

# Laparoscopic Management of Superior Mesenteric Artery Syndrome

Honnie Bermas, MD, Michael E. Fenoglio, MD

## ABSTRACT

**Objectives:** The differential diagnosis of intestinal obstruction includes mechanical obstruction, obstruction secondary to systemic disease, and idiopathic intestinal pseudo-obstruction. The causes of these are extensive; however, the majority of cases involve a mechanical cause. Superior mesenteric artery syndrome (SMAS) is a rare and controversial form of mechanical obstruction with just over 300 well-defined cases described in the literature. The diagnosis is often difficult to establish, even after surgery. In addition, this syndrome sometimes may be managed conservatively, leaving a definitive diagnosis unproven. We describe herein 2 patients with SMAS successfully treated with laparoscopic duodenojejunostomy.

**Methods:** Two cases of SMAS occurred in young men ages 23 and 34. The workup included a consultation with a gastroenterologist, an upper gastrointestinal (GI) endoscopy, upper GI series with small bowel follow-through, computed tomography scan, ultrasound of the abdomen, and abdominal aortogram. This diagnosis was established after consultation with the surgeon and the gastroenterologist in each case.

**Results:** Laparoscopic duodenojejunostomy was performed in each case, and both patients have had complete resolution of their preoperative symptoms.

**Conclusions:** A laparoscopic approach to the management of superior mesenteric artery syndrome is a reasonable and successful way of treating these patients.

**Key Words:** Laparoscopy, Superior mesenteric artery syndrome.

## INTRODUCTION

Superior mesenteric artery syndrome was first described by Rotinsky in 1842.<sup>1</sup> He defined it as "a syndrome characterized by intermittent emesis with copious bile-stained material in asthenic people resulting from compression of the duodenum between the aorta and the superior mesenteric artery." For the next 100 years, it was a controversial and often confusing diagnosis. In the 1960s, modern radiologic techniques allowed criteria to be established for the diagnosis of SMAS.<sup>2</sup> In 1908, Stavely<sup>3</sup> performed the first open duodenojejunostomy. In 1997, laparoscopic techniques were introduced as an option in the operative management of SMAS.

Patients are typically between the ages of 10 and 39. Predisposing factors include wasting syndromes (cancer, burns), pancreatitis, diseases of the spine (lordosis, scoliosis), immobilization in a body cast or girdle, and dietary disorders (anorexia nervosa, malabsorption).<sup>2,4</sup> Clinically, patients present with weight loss, bilious emesis, and postprandial epigastric pain. The pain is usually relieved by assuming a knee-chest position or when lying prone. SMAS is associated with peptic ulcer disease in 25% of patients.<sup>5</sup>

The workup is often extensive because it is important to exclude other more common causes of GI obstruction. Most patients will have an upper GI study, endoscopy, abdominal ultrasound, a computed tomography (CT) scan, and an aortogram. Radiologic criteria include dilatation of the first and second portions of the duodenum, abrupt vertical and oblique compression of the mucosal folds, antiperistaltic flow of barium proximal to the obstruction producing to and fro movements, and delay in transit of 4 to 6 hours through the gastroduodenal region.<sup>2</sup> Arteriographic criteria include a significantly decreased aorto-SMA angle of 6° to 25° (nl=45°) and a shortened aortomesenteric distance of 2 to 8 mm (nl=10 to 20 mm).<sup>6</sup>

Several structural abnormalities occur that have been implicated in the pathophysiology of SMAS. A decreased angle between the aorta and the SMA can cause the duodenum to be pinched. The pathologic angle can either be congenital or it may be the result of weight loss with

Surgical Consultants, Denver, Colorado, USA (all authors).

Address reprint requests to: Honnie Bermas, MD, Surgical Consultants, 1601 E. 19th Avenue, Suite 4500, Denver, CO 80218, USA. Telephone: 303 831 6100, Fax: 303 831 8200, E-mail: bken4@quest.net

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subsequent thinning of retroperitoneal and mesenteric fat. Another abnormality is a short ligament of Treitz, which wedges the duodenum into the aorto-SMA angle.<sup>4,7</sup>

In terms of management, patients are initially treated medically with total parenteral nutrition (TPN), intravenous fluids, frequent small meals with the patient in the knee-chest position, and promotility agents. Failure of medical management is an indication for surgery. Surgical options include gastrojejunostomy, duodenojejunostomy, or lysis of the ligament of Treitz.

Laparoscopic surgery has recently been successfully used in the management of SMAS. In 1995, Massoud<sup>8</sup> described laparoscopic severing of the ligament of Treitz. In 1998, Gersin<sup>9</sup> performed the first laparoscopic duodenojejunostomy.

