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Diffuse esophageal leiomyomatosis: A case report with surgical correlation

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ABSTRACT

A 15 year old female with a history only significant for long standing dysphagia and intermittent chest pain underwent a screening chest radiograph. Findings of a large mass prompted cross sectional imaging where extensive and marked diffuse esophageal thickening was demonstrated. The patient ultimately underwent biopsy and surgical resection for diffuse esophageal leiomyomatosis. Diffuse leiomyomatosis of the esophagus has been described in the literature for about 100 years with increasing recognition in more recent times. There is a known association with inherited syndromes such as Alport and Esophageal-Vulvar syndrome, though some cases are sporadic. This case report will demonstrate the imaging features of diffuse esophageal leiomyomatosis utilizing multiple modalities including radiography, fluoroscopy, CT, and MRI, with surgical and pathologic correlation.

1. Introduction

The entity now referred to as diffuse esophageal leiomyomatosis (DEL) was probably first described by Hall in 1916 in a case report of a 17 year old female who died of starvation due to dysphagia, with the diagnosis subsequently made on autopsy [1]. While some cases of DEL are sporadic, there is a well-established association with the x-linked Alport Syndrome, especially in the pediatric population [2]. Alport syndrome is characterized by sensorineural hearing loss, early cataract formation, and glomerulonephritis with consequent renal failure. Up to 5% of Alport patients are affected by DEL and as many as 2/3 of pediatric patients with DEL carry the diagnosis of Alport Syndrome [3]. Esophageal-Vulvar syndrome, characterized by leiomyomata of both the vulva and esophagus, presents with findings of DEL on imaging in many cases, often in young adult females [4]. For this reason, if DEL is discovered in a proband, the immediate family should be screened for the related syndromes.

Patients may present at any age, from as young as 2 years [1] or as old as 68 years [5]. For the majority of patients, dysphagia is the presenting symptom, usually long standing from months to years with some patients enduring decades of symptoms [6–11]. Less commonly, the patient may present with an incidental finding on chest radiograph prompting further workup [4,12,13].

Irrespective of age at presentation and/or underlying genetic cause, the extent of esophageal involvement can vary from the entire thoracic esophagus to as little as one-third of the esophageal length, with the distal more often involved than the proximal [14]. Consistent in all cases is circumferential thickening of the muscular layer of the esophageal wall which often results in dysphagia. Regardless of the etiology and length of esophageal involvement, DEL is typically treated with a total esophagectomy for symptomatic relief [11,15].

2. Case

A 15-year-old female with no significant past medical history except for approximately 10 years of long standing dysphagia and intermittent chest pain. She described pain when eating potato chips or other hard foods. She initially presented for a frontal and lateral radiograph at an outside institution. The chest radiograph showed a long segment density along the right heart border concerning for mediastinal mass (Fig. 1). The patient subsequently underwent a contrast enhanced CT at the outside institution for the mediastinal lesion. Diffuse circumferential thickening of the esophagus began just below the thoracic inlet and extending for approximately 17 cm to the level of the esophageal hiatus (Fig. 2). The lesion was diffusely homogenous without evidence of nodularity or focal enhancement. The soft tissue thickening gradually increased in diameter from cranial to caudal, reaching a maximal thickness just above the GE junction, where it measured approximately

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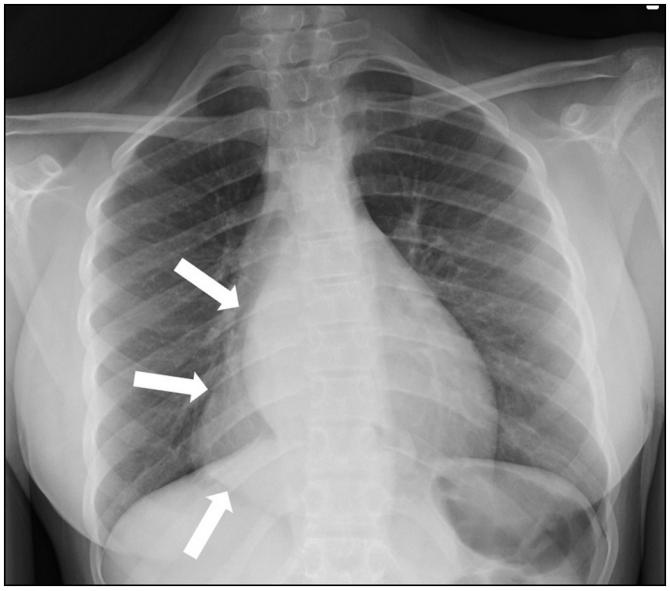

Fig. 1. Erect PA radiograph of the chest. The frontal view shows an opacity adjacent to the right heart border and medial hemi-diaphragm, neither of which are obscured (arrow).

