



Case report

Low-cost of uniportal thoracoscopic surgery for primary spontaneous pneumothorax

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ARTICLE INFO

Keywords:

Uniportal video-assisted thoracic surgery
Primary spontaneous pneumothorax
Ligation
Medical costs

ABSTRACT

Objective: Single-incision thoracoscopic surgery is a favorable treatment choice for primary spontaneous pneumothorax, and manual ligation of the bleb during thoracoscopic surgery appears to offer better economic results. In this study we undertook ligation of the bleb by hand under uniportal thoracoscopic surgery for primary spontaneous pneumothorax.

Methods: Between June 2015 and December 2016, a series of 26 patients with primary spontaneous pneumothorax underwent hand ligation of blebs using the technology of uniportal thoracoscopy, followed by pleural abrasion as necessary.

Results: No case was converted to two- or three-port video-assisted thoracoscopic surgery during the operation. No patients experienced prolonged (> 5 days) air leakage. No other complication was recorded. No recurrence of pneumothorax was encountered during 29–47 months follow-up. Compared with the group treated by bullectomy using stapler, we found a significant reduction in medical costs in the group with bleb ligation.

Conclusions: Ligation of the bleb by hand under uniportal thoracoscopic surgery for primary spontaneous pneumothorax is a safe and offers better economic results, which is applicable for low income family.

1. Introduction

As technological innovation in health care is an important driver of cost growth, it is all the more important to develop advanced technology that is also low-cost. Nowadays, while uniportal video-assisted thoracoscopic surgery for primary spontaneous pneumothorax has become more popular [1–8] because it offers better clinical results [8–11]. In our previous study, ligation of the bleb by hand under biportal thoracoscopic surgery appeared to offer better economic results [12]. For this reason we attempted to manually ligate the bleb under uniportal thoracoscopic surgery for primary spontaneous pneumothorax.

2. Patients and methods

2.1. Patients

Between June 2015 and December 2016, we operated on a series of 26 consecutive patients (age 26.08 ± 6.00 years, male/female 19:7) with primary spontaneous pneumothorax using techniques of hand ligation of blebs under uniportal thoracoscopic surgery. Preoperative computed tomography (CT) was performed to delineate precisely the location of the blebs. Indications for thoracoscopic surgery and

resection of primary spontaneous pneumothorax included: 1) recurrent ipsilateral pneumothorax; 2) prolonged air leak over 4 days in the first episode of pneumothorax; 3) visible large bullae > 10 mm in diameter on chest CT; 4) bilateral pneumothorax in the first episode; and 5) occurrence of contralateral pneumothorax. All procedures were carried out with the legal consent of the individual patient and with the approval of the local Ethics Committee.

2.2. Operative techniques

The patients were placed in a lateral position with the ipsilateral arm abducted. The procedures were performed under general anesthesia with double-lumen endotracheal intubation for single-lung ventilation. A port was placed in the fourth intercostal space on the anterior axillary line (about 2–3 cm). After the lung on the operative side was deflated, a 10-mm rigid scope with a 30° angle and endoscopic instruments were introduced into the thoracic cavity. Next, the base of the bleb was held with a curved vascular clamp. After a 1/0 silk thread was placed beneath the curved clamp, the video thoracoscope was withdrawn. Lastly, the bulla/bleb was pulled close to the incision and ligated by hand, then ruptured by electrocoagulation. Once the bleb was ligated, the thoracoscope was withdrawn to facilitate manipulation

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<https://doi.org/10.1016/j.rmcr.2019.100878>

Received 20 February 2019; Received in revised form 6 June 2019; Accepted 10 June 2019

