

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

A rare case of median arcuate ligament syndrome presenting with chronic abdominal pain managed surgically: A case report ☆,☆☆

Md. Deluwar Hussien, MBBS^{a,*}, Zareen Tabassum, MBBS^a, Anawara Afroz Jenny, MBBS^b, Kashfia Naharin, MBBS^c, Farjana khanam, MBBS^d

^a Dinajpur Medical College, Dinajpur, Bangladesh

^b Ad-din Sakina Medical College and Hospital, Jashore, Bangladesh

^c Sir Salimullah Medical College, Dhaka, Bangladesh

^d Central Medical College, Comilla, Bangladesh

ARTICLE INFO

Article history:

Received 11 December 2024

Revised 4 March 2025

Accepted 6 March 2025

Keywords:

Abdominal pain

Median Arcuate Ligament Syndrome

Celiac artery compression syndrome

Dunbar syndrome

Case report

ABSTRACT

The disorder median arcuate ligament syndrome (MALS) develops when the median arcuate ligament compresses the celiac artery and accompanying nerve fibers leading to postprandial abdominal pain, nausea and bloating symptoms that are commonly mistaken for other gastrointestinal or vascular conditions. A 29-year-old female patient experienced right hypochondrium pain after eating combined with burning stomach pain and debilitating bloating episodes for 5 months. Computed tomography (CT) angiography scan and Doppler ultrasonography revealed celiac artery stenosis due to pressure from the median arcuate ligament along with cholelithiasis. The patient's vague symptoms illustrate the diagnostic difficulty of MALS patients who also have cholelithiasis and demonstrates how CT and Doppler ultrasonography serve crucially to validate MALS diagnosis. Surgical treatment of the median arcuate ligament by physical release has proved successful in treating symptoms despite patients also having cholelithiasis. Early detection and surgical treatment can increase favorable outcomes for patients with such rare conditions.

© 2025 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

☆ Competing Interests: All authors confirm they adopt no conflict of interest and would like to support the corresponding author for submission.

☆☆ Acknowledgments: We are deeply grateful to Beth Younger DNP AGACNP-BC of SSM Health Saint Louis University Hospital for her meticulous help in reviewing and improving the English language clarity of our manuscript.

* Corresponding author.

E-mail address: deluwar664@gmail.com (Md.D. Hussien).

<https://doi.org/10.1016/j.radcr.2025.03.021>

1930-0433/© 2025 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Median arcuate ligament syndrome (MALS), otherwise referred to as celiac artery compression syndrome or Dunbar syndrome, is a relatively rare pathophysiologic vascular and neurogenic process caused by median arcuate ligament compression of the celiac artery and surrounding neural tissues [1]. The median arcuate ligament is a tendinous band which runs between the 2 diaphragmatic crura and usually lies at a level above the celiac artery [2]. In certain cases, it descends abnormally and leads to significant impairment of both vascular and neural blood supply to the celiac trunk and the celiac plexus [3,4]. Incidence of the condition is rare and is estimated at 2/100000, with a majority of patients being females between the age of 20 and 50 years ([5]; Maciej [6,7]). Symptoms include long-standing relatively mild epigastric pain after meals, nausea, vomiting, feeling full quickly and unexplained weight loss [8]. Such are signs of ischemia of structures supplied by the celiac artery or nerve irritation [5,9]. These, in most cases, lead to considerable psychological and physical ill-health or disease [10].

Evaluating the disease is difficult; diagnostics may include Doppler ultrasonography, CTA, or MRA showing the stenosis of

the celiac artery during the expiratory phase [11]. Functional tests, including celiac plexus block, may help support a subsequent diagnosis of neurogenic causes [12]. MALS is managed based on the severity of the symptoms, which usually requires a surgical procedure in the form of median arcuate ligament release (MALR) [13]. This can be done in an open method, as a laparoscopy, or by way of robotic assistance [14–16]. Surgical results are satisfactory in most cases and 60%-80% of patients remain symptom-free postoperatively [17,18]. Nevertheless, some issues still prevail. Relapse and suboptimal effectiveness due to persistent neuralgias or adhesions are common reasons for treatment failure. Here, we report a case of a 29-year-old female, who suffered from typical signs of MALS – abdominal pain, nausea, vomiting and bloating, and discuss the key diagnostic and therapeutic issues of this rare syndrome's management. This report complies with the SCARE 2023 guideline for reporting surgical cases.

