CLINICAL STUDY

Video-assisted thoracoscopic surgery for spontaneous pneumothorax in children-our experience

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Abstract

The aim of this case report was to analyse the efficiency of video-assisted thoracic surgery (VATS) in the treatment of spontaneous pneumothorax. Spontaneous pneumothorax occurs subsequently to a disruption of visceral pleura and escape of air into pleural space. A retrospective study was performed in 5 patients from December 2001 until May 2006. Four procedures for recurrent spontaneous pneumothorax and one procedure for primary spontaneous pneumothorax were performed. The main symptoms in our patients included chest pain (100 %), shortness of breath (60 %) and cough (10 %) In all patients we made routine X-rays and CT scans. With CT scans in four patients we detected apical bullae. In one patient we had not appropriate diagnosis and we made VATS as diagnostic and later therapeutic procedure. In all patients bullae were in apical zone and resected with endostapler device. There was no postoperative mortality or any complications after VATS. The median duration of the operation was 75 minutes (65–120 minutes), and postoperative hospital stay was 6 days (range 5 to 8 days). On the basis of our results and results from literature we conclude that VATS allows effective, safe performance of standard surgical procedures, avoiding a formal thoracotomy incision *(Ref. 15)*.
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Key words: video-assisted thoracic surgery (VATS), pneumothorax, children.

Primary spontaneous pneumothorax is a common disease defined as the accumulation of air in the pleural space with secondary lung collapse. Spontaneous pneumothorax occurs subsequently to a disruption in the continuity of visceral pleura and escape of air into pleural space (1). Treatment options greatly vary from observation in minor pneumothorax to operation. Conservative treatment, including observation, aspiration and tube thoracostomy is usually the first line of treatment. However, approximately one half of patients who receive conservative therapy will have recurrence (2). Open thoracotomy is more invasive but its recurrence rate is much lower than that of the conservative treatment (3). Since VATS has taken the role in pediatric surgery, operative treatment is more better than conservative treatment due to its minimal invasiveness and low morbidity. A minimally invasive thoracoscopic surgery offers several options in diagnosis and surgical treatment in the field of pediatric surgery (4). In VATS technique three-port was applied. When bullae or blebs were present, wedge resection or excision was performed using a linear stapler. In cases with multiple bullae, suspicious for a high rate of recurrence and thought to be unresectable, apical pleurodesis was performed (5). The diagnosis was performed with simple chest radiography and CT scan (6). The main symptoms in our patients included chest pain (100 %), shotness of breath (60 %) and cough (10 %). VATS demonstrates low recurrence, low morbidity and short hospitalozation in the first episode of spontaneous pneumothorax but many authors have described recurrence cases in their articles (7–11).

Materials and methods

Before December 2001 we used only two treatments options for spontaneous pneumothorax: conservative treatment including observation, aspiration and tube thoracostomy and open thoracotomy. After December 2001 we had also two different treatments but we avoid open thoracotomy and we prefer VATS.

In December 2001 the VATS technique was initiated at our institution. In all patients with spontaneous pneumothorax X-

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ray and CT scan were done. In the first episode in four patients in whom blebs or bullae were not detected, conservative treatment was selected. But, in all four patients who were treated with conservative treatment recurrent episode of spontaneous pneumothorax was observed from 3 months to 2 years. In the first episode of pneumothorax in patient in whom blebs or bullae were observed with X-ray and CT scan, VATS was undertaken. We performed VATS in patients when computed tomographic (CT) scans detected apical bulla formation. With CT scan in three patients with recurrent pneumothorax we detected apical bullae. In one patients with recurrent pneumothorax the diagnosis was not appropriate and we made VATS as diagnostic and later therapeutic procedure.

The three-port VATS technique was applied. For VATS in children, 5 mm and 10 mm telescopes are used. In all our patients blebs or bullae were present on the apical part of lung, and excision was performed using a linear stapler.

Five patients with spontaneous pneumothorax were treated by video-assisted thoracic surgery. Four patients were treated for a recurrent episode and one procedure for primary spontaneous pneumothorax were performed and all of them had unilateral pneumothorax. Stapling pleural apical bullae with endoscopic linear stapler was performed in all patients. We had four male and one female patients aged 15.2 years (range 13 to 17 years)

Results

In the last five years we had four patients with recurrent episode of unilateral spontaneous pneumothorax and one patient with primary spontaneous pneumothorax. Four patients were treated with conservative treatment including observation, aspiration and tube thoracostomy because we did not found bullae on simple chest X-ray or CT scan. In one patient we found in the apical part of the lung on CT scan bullae and VATS was performed immediately. Four patients who were treated with conservative treatment had recurrent episode and VATS was undertaken.

We had four male and one female patients aged 15.2 years (range 13 to 17 years). After VATS and wedge resection of apical bullae there were no complications. After operative treatment no recurrences occurred, no persistent air leaks were reported and no prolonged bleeding or persistent pain occurred. The right lung was involved in three patients and left lung was involved in two patients. The mean follow-up period was 29.5 months (range 3 to 53 months). Length of hospital stays were 6 days (range 5 to 8 days). The mean duration of chest drainage was 2 days. The median duration of the operation was 85 minutes (65–105 minutes). All patients received antimicrobial chemoprophylaxis with single dose of Ceftriaxone and postoperative patient controlled analgesia. Cosmetic benefits were also very important because wounds healed with minimally scars. We prefer apical bullectomy with linear stapler because this operation was safer, simple and fast, and the obtained specimen could possibly reveal the underlying diseases.

