Introduction

Superior mesenteric artery (SMA) syndrome is a rare cause of upper gastrointestinal (GI) obstruction. This syndrome was first described in 1861 by Von Rokitansky, who proposed that its cause was obstruction of the third part of the duodenum as a result of arteriomesenteric compression. Later, Wilkie provided a more detailed clinical and pathophysiologic description in a series of 64 patients and suggested treatment approaches. This is usually associated with conditions that cause significant weight loss, such as anorexia nervosa, malabsorption, or hypercatabolic states such as burns, major surgery, severe injuries, or malignancies as fat loss causes direct compression of third part of duodenum with superior mesenteric artery anteriorly.

Case Report

A 13 year old female patient presented with history of bilious vomiting after 1-2 hours of the meal with colicky pain since 1 month. Vomitus contained only the recently ingested food. The patient also presented with rapid weight loss i.e. about 3 kg in last 1 month. She was not having haematemesis associated with it. Patient had history of Pulmonary Koch’s at the age of 9 years but she had not taken treatment. Patient lost significant weight during the course of last 4 years. On examination she was thin built. There was no abdominal distension or tenderness or palpable lump. Succussion splash was present. Her Haemoglobin were 9 gm%; leucocyte count was 8,000/cumm. Serum albumin was 2 gm% and rest of the investigations were normal. Abdominal erect radiograph and ultrasound abdomen were normal. She underwent upper gastrointestinal endoscopy where the 1st and 2nd part of duodenum was dilated. Biopsy from the duodenum was nonspecific duodenitis. She underwent barium meal follow through (BMFT) which revealed
dilated 1st and 2nd part of duodenum and there was hold up of the barium at 3rd and 4th part of duodenum which was more in supine than in prone suggestive of SMA syndrome or vascular impression at the aortomesenteric angle (Fig. 1). Computed tomogram (CT) revealed dilatation of stomach, first and second part of duodenum. Third part of duodenum was compressed between superior mesenteric artery (SMA) and superior mesenteric vein (SMV) anteriorly and aorta and vertebrae posteriorly. On prone position the narrowing of fourth part opens up but dilatation of third part persists. These features were suggestive of SMA syndrome (Fig. 2). Patient was not responding to the conservative management. She underwent surgery and side to side duodenojejunostomy was performed (Fig. 3). Post operative period was uneventful. She has even gained weight in last 3 months of follow-up.

**Discussion**

Superior mesenteric artery (SMA) syndrome is an uncommon but well recognized clinical entity characterized by compression of the third, or transverse, portion of the duodenum against the aorta by the SMA, resulting in chronic, intermittent, or acute, complete or partial duodenal obstruction. This entity which is also called cast syndrome is a well-known complication of scoliosis surgery and often poses a diagnostic dilemma; its diagnosis frequently is of exclusion. The precise incidence of this entity is unknown. In a review of the literature, approximately 0.013-0.3% of the findings from upper GI tract

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**Fig. 1 :** BMFT showing dilated 1st and 2nd part of duodenum and hold up of dye in 3rd part.

**Fig. 2 :** CT showing dilatation of stomach, 1st and 2nd part of duodenum with 3rd part being compressed between SMA and SMV anteriorly and Aorta and spine posteriorly.

**Fig. 3 :** Side to side duodenojejunostomy between 3rd part of duodenum and 2nd loop of jejunum.
barium studies support a diagnosis of SMA syndrome. More females are affected by SMA syndrome. In one large series of 75 patients with SMA syndrome, two thirds of the cases involved women, with an average age of 41 years; one third of cases involved men, with an average age of 38 years. Despite the fact that about 400 cases are described in the literature, many have doubted the existence of superior mesenteric artery (SMA) syndrome as a real entity; indeed, some investigators have suggested that SMA syndrome is over diagnosed because it is confused with other causes of megaduodenum.

The SMA usually forms an angle of approximately \(45^\circ\) (range \(38-56^\circ\)) with the abdominal aorta, and the third part of the duodenum crosses posteroinferiorly to the origin of the SMA, coursing between the SMA and aorta. Any factor that sharply narrows the aortomesenteric angle to approximately \(6-25^\circ\) can cause entrapment and compression of the third part of the duodenum as it passes between the SMA and aorta, resulting in SMA syndrome. In addition, the aortomesenteric distance in SMA syndrome is decreased to \(2-8\) mm (normal is \(10-20\) mm). Alternatively, other causes implicated in SMA syndrome include high insertion of the duodenum at the ligament of Treitz, a low origin of the SMA, and compression of the duodenum due to peritoneal adhesions.

Important aetiologic factors that may precipitate narrowing of the aortomesenteric angle and recurrent mechanical obstruction include, thin body build, exaggerated lumbar lordosis, visceraloptosis and abdominal wall laxity, depletion of the mesenteric fat caused by rapid severe weight loss due to catabolic states such as cancer, surgery, burns, or psychiatric problems. Severe injuries, such as head trauma, spinal disease, deformity, or trauma leading to prolonged bedrest, dietary disorders such as anorexia nervosa and malabsorption may cause loss of fat. Use of body cast in the surgical treatment of scoliosis or vertebral fractures and rapid linear growth without compensatory weight gain, particularly in adolescents may cause SMA syndrome. Similarly, our patient was having symptoms of anorexia nervosa and was treated for it and later on due to severe weight loss she developed SMA syndrome.

