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Bronchogenic cyst excision using a robotic laparoscopic transdiaphragmatic approach☆

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ABSTRACT

We describe one case of a bronchopulmonary foregut malformations (BPFM) excision using robotic technology in a pediatric patient. Traditionally, surgical resection is performed using a thoracotomy or video-assisted thoracic surgery. A 12-year-old girl with a previous medical history of cough was diagnosed with a left cystic paracardiac mass. Her operation employed a transdiaphragmatic approach to remove the mass. The postoperative course was uneventful, and she was discharged after four days. The subsequent pathology concluded that the mass was a bronchogenic cyst. To the best of our knowledge, this is the first report of transdiaphragmatic laparoscopic approach and first use of robotics-platform for BPFM excision by children. We elected to use this type of procedure to decrease the postoperative morbidity associated with the thoracic approach. The robotic technology permitted surgical resection with a similar efficiency as standard thoracic or laparoscopic procedures. We hypothesized that this technology would simplify some of the technical points, decreasing any postoperative complications.

Lower posterior mediastinal cysts in children include bronchopulmonary foregut malformations (BPFM), such as esophageal duplications and bronchogenic cysts. They often present as paraesophageal masses and are revealed prenatally or after other complications arise. Traditionally, a resection is performed using a posterolateral thoracotomy. Thoracoscopic resection is a safe and effective method for treating isolated BPFM [1]. Robotic thoracic surgery is slowly gaining acceptance including in the field of mediastinal masses [2,3]. Very few cases of robotics-assisted thoracoscopic BPFM excisions have been reported by children [4]. Herein we detail for the first time the transdiaphragmatic approach and report the first use of robotics-assisted laparoscopic BPFM resection in a child.

1. Case report

A 12-year-old girl was referred to our center with a two-year history of intermittent cough and acute respiratory dyspnea. In a workup that included a chest MRI (Fig. 1) and CT scan with esophagogram, the patient was diagnosed with a non-communicating left cystic paracardiac mass. It measured 2.5 × 1.5 cm in size and was located 4 cm above the gastroesophageal junction. A surgical resection was chosen as the course of action.

Because of the cyst location, the patient was elected to undergo a laparoscopic robotics-assisted enucleation using a transdiaphragmatic approach. Informed consent was obtained from the parents. Extirpation was performed using the da Vinci Surgical Robot manufactured by Intuitive Surgical (Sunnyvale, CA, USA). The girl was placed in a supine, reverse Trendelenburg position with an orogastric tube to decompress the stomach. The robot was at the head of the patient, and the anesthesia team was on the right-hand side. The nurse was positioned on the right-hand side of the patient, and the assistant surgeon was placed between the legs of the patient (Fig. 2A). Four trocars were inserted: one, 8 mm in diameter for the 30° camera, just above the navel; two 8 mm trocars for the robotic arms were placed in the same line on the left and right resulting in a V configuration, with a minimum of four fingerbreadths distance between each port to allow for a full range of motion of the robotic arms; and finally, a 5 mm accessory port was placed between the right trocar and the navel to aid for the placement of the stitches, the aspiration and for aid in exposure. The surgeon operated while

