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Video-assisted thoracic surgery resection for pediatric mediastinal neurogenic tumors

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Abstract

Background/Purpose: Video-assisted thoracoscopic surgery (VATS) resection of mediastinal neurogenic tumors is still controversial in children. The aim of this study was to review the cases of VATS resection of such tumors in children from 3 institutions located in different countries.

Methods: This retrospective study included 17 children treated between July 1995 and February 2011. Medical charts were reviewed for collection of data on age, sex, histologic type of tumor, clinical manifestations, age and weight at surgery, tumor size, duration of thoracic drainage, surgical complications, tumor recurrence, and mortality.

Results: Thirteen (76.5%) males and 4 (23.5%) females were studied. Median age was 16 months (range, 10.6-60 months), and median weight was 11.9 kg (range, 9.3-27.4 kg). Ten children had neuroblastoma (58.8%), 4 had ganglioneuroma (23.5%), and 3 had ganglioneuroblastoma (17.7%). The median duration of the operation was 90 minutes (range, 45-180 minutes), with complete thoracoscopic resection in all cases. Two children (11.8%) developed Horner syndrome postoperatively. No deaths were reported, and no recurrence was noted during a median follow-up period of 16 months (range, 8.9-28.6 months).

Conclusions: Video-assisted thoracoscopic surgery resection of mediastinal neurogenic tumors in children produced good results, with no recurrence and minimal postoperative complications. The major advantages of this approach are the avoidance of thoracotomy complications and the enhanced surgical accuracy provided by improved visualization.

Intrathoracic neurogenic tumors originate in the posterior mediastinum and comprise about a third of all mediastinal tumors in children [1]. In this age group, 60% of posterior mediastinal tumors are malignant, and neuroblastoma is the most common histologic type [2].

Video-assisted thoracic surgery (VATS) has been increasingly used for diagnosis and treatment of various thoracic diseases in children, especially after smaller endoscopic instruments have become available and endoscopic skills have improved [3,4]. In addition, the results obtained with VATS are similar to those obtained with thoracotomy, with

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the advantages of better visualization of mediastinal structures, less postoperative pain, reduced hospital stay, and excellent cosmetic results [5]. In addition, this minimally invasive approach can prevent the complications of classic thoracotomy, such as scoliosis, shoulder elevation, winged scapula (scapula alata), or chest wall asymmetry [6].

Many investigators have enthusiastically reported their experience with VATS for pediatric mediastinum neurogenic tumor resection [5,7-10]. Despite these benefits, the use of VATS to treat intrathoracic malignancies in childhood is still controversial [11].

The aim of this study was to review the results obtained with VATS in children with mediastinal neurogenic tumors in 3 tertiary-care hospitals located in different countries.

1. Methods

A nonrandomized, retrospective review of all children with neurogenic tumors in the posterior mediastinum cavity operated by VATS at the Pediatric Surgery Service of The Rocky Mountain Hospital for Children (RMHC) in Denver, Colorado, the Great Ormond Street Hospital (GOSH) in London, United Kingdom, and at the Hospital de Clínicas de Porto Alegre (HCPA), Brazil, was performed. At each hospital, all pediatric (age 0-14 years) VATS procedures for posterior mediastinum tumors in the period from July 1995 to February 2011 were identified, and all cases were reviewed. The study was approved by the research ethics committees of each hospital.

During the period of this study, the decision to use VATS or open surgery was made by the surgeon based on his/her own experience and confidence at GOSH and HCPA; at RMHC, all the patients were treated with VATS. Cases with abdominal neurogenic tumor or intraabdominal extension and those in whom surgical removal of tumor was not possible (submitted only to biopsy) were not included. The 3 institutions use similar criteria for chest tube use and removal and for hospital discharge in these cases [12,13].

The medical charts were reviewed for collection of data on age, sex, histologic type of tumor, clinical manifestations, age and weight at surgery, tumor size, duration of thoracic drainage, surgical complications, postoperative follow-up time, tumor recurrence, and mortality. Tumor size was determined during surgery, but because these tumors are irregularly shaped, only the largest diameter was considered in this study. Tumors were staged using the *International Neuroblastoma Staging System* (INSS) [14].

Surgical resection by VATS was performed with the child placed in lateral decubitus or modified prone position, using general anesthesia and selective bronchial contralateral intubation in most cases. In older children, selective ventilation of the contralateral hemithorax was performed using a double lumen endotracheal tube, whereas younger children were submitted to mainstem bronchus intubation with uncuffed tube or bronchial blocker. It was not possible to do selective bronchial intubation in small children. The ipsilateral lung was collapsed by insertion of low-pressure carbon dioxide (3-5 mm Hg). Three or more trocars were arranged to form a triangle. Trocars ranged from 3 to 10 mm, depending on the size of the patient. The first trocar was placed in the midaxillary line, between the fifth and the seventh intercostal spaces, according to the location of the tumor. Depending on the preference of the surgeon, 0° or 30° optical lenses were used; to perform dissection, 2 other trocars were then inserted between the anterior and posterior axillary lines. The pleural tissue covering the mass was incised around the overall circumference of the lesion, and the tumor was released by dissection with scissors. The intercostal and vertebral vessels involved were occluded with clips, electrocautery, or other energy devices. Once fully released, the tumor was placed in a plastic bag and removed through an enlarged trocar site. In 1 child with a big ganglioneuroma tumor (18 cm), the tumor was morcellated in the plastic bag before removal. In some children, after the procedure was performed, a single chest tube was placed into the thoracic cavity. None of the children in this series required conversion to open surgical procedures.

The Kolmogorov-Smirnov test was used to assess normality of data distribution. Because the distribution of quantitative data was not normal, quantitative results are described by median and interquartile range. Categorical results are described by frequency and percentage. Data were stored in Microsoft Excel 2008 spreadsheets (Microsoft, Redmond, WA) and analyzed using SPSS, version 14.0 (SPSS, Chicago, IL). The confidence interval was considered to be at 95%.

2. Results

Seventeen children with mediastinal neurogenic tumors were operated by VATS: 11 at RMHC, 5 at GOSH, and 1 at HCPA (Table 1). Thirteen patients (76.5%) were male, and 4 (23.5%) were female. The tumor was located on the left hemithorax in 11 children (64.7%) and on the right side in 6 (35.3%). Tumor type was defined after surgical resection as neuroblastoma in 10 cases (58.8%), ganglioneuroma in 4 (23.5%), and ganglioneuroblastoma in 3 (17.7%).

The median (interquartile range) age and weight of patients undergoing surgery was 16 months (range, 10.6-60 months) and 11.9 kg (range, 9.3-27.4 kg), respectively. Seven children (41.2%) had no clinical manifestations of the tumor, and diagnosis was made by chest radiography for assessment of upper respiratory tract infections. Table 2 shows the clinical manifestations in the remaining 10 children (48.8%). Coughing was the most common symptom.

As for INSS staging, 4 tumors were classified as stage I (3 neuroblastomas and 1 ganglioneuroblastoma), 5 as stage II (3 neuroblastomas and 2 ganglioneuroblastomas), 3 as stage III (all neuroblastomas), and 1 as stage IV-S (neuroblastoma).