New Methods

Video-Assisted Thoracoscopic Thymectomy (VAT-T) with Lateral Thoracotomy for Stage II and III Thymoma

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Thymoma has malignant potential and is the most common anterior mediastinal tumor. Video-assisted thoracic surgery (VATS), which is less invasive surgical procedure, is a good option for resecting Masaoka stage I tumors. Whether VATS is appropriate, depends on the surgeon’s judgment and accurate imaging diagnosis. We introduce a technique involving a combination of video-assisted thoracoscopic thymectomy (VAT-T) and lateral thoracotomy for stage II and some stage III thymomas that have locally invaded the lung and/or pericardium.

Keywords: video-assisted thymectomy, invasive thymoma, lateral thoracotomy

Introduction

Video-assisted thoracic surgery (VATS) for mediastinal tumors has become much more common over the last decade. VATS results in less postoperative pain and a shorter period of hospitalization. Some authors have suggested that VATS should be considered to be an effective alternative procedure for noninvasive thymomas provided it is carried out carefully by experienced surgeons.1,2) VATS might also be a suitable surgical procedure for Masaoka stage I and II thymomas.3) However, long-term studies are required to evaluate the efficacy of these approaches in the treatment of thymomas. In advanced thymomas, a median sternotomy or clamshell incision might be suitable, especially if the lung or pericardium has been invaded by the tumor. For stage III thymomas that had locally invaded the lung and/or pericardium, we were reluctant to perform VATS for tumor resection due to the possibility of incomplete resection. However, for stage III thymomas that mainly involved the lower pole of the thymus and had locally invaded one of the lungs and/or the pericardium, we performed VAT-T; i.e., video-assisted thoracoscopic thymectomy combined with lateral thoracotomy using the chest wall lifting method with subcutaneous kirschners placed on the sternum. A full sternotomy or clamshell incision always results in cosmetic problems and requires the use of wires to reconnect the dissected sternum. Four females of our cases, who had already had an operative wound because of abdominal disease and pregnancy, chose our surgical approach, in spite of the risk of tumor recurrence. For females, a long midline wound at their body unexpectedly brings about mental stress. VATS combined with lateral thoracotomy is a surgical approach with potential, which depends on cases of stage III thymoma. Additionally, there is no clinical evidence that the full sternotomy is the best surgical approach at present, for thymomas invading local lung and pericardium. In patients with cardiac disease, a cardiac operation performed via a median sternotomy might be necessary in the future; however, where possible performing more than two sternotomies should be avoided.
Obviously, the long-term survival of patients with locally advanced thymoma is associated with surgical treatment or induction therapy plus surgery. Careful complete resection of the tumor was performed by our new technique using thoracoscopy and hand. We reviewed the cases of 15 patients that underwent resections for stage II (7 case) or III (8 cases) thymomas without myasthenia gravis at our department between January 2007 and April 2010. In all cases, the pathological results showed that complete resection had been achieved. Additionally, pleural lavage cytology, performed during the operation, and postoperative cytology of the patient’s pleural effusion were negative in all cases. Preoperative and follow-up positron emission tomography (PET), computed tomography (CT) were evaluated for the localization of tumor tissue or recurrence. Postoperative radiotherapy was carried out in 3 patients with stage III thymoma. The patients were followed-up for a mean period of 2.10 ± 0.85 years (range: 0.42–2.83 years), and no recurrence was detected. There were no complications and no conversion to median sternotomy during the operation. Below, we introduce a new surgical technique for invasive thymoma resection.

**Technique**

The bilateral arms were extended and lifted as shown in Fig. 1A. The semi-lateral position was employed for this procedure. Whether the thoracic cavity was approached from the right or left side, depended on the tumor localization and the planned operative procedure. The standard median sternotomy technique was employed as a standby procedure. One or two 10-mm ports were placed along the anterior axillary line. Then, under thoracoscopy, we carefully evaluated whether VAT-T with lateral thoracotomy could be safely performed. Tumors of greater than 10 cm, those that displayed extended invasiveness, and those localized superior to the left brachiocephalic vein were not subjected to this procedure. Occurrence in the lower pole of the thymus and local invasion into the lung and/or pericardium were allowable. The thoracotomy skin incision measured between 15 cm and 20 cm. When necessary, this lateral thoracotomy allows a hand to be inserted into the thoracic cavity to evaluate the pericardial involvement of the tumor via palpation and thoracoscopic techniques, and it also minimizes chest wall trauma and mental stress caused by the wound. The lateral thoracotomy was placed at the proper intercostal level, from where the tumor invasion site can be palpated safely (Fig. 1B). In cases involving the right thoracic cavity, the right mediastinal pleura was opened along the phrenic nerve, and the lower pole of the thymus and tumor was removed from the pericardium. Thymomas in the bilateral upper pole were extirpated using the chest wall lifting method, and residual thymoma tissue in the cardiophrenic angle area was removed under thoracoscopy.

In the case of lung invasion, an automatic stapling device was inserted through a 10-mm port, and partial resection of the lung was performed under thoracoscopy (Fig. 2A and 2B). The tumor-free margin of the pericardium was carefully determined by palpation and thoracoscopy, and an intraoperative pathological examination of the margin was also performed. For the materials used to reconstruct pericardial defects, we prepared a
Gore-Tex pericardial patch and repaired the defects via the lateral thoracotomy (Fig. 2C and 2D). Ablation was thoroughly performed at the tumor extirpation site using TissueLink™ (Salient Surgical technologies, Inc). The Harmonic Scalpel (Ethicon Endo-Surgery, Cincinnati, OH, USA) was commonly used for thymic resection.

**Comments**

The recurrence rate of Masaoka stage II and III tumors after complete resection via a median sternotomy was 5% and 23% in patients with postoperative radiotherapy and 4% and 26% in patients without radiotherapy, respectively. In patients subjected to complete resection of Masaoka III thymomas, there were no significant differences in the survival rate between surgery alone and surgery combined with postoperative radiotherapy. The efficacy of adjuvant irradiation after complete resection remains controversial. Moreover, radiotherapy sometimes provokes radiation pneumonitis, resulting in the poor prognosis. It is obvious that complete resection is the most significant predictor of an improved prognosis. Therefore, a complete median sternotomy or clamshell incision followed by complete thymectomy is recommended for stage III thymoma. However, performing accurate thoracoscopic surgery via a lateral thoracotomy allows a median sternotomy or clamshell incision to be avoided. There was mental stress related to the large midline wound and residual wires. In our cases, postoperative pleural effusion cytology, an intraoperative pathological examination of the surgical margin, and PET/CT were done carefully to detect the early tumor recurrence. There was no complication and recurrence as of April 2011. We believe that VAT-T with lateral thoracotomy is safe and...
feasible for stage II and some stage III thymomas. However, follow-up duration is not long enough, and further careful observation is necessary to evaluate the long term results of this new technique.

References