7×7 cm, with the lumen of the esophagus displaced slightly asymmetrically to the right and posteriorly. Only a short segment of abnormal wall thickening was seen immediately below the diaphragm.

The patient's care was then transferred to a tertiary pediatric facility. Evaluation of the esophageal lumen was performed at our institution utilizing reduced pediatric dose pulsed fluoroscopy with a barium esophagram (Fig. 3). While the cervical and upper 1/3 of the thoracic esophagus had a normal luminal diameter and contour, there was irregular contractility and motility throughout the upper esophagus. The lower 2/3 showed narrowing which did distend with barium passage. A slightly irregular contour of the gastric fundus was also noted.

At this juncture, an ultrasound-guided endoscopic biopsy had been performed. Pathology described the lesion as a leimyoma. Preoperative planning MRI was then undertaken. Each sequence extended from the level of the upper cervix to the level of the proximal stomach to ensure complete evaluation of the esophagus. The study was performed on a 1.5 T scanner with and without intravenous contrast. As seen with the CT, diffuse circumferential thickening of the esophagus began just below the thoracic inlet with progressive thickening continuing distally to a maximum thickness just above the GE junction where the lesion measured 7.5 cm in greatest transverse dimension, and 6.5 cm in greatest AP dimension (Fig. 4). Again, the total craniocaudal extent measured approximately 17 cm with extension to just beyond the diaphragm into the gastric fundus wall. Signal intensity on T1 and T2 and enhancement pattern are similar to that of chest wall musculature.

2.1. Surgical management

The patient and her family were counseled regarding the need for an esophagectomy with possible gastric or colonic conduit depending on the presence or absence of gastric involvement.

In the operating room, the patient was intubated with a double lumen endotracheal tube in order to provide single lung ventilation during the planned right thoracotomy. A midline laparotomy was performed and the abdomen was explored. There was no evidence of metastasis and the stomach was palpated and examined with no evidence of gross involvement by tumor. The decision was made to proceed with a gastric conduit as opposed to a colonic interposition. A right-sided thoracotomy was performed and a predominantly extra-

