Single-incision thoracoscopic surgery for spontaneous pneumothorax in a 14-year-old girl

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Single-incision thoracoscopic surgery has become popular because of its potential to further extend the benefits of thoracoscopic surgery, such as less pain, a faster recovery time, and improved cosmesis, but the limited visualization due to crowding of instruments requires a certain amount of skill, especially in children. We herein describe a single-access video-assisted thoracoscopic surgery for a pediatric spontaneous pneumothorax. This procedure was useful, led to less postoperative pain and a better cosmetic appearance, and resulted in satisfactory results. ***Ann Pediatr Surg*** **12:71–72 © 2016 Annals of Pediatric Surgery.**

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Introduction

Single-incision laparoscopic surgery (SILS) had proven to be effective for appendectomy and inguinal hernia repair in children. However, there have been few published studies of single-incision thoracoscopic surgery (SITS) in children. We have used this approach for a pediatric case of spontaneous pneumothorax. Three-port video-assisted thoracoscopic surgery (VATS) has shown clear benefits and advantages in terms of a faster postoperative recovery and decreased postoperative pain compared with traditional surgery. As surgeons have acquired new skills, resulting in procedures requiring fewer and smaller incisions, conventional VATS has changed to involve fewer working ports for surgical procedures.

Case report

A 14-year-old girl was admitted in our hospital with left chest pain and dyspnea. The patient was diagnosed with a moderate spontaneous pneumothorax. Although we initially tried to improve her symptoms with chest drainage, we finally decided to perform surgery because of the presence of bullae on computed tomography and continuous air leakage. SITS was performed with three instruments through a single small incision. There were no postoperative complications. The patient was discharged uneventfully after surgery and has since had no recurrence. SITS is a markedly helpful procedure for relatively simple surgeries such as that in the present case because of its advantages, including minimal invasion and an excellent cosmetic appearance, although it does require a higher level of skill compared with conventional procedures.

Surgical technique

SITS was performed with the patient under general anesthesia. A 2-cm-long incision was made by extending the drainage hole in the fifth intercostal space on the median axillary line of the affected side, and subcutaneous flaps were dissected extensively. Three instruments were placed through this single incision (Fig. 1): two 5 mm trocars into the fifth and sixth intercostal spaces, respectively, and an endoscopic linear stapler (Echelon60; Ethicon Endo-Surgery, Ethicon, NJ, USA) directly into the fifth intercostal space not through the trocar. An artificial pneumothorax was created with the injection of CO_2 (at a pressure of 5 mmHg) through the trocar during the operation. The lung surface, mainly the mediastinal side of the S1 + 2 segment, was carefully observed through the 5 mm trocars with a 5 mm 0° videothoracoscope. The apical lung blebs were stapled and resected with an endoscopic linear stapler (Eche-

Fig. 1

The surgical technique: three instruments were placed through this single incision.

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Fig. 2

The surgical technique: the apical lung blebs were stapled and resected with an endoscopic linear stapler.

lon60; Ethicon Endo-Surgery) (Fig. 2). A 19 Fr J-VAC drain (Ethicon Endo-surgery) was inserted into the upper apical portion through the port site at the end of the procedure and left for drainage. The total length of the operation was 60 min. Blood loss was extremely small.

Discussion

VATS for patients with spontaneous pneumothorax was first reported by Levi *et al.* [1]. Video systems and surgical instruments have continued to evolve, and the mainstream surgical approach for pneumothorax is now VATS. Most reports on single-incision VATS are about the single-incision approach using a standard abdominal SILS port (Covidien, Mineapolis, MN, USA) [2–5]. In the present case, we performed SITS without a SILS port. Because a SILS port requires an incision larger than 2.5 cm, it may be associated with an increased risk for complications compared with procedures not using the port. For example, Mier *et al.* [4] found higher rates of surgical wound complications, which they attributed to the fact that the tissue was compressed by the SILS port. In our procedure, the incision was less than 2.5 cm. The advantages of SITS include a better cosmetic outcome [5,6] and less incisional pain [3,7] than that experienced with conventional multiport procedures. The present procedure was accomplished with only a single incision: all trocars were introduced through the 2 cm incision, and all procedures were completed in the pleural space. However, the visualization was limited, and the manipulation was difficult in this approach due to the short distance between trocars. By placing the incision on the median axillary line, the resulting scar was almost invisible once the arm was put down, which further improved the cosmetic outcome. There were no associated complications or recurrence in the present case.

As noted above, the major disadvantage of this procedure is the decreased flexibility in terms of visualization and manipulation. The narrow space between the trocars sets the videothoracoscope and forceps close to each other, and limits the visualization. The forceps easily interfere with the videothoracoscope, and so careful and precise manipulation is necessary. Nevertheless, although SITS is associated with visual and manipulatory disadvantages, adequate skills and experience with existing thoracoscopic surgeries, such as VATS, can overcome them. In this case, the use of an artificial pneumothorax with the injection of CO_2 through the trocar helped in improving the visual and manipulatory limitations.

With the improvements in surgical techniques and postoperative management, surgeons are now facing new challenges; less-invasive surgery and improvement of the patients' quality of life are now important factors that must be considered. Improvement of the cosmesis is important, and, especially for children, surgeons must make efforts to reduce the size of scars as much as possible, because scars can lead to both physical and mental burdens during their growth process. Thus, SITS for spontaneous pneumothorax provided excellent outcomes in terms of both the cosmesis and low level of invasiveness.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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