Case presentation

A 29-year-old female, with no past medical history, came to the surgical outpatient department with the chief com-

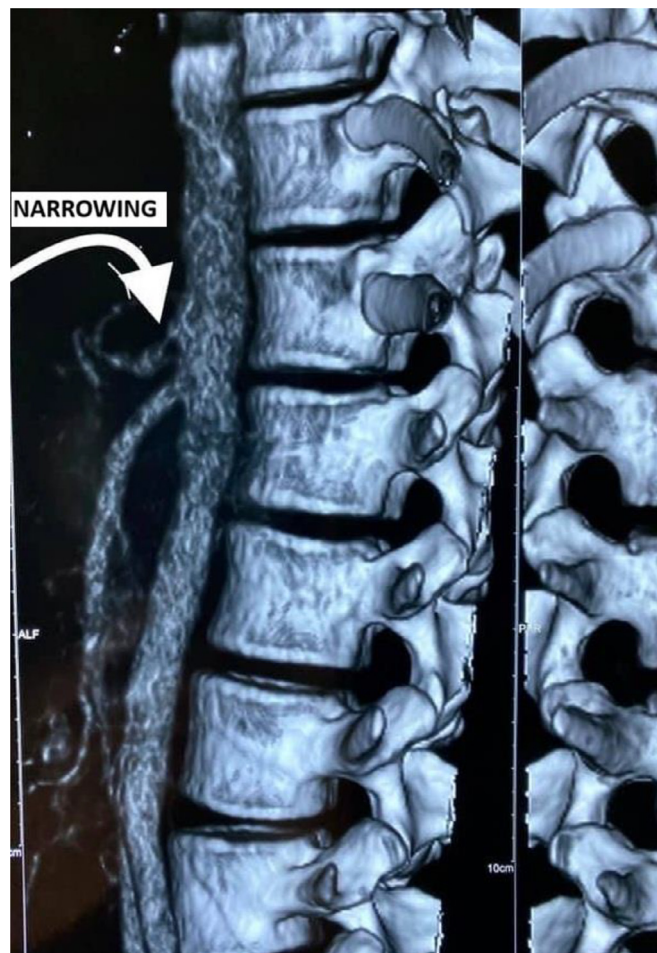


Fig. 1 – Preoperative CT angiogram showing median arcuate ligament compressing the celiac artery and its narrowing immediately after the origin.

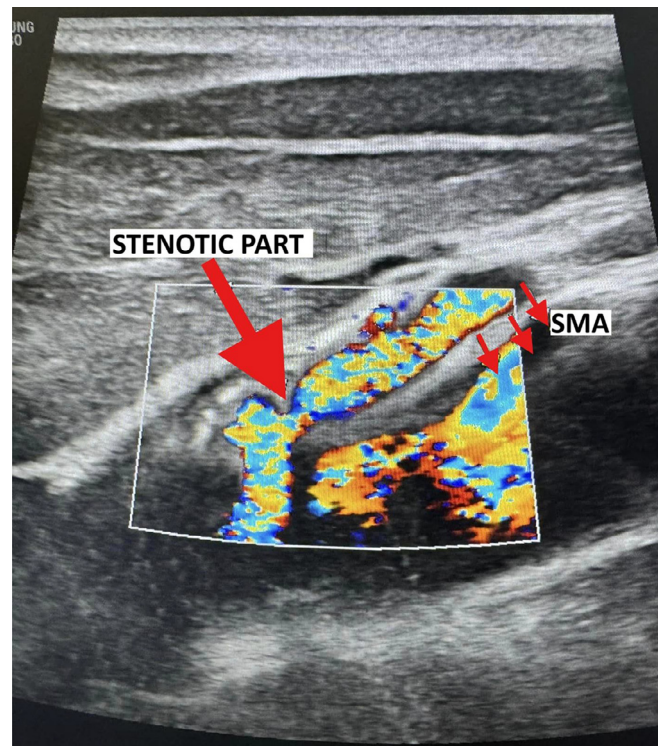


Fig. 2 – Doppler ultrasonography findings. Showing compression of celiac artery just distal to its origin from abdominal aorta.