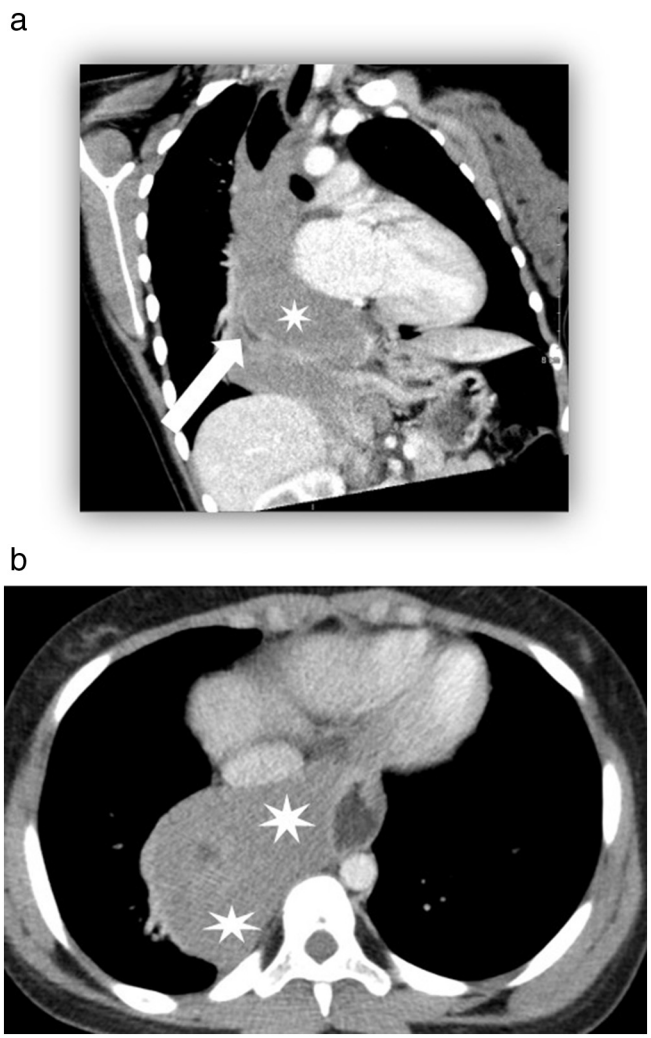

Fig. 2. (a) Coronal oblique reformatted CT image defines the extent of esophageal wall involvement (asterisk) from the upper thoracic esophagus down to the hiatus and clearly demonstrates the distally narrowed lumen (arrow). Also appreciable is mass effect on the esophageal lumen by the asymmetry of the thickening which is greater to the left causing rightward bowing of the lumen (arrow). (b) Axial CT images at the level of the distal third esophagus demonstrates circumferential thickening of the wall (asterisk). Note the diffuse homogenous appearance of the lesion on this post contrast study.

pleural dissection was used in order to allow retraction of the entire lung as a single unit. The esophagus was very enlarged, firm, and irregular. Dissection was carried proximally to the thoracic inlet where the esophagus felt slightly dilated but otherwise normal. Dissection was carried distally to the diaphragmatic hiatus. Given these findings, a thoracic anastomosis was performed. A pyloroplasty was performed to allow gastric emptying. The abnormal esophagus was resected (Fig. 5) and an end-to-end anastomosis was created between the proximal esophagus and the stomach.

Postoperatively, the patient did well. Her pain was managed with a combination of intravenous medications and an epidural. She had an esophagram on postoperative day 7 which showed no leak (not shown). Her diet was advanced and her chest tube was removed without incident. She was followed postoperatively in the surgery clinic. Approximately three months after surgery she reported some dysphagia. An esophagram showed mild narrowing at the anastomosis and this was dilated in the operating room with resolution of her symptoms.

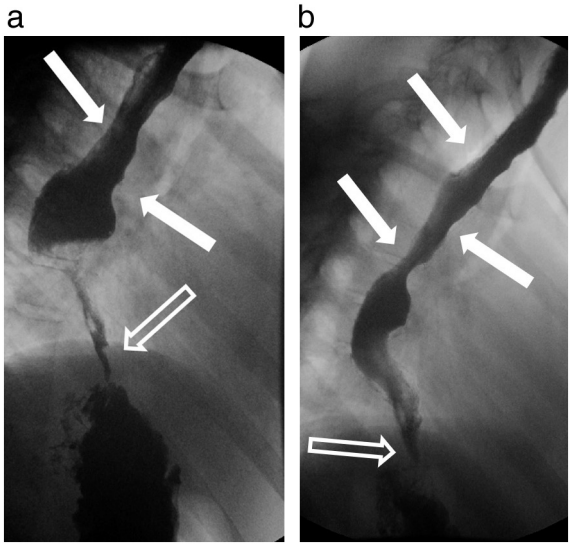

Fig. 3. Barium esophagram demonstrates segmental narrowing (open arrow) of the distal third of the esophagus with mild upstream dilatation with a lobulated contour to the upper esophagus (arrow) (a). Subsequent image (b) shows the distal third eventually relaxes (open arrow) and lobulated upper esophageal contour (arrows).

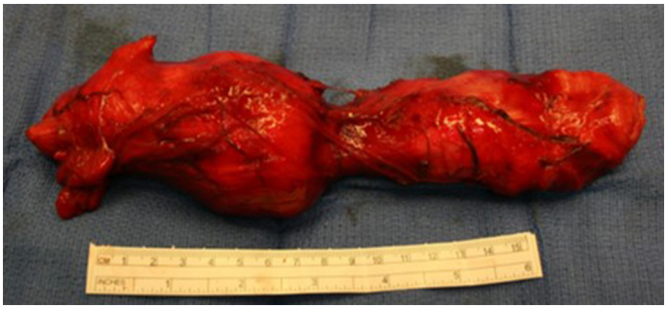

Fig. 5. Intraoperative picture immediately upon resection. Distal esophagus to the left and proximal less thickened esophagus to the right.

