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Video-Assisted Thoracoscopic Surgery in treatment of stabbing chest injuries

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Since 1994, we have performd video-assisted thoracoscopic surgery in order to treat thoracic trauma. In general, emergency surgery is performed for trauma injuries incurred by knives. Between 1994 and 2005, we performed thoracoscopic surgery on eighteen cases of thoracic stab wounds. Among these eighteen cases, two were characterized by wounds to the internal thoracic artery, and they had to be switched over to open thoracotomy due to excessive bleeding. In conclusion, open thoracotomy should be performed in cases in which the patient is in a state of shock due to severe intrathoracic bleeding; however, in cases in which the vital signs are stable, thoracoscopic surgery may be carried out to stop intrathoracic bleeding, to repair the lung injury by suturing, as well as by performing a partial resection of the lung.

Key words: video-assisted thoracoscopic surgery (VATS), emergency surgery, thoracic trauma, stabbing chest trauma

INTRODUCTION

Video-assisted thoracoscopic surgery (VATS) is used in operations of spontaneous pneumothorax or lung tumors, and the benefits of this treatment are well known due to its minimal invasiveness. Therefore, we began to perform VATS for thoracic trauma patients in 1994. In particular, emergency surgery is frequently performed for trauma caused by knives, and there have been many cases in which VATS could be carried out with excellent results. At our institution, VATS has been successfully performed to stop intrathoracic bleeding, to carry out intrathoracic lavage, to repair the lung by suturing, to make a partial resection of the lung, and to suture repair of the diaphragm injury.

SUBJECTS AND RESULTS

Between 1994 and 2005, we performed emergency surgery on thirty-one thoracic stab wounds caused by knives, and we performed VATS on eighteen of those cases. Among these eighteen cases, two were characterized by stab wounds to the internal thoracic artery, and they therefore had to be converted to open thoracotomy due to excessive bleeding. Fifteen of these cases were male, while three were female. The average age was 41.8 (17-90 years old). Ten of them were suicide attempts. Extrathoracic injury coexisted in five cases. No cases showed a disturbance of consciousness upon arrival at the hospital, and none of these patients demonstrated stab wounds in the bilateral thorax. Chest X-rays were performed in all eighteen cases, and thoracostomy tubes were inserted. After inserting the Univent tube® under general anesthesia with the patient in the lateral position [1], VATS was performed using two skin incisions measuring about two centimeters in length [2]. Among these eighteen cases, two were characterized by stab wounds to the internal thoracic artery, and they had to be converted to open thoracotomy due to uncontrollable bleeding. The average length of stay at the hospital for patients who had undergone VATS was 11.5 days (2-26 days). The operations for these sixteen cases included: one operation to stop hemorrhaging, four repairs of the lung injury by suturing, and eleven partial resections of the lung (Table 1). There was no case in which only a suture repair of the diaphragm was performed, but in addition to the repair of the diaphragm, a suture repair of the lung was required. Among these sixteen cases, fifteen underwent emergency surgery within six hours after the injury, while VATS was performed on the last case one day after suffering the injury.

DISCUSSION

Cases of emergency surgery for blunt thoracic trauma can be classified roughly into those presenting with tracheobronchial disruption and those with severe intrathoracic hemorrhage [3, 4]. For penetrating thoracic traumas, surgery is usually performed for intrathoracic observation, or intrathoracic lavage. Open thoracotomy was previously the only surgical method for thoracic trauma. Branco reported using a thoracoscope to diagnose a penetrating thoracic trauma in 1946 [5]. Thereafter, cases where a thoracoscope was used for the intrathoracic observation of penetrating thoracic trauma have been sporadically reported [6-8]. However, very few cases have been reported in which VATS has been used for such treatment [9-12].

Recently, VATS is used for operations involving spontaneous pneumothorax or lung tumors, and this operational technique has now been established.

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Table 1 Injuries sustained and operation performed.

Patient	Side	Thoracic injury	Extrathoracic injury	Operation performed
1	Stab left chest	Lung laceration	None	Suture and repair of the lung
2	Stab left chest	Intercostal bleeders, lung laceration	Wrist tendon laceration	Hemostasis of bleeders, wedge lung resection
3	Stab left chest	Lung laceration, diaphragm laceration	None	Wedge lung resection, repair of diaphragmatic laceration
4	Stab left chest	Lung laceration, pericardiac laceration	Mesenterium laceration	Wedge lung resection, repair of pericardiac laceration
5	Stab left chest	Lung laceration	None	Wedge lung resection
6	Stab left chest	Lung laceration	None	Wedge lung resection
7	Stab left chest	Lung laceration	None	Wedge lung resection
8	Stab left chest	Intercostal bleeders	None	Hemostasis of bleeders
9	Stab right chest	Lung laceration	None	Wedge lung resection
10	Stab left chest	Lung laceration, pericardium laceration	Omentumn laceration	Suture and repair of the lung, repair of pericardiac laceration
11	Stab right chest	Lung laceration	None	Wedge lung resection
12	Stab left chest	Lung laceration	None	Suture and repair
13	Stab left chest	Lung laceration	Upper arm tendon laceration	Suture and repair
14	Stab left chest	Lung laceration	None	Wedge lung resection
15	Stab left chest	Lung laceration	Neck	Wedge lung resection
16	Stab left chest	Lung laceration	None	Wedge lung resection

Therefore, even for thoracic trauma, minimally invasive thoracoscopic surgery is desirable. However, in the case of severe bleeding in which the stabilization of vital signs is essential, open thoracotomy should be performed.

