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## Laparoscopic Duodenojejunal Bypass for Superior Mesenteric Artery Syndrome after Failed Medical Management: A Case Report

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### Abstract

Superior mesenteric artery syndrome is an uncommon cause of proximal small bowel obstruction in which the third part of the duodenum is compressed between the superior mesenteric artery (SMA) and the aorta. It is a rare entity and is usually considered as a diagnosis of exclusion. In this case report, a 21-year-old male patient is shown who has the typical SMA syndrome symptoms such as vomiting, upper abdominal pain, and h/o weight loss. Initially, conservative management was tried for a few days, but symptoms continued to persist. The patient underwent laparoscopic duodenojejunal bypass after imaging studies confirmed the diagnosis. The patient had a smooth post-operative course and was discharged in stable condition. The minimally invasive surgical intervention is safe and successful in treating SMA syndrome and preventing complications.

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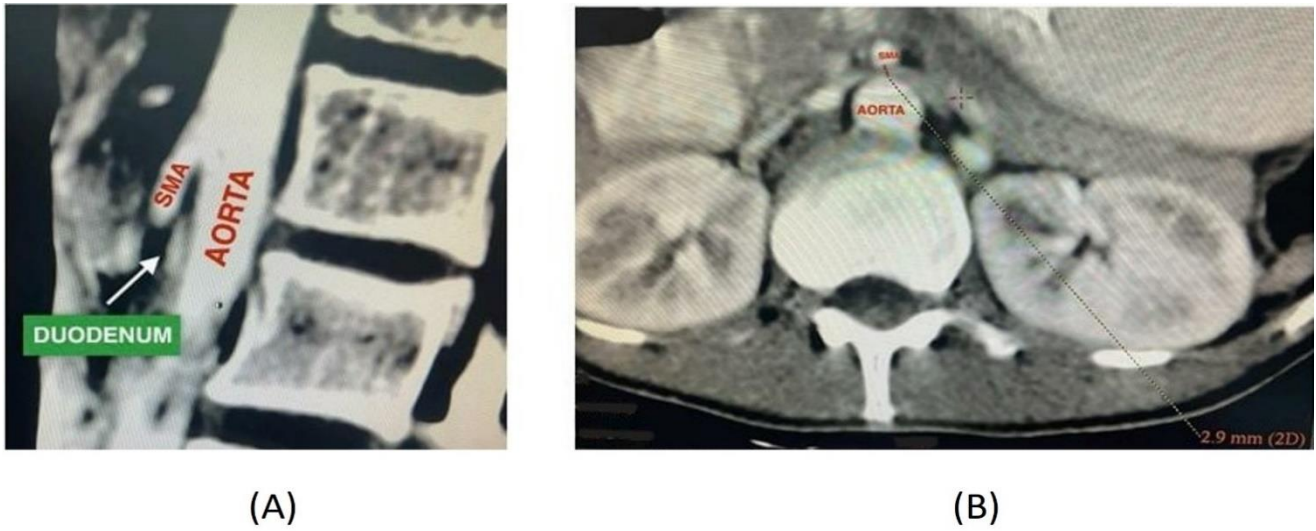
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### Introduction

