ORIGINAL ARTICLE

ANOMALOUS INSERTION OF MEDIAN ARCUATE LIGAMENT IN ASYMPTOMATIC INDIVIDUALS ON MULTIDETECTOR COMPUTED TOMOGRAPHY

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ABSTRACT

Background: Median arcuate ligament syndrome is a controversial entity because anomalous insertion of median arcuate ligament can be seen in asymptomatic individuals. Multidetector CT scanners, along with multiplanar reformats have greatly improved the visualization of this ligament. This study was conducted to determine the presence of anomalous insertion of median arcuate ligament on CT in asymptomatic individuals.

Material & Methods: This was a record base cross-sectional study conducted at the Department of Radiology, Shifa International Hospital, Islamabad, Pakistan from February 5, 2015 to May 15, 2015. It included case records of post-contrast CT scan abdomen of 852 asymptomatic (without median arcuate ligament syndrome) individuals carried out from July 2011 to June 2013. Cases were reviewed for identification of anomalous median arcuate ligament insertion on MDCT. Postsurgical cases and those with vascular thrombosis and arteriovenous malformation were excluded. The CT images were reviewed on workstation after image post processing.

Results: A sample of 852 persons was studied. Out of 852 cases, the anomalous insertion of MAL was identified in 133 (15.60%) cases. These included 46 (5.39%) males and 87 (10.21%) females with a male to female ratio of 1:1.89.

Conclusion: A significant number of asymptomatic persons have anomalous insertion of median arcuate ligament. It is important to correlate the radiologic findings with clinical symptoms to identify the subset of patients who will benefit from treatment.

KEY WORDS: Celiac Artery Stenosis from Compression by Median Arcuate Ligament of Diaphragm; Median arcuate ligament; Median arcuate ligament syndrome; Computed tomographic angiography; Arteriovenous malformations; Celiac artery; Multidetector Computed Tomography; Laparoscopic surgery.

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INTRODUCTION

Median arcuate ligament (MAL) is a fibrous arch at T12 and L1 level that bridges the diaphragmatic crura on either side of the aortic hiatus.[1-4] It is used as an anatomical landmark in the localization of renal hilum in the laparoscopic surgeries.[5] The ligament usually passes above the origin of celiac axis, however in 10% to 24% people it inserts lower down crossing the root of the celiac axis. This can lead to dynamic compression of the celiac trunk resulting in postprandial abdominal pain, nausea, vomiting and weight loss.[1,2,6] This condition is called median arcuate ligament syndrome (MALS) and is more common in thin women.[1,6,7] It is defined by the dynamic compression and narrowing of proximal celiac artery by the anomalous MAL. Initially described by Harjola[1,4] in 1963, it is also known as Dunbar syndrome, after the radiologist JD Dunbar who published results of 15 patients following MAL release in 1965.[1,2,4,8-10]

MALS is a controversial entity because anomalous insertion of median arcuate ligament can be seen in asymptomatic individuals.[3,11] Moreover, in symptomatic patients the symptoms of MALS can recur after surgical resection of the ligament.[11] Yet the importance of median arcuate ligament cannot be written off, because of the marked improvement of symptoms after surgery in many cases.[1,7,11,12] Many theories postulate the origin of pain in MALS due to mesenteric ischaemia or ganglia irritation.[11,13]

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In the past, the anomalous MAL was indentified using the conventional catheter angiography. Nowadays the condition is diagnosed with Doppler ultrasound, intravascular ultrasound, CT and MRI.[1,3,4,14] Multidetector CT (MDCT) scanners, along with multiplanar reformats have greatly improved the visualization of MAL. Typically, the sagittal plane is optimal for its identification and demonstrates a characteristic hook shaped focal narrowing in the proximal celiac axis.[1,3,4]

Traditionally, the treatment of this syndrome is open surgery or a novel laparoscopic approach assisted with intraoperative duplex ultrasound. In patients with persistent celiac flow abnormalities, endovascular approaches as an alternative option are advocated such as celiac angioplasty and stenting. Vascular reconstruction is also an alternative.[1,7,14,15] The objective of this study was to determine the presence of anomalous insertion of median arcuate ligament on CT in asymptomatic individuals.

