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Superior mesenteric artery syndrome in a patient with celiacomesenteric trunk

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SUMMARY

Superior mesenteric artery (SMA) syndrome is an uncommon entity leading to compression of the duodenum between the aorta and the SMA. Normally the coeliac trunk and the superior mesenteric arteries have distinct origins from the abdominal aorta. The celiacomesenteric trunk (CMT) is the least frequently reported anatomic variation of all abdominal vascular anomalies. CMT denotes a common trunk of origin of the coeliac and superior mesenteric arteries. The coexistence of these anomalies has never been reported in the literature. We present a case of a 59-year-old man presenting with duodenal obstruction due to SMA syndrome with CMT. The aortomesenteric angle was 13 degrees and SMA-aorta distance was 8 mm. Patient underwent a gastrojejunostomy. After an uneventful recovery, the patient has been symptom free for 1-year follow-up.

BACKGROUND

Superior mesenteric artery (SMA) in humans leaves the aorta at an acute and downward angle.¹ Hence, there is a possibility of the third part of the duodenum to get compressed between the aorta posteriorly and the SMA anteriorly.² This compression has been termed as SMA syndrome, arteriomesenteric artery syndrome, chronic duodenal ileus, cast syndrome, mesenteric root syndrome, intermittent arteriomesenteric occlusion and Wilkie's syndrome.^{3 4} This is commonly attributed to the loss of the cushion of fat that normally surrounds the neurovascular pedicle.⁵ Hence, those who are presumed to be predisposed to the condition are those who are thin and those experiencing acute weight loss.^{6 7}

The three main anterior branches of the abdominal aorta are the coeliac trunk, SMA and the inferior mesenteric artery. Celiacomesenteric trunk (CMT) leads to a common origin of coeliac trunk and SMA. CMT accounts for less than 1% of all abdominal vascular anomalies, and it is estimated to have an incidence of 0.25%.⁸⁻¹⁰ According to radiological studies, the incidence of SMA compressing the duodenum is reported as between 0.20% and 0.78%.^{11 12} Incidence of SMA syndrome in the general population ranges between 0.0024% and 0.34%.¹³

According to our review of the literature, SMA syndrome has never been reported in co existence with CMT.

CASE PRESENTATION

A 59-year-old man presented to surgical emergency with abdominal distension and repeated episodes of bilious vomiting for the past 12 hours. He had a pulse rate of 110/min and other vitals were stable. Nasogastric tube insertion drained 2 L of bilious gastric contents. The nasogastric drainage was followed by a significant decrease in the abdominal distension and also relief of symptoms.

A detailed history revealed that the patient was a farmer by occupation and belonged to a low socioeconomic class. He had a habit of chewing tobacco and was noted to have poor mouth opening. He gave a history of over-working and loss of significant weight over the past year.

He had lost 10% of body weight in the past 3 months. His body mass index had decreased from 21 kg/m² to 18.9 kg/m².

He had no comorbidities and no previous surgical history.

The patient was kept nil per oral for 2 days and was resuscitated with intravenous fluids.

INVESTIGATIONS

His laboratory investigations were within normal limits.

Contrast-enhanced CT scan of the abdomen was done with oral and intravenous contrast. It revealed a common origin of the coeliac trunk and SMA, a CMT. The CMT was seen branching into coeliac trunk and SMA. The coeliac trunk further branched into splenic artery, common hepatic artery and the left gastric artery (figures 1 and 2). Obstruction of the third part of the duodenum between the SMA and abdominal aorta with dilated proximal duodenum (figure 3). The aorto-celiaco-mesenteric angle was 13 degrees (figure 4) and SMA-aorta distance was 8 mm (figure 5).

DIFFERENTIAL DIAGNOSIS

Initially when the patient presented with features suggestive of gastric outlet obstruction and history of significant loss of weight in the recent past, the differential diagnosis of carcinoma of the stomach was considered. Highly specific findings on CECT scan helped clinch the diagnosis of SMA syndrome with CMT.

TREATMENT

The initial plan of management was to implement a conservative approach. Conservative management aimed to make the patient gain weight and improve



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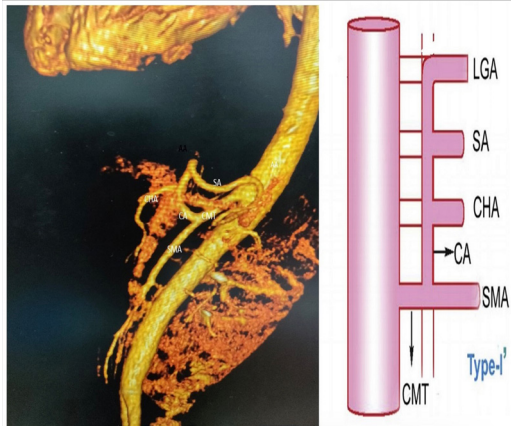


Figure 1 (Left half)- vascular reconstruction image of the CECT scan depicting the various branches of the celiaco-mesenteric trunk. (Right half)- pictorial depiction of Type I' of Morita classification (16). AA, abdominal aorta; Ca, coeliac artery; CECT, contrast-enhanced CT; CHA, common hepatic artery; CMT, celiacomesenteric trunk; LGA, left gastric artery; SA, splenic artery; SMA, superior mesenteric artery.

nutrition, as this would lead to an increment in the aortomesenteric angle.

