



Giant Pediatric Lymphangioma Resected by Robotic Surgery in the Mediastinum – Case Report

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Abstract: Lymphangiomas are slow-developing benign malformations of the lymphatic system. They are characterized by lymphatic proliferation in mucous membranes. The diagnosis is based on clinical history and, mainly, imaging findings, such as CT and NMR. Standard treatment demands total surgical excision for curative purposes. A 1 year and 4 months old boy went to the hospital's ER presenting with cough and fever. Chest X-rays showed enlarged mediastinum, and computed tomography (CT) revealed a large cystic lesion in the anterior mediastinum measuring 91x40x68 mm. Propaedeutic was extended with nuclear magnetic resonance (NMR) and transthoracic echocardiogram. A multidisciplinary team formed by pediatricians, pediatric oncologists and thoracic surgeons decided for surgical resection of the mass with the thoracic robotic surgery. Although sternotomy and thoracotomy are classic surgical choices, resection by robotic surgery was preferred in this case. Port placement: the optical portal was positioned at the level of the ninth intercostal space in the posterior axillary line, and the others were positioned under vision, respecting a minimum distance of 7 cm between them. In this case, the trochanters positioning outside of the "remote center" was important, because of the small pleural cavity with less room for tweezers mobility. The dissection and release of tumor adhesions to the brachiocephalic vein, superior vena cava and internal thoracic veins were carried out and the tumor was removed. The patient's condition improved in the postoperative period, being discharged from the ICU in the first postoperative day and hospital discharge was on the third postoperative day, without any complications. The anatomopathological confirmed mediastinal cavernous lymphangioma.

Keywords: Mediastinal Neoplasms, Pediatric, Robotics, Case Report

1. Introduction

Mediastinal tumours are not uncommon in paediatric population and often pose a diagnostic challenge. They include a variety of entities including developmental, inflammatory, infectious and neoplastic; most are malignant. [1-4]

Lymphangiomas are slow-developing benign malformations of the lymphatic system. They are

characterized by lymphatic proliferation in mucous membranes [5-7]. This is a rare disease, affecting 1:6 000 – 1:16 000 newborns alive and being responsible for 4.5% of all mediastinal tumors [8].

The diagnosis is based on clinical history and, mainly, imaging findings, such as CT and NMR. Standard treatment demands total surgical excision for curative purposes [9]. The prognosis is satisfactory in most cases, with long-term survival regardless of age and gender.

This case report describes the case of a 1 year and 4 months old boy with a great anterior mediastinal solid-cystic lesion, lateralized to the right, measuring 91x40x68 mm. A multidisciplinary team formed by pediatricians, pediatric oncologists and thoracic surgeons decided for surgical resection of the mass with the thoracic robotic surgery. The benefits of the robotic system, including a high-definition, 3-dimensional view and articulating endo-wristed instruments, improve on the shortcomings of videothoroscopic surgery while allowing for small, less-morbid incisions. Furthermore, the robotic-assisted surgical system filters hand tremors from surgeons and scales down movement, which is vital when working in small areas such as the mediastinum. [9-11] The tumor was successfully removed by robotic surgery and the child had a good postoperative evolution.

2. Case Report

This case report describes the case of a 1 year and 4 months old boy, without any previous illness, who presented with cough and fever cough and progressive fever that started 6 months ago.

There were no significant alterations in the blood count and during the pediatrician's evaluation, mediastinal enlargement was visualized on the chest X-ray. No alterations were found on the clinical examination. Screening for infectious diseases came back negative.

Chest X-ray showed the right hemithorax presented with hypoattenuation and double-density sign. Transthoracic echocardiogram revealed an intra-atrial communication (IAC); LVEF 79%; large solid-cystic mass, which borders the right and left atriums, extending to the right ventricle. It had a sept in the middle, but no vascularization patterns were found, neither cardiac compressions or alteration in myocardial function.

Computed tomography (CT) of the chest (figure 1A) showed a great anterior mediastinal solid-cystic lesion, lateralized to the right, measuring 91x40x68 mm. The lesion had heterogeneous content, with soft tissue density area, without blush by intravenous contrast. No mediastinal lymph nodes were found.