Available online 13 June 2019

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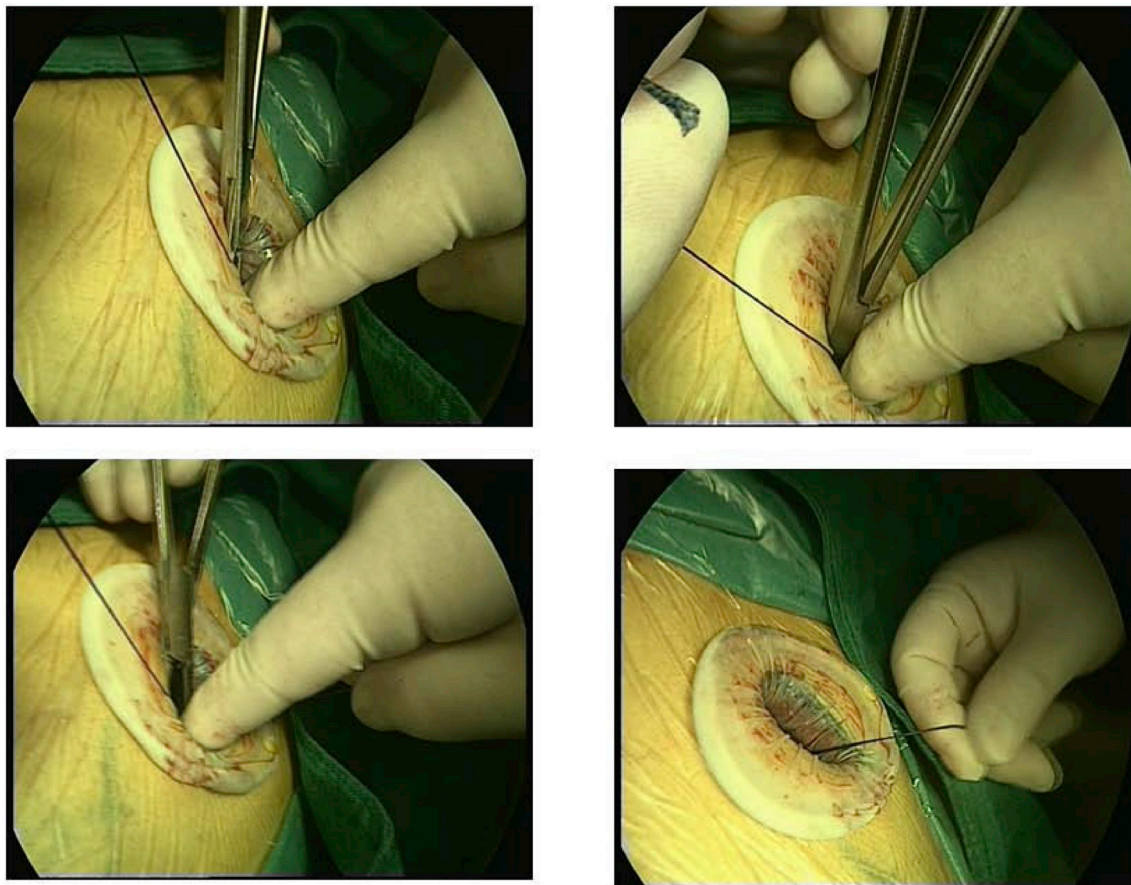


Fig. 1. The bleb was ligated by hand under a uniportal approach.

(Video 1 and Fig. 1). After testing for air leakage or pleural abrasion, an 8.5F drainage tube was inserted into the thoracic cavity via the port. If the bulla or blebs are in the lower lobe, inferior pulmonary ligament is cut off to facilitate pulling and ligation the bulla/bleb. When drainage reached < 100 mL/day in the postoperative period, the chest tube was removed.

Supplementary video related to this article can be found at <https://doi.org/10.1016/j.rmcr.2019.100878>.

3. Results

The mean operative time was 62.92 ± 12.64 minutes and the postoperative drainage duration was 1.15 ± 0.46 days. No case was converted to two- or three-port video-assisted thoracoscopic surgery during the operation. No patients experienced prolonged (> 5 days) air leakage. The mean duration of postoperative hospital stay was 4.65 ± 1.47 days. No other complication was recorded and no recurrence of pneumothorax was encountered during 29–47 months follow-up and the high density of tissue caused by ligation as observed on lung CT was absorbed about 6 months after the operation (Fig. 2). Compared with the group treated by bullectomy using stapler [12], we found a significant reduction in medical costs in the group with bleb ligation [2692.02 ± 494.68 vs 3405.80 ± 969.92 , $P = 0.01$, CNY 1 = USD 0.1608. CNY (Chinese Yuan)]

4. Discussion

Nowadays, uniportal video-assisted thoracoscopic surgery for primary spontaneous pneumothorax has become more popular [1–11] because of its many advantages. However, it always need expensive endoscopic consumables. Previously we described that manual ligation

of blebs under biportal endoscopy is a safe, efficacious, simple, and low-cost technology [12]. For this reason we attempted the same approach under uniportal endoscopic surgery. Our experience shows that ligation of blebs under uniportal endoscopy is just as easy as under the biportal approach.

Nevertheless, two issues should be of concern regarding ligation of blebs by hand under uniportal endoscopy. First, the thoracoscope was withdrawn when the bleb was ligated to facilitate manipulation. Second, the thoracoscope was placed as near to the end of the incision as possible to avoid interference with other instruments. Our technique differs from bullectomy using a stapler under uniportal video-assisted thoracoscopy [7,13–16] in the following regards. 1) Hand ligation of blebs under uniportal video-assisted thoracoscopy may be more convenient. Because no anchoring suture [7,13,15], retractor [5], or endoloop [14] is required, an ideal angle to facilitate bullectomy is contrived and requires no stapler. However, the required skin incision of 2–3 cm in our technique is larger than that for bullectomy with a stapler [7,13–16]. 2) Manual ligation of blebs under uniportal video-assisted thoracoscopy requires no fleece-coated fibrin glue to reduce the risk of air leaks from the cutting edge.

In uniportal thoracoscopic surgery for primary spontaneous pneumothorax, holding the base of the bleb with a curved vascular clamp may sometimes be difficult without using instruments to lift the lesion. Under these circumstances, a ligation was made in the bleb with 1/0 silk thread. By pulling the thread through the incision site, the base of the bleb was lifted to create an angle, which enabled a curved vascular clamp to hold the base of the bleb and facilitate ligation. If the bleb was not completely ligated after the first ligature, further ligation was performed in the same manner. Our technique used no expensive endoscopic consumables and made only one incision. Consequently, the technique reduces hospital costs and provides better cosmetic results.

