






# Median arcuate ligament syndrome during pancreaticoduodenectomy

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## ABSTRACT

Median arcuate ligament syndrome is caused by the compression of the celiac artery by a fibrous band called the median ligament, which originates from the crus of diaphragm. The prevalence of Median arcuate ligament syndrome has been reported as 10%–24% among patients; however, the etiology is unclear. The components of the clinical triad include a chronic post-prandial pain, epigastric murmur, and weight loss. Diagnosis is based on clinical and radiological findings. Median arcuate ligament syndrome has been reported in a small portion of patients undergoing pancreaticoduodenectomy. Most patients have been diagnosed prior to surgery.

**Keywords:** Celiac artery stenosis, median arcuate ligament syndrome, pancreaticoduodenectomy

## INTRODUCTION

Median arcuate ligament syndrome (MALS), also known as celiac artery compression syndrome, is characterized by gastrointestinal ischemia occurring as a result of the compression of the proximal part of the celiac trunk by the median arcuate ligament, which originates from the diaphragm (1). The etiology is unclear. The majority of patients are asymptomatic under normal conditions. However, it can lead to life-threatening organ ischemia when collateral circulation from the superior mesenteric artery is interrupted during surgeries, such as pancreaticoduodenectomy (2-4).

In this report, we present the case of a patient with MALS that was intraoperatively diagnosed during pancreaticoduodenectomy.

## CASE PRESENTATION

The 43-year-old male patient presented at our hospital with complaints of jaundice and itching. His laboratory results revealed a serum bilirubin level of 3.2 mg/dL. Abdominal ultrasonography and computed tomography (CT) revealed a 3×2.5 cm mass lesion at the head of the pancreas, which raised the suspicion of pancreas cancer. Contrast-enhanced abdominal CT did not reveal any pathology associated with arterial structures or any sign of arterial invasion. A fine needle aspiration biopsy was performed from the mass lesion at the head of the pancreas under endoscopic ultrasonography guidance. The biopsy result was reported as malignant cytology. The patient was taken into operation. After liberating the pancreatic head via Kocher maneuver and ligating the gastroduodenal artery, no flow was observed in the hepatic, left gastric, or splenic arteries. During surgery, the radiology clinic was requested to re-evaluate the patient's abdominal CT images, which revealed complete occlusion in the celiac trunk caused by the compression by a median arcuate ligament (Figure 1). Following the excision of the median arcuate ligament, pulsatile flow was observed in the hepatic, left gastric, and splenic arteries. Pylorus-preserving pancreaticoduodenectomy was performed. A control CT was postoperatively performed. The celiac trunk and its branches were observed filling with contrast (Figure 2). The patient was discharged on the postoperative day 8 without any complication.

## DISCUSSION

The compression of the celiac artery by the median arcuate ligament was first reported in 1917 by Lipschutz. Later, in 1963, Harjola described the compression of the celiac artery as a clinical syndrome in which there is a post-prandial abdominal pain, nausea, vomiting, and occasional diarrhea with accompanying malabsorption and a systolic murmur that is always present during the auscultation of the abdomen (1).

Diagnosis is based on clinical and radiological findings. Radiologically, its diagnosis can be made using Doppler ultrasonography or CT angiography. Lateral projection in CT angiography is highly sensitive in detecting obstruction in the celiac axis (1, 3, 4). The clinical triad comprises chronic post-prandial pain, epigastric murmur, and weight loss. MALS can be detected in 10%–24% of patients. Patients are usually

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Figure 1. Compression of celiac trunk due to the median arcuate ligament



Figure 2. Postoperative image

asymptomatic and are often young adults. The classical findings are not present in the majority of patients because of the presence of collateral circulation coming from the superior mesenteric artery (2). The classical treatment of MALS is the surgical excision of median arcuate ligament fibers.

Median arcuate ligament syndrome is observed in a minority of patients undergoing pancreaticoduodenectomy, and the diagnosis is often preoperatively made in these patients (4). Our patient was not preoperatively diagnosed, and during the operation, the lack of pulsatile flow in the hepatic artery following the ligation of gastroduodenal artery raised the suspicion of MALS or celiac artery occlusion due to atherosclerosis, and the diagnosis was made after the re-evaluation of the pa-

tient's CT images. As laparoscopic pancreaticoduodenectomy operations become more common, it becomes more difficult to intraoperatively diagnose the complications of MALS. During the preoperative radiological evaluation of tumors of the periampullary region, attention is mostly paid on the tumor's relation with vascular structures and its operability, while conditions that can cause occlusion in the celiac artery are overlooked. It should be taken into consideration that, although rare, celiac artery occlusion due to atheroma plaque or MALS can accompany these tumors. Therefore, a careful preoperative radiological assessment of patients who are planned to undergo pancreaticoduodenectomy will aid in the diagnosis of MALS and in the reduction of its vascular complications and the associated morbidity and mortality. In all patients, pulsation in the hepatic artery should always be checked after clamping the gastroduodenal artery (3,4).

## CONCLUSION

In patients with celiac artery stenosis or occlusion, it should be considered that the ligation of the gastroduodenal artery during pancreaticoduodenectomy can lead to impairment in the blood supply of upper abdominal organs, which can possibly result in mortality. Therefore, celiac trunk and its branches should be carefully evaluated before pancreaticoduodenectomy.

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