Median Arcuate Ligament Syndrome is Effectively Relieved with Minimally Invasive Surgery

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ABSTRACT:

Introduction

The following study describes one institution's experience with minimally invasive release of the median arcuate ligament (MAL) for median arcuate ligament syndrome (MALS) and reports on outcomes of this procedure and patient's quality of life. MALS is a constellation of symptoms related to compression of the celiac artery trunk consisting of chronic, recurrent abdominal pain, usually postprandial, which may be accompanied by nausea, vomiting, and weight loss. Minimally invasive release of the ligament has been shown to improve these symptoms.

Methods and Procedures

We performed a retrospective chart review of all patients who underwent minimally invasive release of the MAL at our institution. Demographic and pre and postoperative data were collected and analyzed. Patients were mailed a survey consisting of the 36-Item Short Form and Visick questionnaires. If surveys were not returned after one month, patients were called and asked to complete them over the phone. Visick scores were calculated based on last follow-up visit if the patient was unable to be reached by phone.

Results

Eleven patients underwent a laparoscopic MAL release from January 2015 to January 2020. Most patients, 73%, reported epigastric pain as their primary symptom for a median of 18 months. All cases were successfully completed laparoscopically, with only one intraoperative complication. Mean hospital length of stay was 1.4 days. At the time of survey completion, the mean weight change was 2.3kg. Additional interventions for resolution of symptoms and celiac artery stenosis were required for 2 patients. Surveys were completed by 8 patients. A mean Visick score of 1.8 showed resolution or improved symptoms for all patients. SF-36 scores were highest for physical functioning, emotional well-being, and social functioning health areas.

Conclusion

Minimally invasive release of the MAL is a safe and effective surgery for patients suffering from MALS. Symptoms improved after adequate release of the ligament, with minimal morbidity and additional postoperative procedures needed.

INTRODUCTION:

Median arcuate ligament syndrome (MALS) is a rare condition that presents with chronic, recurrent abdominal pain, nausea, emesis, and weight loss[1]. Symptoms are due to the extrinsic compression of the celiac trunk and/or celiac ganglion by a fibrous band, the median arcuate ligament (MAL), traversing the crura of the diaphragm[2]. In an estimated 10-24% of individuals, the MAL crosses anterior to the celiac artery, however not all patients experience stenosis or compression or develop symptoms[3]. Thus, this syndrome remains a diagnosis of exclusion.

Patients often see multiple specialists, including gastroenterologists and vascular surgeons, and undergo a variety of tests and imaging studies before a diagnosis is made. These can include an abdominal computed tomography (CT) scan, upper endoscopy, duplex abdominal ultrasonography, CT angiography (CTA), or traditional angiography[2-4]. Treatment for symptomatic patients involves surgical division of the MAL and associated fibers, with possible celiac ganglionectomy, to decompress the celiac artery. In addition, celiac artery bypass or endovascular stenting may be performed. Traditionally, this operation was performed through an open laparotomy approach; however, in recent years, minimally invasive laparoscopic or robot-assisted techniques have become popular[5–8]. In this study, we report our institution's experience with laparoscopic release for MALS in 11 patients, including intermediate-term outcomes and quality of life survey information.



Figure 1: Placement of the camera, retractor, and three working ports for a laparoscopic median arcuate ligament release

METHODS:

A retrospective review was conducted for all patients undergoing treatment for MALS between January 2015 and January 2020. Information including demographics, pre-operative symptoms and workup, operative details, and post-operative information was collected. Identified patients were mailed letters notifying them of and explaining the study, along with a survey to complete. Diagnosis of MALS was made in consultation with a gastroenterologist, vascular surgeon, and minimally invasive surgeon based on history, symptoms, and imaging findings.

The survey consisted of the 36-Item Short Form Survey (SF-36) and the Visick score. The SF-36 measures the quality-of-life outcomes in healthcare and related to eight health areas[9]. Results were scored using the key available online, with higher scores representing a more favorable health state[10]. The Visick score is a subjective score that looks at symptom severity after surgery, helping to evaluate the effectiveness of the procedure. A lower Visick score corresponds to better symptom outcomes. If a patient failed to return a completed survey or inadequate data was available, the patient was excluded from the study.