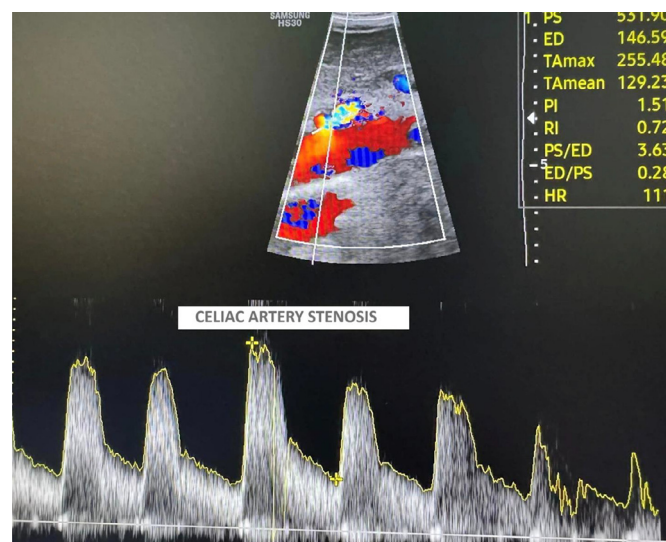


Fig. 3 – Showing high velocity within stenotic part, Peak systolic velocity: 531.90 cm/s.

plaints of postprandial right hypochondriac pain for the last 5 months. The patient reported burning discomfort in the epigastric area, mild to moderate in character and triggered by overeating or consumption of fatty foods. She also endorsed that the pain often came in conjunction with bloating. Most significantly there was no history of radiation or referral of pain to other sites. There were no complaints of diarrhea or change in bowel habits. She also denied any form of jaundice

or signs of liver dysfunction, alcohol dependence, and the use of other substances of abuse, or tobacco smoking.

Abdominal examination revealed the abdomen to be soft, however somewhat distended. There was no tenderness to palpation and no palpable mass. The bowel sounds were auscultated and no tinkling bowel sounds were heard. The patient was in no acute distress and no other abnormalities were noted on general physical examination. Complete

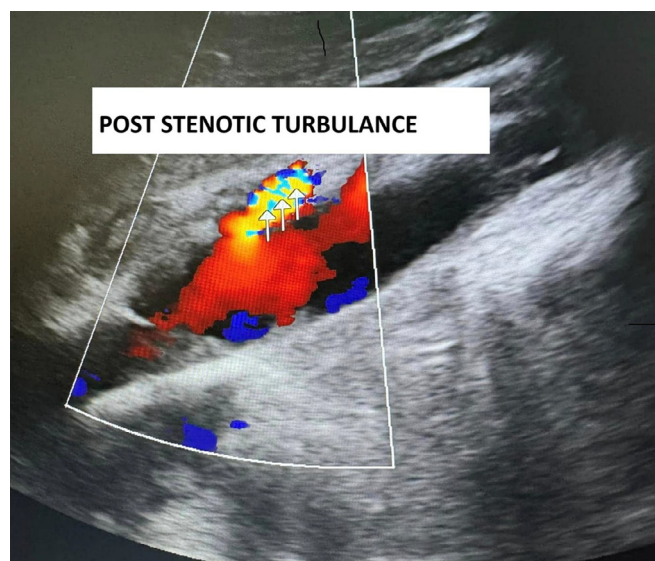


Fig. 4 – Post stenotic turbulent flow of blood.

blood count, liver function test, and renal function test were normal, excluding differential diagnoses of other etiological factors.

Ultrasonography revealed multiple echogenic structure with posterior acoustic shadowing in the gallbladder lumen which correspond to gallstones. Even though the gallstones were observed, they could not account for symptoms exhibited by the patient after eating hence they had to be investigated further. Upper abdominal CT scan was ordered to look for other possible etiologies. On the evaluation of the CT angiogram, the median arcuate ligament was compressing the proximal part of celiac trunk and was associated with moderate stenosis with poststenotic dilatation and normal enhancement of the distal celiac trunk (Fig. 1), consistent with the typical feature of MALS. To further evaluate the vascular extent, Doppler ultrasound of the abdomen was performed. It showed that there was a reduced caliber of the celiac trunk at the origin (Figs. 2-4), with aliasing and higher PSV (peak systolic velocity) at the compressed area, indicative of the diagnosis of vascular compression. The Doppler ultrasound results showed that the celiac trunk presented with a peak systolic velocity (PSV) of 531.90 cm/s which indicated important stenosis. Testing occurred during fasting periods to achieve a standardized diagnostic assessment.