MATERIAL AND METHODS

This was a record base cross-sectional study conducted at the Department of Radiology, Shifa International Hospital, Islamabad from February 05, 2015 to May 15, 2015. Approval for the study was obtained from Institutional Review Board and Ethics Committee of the Hospital. It included case records of post-contrast CT scan abdomen of 852 asymptomatic individuals i.e. without median arcuate ligament syndrome carried out from July 2011 to June 2013. Cases were reviewed for identification of anomalous median arcuate ligament insertion on MDCT (Figure 2 & 3). Postsurgical cases and those with vascular thrombosis and arteriovenous malformation were excluded. The CT images were reviewed on workstation after image post processing. Gender was the only demographic while presence of anomalous insertion of median arcuate ligament was the only research variable. Both were nominal data and hence analyzed by frequency and percentage.

RESULTS

A sample of 852 persons was studied. Out of 852 cases, the anomalous insertion of MAL was identified in 133 (15.60%) cases. These included 46 (5.39%) males and 87 (10.21 %) females with a male to female ratio of 1:1.89. (Table 1)

Table 1: Presence of anomalous insertion of median arcuate ligament (MAL) in asymptomatic cases.

Sample size	MAL Present		
	Males	Females	Total
852	46 (5.39%)	87 (10.21%)	133 (15.60%)

Figure 1: CT scan 3D reformat axial image showing anomalous insertion of median arcuate ligament causing narrowing of celiac axis.

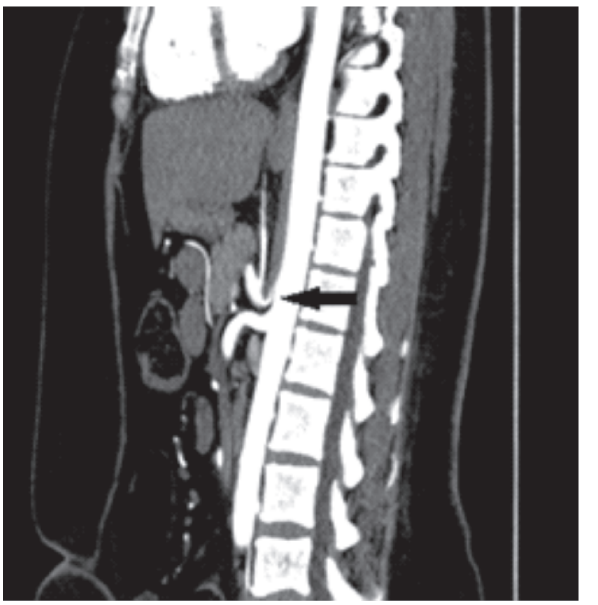

Figure 2: CT scan saggital image demonstrates characteristic focal narrowing in the proximal celiac axis due to anomalous insertion of median arcuate ligament.

DISCUSSION

Our study showed that anomalous insertion of MAL can be visualised in 16% of asymptomatic individuals, which according to other studies is 4%, 7.3% and 24% respectively.[15-17] Our study showed that anomalous insertion of MAL is more common in females which is in concordance with the international literature.[1,6,7]

MALS is a controversial entity as abnormal insertion of MAL is shown to exist in asymptomatic people and therapeutic interventions help in a small subset of symptomatic people, as described by Horton et al.[1,2] However, some case reports and studies show improvement of symptoms after therapeutic interventions, like that by Daniel et al.[7] Symptoms of the disease are nonspecific, leading to confusion

among other entities.[6] Even some studies show recurrence of disease after surgical division of MAL, like Geelkerken et al.[18] As MALS is a diagnosis of exclusion, hence it is important to correlate radiologic findings with the degree of clinical symptoms to identify the subset of patients who will benefit from the treatment.[19]

Exact cause of MALS is not known although studies suggest that compression of celiac axis may lead to irritation, fibrosis and enlargement of the nearby celiac ganglia, which is responsible for the symptoms.[15] Significant number of asymptomatic individuals can be due to the fact that celiac ganglia occur away from the celiac trunk in 32% of patients and thus remain unaffected from the effects of compression of celiac axis.[20] We suggest studies to follow the asymptomatic individuals with anomalous insertion of MAL till the development of symptoms and their relationship with the celiac ganglia.

CONCLUSION

A significant number of asymptomatic persons have anomalous insertion of median arcuate ligament. It is important to correlate the radiologic findings with clinical symptoms to identify the subset of patients who will benefit from treatment.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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