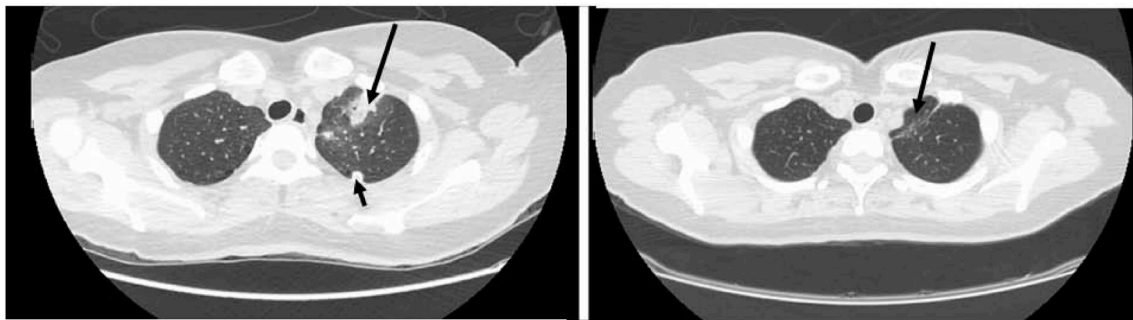


Fig. 2. The high density of tissue was absorbed by tissue 6 months after the operation.

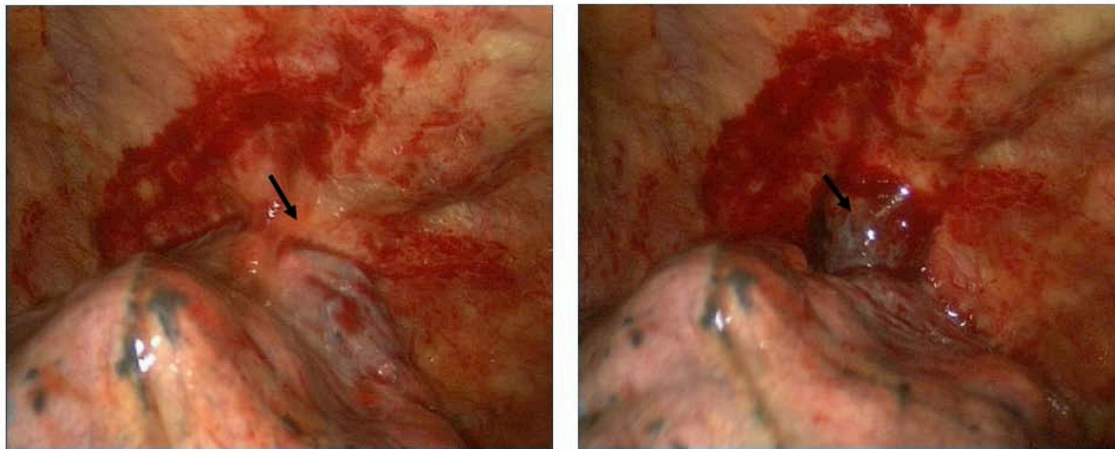


Fig. 3. Dense adhesion induced by ligation 7 days after surgery.

One study found that lung tissue ligation can reduce air leakage from the lung in patients with severe emphysema [17]. By contrast, bullectomy using a stapler carries the risk of air leaks from the cutting edge, which in our case was entirely avoided because no lung tissue was cut in our 26 patients. Another study reported a significantly lower recurrence during follow-up in patients who underwent ligation compared with those who underwent the stapling method [18]. These authors believe that the lower recurrence rate after ligation may be secondary to compression of the base of bullae and the facilitation of inflammatory and fibrotic reaction over the bullae region [18]. Their hypothesis is confirmed by a patient with lung cancer (Fig. 3) (The patient underwent bullectomy for rapid pathological biopsy, which showed benign tumor. During procedures, manual ligation of lung tissue since bleeding. But, routine pathological examination indicates lung cancer. So, radical operation for lung cancer was done 7 days after the first operation. And a dense adhesion induced by ligation of lung tissue was found). We also observed on lung CT imaging about 6 months post-operatively that the high density of tissue caused by ligation was absorbed, which helped avoid misdiagnosis in the future.

5. Conclusions

Ligation of the bleb by hand under uniportal thoracoscopic surgery for primary spontaneous pneumothorax is a safe and offers better economic results, which is applicable for low income family. Nevertheless, the experience with this method is limited. It is important that further research confirms the advantage and disadvantage of this technique.

Disclosure

The authors declare no conflict of interest.

Acknowledgments

Funding: This research was supported by the Department of Health of Guangxi Zhuang Autonomous Region of China (No. S2016179).

We thank Hugh McGonigle, from Liwen Bianji, Edanz Group China (www.liwenbianji.cn/ac), for editing the English text of a draft of the manuscript.

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