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(RESEARCH ARTICLE)

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Celiac artery compression syndrome: Operative management and clinical outcomes following median arcuate ligament release a three-case series

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Abstract

Median Arcuate Ligament Syndrome (MALS) is a rare condition resulting from external compression of the celiac trunk by the median arcuate ligament. The clinical presentation is often nonspecific typically postprandial abdominal pain, nausea, vomiting, and weight loss leading to frequent diagnostic delays. CT angiography plays a pivotal role in identifying the characteristic celiac artery stenosis and post-stenotic dilatation.

We report three clinical cases: two young female patients and one 61-year-old male presenting with chronic abdominal pain and weight loss. CT angiography confirmed significant celiac trunk stenosis in all cases, with post-stenotic aneurysmal dilatation in two patients and collateral circulation in one. All underwent open surgical decompression through division of the median arcuate ligament.

Postoperative outcomes were favorable, with marked improvement in abdominal symptoms and progressive weight gain. Follow-up CT angiography demonstrated a fully patent celiac trunk without residual stenosis.

MALS is a challenging diagnostic entity requiring careful correlation between clinical manifestations and dynamic imaging findings. CT angiography remains essential for diagnosis and preoperative planning. Surgical decompression provides substantial symptomatic relief in appropriately selected patients. Larger prospective studies are needed to identify predictors of optimal postoperative outcomes

Keywords: Median Arcuate Ligament Syndrome; Celiac Artery Stenosis; CT Angiography; Dunbar Syndrome; Surgical Decompression; Visceral Ischemia

1. Introduction

Median arcuate ligament syndrome (MALS) is a rare neurovascular condition, with an estimated prevalence of approximately 2 cases per 100,000 individuals. It results from extrinsic compression of the celiac trunk and the celiac plexus by the median arcuate ligament (MAL), a fibrous arch that connects the right and left crura of the diaphragm at the level of the aortic hiatus. This compression is often associated with anatomical variations, such as a low insertion of the MAL or a high origin of the celiac artery from the aorta.

Clinically, MALS typically presents with postprandial abdominal pain, often accompanied by nausea, vomiting, and progressive weight loss, with symptom exacerbation during expiration. Due to the non-specific nature of these symptoms, MALS remains a diagnosis of exclusion. Imaging modalities, particularly computed tomography (CT) with vascular reconstruction and Doppler ultrasound, play a key role in identifying dynamic stenosis of the celiac trunk.

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If left untreated, prolonged vascular and neural compression may lead to chronic visceral ischemia and autonomic dysfunction. The mainstay of treatment is surgical decompression, typically involving division of the median arcuate ligament to relieve pressure on the celiac axis and associated neural structures.

The aim of this article is to review the clinical, anatomical, and diagnostic features of MALS and to discuss the therapeutic approaches, in order to enhance awareness and improve recognition of this underdiagnosed condition.

2. Case report

2.1. Case 1

A 48-year-old female patient with no significant medical history was admitted to the emergency department for postprandial abdominal pain, vomiting, and constipation.

2.1.1. Clinical Examination

- Patient alert, hemodynamically and respiratory status stable.
- Abdominal tenderness on palpation, without signs of peritonitis or vascular bruit.

2.1.2. Medical History

In-depth history revealed a 10 kg weight loss over the past two months.

2.1.3. Additional Investigations

Abdominal CT Angiography

A characteristic "hook-shaped" appearance of the celiac trunk with severe stenosis and post-stenotic aneurysmal dilatation, suggestive of compression by the median arcuate ligament (MAL).

Figure 1 CT angiography of the abdomen: axial slice showing celiac trunk stenosis

2.1.4. Laboratory Tests

No significant abnormalities.

2.1.5. Management

- A midline laparotomy was performed. The celiac trunk vessels were identified and followed to the site of compression.
- Severe compression of the celiac artery by the median arcuate ligament was confirmed.
- The tense ligamentous tissue crossing the cephalic portion of the celiac artery was carefully divided and excised.

- Tissue extending one centimeter from the celiac trunk was circumferentially resected to ensure complete decompression.
- Regional lymph nodes were meticulously excised.