RESULTS:

Patient number	Age(yr) /sex	BMI	Preoperative symptoms	Symptom duration (months)	Preoperative Studies		Preoperative celiac artery PSV, cm/s
1	62/F	15.8	Epigastric pain, anorexia, nausea, diarrhea, wt loss	36	EGD, MRA, Angiogram, US	Duplex	303
2	21/M	20.1	Epigastric pain, postprandial pain, anorexia	36	Duplex US		488
3	52/F	20.2	Postprandial pain, wt loss	3	Duplex US		461
4	31/F	25.7	Epigastric pain, diarrhea	180	EGD, CT, Duplex US		421
5	57/M	26.5	Epigastric pain, early satiety, nausea, wt loss	120	CTA, Duplex US		568
6	15/F	15.1	Epigastric pain, early satiety, nausea	60	EGD, CT, Duplex US		342
7	61/F	18.8	Epigastric pain, postprandial pain, nausea, wt loss	4	EGD, MRA, Angiogram, US	Duplex	143
8	60/F	24.0	Epigastric pain, postprandial pain, early satiety, wt loss	6	EGD, CTA, Angiogram, US	Duplex	177
9	29/F	15.8	Postprandial pain, early satiety, nausea, emesis, wt loss	9	EGD, CTA, Duplex US		484
10	47/M	19.9	Epigastric pain, postprandial pain, anorexia, nausea, emesis, wt loss	18	EGD, MRA, Duplex US		Not provided in report
11	23/F	22.3	Postprandial pain, nausea	18	CTA, MRI		Not done

Table 1: Baseline patient characteristics and demographics
Yr, years; PSV, peak systolic velocity; M, male; F, female; EGD, esophagogastroduodenoscopy; MRA, magnetic resonance angiography; US, ultrasound; CT, computed tomography; CTA, computed tomography angiography; MRI, magnetic resonance imaging

Eleven patients underwent a laparoscopic release of the median arcuate ligament. There were 8 females and 3 males, with a mean age of 42 years old. Mean BMI was 20.4 (range 15.1-26.5) pre-operatively. Epigastric pain was the most reported symptom (73%), followed by postprandial pain, nausea, and weight loss, each reported by 64% of patients. Median length of time of symptoms was 18 months.

All 11 patients underwent a laparoscopic procedure without conversion to open. One intraoperative complication was reported, an arteriotomy, which was repaired intra-operatively. Mean length of stay was 1.4 days (range 1 to 3 days). Post-operative angiograms were performed in 2 patients, with 1 occurring 2 months post-operatively requiring a celiac stent placement, and the other at 2 years post-operatively requiring a balloon angioplasty.

The mean weight change was 2.3kg with a mean post-operative BMI of 21.3, not statistically significant (p=0.12). The mean Visick score was 1.8 (range 1-3). 82% of patients reported either no symptoms or improved symptoms following the procedure. The SF-36 scores are shown in Table 2. When comparing their health to a year ago, 3 patients reported much better health, 4 somewhat better health, and 1 about the same.

Patient number	Physical functioning	Role limitations due to physical health	Role limitations due to personal or emotional problems	Energy/ fatigue	Emotional well-being	Social functioning	Pain	General health
1	100	75	100	60	88	75	67.5	70
2	75	100	100	80	92	87.5	55	25
3	100	75	100	60	100	100	90	20
4	100	100	100	80	88	100	90	95
5	95	0	33.3	15	72	62.5	67.5	40
8	10	0	0	0	44	37.5	22.5	5
10	75	100	100	80	92	100	77.5	75
11	95	100	0	40	44	37.5	77.5	50
Mean	81.2	68.7	66.7	51.9	77.5	75.0	68.4	47.5

Table 2: Postoperative SF-36 health area scaled scores listed by participant and mean score





Figure 2 Left: Arterial angiogram, post laparoscopic MAL release, showing celiac artery stenosis
Right: Arterial angiogram with resolution of stenosis after celiac artery angioplasty and stent placement

CONCLUSIONS:

- Laparoscopic release of the median arcuate ligament is a safe and effective technique for treating median arcuate ligament syndrome
- Patients benefit by an improvement in or resolution of their symptoms with relatively low morbidity associated with this procedure.

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