Since the MALS was associated with cholelithiasis, surgical intervention was recommended. Because of the degree of vascular insufficiency and the patient's persistent symptoms, a decision was made to choose the complex surgical management plan. Laparoscopy revealed hypertrophied and thickened median arcuate ligament compressing the aorta and celiac trunk near the origin (Fig. 5). No pathological feature of the esophagus or any other anomaly including a hiatal hernia was demonstrated. To release the pressure to the celiac trunk a few correlation points of the median arcuate ligament were cautiously opened up by the help of a harmonic scalpel. At the same time, the laparoscopic cholecystectomy

for the stones, which has been contributing to her symptoms, was performed. All the procedures were done without adverse effects.

Immediately following surgery, she had stable vital signs and a healthy incision. Due to the patient's rather high pain threshold, prescribed analgesics were required only in the third postoperative day. When seen 3 months later, the patient had no complaint of being sick and all the symptoms related to postprandial abdominal pain and bloating had disappeared. These findings revealed that she had high level of satisfaction with the health treatment and self-perceived quality of life.

This case also demonstrates the diagnostic and therapeutic concerns in median arcuate ligament syndrome in patients with cholelithiasis. The patient underwent both median arcuate ligament release and cholecystectomy surgical interventions allowing the pathologic conditions to be resolved, achieving a positive outcome for the patient.

Discussion

The purpose of this case report is to discuss the diagnostic dilemma and favorable treatment outcome of a 29-year-old female patient diagnosed with median arcuate ligament syndrome (MALS) concomitant with cholelithiasis. MALS is a rare and under recognized condition with typical presentation being chronic abdominal pain due to compression of the celiac artery and its neural structures by the median arcuate ligament [19]. The pathological changes are based on vascular insufficiency and resulting in ischemic abdominal organs and abdominal celiac plexus irritation, which is a neurogenic cause of the syndrome [20]. The symptoms with which patients present often mimic other gastrointestinal or vascular illnesses, and this often results in the postponement of the diagnosis of the MALS [21]. This case emphasizes that MALS

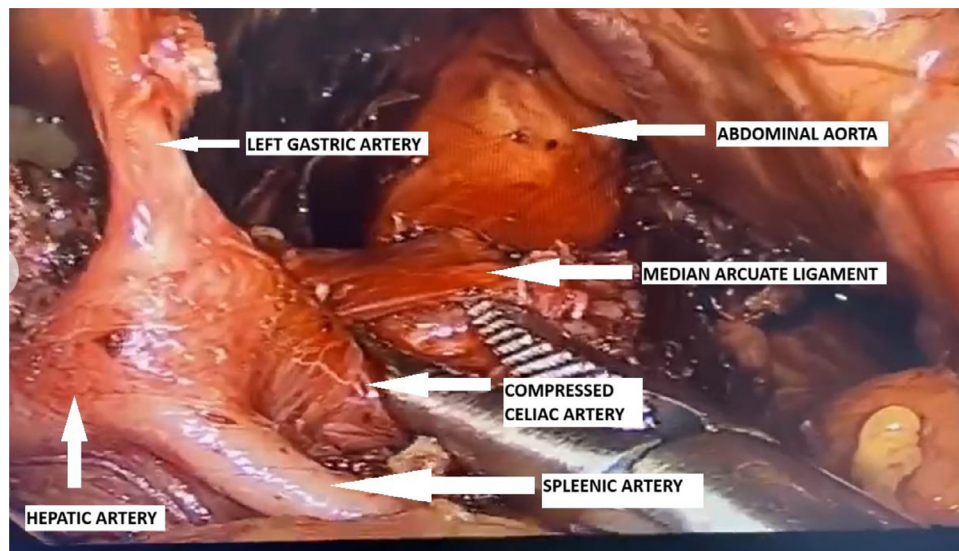


Fig. 5 – The surgical exploration showed median arcuate ligament thickening which compressed the celiac artery immediately after its origin matching the previously obtained imaging results. Surgeons performed a release procedure to restore ordinary anatomical connections of these structures.

should always be considered in patients with postprandial abdominal pain that cannot be explained otherwise even if routine investigations give negative results (O. [22]).

