Video-Assisted Thoracoscopic Surgery (VATS) for Patients with Solitary Fibrous Tumors of the Pleura

Jun Liu, MD,† Chengjie Cai, MD,*† Daoyuan Wang, MD,*† Hanzhang Chen, MD,*† Linling Cheng, MD,*† Wenlong Shao, MD,*† Shuben Li, MD,*† Yubao Guan, MD,‡ Yingying Gu, MD,§ and Jianxing He, MD, PhD, FACS*†*

Objectives: To present our experience of video-assisted thoracoscopic surgery (VATS) for patients with solitary fibrous tumors of the pleura (SFTPs) and to discuss the treatment of choice of such neoplasms.

Methods: Between June 2000 and September 2008, 21 patients with SFTPs (9 men and 12 women) underwent VATS at our department. The mean age was 52.5 years (range, 33–76 years).

Results: Surgical excision was performed in all patients. Surgical excision was performed by VATS in 15 patients (71.4%), by VATS plus a small thoracotomy (<5 cm) in 4 patients (19.0%), and by posterolateral thoracotomy accompanied by VATS in 2 patients (9.5%). Mean chest drain duration was 2.3 days (range, 1–4 days), and the mean hospital stay was 7.2 days (range, 4–15 days). There were 18 pathologically benign SFTP cases (85.7%) and 3 malignant SFTP cases (14.3%). There was no operative morbidity or mortality. No recurrence or metastasis of SFTPs developed during postoperative median follow-up period of 43 months.

Conclusions: Complete resection and close follow-up for years after operation is recommended for SFTPs. VATS may play an important role in reducing the size of the thoracotomy incision in the treatment of SFTPs, which results in less invasive surgery.

Key Words: Solitary fibrous tumors of the pleura, Video-assisted thoracoscopic surgery, Immunohistochemical analysis.

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Solitary fibrous tumors of the pleura (SFTPs) are rare neoplasms that usually originate from the visceral pleura. Because its pathologic characteristics was first described by Klemperer and Rabin[1] in 1931, the nomenclature has become confused, and the disease has also been referred to as a localized mesothelioma, localized fibrous tumor, fibrous mesothelioma, or a pleural fibroma.[2] The further development of electron microscopy and immunohistochemistry has clarified that the tumor does not originate from the mesothelial layer but from the submesothelial, noncommitted mesenchymal layer.[3,4] Thus, the various names used for this disease have become unified, and the disease is now referred to as solitary or localized fibrous tumors of the pleura. Mesenchyme is pluripotent tissue and possesses diverse differentiation potential to bone, cartilage, or blood vessels. Because of this diversity of the mesenchyme, the pathologic morphology of SFTP seems variable.[5] Recent studies on SFTP have mainly involved immunologic markers for pathologic diagnosis[6,7] and some clinical reports that include postsurgical resection results and description of its clinical behavior.[8–10]

Complete surgical resection is the treatment of choice for SFTP.[11] Pedunculate tumors can be safely treated by wedge resection. For these pedunculate tumors, video-assisted thoracoscopic surgery (VATS) provides a powerful and useful approach. In addition, some authors have reported the assistance of thoracoscopy to obtain a more precise view of the resection margins, even in parietal tumors.[12,13] Although a small thoracotomy can be added to the VATS for the removal of large tumors, VATS plays an important role in reducing the size of the thoracotomy incision, which results in less invasive surgery.[14] Initially, we selected a thoracoscopic approach for the resection of SFTPs in all cases. Even with large tumors, if a VATS resection is technically feasible, it can be carried out. If necessary, we add a small thoracotomy incision to remove the tumor safely and completely, with free surgical margins. The aim of this study was to present our experience of VATS for 21 consecutive cases with SFTPs and to discuss the treatment of choice of such neoplasms.

PATIENTS AND METHODS

Between June 2000 and September 2008, 21 patients with SFTPs (9 men and 12 women) underwent VATS at our department. The mean age was 52.5 years (range, 33–76 years). Chest pain (in one patient), dyspnea (in five patients), cough (in six patients), and hemoptysis (in one patient) were the symptoms. Fifteen patients were symptom-free. On physical examination, dullness to percussion and absence of

*Department of Cardiothoracic Surgery, The First Affiliated Hospital of Guangzhou Medical College; †Division of Thoracic Oncology, Guangzhou Research Institute of Respiratory Disease and China State Key Laboratory of Respiratory Disease; and Departments of ‡Radiology and §Pathology, The First Affiliated Hospital of Guangzhou Medical College, Guangzhou, People's Republic of China.

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Address for correspondence: Jianxing He, MD, PhD, FACS, Department of Cardiothoracic Surgery, The First Affiliated Hospital of Guangzhou Medical College, No. 151, Yanjiang Rd., Guangzhou 510120, Guangdong Province, People's Republic of China. E-mail: drjianxing.he@gmail.com

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breath sounds in the ipsilateral hemithorax were detected in all patients, and clubbing was present in three patients. None of the patients presented with a history of hypoglycemia, but two of them were associated with diabetes mellitus. No history of exposure to asbestos was recorded in any patient. Twelve of the patients were current smokers or ex-smokers. All patients underwent chest roentgenography and computed tomography (CT) scanning of the chest. A moderate pleural effusion was associated with six patients (in all the cases, the main diameter of the tumor was >5 cm). Fiberoptic bronchoscopy was performed in five patients. In all of them, extrinsic compression of segmental bronchi was observed, but no endobronchial lesion was detected. One patient underwent CT-guided, fine-needle aspiration biopsy; specimen was not significant by histologic examination. In brief of the technical aspects of VATS, general anesthesia with selective lung ventilation was performed with the use of a double-lumen endotracheal tube. When postoperative mechanical ventilation was necessary, a standard endotracheal tube was substituted for the double-lumen tube. Patients were placed in the lateral decubitus position. Two thoracoports were placed in the sixth or seventh intercostal space (ICS) on the anterior axillary line and in the seventh or eighth ICS on the posterior axillary line; an anterolateral minithoracotomy (2.5–5 cm) was made in the fourth or fifth ICS. The cautery was used in the excision SFTPs from the parietal pleura.

