INTRODUCTION

Leiomyoma is the most common benign mesenchymal esophageal tumor and accounts for up to 80% of benign esophageal tumors. Esophageal leiomyomas can occur at any age, but the peak incidence is in the third to fifth decades of life. Lesions in adults are usually localized to the middle- and lower third of the esophagus. In children, the diffuse form of the disease predominates and can be associated with familial syndromes (e.g., familial leiomyoma and Alport’s syndrome). In cases of diffuse esophageal leiomyomatosis or giant esophageal leiomyoma, esophagectomy is often required. Localized esophageal leiomyomas have been conventionally resected via an open thoracotomy and extramucosal enucleation. Thoracoscopic techniques have been described for simple leiomyomas and are associated with reduced operative morbidity. However, complex lesions may not be amenable to standard thoracoscopic techniques because of limitations posed by the two-dimensional visual field and the reduced range of motion of thoracoscopic instruments. Robotic-assisted thoracoscopic surgery offers the benefit of three-dimensional (3D) imaging, motion scaling, tremor filtration, and the full range of motion from articulated instruments. In this paper, we report a case of a large (7-cm), complex, multilobulated retrocardiac esophageal leiomyoma that was successfully extirpated by using a robotic-assisted thoracoscopic approach. Intraoperative esophagoscopy and transillumination were useful adjuncts in identifying the esophagus and developing a safe extramucosal dissection plane.

CASE REPORT

A 17-year-old asymptomatic boy was incidentally noted to have a retrocardiac rounded density on a chest X-ray following a motor vehicle accident. A magnetic resonance image of the thorax demonstrated a bi-lobed 7 × 7 × 5.5 cm complex encircling esophageal mass adjacent to the posterior aspect of the heart and anterior aspect of the descending aorta (Fig. 1). The differential di-
agnosis included esophageal leiomyoma versus foregut duplication cyst, although a tumor could not be excluded.

The patient was positioned in the right lateral decubitus position. A dual-lumen endotracheal tube was utilized for single-lung ventilation. The first-generation da Vinci robot (Intuitive Surgical, Inc., Sunnyvale, CA) was utilized and positioned near the patient’s left shoulder (Fig. 2). A 12-mm trocar was placed for the 3D vision system. Two 8-mm trocars were placed as working ports for the robotic instruments. Two additional ports were utilized to help retract, irrigate, and suction. The mass was multilobulated and encircled the esophagus. In order to identify the esophagus and identify an extramucosal dissection plane, an endoscope was introduced and used both as a bougie and for transillumination. A multilobulated tumor within the muscularis propria was identified and dissected free from the intact underlying mucosa. Air insufflation at the end of the procedure revealed no leak. A postoperative esophagogram demonstrated a mildly dilated distal esophagus, with no extravasation and easy passage of contrast into the stomach. On postoperative day 2, the patient was transitioned to a full-liquid diet and oral pain medication. The chest tube was removed and the patient discharged on postoperative day 4. A repeat esophagogram 1 year later demonstrated less dilation of the distal esophagus. The patient remains asymptomatic 2 years postoperatively.

**DISCUSSION**

There has been an explosion in the use of laparoscopic and robot-assisted techniques for esophageal procedures, including Heller myotomies for achalasia, esophagectomies for esophageal cancer, and the excision of benign esophageal tumors. The success of laparoscopic Heller myotomies in the treatment of achalasia is well documented and has achieved a 90% success rate in achieving good or excellent swallowing status while minimizing postoperative pain and hospitalization, compared with open procedures. The esophageal perforation rate with laparoscopy is equivalent to open procedures and ranges from 1 to 15% (average, 5%). Several recent reports demonstrate the benefit of a robotics platform in decreasing the esophageal perforation rate to 0%. The ability of the robot platform to decrease the perforation rate is attributed primarily to improved visualization with three dimensions and secondarily to improved instrument handling, ergonomics, and motion scaling.

The role and benefit of minimally invasive techniques in esophagectomies for esophageal cancer is not as clearly defined. Several papers demonstrate that minimally invasive approaches result in decreased postoperative pain and earlier discharge but increased operative time. In most series, the minimally invasive approach did not appear to compromise the oncologic resection, as the extent of lymphadenectomy and 5-year survival rate were similar for that of open procedures. A few case reports describe laparoscopic and robotic approaches to the resection of benign simple esophageal tumors. However, there is limited experience with the minimally invasive resection of complex benign esophageal lesions.

Robot-assisted thoracoscopic techniques have several advantages that can facilitate the extirpation of complex masses. The mass was predominantly on the left side and in the lower esophagus. Therefore, the patient was positioned in the right lateral decubitus position. The da Vinci robot and monitor were positioned posterior to the patient. The tableside assistant (A) is positioned anterior to the patient. The surgeon (S) sits at the console away from the operative field.
esophageal lesions and help avoid technical complications, including esophageal perforation. The free range of motion obtained with the multiarticulated robotic instruments facilitates circumferential dissection around the esophagus. Motion scaling and tremor filtration help to prevent inadvertent motions that can lead to mucosal disruption. The 3D vision system enhances magnification, improves visuospatial orientation, and aids in the identification of the extramucosal tissue plane. The da Vinci robotic system does have drawbacks, including high cost, longer setup and operative time, and the lack of haptic feedback. Proper room setup, patient positioning, and trocar placement are critical to an efficient operation.

Intraoperative endoscopy is an extremely helpful adjunct in the thoracoscopic resection of esophageal tumors. Endoscopy can be useful in localizing the tumor when the mass itself can be visualized. When the entire esophagus is circumferentially involved with tumor, as in this case report, transillumination can be used to identify anatomic landmarks, including the proximal and distal extent of the tumor. The endoscope can also be used as a bougie to facilitate dissection. Once extirpation of the tumor is completed, insufflation of air into the esophagus can be used to check for a leak and verify mucosal integrity. Finally, a breach in the musculature can be identified as a bulge and suggest the need for myotomy repair. In this case, the tumor was so extensive and the esophageal musculature so thinned out that a repair of the myotomy to prevent aperistalsis and the formation of a diverticulum remains controversial but is recommended, when feasible, in large series.

**CONCLUSIONS**

Extramucosal enucleation of esophageal leiomyomas can be performed thoracoscopically with minimal morbidity. Many institutions limit the thoracoscopic resection of esophageal leiomyomas to cases where the tumor is simple, small, and round and when the submucosal plane can be easily identified. Robot-assisted thoracoscopy enables the resection of more complex lesions, which account for up to one third of esophageal leiomyomas. These minimally invasive surgery approaches may offer advantages of decreased pain, reduced atelectasis, and shorter hospital stay. Robot-assisted surgery arguably offers technical advantages over open surgery, including better exposure, magnification, and instrument control, facilitating the completion of complex esophageal surgery. Finally, as seen with Heller myotomies, the robotic platform may help avoid technical complications, including esophageal perforation.

**REFERENCES**


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