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Original research

# Subxiphoid vs intercostal single-incision video-assisted thoracoscopic surgery for spontaneous pneumothorax: A randomised controlled trial

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## HIGHLIGHTS

- Single subxiphoid incision VATS can perform favourably unilateral or bilateral bullectomy.
- Subxiphoid incision can reduce the postoperative pain.
- Subxiphoid incision can provide a choice of the incision position for these young patients with the spontaneous pneumothorax.

## ARTICLE INFO

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## ABSTRACT

*Introduction:* The conventional video-assisted thoracoscopic surgery (VATS) is performed through the intercostals incisions. In this study, we reported our current experience of thoracoscopic surgery using a subxiphoid single-incision and compared it with the intercostal uniport VATS in the operation time and postoperative pain for spontaneous pneumothorax.

*Methods:* From July 2014 to September 2015, 43 consecutive patients with spontaneous pneumothorax underwent the unilateral or bilateral bullectomy vie VATS. Among these, 22 patients were treated by the subxiphoid single-incision VATS, and 21 patients were treated using the conventional intercostals uniport VATS. The duration of operation, hospital stay days and inpatient pain scores were compared between each group.

*Results:* The postoperative pain scores on postoperative days (POD) 0, 1, 2 and 3 were significantly lower for patients who underwent the subxiphoid single-incision VATS than those who underwent the intercostal uniport VATS ($p < 0.05$). However, the subxiphoid single-incision VATS needed longer surgical time than the intercostal uniport VATS ($p < 0.001$).

*Discussion:* The subxiphoid uniport VATS could decrease the postoperative pain and was safe and effective for performing the unilateral or bilateral bullectomy, but, demanded longer surgical time comparing with the intercostal uniport VATS.

*Conclusions:* Subxiphoid single-incision VATS, as a new method for bullectomy, could provide a good choice of the incision position for these young patients with spontaneous pneumothorax.

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## 1. Introduction

The conventional video-assisted thoracoscopic surgery (VATS) is performed though the intercostals incisions with the reduction in the number of incisions (ports), from four or three to two, even a single one for the reduction of the postoperative pain, chest wall paresthesia and aesthetical view [1–3]. But, due to damage or compression of intercostal nerves and intercostals incisions in thoracoscopic surgery, it is inevitable to cause some intercostal nerve injury which lead to chest wound pain. At present, there had been the reports describing a novel technique for performing thoracoscopic lobectomy and bilateral partial lung resection through a subxiphoid single-incision [4,5]. Here, we reported our current experience of thoracoscopic surgery for spontaneous pneumothorax using a subxiphoid single-incision and compared it with the intercostal uniport VATS in the postoperative pain and surgical time.

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## 2. Patients and methods

We retrospectively analyzed 43 consecutive patients who underwent unilateral and bilateral bullectomy vie VATS for primary or secondary spontaneous pneumothorax from July 2014 to September 2015. According to the surgical procedures, the patients were randomly divided into two groups. Among these, 22 patients were treated by the subxiphoid single-incision VATS, and 21 patients were treated using the conventional intercostals uniport VATS. Our work was fully compliant with the CONSORT criteria and had been reported in line with the CONSORT criteria [6]. For each patient, a retrospective case note review including the following variables was made: age at operation, gender, body mass index (BMI), location of pathology, surgical time, number of resected lesions, duration of chest drainage (days), duration of hospital stay (days), inpatient pain scores. The surgery was performed after a written informed consent was obtained. According to the pre-operation computed tomography, the patients with the bilateral pulmonary bulla would accept the bilateral bullectomy.

Maximum pain scores were evaluated using a visual analogue scale (VAS) from 0 to 10. Pain scores were recorded by an attending nurse who was unaware of the ongoing study on postoperative days (POD) 0, 1, 2 and 3. The patients did not routinely use the analgesic, only when feeling intolerable. In order to evaluate the residual pain, all patients were followed up in the outpatient department by the general inquiry at the time of first month and third month after surgery.

The subxiphoid single-incision (or uniport) technique we used was a 3–4 cm vertical incision in the subxiphoid area, and a created substernal tunnel passed into thoracic cavity. In order to provide the optimal exposure, a wound protector was placed into the wound, and the sternocostal margin was lifted using a retractor. The patient underwent single-lung ventilation and was placed in the horizontal decubitus position. A 10-mm, 30° angled thoracoscope was used during the operation (Fig. 1).


**Fig. 1.** The subxiphoid single-incision VATS. (A and B) The instruments used in subxiphoid single-incision technique: wound protector, retractor, 30° angled thoracoscope, oval forceps, endostapler and so on. (C and D) A 28F chest tube (or two tubes at the time of performing bilateral operation) placed at the wound.

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