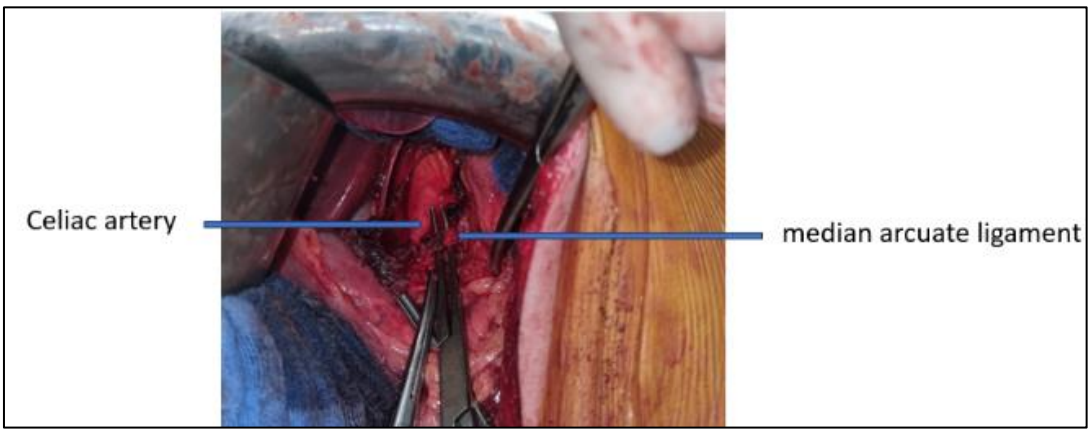

Figure 2 Intraoperative exposure of the celiac trunk compressed by the median arcuate ligament

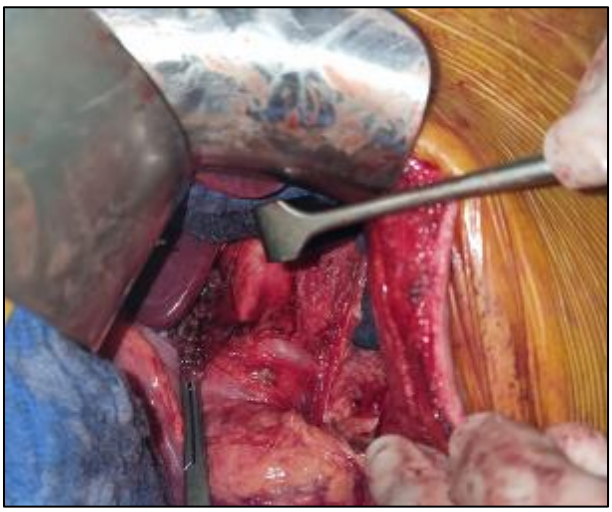

Figure 3 Decompression of the celiac trunk following division of the median arcuate ligament

2.1.6. Postoperative Course

- The patient recovered well and was discharged on postoperative day four.
- One-month post-surgery, she reported near-complete resolution of symptoms.

2.1.7. Follow-up CT Angiography

Performed one month after surgery, showing a celiac trunk free of any compression.

2.2. Case 2

A 28-year-old female patient with no prior medical history presented with chronic abdominal pain and vomiting.

2.2.1. History of Present Illness

Symptoms began 6 months earlier, consisting of chronic postprandial abdominal pain and vomiting, afebrile accompanied by unquantified weight loss.

- She was referred to gastroenterology were
- A colonoscopy was performed and was normal.
- An upper GI endoscopy with duodenal biopsies revealed nonspecific interstitial duodenitis.

2.2.2. Further Investigations

- CT angiography showed
- Ostial stenosis of the celiac trunk due to extrinsic indentation.
- Post-stenotic dilatation, highly suggestive of median arcuate ligament syndrome (MALS), without indirect signs of hemodynamic impact.

Figure 4 CT angiography: Ostial stenosis of the celiac trunk with post-stenotic dilatation

2.2.3. Management

Surgical division of the median arcuate ligament was performed via midline laparotomy.