In this case, the diagnosis of MALS was made with the help of the CT angiography (Fig. 1) and Doppler ultrasound investigations (Figs. 2–4), which showed features of celiac trunk stenosis and pathologic blood flow. The presence of cholelithiasis at the time of diagnosis complicated the clinical picture, since both entities manifest with similar features. This case report showed that surgical intervention: median arcuate ligament release (MALR) and laparoscopic cholecystectomy were the key treatment strategies. Surgical reduction of the hypertrophied ligament (Fig. 5) served to alleviate the pressure on the poorly vascularized celiac trunk. The outcome of this patient and symptom improvement after the surgery supports the success of MALR in treating MALS. A majority of the patients achieve high satisfaction from the surgical procedure. This case also seeks to illustrate the importance of using imaging, surgery, and follow up in endeavors to gain the best results for patients.

Conclusion

The case shows that median arcuate ligament syndrome exists among rare diagnoses, but physicians should consider this condition for patients with chronic postprandial abdominal pain when celiac artery compression appears in imaging results. The integrated presence of MALS with cholelithiasis produces complicated diagnostic challenges since the symptoms between these 2 conditions routinely overlap. This patient received complete symptom relief after undergoing MALR thus confirming the pathology affected her clinical course.

CT angiography together with Doppler ultrasound were essential diagnostic tools as they enabled proper MALS detec-

tion in the patient. The treatment approach must reflect individual pathologies for surgery to achieve successful outcomes and eliminate symptoms.

Patient consent

Written informed consent was obtained from patient to publish this report in accordance with the journal's patient consent policy.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.radcr.2025.03.021](https://doi.org/10.1016/j.radcr.2025.03.021).

REFERENCES

- [1] Upshaw W, Richey J, Ravi G, Chen A, Spillers NJ, Ahmadzadeh S, et al. Overview of median arcuate ligament syndrome: a narrative review. *Cureus* 2023;15(10):e46675. doi:10.7759/CUREUS.46675.
- [2] Narwani P, Khanna N, Rajendran I, Kaawan H, Al-Sam R. Median arcuate ligament syndrome diagnosis on computed tomography: what a radiologist needs to know. *Radiol Case Rep* 2021;16(11):3614. doi:10.1016/j.RADCR.2021.06.093.
- [3] Okobi OE, Afuda BA, Boms M, Ekpemiro CU, Umeh NJ, Nnaji CG, et al. Median arcuate ligament syndrome: management and literature review. *Cureus* 2022;14(9):e28889. doi:10.7759/CUREUS.28889.
- [4] Rama M, Nasser W, Palvannan P, Belko S, DiMuzio P, Palazzo F. Supradiaphragmatic origin of the celiac trunk leading to median arcuate ligament syndrome with superior