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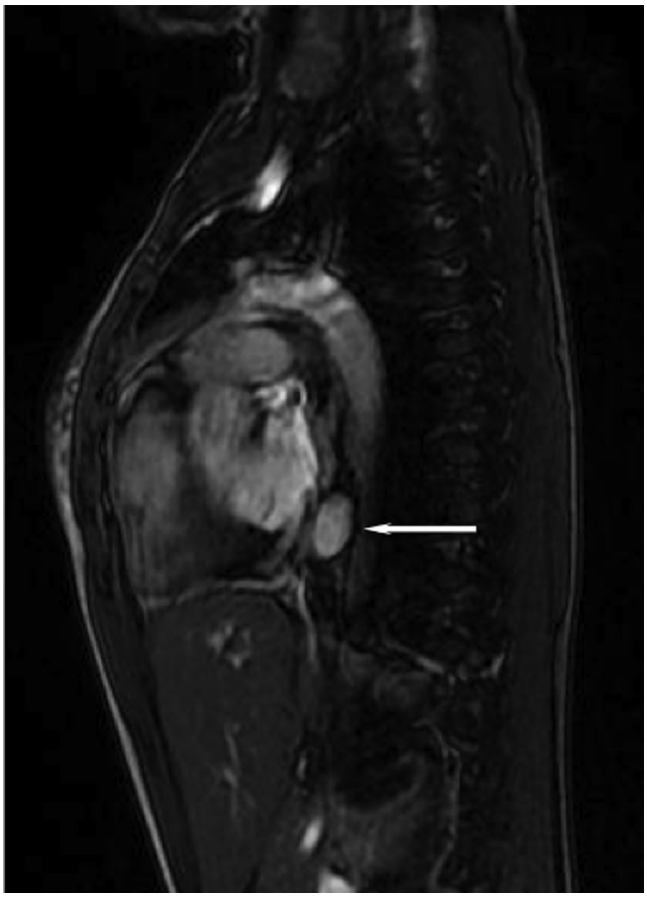

Fig. 1. Preoperative chest MRI. Sagittal T2-weighted MR image showing a left retrocardiac and paraesophageal cyst (arrow).

seated at a console and controlled the two arms of the robot and three-dimensional camera. Carbon dioxide was insufflated in the body through the accessory port at a flow rate of 0.1 L/min and maintained throughout the intervention at a positive pressure of 10 mm Hg.

After retracting the liver, a dissection was performed around the gastroesophageal junction. After identification of the posterior vagal trunk, the hiatus was opened at eleven o' clock using monopolar scissors on about 3 cm of length. Exposure was facilitated with the use of two traction stitches, the first one between the right edge of the diaphragm and the right part of the abdominal wall and the second one surrounding the esophagus (Fig. 2B). Dissection of the posterior mediastinum was performed laterally and anteriorly using monopolar forceps to expose the lower third of the esophagus. The cyst was identified just behind the left cardiac atrium. It was carefully removed after opening the esophageal muscle layer. Resection was achieved without mucosal perforation or pleural damage. Closures of the myotomy and of the diaphragm were performed using a knotless running absorbable suture with V-Loc™ 90 (Covidien; Mansfield, MA, USA). The operative time was 190 min. No perioperative complications were noted and the postoperative course was uneventful, with a resumption of food intake on the first day. Discharge was planned on the second day but delayed to the fourth because of familial difficulties. The pathologist report confirmed that the mass was indeed a bronchogenic cyst. All symptoms had completely disappeared at nine months after the surgery.

2. Discussion

The surgical indication for BPFM is usually determined either from the symptoms (compression and infection) or the parental concern facing diagnostic dilemma until tissue diagnosis is performed. Thoracoscopic resection is a safe technique, and there have been many reports in the literature detailing the surgical management of BPFM using video-assisted thoracic surgery in children. For upper mediastinal lesions, video-assisted mediastinoscopic resection has been reported [5]. However for lower mediastinal lesions, the laparoscopic approach can also be attempted. Indeed, laparoscopic surgery has been reported for the management of supradiaphragmatic pulmonary sequestrations in children [6]. By contrast, the transdiaphragmatic approach has been described only for adult cases in the literature [7]. It may be well suited for small lesions located just above the gastroesophageal junction.

We favored the transdiaphragmatic approach because we hypothesized that it might decrease the morbidity usually associated