Nasojejunal tube insertion was planned to bypass the site of obstruction. The patient was posted for upper Gastro-intestinal (GI) scopy with nasojejunal tube insertion. The procedure could not be performed as the patient had poor mouth opening and the scope could not be negotiated even with fluoroscopy guidance.

Then it was planned that the patient will be given nasogastric feeding. The patient could not tolerate nasogastric feeds.

The conservative management was not successful. A decision was then taken to perform an exploratory laparotomy on the fourth day after admission. A midline skin incision was taken and the peritoneal cavity was exposed. There were no features suggestive of peritonitis or contamination. The third part of duodenum was compressed and the second part of the duodenum was grossly distended. There was no evidence of ischaemia of the intestine or colon. Due to grossly dilated duodenum, the decision was taken to perform gastrojejunostomy instead of

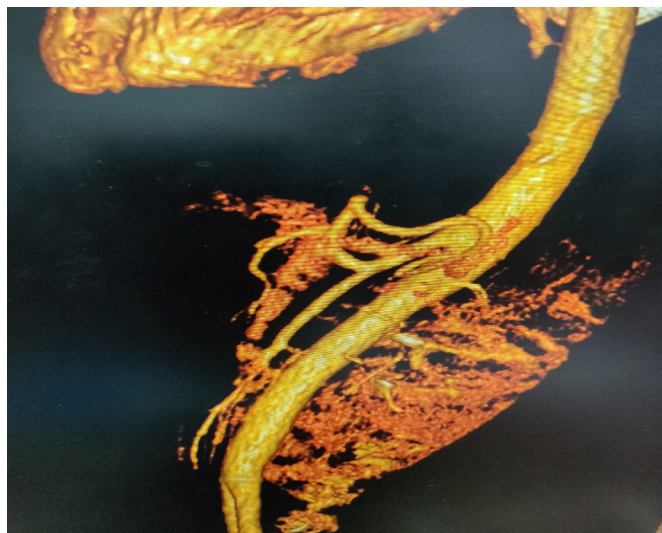


Figure 2 Unlabelled vascular reconstruction image of the contrast-enhanced CT scan of abdomen—depicting the various branches of the celiaco-mesenteric trunk.

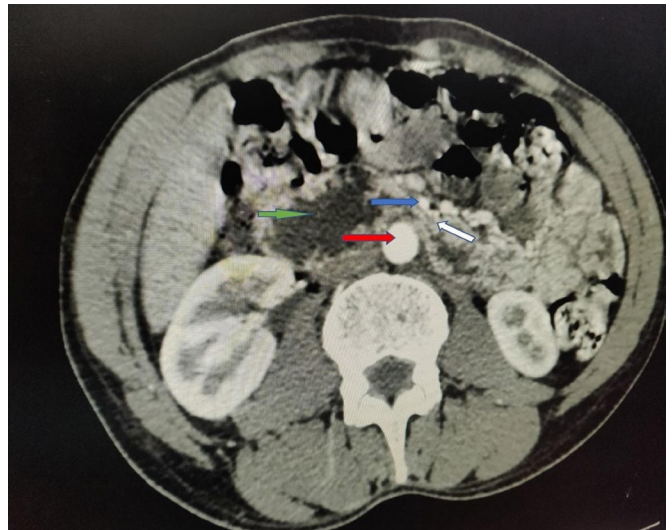


Figure 3 Axial section of the contrast-enhanced CT scan image of abdomen and pelvis depicting the compression of third part of the duodenum between the SMA and the abdominal aorta. The proximal part of the duodenum is dilated (White arrow—compressed third part of the duodenum, green arrow—the dilated proximal part, red arrow—abdominal aorta, blue arrow—superior mesenteric artery). SMA, superior mesenteric artery.

duodenojejunostomy. Stapled posterior gastrojejunostomy was done to bypass the compressed duodenum. An intraperitoneal drain was kept. The patient was extubated on the table and had an uneventful recovery.

OUTCOME AND FOLLOW-UP

The patient was discharged after suture removal on 10th postoperative day. He was advised to gain weight through a balanced diet and was advised to follow-up regularly. He failed to follow-up as he migrated to a distant village soon after the surgery. On regular telephonic conversations, he seemed to have symptomatic relief and could resume his work 1 month after the surgery. He says he has gained weight and has been asymptomatic over the past year.



Figure 4 Sagittal section of contrast-enhanced CT scan of the abdomen and pelvis—depicting the the aorto-CMT angle of 13 degrees. CMT, celiacomesenteric trunk.

