Modified Incision and Closure Techniques for Single-Incision Thoracoscopic Lobectomy

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Single-incision video-assisted thoracoscopic surgery (VATS) lobectomy has recently gained attention due to its various advantages. However, this technique requires direct insertion of the chest tube into the thoracic cage; thus, leakage of intrathoracic fluid or air around the tube frequently occurs. Additionally, cosmetic problems may develop due to direct fixation of the chest tube at the site of the skin incision. To solve these problems we designed new incision and closure techniques for VATS lobectomy. In our technique the skin is incised lower than an intercostal muscle incision, and the chest tube transpierces the chest wall muscle about 1 cm below the incision. Finally, nylon is used for tube fixation and is anchored through the subcutaneous suture.


Technique

The working window for single-incision VATS lobectomy is created in the fifth intercostal space between the anterior axillary line and midaxillary line. An incision is made through the skin and subcutaneous tissue in the lower margin of the sixth rib until the muscle layer is found. Upward dissection between the subcutaneous tissue and chest wall muscle is then performed until the middle aspect of the fifth intercostal space is reached, and the intercostal muscles are incised to open the thoracic cavity (Fig 1A). A small wound protector is inserted to create the working window (Fig 1B). After single-incision VATS lobectomy, the chest wall muscle is pierced 1-cm below the main wound with a mosquito forceps. The chest tube is pulled out through the muscle and inserted into the thoracic cavity (Figs 1C, 1D). This procedure separates the wound and tube insertion site. Conventional continuous suturing with 1-0 Vicryl (Ethicon Inc, Somerville, NJ) is then performed, followed by chest tube fixation and skin closure. The first subcutaneous suture and ligation are performed with 2-0 Vicryl in close proximity to the chest tube, and 2-0 nylon is then anchored through the knot before ligating the first subcutaneous suture (Fig 2A). Subcutaneous tissue and skin closure are then carried out. After the skin closure, tube fixation is performed by the already prepared nylon suture (Fig 2B).

Comment

Single-incision VATS lobectomy has been an emerging lobectomy technique since Gonzales first reported it in 2011 [4]. The indications for single-incision VATS lobectomy have been extended to most major resections, including complex cases and advanced tumors [5]. Although it has not gained general acceptance for standard VATS lobectomy, many thoracic surgeons prefer it because it is associated with less postoperative pain and paresthesia, and fewer cosmetic problems. We introduced single-incision VATS lobectomy to our institution in October 2013 because of these advantages. The early clinical results were acceptably good.

In the early phase we thought that the short distance from the skin to the thoracic cavity would reduce instrument collision and make the operation technically easier to perform. Therefore we intended to create the...
working window in the middle of the intercostal space to secure the shortest possible route. However, we encountered some unanticipated problems related to the chest tube using this technique. The chest tube was directly inserted into the working window. Although the muscle around the tube was tightly closed to reduce the gap between the muscle and the tube, we could not completely prevent peritubular leakage of pleural fluid and intrathoracic air.

Three patients of our previous 10 single-incision VATS lobectomy cases experienced severe wound problems that required reopening of the wound. As a result, chest tubes were reinserted into another site to treat peritubular leakage despite successful operative results. Thus, improvements to both the incision and tube insertion techniques were necessary. First we thought that separation of the tube insertion site from the main wound would be necessary for complete closure of the
main wound. We lowered the incision site to the lower margin of the lower rib and performed upward subcutaneous dissection; the thorax was opened by the middle intercostal space. The chest tube was then inserted about 1-cm below the main wound for isolated chest tube insertion. Using this technique, we performed 28 cases of single-incision VATS lobectomy through April 2014 and did not encounter tube-related wound problems.

After this modification, our technique underwent an additional slight change because some patients developed cosmetic problems associated with the suture site for tube fixation. Therefore, we applied our above-described tube fixation technique. After this change, there were no complaints about cosmetic problems.

In conclusion, although our modification involving wound opening and closure is not an important factor in single-incision VATS lobectomy, it could be useful to obtain a better cosmetic effect after single-incision VATS lobectomy.

References

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