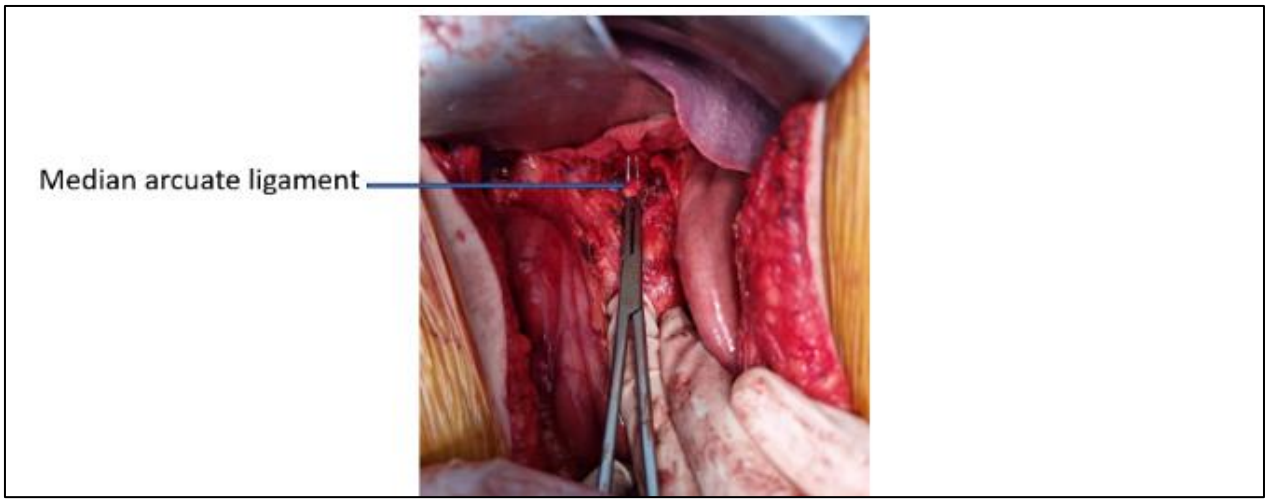

Figure 5 Intraoperative control of the median arcuate ligament overlying the celiac trunk

2.2.4. Outcome

- Postoperative resolution of abdominal pain.
- The patient regained 4.5 kg over four months.

2.3. Case 3

- A 61-year-old male, former smoker.
- The patient was admitted to the gastroenterology department for chronic diarrhea, vomiting, and unquantified weight loss.

2.3.1. Diagnostic Work-up:

- Upper GI endoscopy showed chronic gastritis with mild atrophy, no metaplasia.
- Total colonoscopy was normal.
- Abdominal CT angiography revealed stenosis of the celiac trunk due to median arcuate ligament compression.
- Collateral circulation from the superior mesenteric artery (via pancreaticoduodenal arcades) supplied the hepatic, gastric, and splenic territories.
- Hemodynamic signs of ischemia were present in gastric and splenic territories.

Figure 6 Sagittal slice of a CT angiography showing an ostial stenosis of the celiac trunk with post-stenotic aneurysmal dilatation

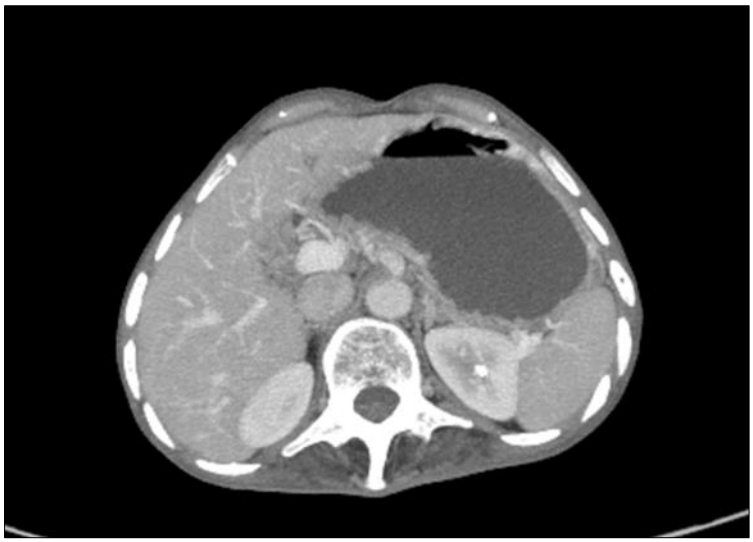

Figure 7 Axial view

2.3.2. Management

A surgical decompression via midline laparotomy was performed. Postoperative recovery was very satisfactory.

2.3.3. Postoperative Imaging

Follow-up CT angiography confirmed a patent celiac trunk with normal caliber and no stenosis.