2.2. Pathologic correlation

The surgical specimen was longitudinally opened to reveal involvement of the submucosal wall by confluent, bulging, white-tan, firm tissue mass which involves almost the entire specimen (Fig. 6). The mass grossly does not penetrate the mucosal or serosal surfaces. The mass ranged in thickness from 1 cm (in proximal half of specimen) up to 2.3 cm (in distal portion of specimen). The mucosa of the esophagus is tan-white and smooth with a few linear ulcerations present at the distal end, measuring up to 4 cm in greatest length. The distal end is lined by gastric mucosa measuring 4.5 cm in greatest length. Microscopically the mass demonstrated homogenous smooth muscle with scattered

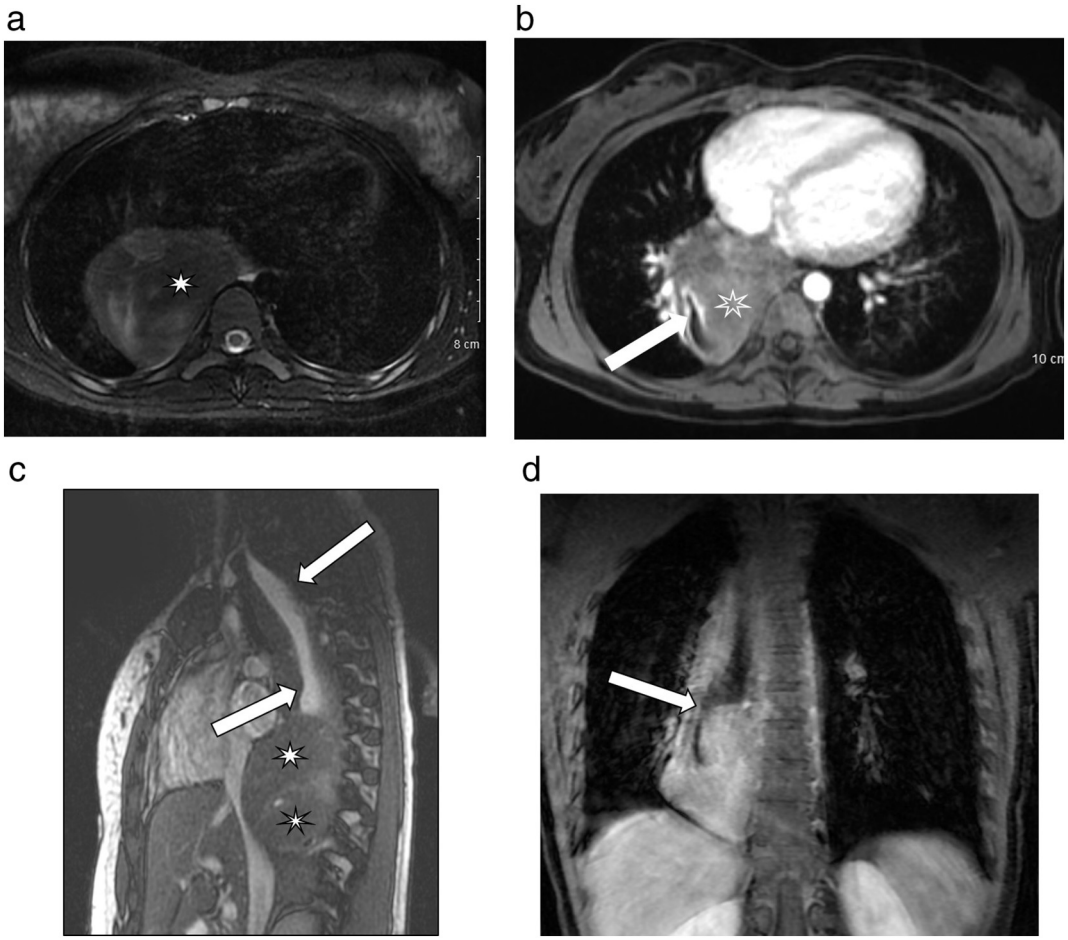

Fig. 4. (a) Axial T2 fat saturated image at the level of the distal third esophagus. (b) Axial LAVA T1 postcontrast fat saturated image at the level of the distal third esophagus with diffuse thickening of the esophageal wall (asterisk). (c) Sagittal T2 image with a distended upper esophagus (arrows) and a markedly thickened lower esophagus (asterisk). (d) Coronal LAVA T1 postcontrast fat saturated image demonstrates the transition point of luminal narrowing (arrow). Signal intensity on T2 weighting imaging and enhancement pattern are similar to chest wall musculature.