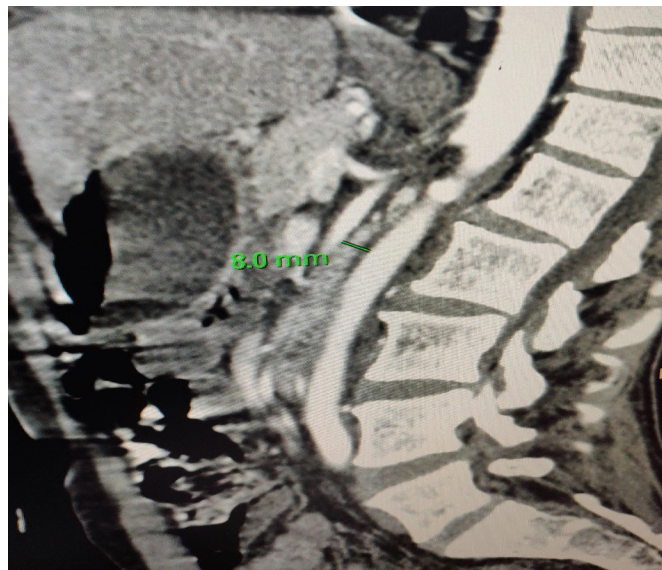


Figure 5 Sagittal section of contrast-enhanced CT scan of the abdomen and pelvis—depicting the distance between aorta and the mesenteric artery (8 mm) and the compressed duodenum between the two.

DISCUSSION

The occurrence of CMT is a rare entity.^{14 15} Our patient had a common origin of CMT with all the three branches of coeliac artery arising from the CMT. In embryonic life, normally the 10th and 13th vitelline arteries develop into the coeliac and superior mesenteric arteries, respectively. Initially, these vitelline arteries are connected by a ventral longitudinal anastomosis. Normally the 11th and 12th vitelline arteries disappear, while the 10th vitelline along with longitudinal anastomosis gives rise to coeliac artery and its three branches. Embryologically, therefore, the occurrence of CMT can be explained by the regression of the 10th root and persistence of ventral anastomosis between 12th and 13th roots.¹⁶

The CMT is usually an incidental finding. It may be associated with aneurysms, occlusion and stenosis resulting in severe mesenteric ischaemia.¹⁷ There has been a recent case report of thrombosis of the CMT leading to widespread ischaemia and death.¹⁸ CMT leads to an intrinsic loss of CA-SMA collateral circulation, which is important in protecting against mesenteric ischaemia. This leaves a large segment of bowel with one dominant vascular feed.^{19 20}

According to our review of the literature, this is the first reported case of SMA syndrome reported with the concurrent existence of CMT. It is unclear whether this anatomic variation predisposed the SMA to cause the compression of the duodenum.

Most recommend a conservative approach as the first line of therapy for SMA syndrome.²¹ Such measures are often multidisciplinary and are aimed at replenishing the mesenteric fat stores and decompressing the third part of the duodenum.²² Postprandial positional changes, such as knee–chest position, tend to widen the aortomesenteric angle. This partially relieves duodenal obstruction.²³ Drainage with the nasogastric tube can be continued in selected cases of SMA syndrome.²¹

Surgery is preferred in patients who fail to respond to conservative management. Both laparoscopic and open surgical procedures such as gastrojejunostomy, duodenojejunostomy or sectioning of the wide division of the ligament of Treitz (Strong's procedure) have been used. Most surgeons prefer

Patient's perspective

Someone who has never been admitted to the hospital, I was very scared to have been informed about the need for a surgery. I felt a lot better after the surgery, as the vomiting had stopped. I cannot wait to get back to work as my family depends on me. I have been told to increase my diet and that is going to be a priority. I want to thank all the doctors and nurses who were involved in making me feel better. Patient himself (translated from Marathi).

Learning points

- ▶ Superior mesenteric artery (SMA) syndrome should be a differential diagnosis in all cases of gastric outlet obstruction.
- ▶ Surgical treatment of SMA syndrome is effective when conservative treatment fails.
- ▶ Gastrojejunostomy can be done when there is significant dilation of duodenum instead of duodenojejunostomy.
- ▶ Vascular anomalies of the abdominal aorta and its branches are rare but can be ruled out by careful observation on CT scan imaging and considering them as a possible differential diagnosis in cases with narrow aorto-mesenteric angle.

duodenojejunostomy as the procedure of choice for SMA syndrome.²⁴ Duodenojejunostomy is more physiological, and, unlike gastrojejunostomy, there are fewer chances of jejunal ulceration.

Gastrojejunostomy may be ideal when patients with SMA syndrome present with severe duodenal dilatation.²⁵ Possible complications of gastro-jejunostomy include anastomotic leak, stenosis and jejunal ulcerations.

In the current case, the second part of duodenum was significantly dilated and hence gastrojejunostomy was done. The patient had an uncomplicated recovery and has been asymptomatic for 1 year after the surgery.

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Contributors SHD—conceptualised the idea, compiled the data and images, drafted the manuscript and was assisting surgeon in the mentioned surgery. JT—review of literature, edited the images. RC—edited the manuscript, operating surgeon in the mentioned surgery in the case report. JSP—final editing of the manuscript, edited the review of literature.

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