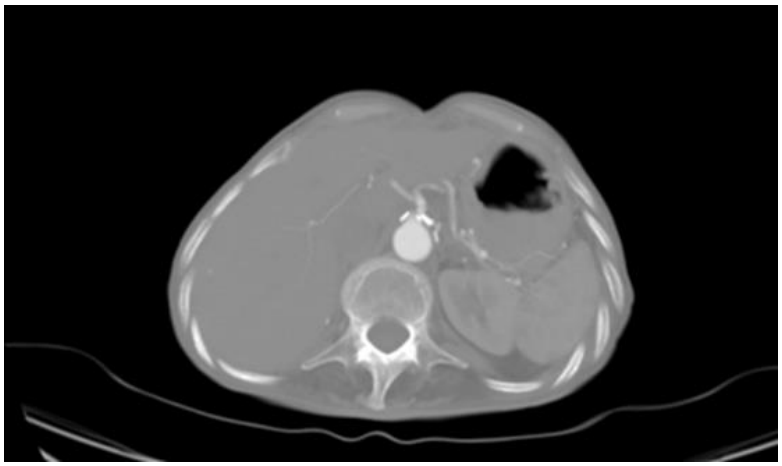

Figure 8 Follow-up CT angiography: patent celiac trunk without stenosis

2.4. Comparative Analysis

2.4.1. Age and Clinical Presentation

- Case 3 involves the oldest patient (61 years) with atypical gastrointestinal symptoms (chronic diarrhea and vomiting).
- Cases 1 and 2 involve younger female patients (48 and 28 years, respectively) with more typical MALS presentation: postprandial pain, vomiting, and significant weight loss.

2.4.2. Diagnostic Work-up

- All three patients underwent imaging confirming celiac trunk stenosis compatible with MALS.
- Cases 1 and 3 particularly emphasized detailed anatomical evaluation by CT angiography to confirm compression and assess collateral circulation.

2.4.3. Treatment

- All cases were managed with midline laparotomy and division of the median arcuate ligament.
- Case 1 included circumferential tissue resection and lymphadenectomy to optimize decompression—details not specified in the other cases.

2.4.4. Postoperative Outcome

- All patients experienced symptomatic relief post-surgery and good clinical recovery.
- Significant weight gain was noted in Cases 2 and 3, but not mentioned in Case 1.
- Case 3 included follow-up CT angiography confirming a decompressed and patent celiac trunk, indicating thorough postoperative monitoring.
- Overall, these three cases highlight the clinical variability of MALS, ranging from typical postprandial pain in young women to atypical gastrointestinal symptoms in older patients.

3. Discussion

Median Arcuate Ligament Syndrome (MALS), also referred to as Dunbar syndrome or celiac artery compression syndrome, is an uncommon vascular condition characterized by non-specific abdominal symptoms, most frequently postprandial abdominal pain. In one series of 36 patients, abdominal pain was reported in 94%, postprandial discomfort in 80%, nausea and vomiting in 56%, weight loss in 50%, and exertional pain in only 8% {1}.

The pathophysiology of MALS remains debated. Two mechanisms are generally proposed: true celiac artery ischemia due to extrinsic vascular compression, and neurogenic pain caused by irritation of the celiac plexus {2}. MALS predominantly affects women (4:1), typically between 30 and 50 years of age and with a slender body habitus. More severe radiologic compression and a history of abdominal surgery have been associated with more significant symptoms {3}.

An abdominal bruit may be detected in up to 85% of patients, although it lacks specificity and may also be present in up to 30% of individuals without MALS {4}. Owing to its nonspecific presentation, MALS is frequently a diagnosis of exclusion, and patients often undergo extensive gastrointestinal, pancreatic, or even cardiac evaluations before the vascular etiology is identified {5}.

Although conventional angiography remains the diagnostic gold standard, its invasive nature has encouraged the widespread use of dynamic non-invasive imaging. Compression of the celiac artery increases during expiration due to diaphragmatic relaxation, a finding that explains why MRI performed during free breathing may demonstrate more pronounced stenosis than CT acquired in end-inspiration {6}.

Doppler ultrasound, CT angiography, and MR angiography have significantly improved detection of celiac artery compression. Diagnostic thresholds include peak systolic velocities > 200 cm/s on Doppler ultrasound or ≥ 50% luminal stenosis on angiography {7}.

Surgical decompression of the celiac axis by division of the median arcuate ligament remains the cornerstone of treatment. Open and laparoscopic approaches are well established, and robotic techniques are increasingly adopted. Celiac plexus neurolysis may be added in selected cases {8}. Endovascular interventions, such as stenting, are reserved for persistent stenosis or aneurysmal changes after decompression and are not recommended as first-line therapy because of high failure rates {9}.

