Extended Thymectomy via Videothoracoscopy-assisted Stepwise-access Sternotomy

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A method of videothoracoscopy-assisted extended thymectomy procedure performed through a movable small access window is introduced. The access window can be moved stepwise and longitudinally alongside full sternotomy to be upon the dissection site. The majority of the thymectomy procedure can be directly viewed and operated from the moving window. However, partial and complete thoracoscopic maneuvers are required for dissection of the lateral-most region near the phrenic nerve and the upper poles of the thymus, respectively.

Key words: thymectomy, thoracoscopy, thymoma, surgery

Introduction

The 2 main goals of a surgeon are to perform less invasive surgery with small incisions and short operating time and to ensure the safety and curability of the surgery. Therefore, even in extended thymectomy, a less invasive method with definitive safety and curability is important. Further, such methods should be uncomplicated and should not require special protocols and equipment. In this report, we introduce a less invasive extended thymectomy by videothoracoscopy-assisted stepwise-access sternotomy (VASAS), a multistep full sternotomy with a small access window that can be moved stepwisely alongside the sternotomy to be upon the dissection site, performed in conjunction with videothoracoscopy.

Patients and Methods

The subject population comprised 10 women (age, 23–80 years) who had thymoma since 2007. Each patient laid in the supine position with the neck extended, and a longitudinal midline skin incision was made in the upper chest at about 6–10 cm from the lower border of the third rib to the xiphoid process (Fig. 1A). The subcutaneous tissue was dissected 2–3 cm laterally from the xiphoid to 2 cm caudally and from the jugular notch to 2 cm cranially. The fascia just lateral to the xiphoid process was incised, and retrosternal dissection was performed. The lower two-third of the sternal body was longitudinally incised using a sternal saw. Then, the skin window was slid cranially, and the upper one-third of the sternal body and lower manubrium were incised. Since the sternal saw cannot reach the upper most part of the manubrium, the sternum was dissected in an inverted V shape (A) by using the pediatric rib spreader (Fig. 2). The residual uncut part of the manubrium was usually within 5mm long and only the outer plate (lamina externa) remained, because the inner plate (lamina interna) had been usually incised by slant application of the sternal saw. Thus, the upper most part of the manubrium was easily cut with Cooper surgical scissors. Next, the lower sternum was spread over 5–6 cm by using the pediatric rib retractor, thereby yielding a rhomboid skin window (Fig. 1B). The
conventional sternal retractor could not be used. A thoracoscopic port was made 4–5 cm below the xiphoid. A thoracoscope with a 30° oblique view was used. Except for the knot pushers, no other endoscopic surgical forceps or devices were used in the procedure. The mediastinal pleura of both pleural cavities were opened, and the lower half of the thymus with the anterior mediastinal fat tissue was dissected through the access window, similar to the procedure for the standard extended thymectomy. The phrenic nerve was observed clearly by thoracoscopy, or even under direct view when the pericardium was pulled anteriorly and contralaterally; therefore, the dissection could be performed safely. No additional thoracoscopic port was required during the entire procedure. After excision of the lower half of the thymus, the skin window was pulled caudally to the upper half of the sternum in a stepwise manner (Fig. 1C). The pediatric rib retractor was reapplied to the upper one-third of the sternal body, and the upper half of the thymus was excised. The access window was stepwisely moved during sternotomy by considering the dissecting site as the reference site. All the branches of thymic vein draining into the superior vena cava and left brachiocephalic vein could be dissected under direct observation and could be easily ligated by using the thoracoscopic knot pusher or surgical clips. Only the upper poles of the thymus were dissected totally under thoracoscopy with conventional long dissecting forceps. The chest tube was inserted through the thoracoscopic port into the anterior mediastinum. The divided sternum was fixed by bilateral intercostal application of 6 or 8 sutures of non-absorbable braided polyester suture Ethicon™ Ethibond™ Excel 1, because usual sternal wire is very difficult to operate in the limited operative field under the tight skin flap. The upper most part, approximately 2–4 cm long, of the manubrium was usually impossible to fix and remained unfixed. The wound was closed, and the procedure was completed.
Results

We performed extended thymectomy through a small skin incision by using VASAS in 10 thymoma patients. The tumor sizes ranged from 2–17 cm. The tumor of 17 cm was thymus-encompassing which was soft, flat, and extending to the bilateral phrenic nerves. Combined resection of the invaded lung or pericardium could also be performed without any difficulties. Intraoperative incidental organ damage, postoperative sternum separation, mediastinal infection, postoperative sternal dehiscence, and other complications were not observed. The bleeding volume was equal to that in standard sternotomy. The operative time during VASAS was 20–30 min longer than that during standard sternotomy. The postoperative hospital stay was 5–10 days. Female patients selected VASAS primarily for cosmetic reasons. All the patients were satisfied with the procedure, and they visited the outpatient clinic without any special covvertures on their neck or upper chest. For example, a picture of a case was shown in Figure 3. The patient was 61-year-old women with thymoma of 4.8cm in diameter detected by chest CT (Fig. 3A). She underwent extended thymectomy (Fig. 3B) via VASAS with 6cm of skin incision. Four months later, the scar was shortened to 3.5cm long approximately (Fig. 3C and 3D).

Comment

In Japan, 1525 patients underwent surgery for thymoma in 2007. Among these, 332 (21.7%) patients underwent video-assisted thoracoscopic surgery (VATS). In another study on endoscopic thymectomy for myasthenia gravis without thymoma, 75 out of 241 thymectomies performed in 2004 used endoscopy. Of 61 institutes that performed endoscopic thymectomy, 27, 7, 4, 2, and 21 institutes used the bilateral VATS approach, ipsilateral, infrasternal, both infra- and suprasternal approaches, and simultaneous mediastinal and thoracoscopic approaches, respectively.
The subxiphoid sternal-lifting (infrasternal) approach presents difficulties in visualizing the left brachiocephalic vein that is easily injured while dissecting and transecting the thymic veins, especially when using ultrasonic devices for cutting and coagulation. Incomplete resection of the thymus was reported in 8.7% of the cases. In comparison with standard sternotomy, the operating time in this approach is longer, and the duration of postoperative drainage is not significant. The operative time of the bilateral VATS approach is also longer than that of standard sternotomy. No statistical difference was observed in the operating time, postoperative drainage, and in-hospital stay between unilateral VATS and standard sternotomy. VASAS enables extended thymectomy via small skin incision even in full sternotomy. It is obviously suitable for appearance-conscious patients. Most of the steps can be performed under direct observation, except the dissection of upper poles of the thymus; this part often requires total thoracoscopic maneuvers. Therefore, most thoracic surgeons who are familiar with thoracoscopic pulmonary resection can perform this method without any special equipment or training. While the operative time for the subcutaneous dissection is slightly more, VASAS is preferred over standard sternotomy because it ensures safety and curability with smaller skin incision even in complicated procedures such as those involving both lung and pericardium or large tumors such as those encompassing the thymus.

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Conflict of interest

The authors have no conflict of interest.

References