We reexamined pathologic slides, and malignant SFTP was diagnosed when one of following criteria was satisfied: increasing mitotic activity (>4 mitoses per 10 high-power fields); high cellularity with crowding and overlapping of nuclei; presence of necrosis; and mild, moderate, or marked pleomorphism.[10] To differentiate the cell origin of resected tumors, we performed immunostaining for a panel of cell markers including vimentin, CD34, cytokeratin, desmin, S-100, Ki-67, and actin.[5] Operative mortality was defined as death within 30 days of an operation or during hospitalization. Recent patient status was determined by using the clinical records of outpatient clinics or by telephone interview.

RESULTS

Surgical excision was performed in all patients. Surgical excision was performed by VATS in 15 patients (71.4%), by VATS plus a small thoracotomy (<5 cm) in 4 patients (19.0%), and by posterolateral thoracotomy accompanied by VATS in 2 patients (9.5%). Mean chest drain duration was 2.3 days (range, 1–4 days), and the mean hospital stay was 7.2 days (range, 4–15 days). There was no operative morbidity or mortality. At surgery, 14 tumors (66.7%) arising from the visceral pleura were pedunculate and 7 tumors (33.3%) from the parietal pleura presented with a broad base of attachment. All tumors were resected with free surgical margins. The largest mass excised in our patients was 18.5 cm × 17 cm × 13.5 cm. The smallest one was 0.5 cm × 0.6 cm × 4.0 cm. The median size of the tumors resected was 6.5 cm (range, 4.0–18.5 cm). Pathologic margins of all cases were confirmed by frozen sectioning free of cancer. On sectioning, the tumors showed a whorled, fleshy appearance, sometimes alternating with some myxoid areas. Focal necrosis and hemorrhagic zones were found in three cases (14.3%), all relatively large in diameter (>5 cm).

Microscopically, all the tumors consisted of spindle-shaped cells. The tumor cells and intercellular collagen fibers proliferated without obvious direction or structure, which corresponded to the so-called "patternless pattern" (Figure 1*A*). There were 18 pathologically benign SFTP cases (85.7%) and 3 malignant SFTP cases (14.3%) who were focally characterized by a mitotic count in excess of 4 mitoses per 10 high-power fields and by cellular pleomorphism. Chest CT scan of all three histologically malignant SFTP showed the supply of blood vessels within the tumor and/or liquefaction necrosis (Figure 1*D*). Immunohistochemical analysis revealed positivity for CD34 and vimentin in all tumors (Figures 1*B*, *C*) and no expression of cytokeratin, desmin, S-100, Ki-67, or actin in any of the tumors. No adjuvant therapy was used. All patients were included in a follow-up program that included clinical examination and chest roentgenogram after 1, 3, and 6 months postoperatively, and annually thereafter. The median follow-up time was 43 months (range, 3–96 months). All of the patients have remained well, with no recurrence or metastasis of the tumors.

DISCUSSION

SFTPs are uncommon, representing less than 5% of all neoplasms involving the pleura.[15] Diagnostic tools, such as chest radiography, CT scanning, and magnetic resonance imaging, are helpful but not decisive in establishing the diagnosis. In most cases, thoracic CT scan shows a well-circumscribed round tumor with a homogenous density. However, these findings lack specificity and other imaging findings are possible. Thus, CT scan cannot differentiate benign from malignant SFTPs.[10,16] Difficulties in differentiating these tumors from others originating from mediastinum or chest wall are possible. Furthermore, if the lesion is not homogeneous, the differential diagnosis with a bronchogenic carcinoma may be also more difficult, especially in the presence of a smoking history (as in 57.1% of our patients). Even fine-needle aspiration is often inconclusive, in fact, only four of nine cases (45%) were identified by CT guided aspiration biopsy.[17,18] Only surgical excision, with subsequent immunohistologic examination, can be diagnostic. Immunohistochemically positive CD34 staining is decisive in establishing the diagnosis differentiating SFTPs from mesotheliomas, synovial sarcomas, fibrosarcomas, and neurogenic tumors. In addition, the bcl-2 essay can confirm the diagnosis of SFTPs in case of CD34 negativity.[19,20] In our experience, malignant forms of SFTPs accounted for 14.3% of all cases, whereas it was observed 7% in the experience of Cardillo et al.,[11] 30% in the experience of de Perrot et al.,[8] 36% in the experience of England et al.,[21] 38% according to Rena et al.,[9] and 60% in the experience of Suter et al.[22] This variability could be probably justified either by the heterogeneity in studied populations or by relative subjectivity in the recognition of some pathology criteria, especially hypercellularity and pleomorphism.

Complete surgical excision with underlying tissue removal lends itself to complete cure and minimizes tumor