NMR was requested for surgical programming (figure 1B) and revealed a large anterior mediastinal mass, with solid-cystic aspect, lateralized to the right, lobulated and with well-defined borders, measuring in its largest diameters 9.2x4.4x7.4cm. At the right and upper border, the lesion was in contact with the right margin of the thymus and in extensive contact with the superior vena cava and aortic arch, without causing compressions or deflection. In addition, it was in contact with the right border of the heart, precisely the right atrium, without causing compression. The trachea did not present alterations, with normal path, size and signal. There was no evidence of axillary, mediastinal or hilar lymph nodes.

A multidisciplinary team formed by pediatricians, pediatric oncologists and thoracic surgeons decided for surgical resection of the mass. Despite the great size of the

mediastinal tumor, which occupied nearly 85% of the child hemithorax, robotic resection of the anterior mediastinal lesion was done, using the robotic Xi system. Robotic surgery offers advantage over VATS due to the three-dimensional visualization and endo-wristed instruments offering greater maneuverability may prove robotic system to be ideally suited for resection of mediastinal cysts without the morbidity.

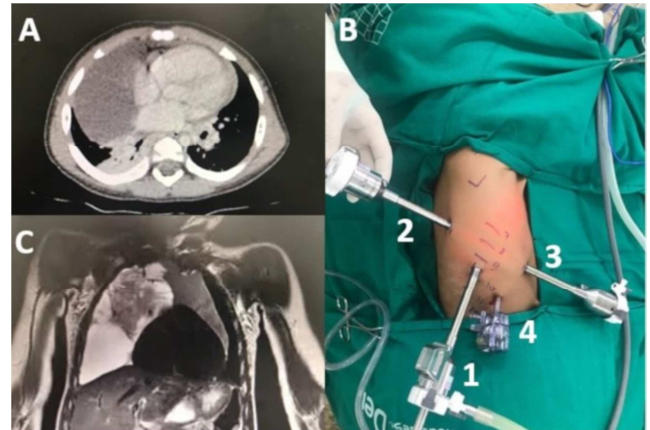


Figure 1. A and C -Great solid-cystic lesion in the anterior mediastinum, lateralized to the right, measuring 9.1x4.0x6.8 cm. B: Port placement: optics (1), left hand (2), right hand (3), and assistant hand (4).

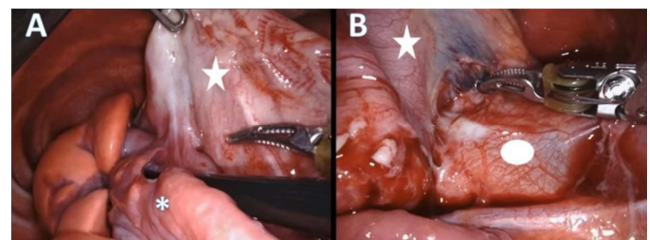


Figure 2. A-Lung (asterisk) and tumor (star) adhesions were undone. B-Dissection and release of tumor (star) adhesions with pericardium (circle).

Patient underwent general anesthesia with an endobronchial blocker positioned via flexible digital bronchoscopy. Patient was positioned on the left lateral decubitus position. Furthermore, a thoracoscopy on the right side was performed with CO₂ gas insufflation with maximum pressure of 8 mmHg and high flow at 25L/min.

Port placement: the optical portal was positioned at the level of the ninth intercostal space in the posterior axillary line, and the others were positioned under vision, respecting a minimum distance of 7 cm between them. In this case, the trochanters positioning outside of the “remote center” was important, because of the small pleural cavity with less room for tweezers mobility (figure 2). Lungs and pericardium tumor adhesions were undone (figure 2A). The dissection and release of tumor adhesions to the brachiocephalic vein, superior vena cava and internal thoracic veins were carried out (figure 2B). Tumor was removed and withdrawn by mini-thoracotomy. A 16 French chest tube was positioned under vision and fixed. The overall operating time was 95 min with actual console time of 45 min.