Postoperative outcomes vary across studies. A systematic review of 35 studies involving 691 patients reported symptom improvement in 75–100% of cases {6}. Another review of 400 patients found immediate symptom relief in 85%, with success rates of 78% after open surgery (n = 279) and 96% after laparoscopy (n = 121) {7}. DeCarlo et al. reported 3-year pain relief rates of 49.3% for open surgery, 62.4% for laparoscopy, and 37.7% for robotic surgery {8}. Shin et al. observed symptom regression at 6 months in 76.9% of laparoscopic cases versus 50% of robotic cases, with operative times of 86 versus 134 minutes and similar hospital stays {9}. Conversely, Gerull et al. reported a 1-year symptomatic improvement rate of 90.3% in 74 patients undergoing robotic decompression {10}. Chen et al. reported more variable outcomes: 62% improvement after open surgery (n = 16), 20% after laparoscopy (n = 12), and 43% after robotic surgery (n = 17) at 1-year follow-up {11}.

Persistent symptoms occur in approximately 15–25% of patients despite technically adequate decompression. This may reflect suboptimal patient selection, unidentified comorbidities, or residual stenosis. Careful preoperative evaluation and structured postoperative assessment are therefore essential to optimize clinical outcomes {12}.

The main limitations of this study are the small sample size and the lack of long-term follow-up. However, the consistency of postoperative improvement across all three cases reinforces the clinical value of surgical decompression.

4. Conclusion

Median Arcuate Ligament Syndrome (MALS) is a rare cause of chronic abdominal pain, arising from celiac artery compression and plexus irritation. Diagnosis relies on correlating symptoms with dynamic imaging. Surgical decompression remains the standard treatment, with generally good outcomes. Larger studies are needed to refine patient selection and long-term management.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Jimenez JC, Harlander-Locke M, Dutson EP. Open and laparoscopic treatment of median arcuate ligament syndrome. J Vasc Surg. 2012;56(3):869–73.

[2] Grotemeyer D, Duran M, Iskandar F, Blondin D, Nguyen K, Sandmann W. Median arcuate ligament syndrome: vascular surgical therapy and follow-up of 18 patients. Langenbecks Arch Surg. 2009;394(6):1085–92.

[3] Saba L, Mallarini G. Anatomical variants of celiac trunk: multidetector row CT angiographic findings and clinical relevance. Eur Radiol. 2011;21(5):1073–83.

[4] Horton KM, Talamini MA, Fishman EK. Median arcuate ligament syndrome: evaluation with CT angiography. Radiographics. 2005;25(5):1177–82.

[5] Reilly LM, Ammar AD, Stoney RJ, Ehrenfeld WK. Median arcuate ligament syndrome: surgical management and outcome. Arch Surg. 1985;120(8):955–9.

[6] The impact of psychiatric comorbidities on patient-reported surgical outcomes in adults treated for the median arcuate ligament syndrome. Skelly CL, Stiles-Shields C, Mak GZ, et al. J Vasc Surg. J Vasc Surg. 2018;68(5):1414–1421. doi: 10.1016/j.jvs.2017.12.078. [DOI] [PubMed] [Google Scholar]

[7] Open and laparoscopic treatment of median arcuate ligament syndrome. Jimenez JC, Harlander-Locke M, Dutson EP. J Vasc Surg. 2012;56:869873. doi: 10.1016/j.jvs.2012.04.057. [DOI] [PubMed] [Google Scholar]

[8] Factors associated with successful median arcuate ligament release in an international, multi-institutional cohort. DeCarlo C, Woo K, van Petersen AS, et al. J Vasc Surg. 2023;77:567–577. doi: 10.1016/j.jvs.2022.10.022. [DOI] [PubMed] [Google Scholar]

[9] Short- and intermediate-term clinical outcome comparison between laparoscopic and robotic-assisted median arcuate ligament release. Khrucharoen U, Juo YY, Chen Y, Jimenez JC, Dutson EP. J Robot Surg. 2020;14:123–129. oi: [PubMed] [Google Scholar] 10.1007/s11701-019-00945-y. [DOI]

[10] Robotic median arcuate ligament release: management algorithm and clinical outcomes from a large minimally invasive series. Gerull WD, Sherrill W, Awad MM. Surg Endosc. 2023;37:3956–3962. doi: 10.1007/s00464-022-09545-8. [DOI] [PubMed] [Google Scholar]

[11] Outcomes of median arcuate ligament release: a single institution retrospective review. Chen AJ, Yeh S, Dhindsa Y, et al. Ann Vasc Surg. 2023;94:296–300. doi: 10.1016/j.avsg.2023.02.030. [DOI] [PubMed] [Google Scholar]