Patients with SMA syndrome may present acutely, with chronic insidious symptomatology, or with an acute exacerbation of chronic symptoms. The acute presentation is usually characterized by signs and symptoms of duodenal obstruction. Chronic cases may present with long-standing vague abdominal symptoms, early satiety and anorexia, or recurrent episodes of abdominal pain, associated with vomiting. Delay in the diagnosis of SMA syndrome can result in malnutrition, dehydration, electrolyte abnormalities, and even death. Our patient was having similar chronic symptoms but presented with acute exacerbation.

The differential diagnosis includes anorexia nervosa and bulimia. In addition, SMA syndrome should be differentiated from other causes of megaduodenum, including diabetes mellitus, collagen vascular conditions, and chronic idiopathic intestinal pseudo-obstruction.

The diagnosis of SMA syndrome is difficult. Confirmation usually requires radiographic studies, such as an upper GI scopy, hypotonic duodenography, and CT scan. Upper GI study with barium reveals characteristic dilatation of the first and second parts of the duodenum, with an abrupt vertical or linear cutoff in the third part with normal mucosal folds. Fluoroscopy demonstrates a to-and-fro motion of the barium in the dilated proximal
portion of the duodenum which is more seen in supine position than prone hence significant of SMA syndrome. Other findings include delay of 4-6 hours in gastroduodenal transit and relief of the obstruction when the patient is in the left lateral decubitus position. A Hayes manoeuvre (i.e., pressure applied below the umbilicus in cephalad and dorsal direction), which elevates the root of small-bowel mesentery, may also relieve the obstruction. In equivocal cases, hypotonic duodenography may depict the site of obstruction and dilation of the proximal duodenum, with antiperistaltic waves within the dilated portion which is supposed to be diagnostic and specific. In our patient, BMFT showed dilatation of 1st and 2nd part of duodenum with hold up of barium at 3rd part which was more on supine than on prone.

Upper GI endoscopy may be necessary to exclude mechanical causes of duodenal obstruction but sometimes extrinsic compression of the SMA can be visualized. However, the diagnosis of SMA syndrome may be missed with this study. Abdominal ultrasonography may help in measuring the angle of the SMA and the aortomesenteric distance but less sensitive than CT.

Contrast-enhanced CT scan and magnetic resonance angiography (MRA) is useful in the diagnosis of SMA syndrome and can provide diagnostic information, including aorta-SMA distances and duodenal distension. Also, it can be used to assess intra-abdominal and retroperitoneal fat. Both these procedures are noninvasive and are probably equivalent to angiography, which has previously been suggested as the reference standard for establishing the diagnosis. CT was the diagnostic in our patient as it revealed the narrow aortomesenteric angle and compression of third part of duodenum.

Reversing or removing the precipitating factor is usually successful in a patient with acute SMA syndrome. Conservative initial treatment is recommended in all patients with SMA syndrome; this includes adequate nutrition, nasogastric decompression, and proper positioning of the patient after eating (i.e., left lateral decubitus, prone, or knee-to-chest position). Enteral feeding using a double lumen nasojejunal tube passed distal to the obstruction under fluoroscopic assistance is an effective adjunct in treatment of patients with rapid severe weight loss and also eliminates the need for intravenous fluids and the risks associated with total parenteral nutrition.

Surgical intervention is indicated when conservative measures are ineffective, particularly in patients with a long history of progressive weight loss, pronounced duodenal dilatation with stasis, and complicating peptic ulcer disease. Duodenojejunostomy is the most frequently used procedure, and it is successful in about 90% of cases. The use of laparoscopic surgery that involves lysis of the ligament of Treitz and mobilization of the duodenum has been reported.

Our patient did not respond to the conservative management so she had to undergo side to side duodenojejunostomy. Second part of duodenum was anastomosed to jejunal loop. Postoperative period was uneventful. In last 3 months of follow up patient is not having any symptoms and has even gained weight.

**Conclusion**

SMA syndrome is a diagnostic challenge. In any patient of doubt, having psychiatric symptoms or is supposed to be mentally ill, or with sudden weight loss should undergo BMFT or CT for the confirmation. SMA syndrome is rare but we should consider it as a differential diagnosis in acute or chronic vomiting with abdominal pain especially in
young adolescent females and with history of weight loss. As superior mesenteric artery syndrome is a diagnosis of exclusion other causes should be ruled out. Duodenojejunostomy is the ideal treatment and patients usually respond well to surgery. Nowadays laparoscopy has changed the view of treatment as it can even rule out other causes.

References
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**TIME TO LOWER TREATMENT BP TARGETS FOR HYPERTENSION?**

A large meta-analysis of observational studies including 1 million individuals without previous vascular disease showed that the risk for cardiovascular death increases with increasing systolic blood pressure above 115 mm Hg. Most hypertension guidelines recommend that blood pressure should be lowered below 140/90 mm Hg. In patients with manifest cardiovascular disease or diabetes mellitus, the recommended treatment goal is usually below 130/80 mmHg.

In The Lancet today, the Cardio-Sis investigators present a study of the efficacy of a treatment goal for systolic blood pressure below 130 mm Hg compared with a goal below 140 mm Hg (tight control and less tight control, respectively) in patients with hypertension but without diabetes. Seven different antihypertensive drugs could be added to reach the treatment goal. A systolic blood pressure goal of below 130 mm Hg was thus more effective in reducing left ventricular hypertrophy than was a treatment goal of less than 140 mm Hg.

Because systolic blood pressure is a more important risk factor than is diastolic blood pressure in individuals older than 50 years, the choice to use systolic blood pressure as the treatment target is highly relevant.