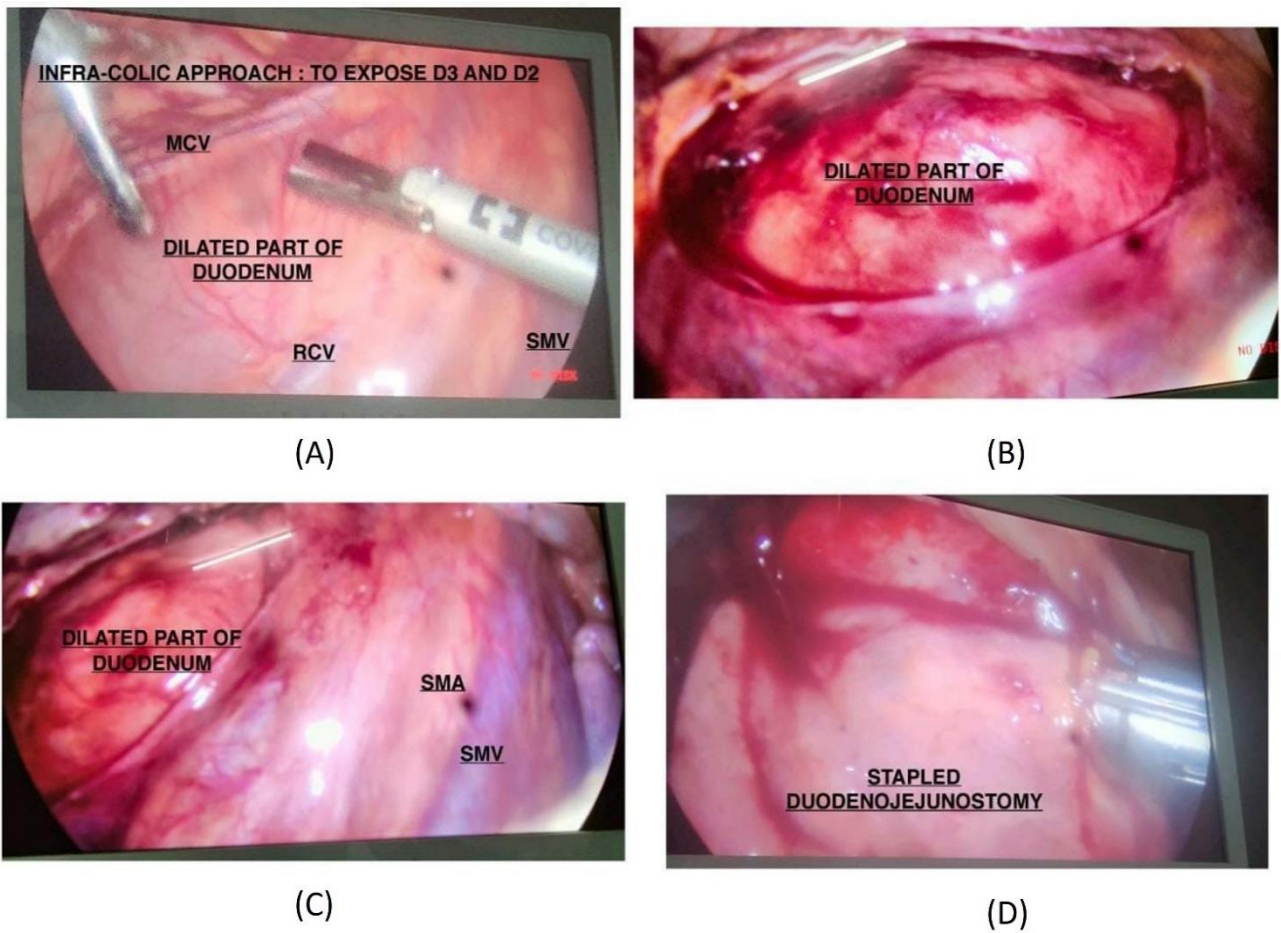
Superior mesenteric artery (SMA) syndrome, also known as Wilkie's syndrome, is a rare type of small bowel obstruction with an incidence ranging from 0.01% to 0.3%.<sup>1,2</sup> The third portion of the duodenum is compressed between the SMA and aorta as a result of the abnormally narrow angle that results in the condition. This -

compression can lead to symptoms such as abdominal pain, nausea and vomiting, early satiety, and weight loss. The history of rapid vertical growth, corrective spinal surgery, or unexpected weight loss brought on by a number of potential comorbid conditions has all been linked to this narrow aorto-mesenteric angle.<sup>3,4</sup> If left untreated, it can result in gastroesophageal reflux disease, malnutrition, dehydration, gastrointestinal (GI) and esophageal problems, psychological distress, and nutritional deficiencies.<sup>5</sup> It's crucial to get diagnosed and treated right away to avoid these potential complications. Nutritional optimization using tube feeds distal to the obstruction site is the typical first-line non-operative treatment.<sup>3</sup> The acute angle between the SMA and the aorta can frequently be corrected with the right amount of weight gain. In situations where medical treatment has failed, surgical intervention is recommended.<sup>6,7</sup> Surgery may be used to mobilize the duodenum away from the SMA (Strong procedure) or to create a bypass (duodenojejunosomy or gastrojejunostomy). Here, we present the case of a 21-year-old male patient with SMA syndrome who underwent laparoscopic duodenojejunal bypass.

**Case Report:**



**Figure 1:** Pre-operative Contrast-enhanced CT scan showing duodenal obstruction between the SMA and the Aorta. (A) Narrowed aorto-mesenteric angle (14°), (B) Reduced aorto-mesenteric distance (2.9mm).



**Figure 2:** Laparoscopic duodenojejunal bypass using infra-colic approach

The patient was a 21-year-old male with a past medical history of pulmonary tuberculosis in 2020 and multiple hospitalizations, and no past surgical history presented with complaints of bilious vomiting and nausea which was more prevalent after feeding. The pain was present typically in the upper abdomen for two months, especially after meals. The upper abdominal pain was intermittent, moderate, and not radiating. Loss of about 10-12kg weight was observed. He took complete treatment for pulmonary tuberculosis. No history of altered bladder habits, fever, jaundice, dysphagia, loss of appetite, or regurgitation was reported.