Discussion

The goal in the surgical management of spontaneous pneumothorax, which often affects apparently healthy young patients, is to secure low recurrence rate with no mortality and quite null morbidity and functional impairment (12). Spontaneous primary pneumothorax has traditionally been managed by conservative treatment including observation and tube thoracotomy. Only in cases of prolonged air leakage and recurrence was a surgical procedure considered. Surgical treatment is more invasive but the recurrence rate is much less than that of the conservative treatment. Before video-assisted thoracoscopic surgery (VATS) was initiated, open transaxillary thoracotomy was performed as a surgical procedure. In 1990 the first VATS was reported by Levi et al (13). Since then this technique has spread rapidly and VATS has taken over the role of open thoracotomy, due to its minimal invasiveness and low morbidity (14). Conservative treatment showed very high recurrence rates, not only after the first episode but also after cases of recurrence. In contrast, VATS demonstrates low recurrence, low morbidity and short hospitalization in the first episode and recurrence cases. Patients with one or more recurrences would be a very good indication for VATS. Our treatment algorithm is: conservative treatment at the first episode of pneumothorax in patients with no bullae on CT scans, and VATS at the first episode in patients with bullae on CT scans or in patients with recurrence or prolonged air leakage. The outcome of VATS was very good compared to conservative treatment and equal to that of open thoracotomy in the first episode and in cases of recurrences. In terms of low morbidity, good results, cosmetic issues and low invasiveness, VATS is superior to open thoracotomy (15). We recommend VATS in patients with first episode with bullae on CT scans or in patients with recurrences or prolonged air leakage.

References

1. **Koizumi K, Haraguchi S, Hirata T, Hirai K et al.** Thoracoscopic surgery in children. J Nippon Med Sch 2005; 72: 34—42.

2. **Shaw KS, Prasil P, Hguyen LT, Laberge JM.** Pediatric spontaneous pneumothorax. Semin Pediatr Surg 2003; 12: 55—61.

3. **Sawada S, Watanabe Y, Moriyama S.** Video-assisted thoracoscopic surgery for primary spontaneous pneumothorax: evaluation of indications and long-term outcome compared with conservative treatment and open thoracotomy. Chest 2005; 127 (6): 2226—2230.

4. **Qureshi FG, Sandulache VC, Richardson W, Ergun O, Ford HR, Hackam DJ.** Primary vs delayed surgery for spontaneous pneumothorax in children: which is better? J Pediatr Surg 2005; 40 (1): 166—169.

5. **Margolis M, Gharagozloo F, Tempesta B et al.** Video-assisted thoracic surgical treatment of initial spontaneous pneumothorax in young patients. Ann Thorac Surg 2003; 76 (5): 1661—1663.

6. **Gupta KB, Mishra DS, Tandon S,Sindhwani G, Tanwar T.** Role of chest CT scan in determining etiology of primary spontaneous pneumothorax. Indian J Chest Dis Allied Sci 2003; 45 (3): 173—177.

7. Lang-Lazdunski L, Chapuis O, Bonnet PM, Pons F, Jancovici R. Videothoracoscopic bleb excision and pleural abrasion for the treatment of primary spontaneous pneumothorax: long-term results. Ann Thorac Surg 2003; 75 (3): 960—965.

8. Connolly SS, Hurson C, Lynch V. Thoracoscopic management of primary spontaneous pneumothorax. Ir J Med Sci 2002; 171 (2): 71—72.

9. De Vos B, Hendriks J, Van Schil P, Van Hee R, Hendrickx L. Long-term results after video-assisted thoracic surgery foir spontaneous pneumothorax. Acta Chir Belg 2002; 102 (6): 439—444.

10. Luh SP, Tsai TP, Chou MC, Yang PC, Lee CJ. Video-assisted thoracic surgery for spontaneous pneumothorax: outcome of 189 cases. Int Surg 2004; 89 (4): 185—189.

11. Ayed AK, Al-Din HJ. The results of thoracoscopic surgery for primary spontaneous pneumothorax. Chest 2000; 118: 235—238.

12. Shigeki S. Yoichi W, Shigeharu M. Video-Assisted Thoracoscopic Surgery for Primary Spontaneous Pneumothorax. Chest 2005; 127: 2226—2230.

13. Levi JF, Kleinmann P, Riquet M et al. Percutaneous parietal pleurectomy for recurrent spontaneous pneumothorax. Lancet 1990; 336: 1577—1578.

14. Wilcox DT, Glick PL, Karamanoukian HL, Allen JE, Azizkhan RG. Spontaneous pneumothorax: a single-institution, 12-year experience in patients under 16 years of age. J Pediatr Surg 1995; 30: 1452—1454.

15. Casadio C, Rena O, Giobbe R, Rigoni R, Maggi G, Oliario A. Stapler blebectomy and pleural abrasion by video-assisted thoracoscopy for spontaneous pneumothorax. J Cardiovasc Surg 2002; 43: 259—262.

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