- mesenteric artery involvement. *J Vasc Surg Cases, Innovat Techn* 2024;10(1). doi:[10.1016/j.jvscit.2023.101315](https://doi.org/10.1016/j.jvscit.2023.101315).
- [5] Chaum M, Shouhed D, Kim S, Walts AE, Marchevsky AM. Clinico-pathologic findings in patients with median arcuate ligament syndrome (Celiac Artery Compression syndrome). *Ann Diagn Pathol* 2021;52:151732. doi:[10.1016/j.anndiagpath.2021.151732](https://doi.org/10.1016/j.anndiagpath.2021.151732).
- [6] Serda M, Becker FG, Cleary M, Team RM, Holtermann H, Sk SK, et al. and مطاف نسح. 2013. "Synteza i Aktywność Biologiczna Nowych Analogów Tiosemikarbazonowych Chelatorów Żelaza" edited by Balint G, Antala B, Carty C, Mabieme J-MA, Amar IB, and Kaplanova A. Uniwersytet Śląski 7(1):343–54. 10.2/JQUERY.MIN.JS.
- [7] Scharf M, Thomas KA, Sundaram N, Ravi SJK, Aman M. Median arcuate ligament syndrome masquerading as functional abdominal pain syndrome. *Cureus* 2021. doi:[10.7759/CUREUS.20573](https://doi.org/10.7759/CUREUS.20573).
- [8] Goodall R, Langridge B, Onida S, Ellis M, Lane T, Davies AH. Median arcuate ligament syndrome. *J Vasc Surg* 2020;71(6):2170–6. doi:[10.1016/j.jvs.2019.11.012](https://doi.org/10.1016/j.jvs.2019.11.012).
- [9] Loganathan P, Gajendran M, McCallum RW. Clinical manifestation and natural history of gastroparesis. *Gastrointest Endosc Clin North Am* 2019;29(1):27–38. doi:[10.1016/j.giec.2018.08.003](https://doi.org/10.1016/j.giec.2018.08.003).
- [10] Anon. n.d. "Median arcuate ligament syndrome | MALS disease symptoms." Accessed December 4, 2024 (<https://rarediseases.org/rare-diseases/median-arcuate-ligament-syndrome/>).
- [11] de Lara FV, Higgins C, Hernandez-Vila EA. Median arcuate ligament syndrome confirmed with the use of intravascular ultrasound. *Texas Heart Inst J* 2014;41(1):57–60. doi:[10.14503/THIJ-12-2495](https://doi.org/10.14503/THIJ-12-2495).
- [12] Iqbal S, Chaudhary M. Median arcuate ligament syndrome (Dunbar syndrome). *Cardiovasc Diagn Ther* 2021;11(5) 1172176–1171176. doi:[10.21037/CDT-20-846](https://doi.org/10.21037/CDT-20-846).
- [13] Skelly CL, Mak GZ. Median arcuate ligament syndrome – current state of management. *Sem Pediatr Surg* 2021;30(6):151129. doi:[10.1016/j.sempedsurg.2021.151129](https://doi.org/10.1016/j.sempedsurg.2021.151129).
- [14] Alnahhal KI, Tedesco A, Khan ZZ, Irshad A, Salehi P. Median arcuate ligament syndrome: comparing the safety of open and laparoscopic management in a large cohort. *Ann Vasc Surg* 2023;96:215–22. doi:[10.1016/j.avsg.2023.04.021](https://doi.org/10.1016/j.avsg.2023.04.021).
- [15] Do MV, Smith TA, Bazan HA, Sternbergh WC, Abbas AE, Richardson WS. Laparoscopic versus robot-assisted surgery for median arcuate ligament syndrome. *Surg Endosc* 2013;27(11):4060–6. doi:[10.1007/S00464-013-3061-X](https://doi.org/10.1007/S00464-013-3061-X).
- [16] Magnus L, Chakfé N, Lejay A, Thaveau F. Robot assisted laparoscopy for median arcuate ligament syndrome relief. *EJVES Vasc Forum* 2022;56:32. doi:[10.1016/J.EJVSF.2022.06.002](https://doi.org/10.1016/J.EJVSF.2022.06.002).
- [17] Butz F, Haase O, Martin F, Hillebrandt KH, Knitter S, Schöning W, et al. Short and longterm outcome of minimally invasive therapy of median arcuate ligament syndrome. *Langenbeck's Arch Surg* 2024;409(1):322. doi:[10.1007/S00423-024-03511-9](https://doi.org/10.1007/S00423-024-03511-9).
- [18] Woestemeier A, Semaan A, Block A, Arensmeyer J, Dohmen J, Kania A, et al. Prognostic factors for the long term outcome after surgical celiac artery decompression in MALS. *Orphanet J Rare Dis* 2023;18(1):1–7. doi:[10.1186/S13023-023-02952-7/TABLES/1](https://doi.org/10.1186/S13023-023-02952-7/TABLES/1).
- [19] Brenner DM, Brandt LJ, Fenster M, Hamilton MJ, Kamboj AK, Oxentenko AS, et al. Rare, overlooked, or underappreciated causes of recurrent abdominal pain: a primer for gastroenterologists. *Clin Gastroenterol Hepatol* 2023;21(2):264–79. doi:[10.1016/J.CGH.2022.09.022](https://doi.org/10.1016/J.CGH.2022.09.022).
- [20] Guazzo L, Lal V. Median Arcuate ligament syndrome: when to consider the diagnosis and management options. *Austral J Gen Pract* 2024;53(12):S28–32. doi:[10.31128/AJGP-11-23-7045](https://doi.org/10.31128/AJGP-11-23-7045).
- [21] Metz FM, Blauw JTM, Brusse-Keizer M, Kolkman JJ, Bruno MJ, Geelkerken RH. Systematic review of the efficacy of treatment for median arcuate ligament syndrome. *Eur J Vasc Endovasc Surg* 2022;64(6):720–32. doi:[10.1016/J.EJVS.2022.08.033](https://doi.org/10.1016/J.EJVS.2022.08.033).
- [22] Mansour O, Mohamed SAM, Bafaraj AA, Alhalawani FA, Ashi RT, Alrashdi AA. Misleading post prandial pain: median arcuate ligament syndrome review of literature and case report. *Int J Adv Res* 2022;10(12):389–94. doi:[10.21474/IJAR01/15852](https://doi.org/10.21474/IJAR01/15852).