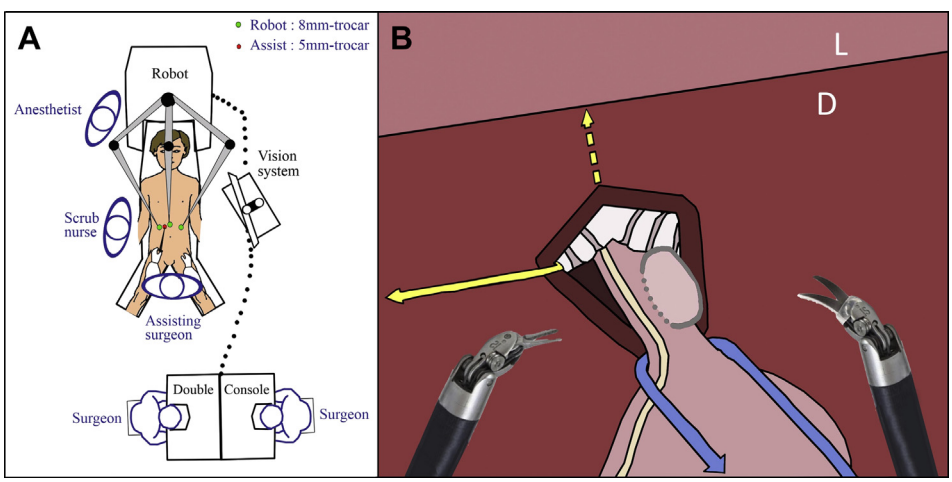

Fig. 2. A) Surgical team. Schematic diagram of the surgical robotic installation and the positioning of the four ports. B) Schematic of the laparoscopic view. Schematic view of the operating field. After diaphragmatic dissection (dotted arrow), the posterior mediastinum is exposed with two transparietal traction stitches. The first one surrounds the esophagus (indicated by a long arrow) and the second (indicated by a short arrow) pulls the right diaphragmatic edge. D: Diaphragm, E: Esophagus, L: Liver.

with thoracic approaches, such as postoperative pain. No pleural drainage was necessary with this technique. Moreover, the paracardiac and lower mediastinal location of the lesion made thoracoscopic surgery more complex and dangerous than a laparoscopy. Indeed, a 30° camera was well suited because of the axis of the esophagus. Therefore, robotic technology would allow for a safe and meticulous dissection because of the excellent visualization of the esophageal layers and precise maneuverability. This provided easy identification of the layer between the mucosa and muscle. The major technical concern associated with this procedure was the presumed loss of tactile feedback, which hampered the precise localization of the orogastric tube. At the end of the dissection, the diaphragm was properly reconstructed. No pleural injury occurred, and we did not need to use postoperative drainage.

3. Conclusion

Laparoscopic transdiaphragmatic approaches appear to be safe for treatment of lower mediastinal BPFM. Preoperative imaging was required to describe the precise location of the mass and then to assess the feasibility of this approach. Although a thoracotomy is considered the standard approach, we believe this surgical option offers many advantages for lower mediastinal lesions, including its use on the pediatric population. The support provided by the robotic platform improves the dissection in such a narrow space. The articulating instruments were particularly well suited to such narrowed spaces.

Conflict of interest

None declared.

References

[1] Bratu I, Laberge JM, Flageole H, Bouchard S. Foregut duplications: is there an advantage to thoracoscopic resection? J Pediatr Surg 2005;40:138–41.
[2] Melfi F, Fanucchi O, Davini F, Viti A, Lucchi M, Ambrogi MC, et al. Ten-year experience of mediastinal robotic surgery in a single referral centre. Eur J Cardiothorac Surg 2012;41:847–51.
[3] Cerfolio RJ, Bryant AS, Minnich DJ. Operative techniques in robotic thoracic surgery for inferior or posterior mediastinal pathology. J Thorac Cardiovasc Surg 2012;143:1138–43.
[4] Meehan JJ, Sandler A. Pediatric robotic surgery: a single-institutional review of the first 100 consecutive cases. Surg Endosc 2008;22:177–82.
[5] Granato F, Luzzi L, Voltolini L, Gotti G. Video-assisted mediastinoscopic resection of two bronchogenic cysts: a novel approach. Interact Cardiovasc Thorac Surg 2010;11:335–6.
[6] Joyeux L, Mejean N, Rousseau T, Couaillier JF, Piard F, Sapin E. Ectopic extralobar pulmonary sequestrations in children: interest of the laparoscopic approach. J Pediatr Surg 2010;45:2269–73.
[7] Tanaka K, Hara I, Yamaguchi K, Takeda M, Takenaka A, Fujisawa M. Laparoscopic resection of a lower posterior mediastinal tumor: feasibility of using a transdiaphragmatic approach. Urology 2007;70:1215–8.