The patient had poor build and nourishment. His weight was 38 kg. On examination, pallor and pedal edema were present. There was no e/o lymphadenopathy anywhere. At the time of admission, he had a blood pressure of 106/72 mmHg, a pulse rate of 116/min, and the temperature was afebrile. He was in a dehydrated condition. On palpation, the abdomen was non-distended, with no palpable mass or free fluid found. Bowel sounds were present on auscultation.

The patient was admitted based on the above history and symptoms in the internal medicine department first, and from there, he was referred to us. The patient was managed in an academic setting. After all the routine blood investigation in view of symptoms UGI endoscopy and CT scan were planned. Abdominal Contrast-enhanced CT scan (CECT) demonstrated a narrow aorto-mesenteric angle of  $14^\circ$  and distance of 2.9mm and overdistended abdomen suggestive of Superior Mesenteric Artery (SMA) Syndrome (Figure 1). An 8.5mm calculus in the middle calyx of the left kidney and calcification of the right adrenal gland was also observed.

Investigations	Pre-Operative values	Normal Values
Hemoglobin (Hb)	9	14-18g/dl
Total Leukocyte Count (TLC)	5900/ul	4000-11000 /ul
Platelets	230000/ul	150000-400000/ul
Total Bilirubin/Direct Bilirubin	1.08 mg/dL/0.4 mg/dL	0.1-1.2 mg/dL / <0.3 mg/dL
Serum G(SGPT)/SGOT	11 units/L / 20 units/L	8-45units/L / 7-56 units/L
Serum Alkaline Phosphatase (ALP)	67 IU/L	44-147 IU/L
Total protein / Albumin	6.34 g/L /2.8 g/L	6- 8.3g/L/3.4-5.4g/L
PT - INR	1	0.8 - 1.1
Serum Urea/Creatinine	60 mg/dl /1.3 mg/dl	5-20mg/dl/0.7-1.3 mg/dl
Random Blood Sugar	97mg/dl	70-100mg/dl
Serum sodium / potassium	135 mmol/L / 3.3 mmol/L	136-145 mmol/L / 3.5-5.2 mmol/L
HIV/ HBsAg / HCV	NR	

Table 1: Pre-operative lab investigation results of the patient

Upper GI endoscopy demonstrated a grossly dilated stomach filled with residual liquid food material. Duodenum thickening at D2/D3 junction with oedematous mucosa with proximal dilation was present, suggestive of duodenal obstruction. Multiple biopsies were taken of the same. The biopsies were unremarkable on histopathological examination, with no granulomas, microorganisms, or neoplasia.



Figure 3: Pre-operative and Post-operative Contrast-enhanced CT scan comparison. (A) Pre-operative CT scan showing no contrast in jejunal and ileal bowel loops. (B) Post-operative passage of contrast in jejunal and ileal bowel loops

Table 2: Post-operative lab investigation results of the patient; SGOT: serum glutamic oxaloacetic transaminase; SGPT: serum glutamic-pyruvic transaminase; PT INR: Prothrombin Time International Normalised Rate

Investigations	Pre-Operative values	Post-Operative Values	Normal value
Hemoglobin (Hb)	9	11.5	14-18g/dl
Total Leukocyte Count (TLC)	5900/ul	6400/ul	4000-11000/ul
Platelets	230000/ul	236000/ul	150000-400000/ul
Total Bilirubin/Direct Bilirubin	1.08 mg/dL/0.4 mg/dL	1.09mg/dl /0.4 mg/dl	0.1-1.2 mg/dL/<0.3 mg/dL
Serum G(SGPT)/SGOT	11 units/L / 20 units/L	15 units/L /22 units/L	8-45units/L /7-56 units/L
Serum Alkaline Phosphatase (ALP)	67 IU/L	68 IU/L	44-147 IU/L
Total protein / Albumin	6.34 g/L /2.8 g/L	6.38 g/L /2.9 g/L	6-8.3g/L /3.4-5.4g/L
PT - INR	1	1	0.8 - 1.1
Serum Urea/Creatinine	60 mg/dl /1.3 mg/dl	38 mg/dl / 0.67 mg/dl	5-20mg/dl/ 0.7 -1.3 mg/dl
Random Blood Sugar	97mg/dl	100mg/dl	70-100mg/dl

Serum sodium / potassium	135 mmol/L / 3.3 mmol/L	142 mmol/L / 4.5 mmol/L	136-145 mmol/L / 3.5-5.2 mmol/L
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On the basis of these investigations, a diagnosis of SMA syndrome was made. The patient was started on conservative management. Electrolyte correction and nutritional optimization with TPN were done before the operation. Continuous gastroduodenal decompression was done. But the patient's symptoms did not improve. The patient was taken for surgery after discussing the nature of the rare disease and the chances of treatment failure.