The patient's condition improved in the postoperative

period, being discharged from the ICU in the first postoperative day and hospital discharge was on the third postoperative day, without any complications. Anatomopathological: mediastinal cavernous lymphangioma.

3. Discussion

The cavernous lymphangioma is a benign tumor and usually asymptomatic. When symptoms are present, they are nonspecific, and mainly associated with effects of the mass due to its location. When this is the case, with the presence of a tumor in the mediastinum, the symptoms may be cough, hemoptysis, chest pain, dysphagia, superior vena cava syndrome, etc. [5-7, 12, 13]. Giant mediastinal tumors are classically treated by sternotomy and/or thoracotomy, however, in this case, we opted for robotic surgery resection.

The first pediatric robotic surgery occurred in 2001. Despite its benefits, the technique developed slowly when compared to robotic surgery in adults, mainly because of the instrumental limitations of the procedure in smaller bodies.

The sources searched – PUBMED, SCIELO, LATINDEX, GOOGLE SCHOLAR, PERIÓDICO CAPES and MEDLINE – did not present any cases of pediatric robotic surgery resection of a giant mediastinal tumor in Latin America.

Generally, robotic surgery in infants has the same benefits as minimally invasive surgeries, including less postoperative pain, less use of opioids, reduction in hospitalization days and a quicker return to daily activities. Furthermore, robotic instruments allow precise movements in smaller and narrower spaces, which is the case with children and newborns. This is due to the anatomic design of robotic instruments, created to copy human wrists. This property makes the learning curve shorter than traditional endoscopic procedures. The ability of robotic systems to magnify images between 10 and 15 times is another advantage over traditional procedures in infants.

Proper robot cart placement is the first step in the robotic resection of a mediastinal tumor. The best way of doing this is by placing the robot cart in the same direction as the tumor mass, for example, in an anterior and superior mass, the robot should be placed anterosuperiorly to the patient. The arms angles are another important detail [14]. The handling is easiest with the da Vinci XI system, which has a rotational “boom” that allows an easy linkage between the robot and the patient.

The primary limitation of pediatric robotic surgery is related to the size of the surgical robot instruments. In the actual approved system – da Vinci Surgical System – there are only 5mm and 8mm sizes, which are prohibitively large for access to children’s cavities.

However, this disadvantage can be overcome by newly developed systems, such as the Senhance robotic platform (Asensus Surgical Inc.), a system with 3mm accessible instruments. In the clinical case reported here, this problem was solved by placing the trochanters outside the “remote center,” not completely introduced.

Budget can be another limitation, because, beyond the material cost, the hospital has to prepare the structure and specialized personnel. However, considering the positive outcomes/cost ratio, studies have shown that robotic procedures have better postoperative results and patient satisfaction.

Robotic surgeries in small children and newborns present technical peculiarities for execution. The anesthetic application must be individualized, considering the different duration time and the limited access to the patient after placing the robot, which cannot be easily displaced. In addition, children that weigh less than 10kg need limited insufflation, and the pneumothorax effects on lung, cardiac and kidney functions should be considered. Indispensable criteria to be reviewed in children with heart and kidney disease [15].

Pediatric thoracic surgery assisted by robotics is on the rise, with reports of diaphragmatic plications and repair of congenital diaphragmatic hernias in the North hemisphere.

Considering the benefits for the surgeon and for the patient, for example, reduction in the number of portals, superior visualization, and procedure facilities; significant increase in the robotic approach is expected, especially in specialties such as thoracic surgery, which is very recent and can become the gold standard treatment.

4. Conclusion

Lymphangiomas are slow-developing benign malformations of the lymphatic system. They are characterized by lymphatic proliferation in mucous membranes. The Standard treatment demands total surgical excision for curative purposes. Surgical resections should be considered in all patients with mediastinal tumors, including lymphangiomas and the thoracic robotic surgery could it be a great option because the three-dimensional visualization a high-definition and articulating endo-wristed instruments.

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