### **CASE REPORT 1**

The patient is a 34-year-old male who had no medical problems and a past surgical history significant for an appendectomy. The patient complained of a 12-year history of abdominal pain. Within the last 2 to 3 years, he had been experiencing daily vomiting episodes, nausea, and persistent periumbilical abdominal pain relieved by the knee-chest position. A CT scan was obtained that demonstrated dilatation of his duodenum. A presumptive diagnosis of SMAS was made and additional studies were obtained. An upper GI study and esophagogastroduodenoscopy (EGD) failed to confirm the diagnosis. An aortogram demonstrated an aorto-SMA angle of 5 to 10 degrees and an aorto-mesenteric distance of 5 mm. After consultation between the surgeon and the gastroenterologist, the diagnosis of SMAS was made.

Surgery was recommended and the patient underwent a laparoscopic duodenojejunostomy. An open Hasson technique was used and 3 other ports were placed. A wide Kocher maneuver was performed. A window was made in the transverse mesocolon. The jejunum was brought up to the duodenum and a stay suture was placed. A duodenojejunostomy was created and 2 firings of a 30-mm Endo-GIA stapler were used to create the anastomosis. A running suture was used to close the resulting defect, which was bolstered by Lembert sutures. A JP drain was left in the vicinity of the anastomosis.

Postoperatively, the patient recovered well. On postoperative day 2, he had a gastrograffin upper gastrointestinal study and small bowel follow through (UGISBFT) that

confirmed no leak or obstruction of the duodenojejunostomy. The patient was advanced to a liquid diet and discharged home on postoperative day 3. Upon follow-up, the patient had complete resolution of his preoperative symptoms.

### **CASE REPORT 2**

The patient is a 22-year-old male with a past medical history significant for asthma and food allergies and no previous surgeries. He had a 10-year history of abdominal pain and over the last 2 to 3 years had postprandial nausea, vomiting, and a 30 lb weight loss. He had had multiple previous hospitalizations that included consultations with an internist, gastroenterologist, neurologist, and an allergy specialist. A CT scan, UGISBFT, EGD, abdominal ultrasound, hydroxy iminodiacetic acid (HIDA) scan, and gastric emptying study were all normal. Ultimately, he underwent an aortogram, which demonstrated a very oblique takeoff of the SMA almost parallel to the aorta, which equaled an angle of zero. He had a repeat CT scan that showed a narrowed duodenum as it crossed between the aorta and the SMA. A repeat EGD showed a dilated duodenum and confirmed the narrowed segment of duodenum. Based on this constellation of findings, the diagnosis of SMAS was made and surgery was recommended.

The patient underwent a laparoscopic duodenojejunostomy and cholecystectomy. The gallbladder had evidence of chronic cholecystitis and therefore was removed. The operative procedure was similar to that of the previous case. An extensive Kocher maneuver was performed, and the anastomosis was completed in a retrocolic fashion.

The patient's postoperative course was complicated by a trocar site bleed. He was taken back to the operating room on postoperative day 2 for re-exploration. On postoperative day 4, he had a gastrograffin UGISBFT that showed no leak or obstruction. He was advanced to a liquid diet and discharged home.

On follow-up, the patient was feeling well, had resolution of his symptoms, and had gained 20 lbs.

### **DISCUSSION**

Because SMAS is a rare condition, no randomized, controlled trials have been conducted to compare operative procedures. Historically, a gastrojejunostomy was used to treat SMAS. That procedure has largely been abandoned

due to associated complications including dumping syndromes, blind loop syndrome, and marginal ulceration.<sup>1</sup>

Lysis of the ligament of Treitz has been used successfully in many cases. In 1958, Strong<sup>10</sup> first described the procedure. In 1961, Martorell<sup>11</sup> demonstrated its success on a 35-year-old man with SMAS. A major advantage of the procedure is the avoidance of a gastrointestinal anastomosis.

In terms of laparoscopic treatment, Massoud<sup>8</sup> described a series of 4 patients with SMAS who were treated with laparoscopic severing of the ligament of Treitz. He described an extensive dissection including the retropancreatic space, the superior paraduodenal fossa, and the posterior surface of the superior mesenteric vessels. Once those areas have been taken down, the duodenum is able to drop away from the aorto-SMA junction. The surgery was successful in 75% of their patients. One patient developed a recurrence of her symptoms within 3 weeks.

Duodenojejunostomy is the third surgical option and can be used when either of the other operations fails. In 1908, Stavelly<sup>3</sup> performed the first successful duodenojejunostomy. In 1976, Appel et al<sup>12</sup> reported an accumulated series of 36 patients with SMAS who were treated surgically. In their series, 100% of the patients treated with a duodenojejunostomy were cured, whereas only 79% of the patients treated with lysis of the ligament of Treitz were cured.

In 1998, Gersin and Heniford<sup>9</sup> reported the first laparoscopic duodenojejunostomy. We have successfully treated 2 patients with laparoscopic duodenojejunostomy.

## CONCLUSION

Laparoscopic duodenojejunostomy is a viable option in the treatment of SMAS. It has all the benefits of minimal-

ly invasive surgery as well as excellent results.

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