Laparoscopic duodenojejunal bypass was done by infra colic approach (Figure 2). No free fluid was found, and all solid organs and viscera were grossly normal. The infra-colic approach was used to expose the second and third parts of the duodenum. Enterotomies were made sharply on the bowel walls of the dilated 3<sup>rd</sup> part of the duodenum and jejunum at 20 cm from DJ flexure, and a tension free side to side duodenojejunal anastomosis with a 45 mm Endo GI stapler was done. Enterotomies were closed in two layers. A negative leak test was established. The surgery lasted around 2 hours, and the blood loss was less than 50 ml.

The patient had a Clavein-Dindo grade 1 postoperative course. The patient's Foley catheter was removed on postoperative day one. He underwent post-operative bowel rest for three days. On POD 4, a contrast study was performed, which demonstrated contrast passing freely into the small bowel, indicating a patent anastomosis with no leak (Figure 3). No wound site infection was reported.

The patient was discharged in stable condition. At the time of discharge, he was passing flatus and stool adequately and tolerated oral feeds. After follow-up after one and a half years, the patient is asymptomatic and gained weight. His current weight was 51 kg.

## Discussion:

Superior Mesenteric Artery syndrome is a rare condition that causes small bowel obstruction by compressing the third section of the duodenum between the SMA and aorta. The SMA syndrome was discovered midway through the 19th century and numerous surgical methods of treatment have since been described. <sup>5</sup> Abdominal pain, nausea, vomiting, early satiety, and weight loss are a few of the symptoms that it exhibits. To avoid complications, prompt diagnosis and treatment are essential. <sup>5</sup> Diagnosis is based on Abdominal Contrast-enhanced CT scan (CECT) demonstrating narrow aorto-mesenteric angle and aorto-mesenteric distance. The first line of treatment is typically medical therapy, which aims to widen the constricting aorto-mesenteric angle through nutritional improvement. Distal feeding with a nasojejunal tube can help with this. Postprandial left lateral decubitus positioning, parenteral nutrition, pro-motility drugs, and anti-reflux prophylaxis may be used as other adjuncts. The aorto-mesenteric angle can be raised to > 25° and intestinal continuity restored by increasing the amount of mesenteric and retroperitoneal fat through weight gain. According to the literature, medical therapy should last one to six weeks, and varying success rates have been reported. <sup>8, 9</sup> Nutritional optimization and electrolyte correction were carried out prior to surgery. A surgical procedure is indicated when medical therapy fails. <sup>9, 10</sup> There are several surgical treatments for SMA syndrome that are focused on either mobilizing the duodenum out of the acute aorto-mesenteric window or completely avoiding the obstruction. The "Strong procedure" for duodenal de-rotation entails caudal

mobilization of the distal duodenum to the right of the SMA and release of the Treitz ligament. Strong procedure supporters list a number of benefits of their method, including avoiding bowel anastomosis and having shorter operating times. <sup>6</sup> Surgical bypass for SMA syndrome patients may involve a gastrojejunostomy or duodenojejunostomy. Enteric contents can pass through the duodenal obstructions using a gastrojejunostomy or a side-to-side duodenojejunostomy at the second portion of the duodenum. <sup>11</sup> The obstructed duodenal segment distal to the bypass, however, might act as a diverticulum and store static enteral contents. Through blind loop syndrome, internal hernias, gastroesophageal reflux disease, and foregut ulceration, this stasis can leave some patients with unresolved symptoms. <sup>7, 12, 13</sup> An alternative to these potential issues is a duodenojejunostomy at the third section of the duodenum. Some authors create defects to have access to the third part of the duodenum, but there will be a risk of internal hernia and the development of afferent loop syndrome with retro-colic anastomosis. In our patient, to avoid all these complications, we exposed the third part of the duodenum via infra colic approach, a technique previously described by Lin et al. <sup>10</sup>

This case study demonstrates the success of a minimally invasive surgical approach in treating SMA syndrome. The duodenal obstruction was successfully treated by the duodenojejunal bypass, enabling the patient to tolerate oral feedings and make a full recovery. The Clavein-Dindo grade 1<sup>14</sup> post-operative course points to a successful outcome with no complications following surgery.

## Conclusion:

This case report highlights the significance of taking SMA syndrome into account in patients who present with recognizable symptoms as well as the necessity of early diagnosis and treatment. Surgery can be a useful tool for treating duodenal obstruction in SMA syndrome and avoiding complications.

## Conflicting Interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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## Author's contribution

All authors contributed equally to the manuscript and read and approved the final version of the manuscript.

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