers several advantages compared with balloon-based technologies (i.e., high-pressure noncompliant and cutting/scoring balloons) and atheroablative technologies (rotational or orbital atherectomy). First, whereas balloon-based technologies are dependent on high static pressure for plaque modification, IVL uses acoustic shockwaves delivered through a semi compliant balloon inflated to only 4 atm, thus avoiding high-pressure inflation with the consequent potential for barotrauma observed with conventional noncompliant balloons. IVL fractures both superficial and deep calcium in situ and minimizes the risk for vascular complications or thermal injury. [4]

As a novel technology, published data on IVL includes highly selected clinical situations and

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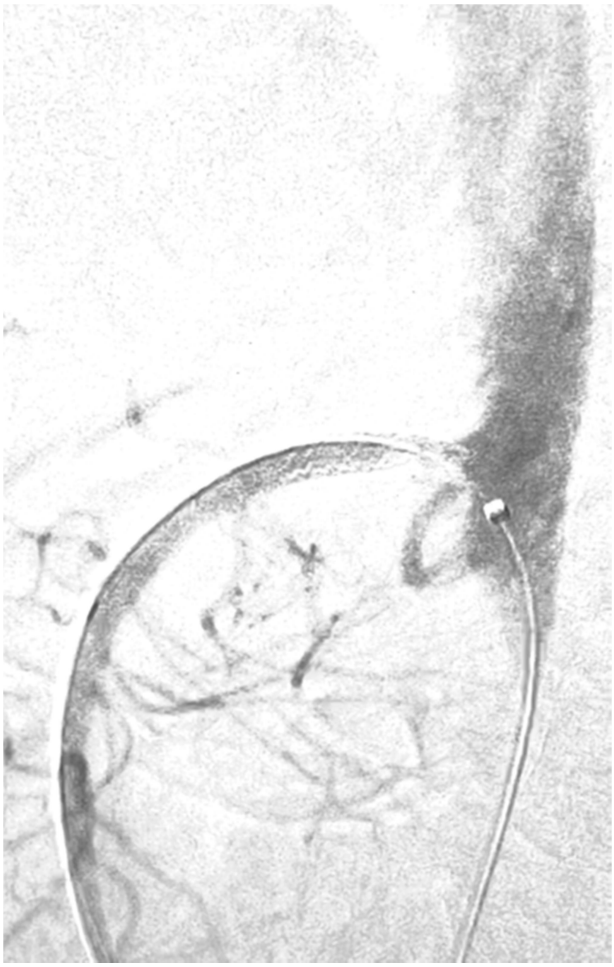

Figure 4. 5.0 x 28 mm stent was placed and selective angiography was performed.

patients, but are reinforced by operator experience in daily clinical practice. This growing experience and new trials would fill the gaps remaining in the current scientific literature for situations not encountered in the Disrupt studies. It would be interesting to have a comparator to IVL for plaque preparation, such as a modified balloon or atherectomy. [5]

Conclusion

Intravascular lithotripsy is a novel procedure with a short learning curve and a favorable safety profile. Currently, there is limited literature of reported cases of superior mesenteric artery stenosis treated with intravascular lithotripsy. There is no evidence that demonstrates clinical benefit of using intravascular lithotripsy in combination with plain old balloon angioplasty and stenting, more controlled studies are needed to demonstrate the efficacy, safety, and feasibility of this new technology.

Conflicts of interests

We declare no potential conflicts of interest of any of the authors in this scientific report.

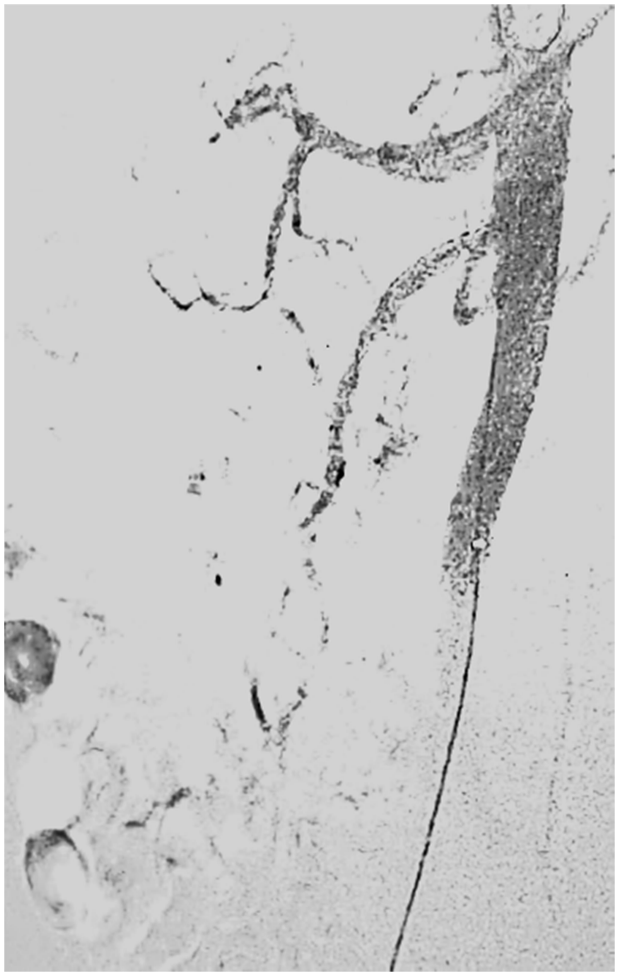

Figure 5. Control angiography

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