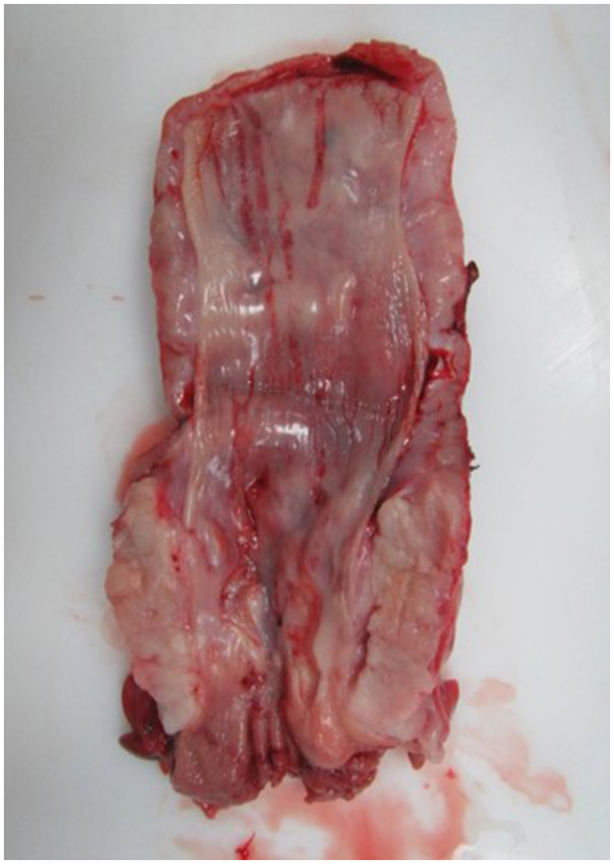

Fig. 6. Gross pathology. A fillet specimen demonstrates the nodular wall thickening.

calcifications and edematous areas of inflammation, without necrosis or fibrosis. Overall staining pattern was consistent with a leiomyoma immunoprofile.

3. Discussion

For the majority of patients, dysphagia is the presenting symptom, usually long standing from months to years with some patients enduring decades of symptoms [6–10]. A recent meta-analysis reviewing operative management described a median of 3 years from presenting symptoms to diagnosis and treatment [11].

Less commonly, the patient may present with an incidental finding on chest x-ray prompting further workup [4,12,13]. In an extreme and unique case, a patient died of massive esophageal hemorrhage and was discovered to have DEL on autopsy [12]. Individuals are screened if DEL is found in a relative due to the high association with Alport syndrome and other aforementioned inheritable causes and may be discovered in this manner.

An exhaustive review of the surgical literature was performed by Federici et al. [1] in 1997 and included 25 cases of patients under the age of 14, and again by Ziogas et al. [11] in 2018 identifying only 35 cases. At the time of Federici's review, chest x-ray and barium esophagram were the recommended diagnostic tests to image the esophagus. Since then CT and MRI have become more widely available and a number of case reports have described the benefits of cross sectional imaging for further evaluation [8].

Although chest x-ray and barium esophagram were the recommended imaging studies of choice to diagnose DEL in the past, modern CT and MRI techniques more rapidly identify the diffuse esophageal wall thickening that leads to biopsy to prove the diagnosis. The overlapping imaging features of DEL and achalasia on barium esophagram can limit its utility for accurate diagnosis. As DEL can also be misdiagnosed as achalasia on esophageal manometry, a confirmatory test, this can result in the wrong diagnosis and delay appropriate therapy [16,17].

Diagnosing DEL by imaging may be difficult radiographically, but identification of a mediastinal lesion will prompt additional cross sectional imaging. Diffuse homogenous thickening of the esophageal wall is the hallmark appearance. Typically, there is no well-defined dominant mass within the lesion. On MRI the intensity of the lesion corresponds to skeletal muscle on all pulse sequences and after contrast administration. With the pediatric and young adult population being the most afflicted by DEL and also the most vulnerable to the risk of ionizing radiation, MRI affords the best opportunity to diagnostically evaluate this lesion while mitigating radiation risk.

Surgery will be indicated in essentially every case [11,15]. Consequently, faster diagnosis can result in significant improvement in patient symptoms sooner. When the diagnosis is made, screening of immediate relatives is important to exclude syndromes such as Alport and Esophageal-Vulvar syndrome, or a yet unknown pattern of DEL inheritance.

4. Conclusion

Diffuse esophageal leiomyomatosis is an uncommon lesion that often presents in young patients with nonspecific dysphagia. Long segment smooth thickening of the esophagus with characteristic features of muscle is the hallmark finding, and is typically treated with esophagectomy. Awareness of the entity can lead to earlier diagnosis and treatment and potential screening of family members for inheritable causes.

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