Median Arcuate Ligament Syndrome (MALS) is a rare disorder that occurs when the celiac artery and celiac nerves are compressed by the median arcuate ligament. Symptoms of MALS can include significant postprandial abdominal pain, weight loss, nausea, and vomiting. It has been suggested that other co-morbid conditions may be associated with MALS [1, 2]. However, there has only been one study of 11 patients looking at multiple co-morbidities [3]. In that study, 71.4% of patients had radiographic evidence of delayed gastric emptying, 18.2% had Ehlers-Danlos Syndrome (EDS), and 27.3% had Postural Orthostatic Tachycardia Syndrome (POTS). All of these are higher than the prevalence of these conditions in the general population.

Another study of 51 patients diagnosed with MALS showed that 28% met the criteria for a psychiatric disorder. This was the first time in the current literature that these conditions were studied in conjunction with a diagnosis of MALS.

### Introduction

The incidence of MALS in the population is predicted to be 2 cases per 100,000 patients, thus other possible co-morbidities must be explored prior to a diagnosis of MALS is reached. It has been suggested that other co-morbid conditions may be associated with MALS [2]. Despite this, there has been only one small study of 11 patients looking at multiple co-morbidities of MALS [3]. As the co-morbid conditions often associated with MALS are rare findings in the general population, we decided to explore the prevalence of these conditions in patients who had already been diagnosed with one relatively rare condition: MALS. In addition to the already loosely associated conditions of dysautonomia, EDS, gastroparesis and psychiatric conditions with MALS, we included an analysis of the prevalence of SIBO, autoimmune conditions and MCAS.

The first time in the current literature that these conditions were studied in conjunction with a diagnosis of MALS.

### Study Design

Patients diagnosed with MALS were identified via three Facebook support groups and consent for posting the survey link was obtained. The survey was posted on all three groups allowing all to view the survey. The number of Facebook members in each group is 3,800, 4,400, and 2,700.

Inclusion criteria: Individuals must have been 18 years or older at the time of the survey and have a diagnosis of Median Arcuate Ligament Syndrome (Celiac Artery Compression Syndrome) diagnosed by a medical provider (MD/DO, PA, NP) at any time in their individual's life prior to completion of the survey. Exclusion criteria: Individuals who do not meet the inclusion criteria; those who had not been diagnosed with Median Arcuate Ligament Syndrome (Celiac Artery Compression Syndrome) by a medical provider (MD/DO, PA, NP) at any time in the individual's life prior to completion of the survey or were not 18 years of age or older.

### Results

**What are the demographics of the 242 MALS patients surveyed?**

- 71.0% of patients reported a diagnosis of POTS. EDS was reported in 31.7% of patients. Gastroparesis was reported to be lower than the previous study with 37.8% (Figure 1).
- Figure 2 shows the prevalence of co-morbidities which is greater than the prevalence of these conditions in the general population.
- All co-morbid conditions were higher in the MALS population surveyed compared to the general population (3). This could also be due to bias where young females could be more likely to participate in Facebook support groups.
- The prevalence of all co-morbid conditions including Dysautonomia, Ehlers-Danlos Syndrome (EDS), Gastroparesis, Mast Cell Activation Syndrome (MCAS), mental health conditions, autoimmune diseases and Small Intestinal Bacterial Overgrowth (SIBO) were higher in our surveyed MALS population than in the general population.

**What type of dysautonomia do MALS patients report?**

We found that the most prevalent type of dysautonomia in patients with MALS was Postural Orthostatic Tachycardia Syndrome (POTS). Among those with a confirmed diagnosis of MALS, 60% reported symptoms of POTS, with 23% having been given a diagnosis of POTS.

Among those without a confirmed diagnosis, 37.8% of those surveyed reported a diagnosis of dysautonomia, 72% reported a diagnosis of POTS.

**What type of Ehlers-Danlos Syndrome (EDS) do MALS patients report?**

Gestational EDS was found to be the most prevalent type of dysautonomia (77%) among those with a confirmed diagnosis of MALS (Figure 2.4). Among those without a confirmed diagnosis of MALS, 70% reported symptoms of EDS.

**What type of autoimmune condition(s) do MALS patients report?**

Various types of autoimmune conditions were present in 37% of MALS patients. Systemic lupus erythematosus (SLE), Crohn’s disease, and rheumatoid arthritis (RA) were reported in 4%, 12%, and 12% of patients, respectively. Gastrointestinal and pulmonary symptoms were reported in 15% of patients with SLE, 12% of patients with RA, and 8% of patients with IBD, respectively.

**What type of psychiatric condition(s) do MALS patients report?**

Anxiety was found to be the most prevalent type of psychiatric condition (34%) among those who had MALS and a diagnosed psychiatric condition. The second most prevalent diagnosis was depression as a second (30%) among those who had MALS and a diagnosed type of Ehlers-Danlos Syndrome:  Our study found that the prevalence of EDS in patients with MALS could be much higher, reported at 31.7% (Figure 2), with hypermobility EDS (HEDS) as the most prevalent type of EDS at 77% (Figure 4).

Gestational EDS was reported in 37.8% of patients surveyed, which was lower than the 71.4% in a previous study when radiographical evidence was used. This discrepancy is most likely due to the lack of radiographic evidence, patient reporting, or the small sample size of the previous study.

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