When a patient with a thoracic stab wound arrives at a hospital, a chest X-ray should be performed, and thoracostomy tubes should also be inserted. If no obvious damage to the heart or aorta is observed, and the patient is not in a state of shock, then thoracoscopy is recommended as the first choice of treatment [12]. Next, the location of bleeding and the level of trauma should be identified. If the injuries are considered to be treatable, then VATS should be performed, and if not, then such cases should be converted to open thoracotomy [10, 11]. Intrathoracic lavage, a repair of the lung injury by suturing, a partial resection of the lung, and a suture repair of the diaphragm can all be effectively performed by VATS. Therefore, it is believed that VATS can be performed for many types of thoracic stab wounds [13]. However, the amount of bleeding from the internal thoracic artery is unnegligible, and such an excessive bleeding is uncontrollable by VATS. As indeed, two cases that were converted from thoracoscopic surgery to open thoracotomy demonstrated bleeding from the internal thoracic artery. On the other hand, VATS is effective in for the treatment of bleeding from either the thoracic walls or intercostal arteries. So far, no cases of a thoracoscopic lobectomy have been previously performed. It is believed that open thoracotomy is more appropriate than VATS if the trauma is severe and requires a lobectomy.

When thoracic trauma is treated by only the insertion of a thoracostomy tube, the following complications have all been observed: thoracic empyema, 3%; delayed hemothorax, 18%; relapsed pneumothorax, 24%; and other complications, 36% [14]. Divisi *et al.* reported the use of a thoracoscope to be superior to that of a simple tube thoracostomy [15].

Because the surgery is performed while the patients are in the lateral position, as described above, a Univent tube® was used in all cases to prevent bleeding from the airway to flow into the unaffected lung [16], and VATS is carried out under general anesthesia.

CONCLUSION

Among the cases of thoracic stab wounds in which open thoracotomy has traditionally been performed, more than half of these can be satisfactorily treated with VATS. Sixteen out of thirty-one cases of emergency surgery for thoracic stab wounds were in this institution successfully treated with VATS. As long as the vital signs of such patients are stable, then VATS is recommended as the first choice of treatment for thoracic trauma.

REFERENCES

1) Inoue H, Shohtsu A, Ogawa J, *et al.*: New device for one-lung anesthesia: Endotracheal tube with movable blocker. J Thorac Cardiovasc Surg 83: 940-941, 1982.
2) Iwasaki M, Nishiumi N, Maitani F, *et al.*: Thoracoscopic surgery for lung cancer using the two small skin incisional method: Two windows method. J Cardiovasc Surg 37: 79-81, 1996.
3) Nishiumi N, Maitani F, Tsurumi T, *et al.*: Blunt chest trauma with deep pulmonary laceration. Ann Thorac Surg 71: 314-318, 2001.
4) Iwasaki M, Kaga K, Ogawa J, *et al.*: Bronchoscopy findings and early treatment of patients with blunt tracheobronchial trauma. J Cardiovasc Surg 35: 269-271, 1994.
5) Branco JMC: Thoracoscopy as a method of exploration in penetrating injuries of the chest. Diseases Chest 12: 330-335, 1946.
6) Senno A, Moallem S, Quijano ER, *et al.*: Fiberoptic thoracoscopy. NY State J Med 75: 51-56,1975.
7) Jones JW, Kitahama A, Webb WR, *et al.*: Emergency thoracoscopy: a logical approach to chest trauma management. J Trauma 21: 280-284, 1981.
8) Hanvesakul R, Momin A, Gee MJ, *et al.*: A role for video assisted thoracoscopy in stable penetrating chest trauma. Emerg Med J 22: 386-387, 2005.
9) Liu DW, Liu HP, Lin PJ, *et al.*: Video-assisted thoracic surgery in treatment of chest trauma. J Trauma 42: 670-674, 1997.

10) Sosa JL, Pombo H, Puente I, *et al.*: Thoracoscopy in the evaluation and management of thoracic trauma. Int Surg 83: 187-189, 1998.
11) Pons F, Lang-Lazdunski L, de Kerangal X, *et al.*: The role of videothoracoscopy in management of pre-cordial thoracic penetrating injuries. Eur J Cardiothorac Surg 22: 7-12, 2002.
12) Manlulu AV, Lee TW, Thung KH, *et al.*: Current indications and results of VATS in the evaluation and management of hemodynamically stable thoracic injuries. Eur J Cardiothorac Surg 25: 1048-1053, 2004.
13) Maitani F, Oiwa K, Nakagawa T, *et al.*: Video-assisted thoracoscopic surgery for chest trauma. Jpn J Chest Surg 20: 715-718, 2006 (in Japanese).
14) Helling TS, Gyles III NR, Eisenstein CL, *et al.*: Complications following blunt and penetrating injuries in 216 victims of chest trauma requiring tube thoracostomy. J Trauma 29: 1367-1370, 1989.
15) Divisi D, Battaglia C, De Berardis B, *et al.*: Video-assisted thoracoscopy in thoracic injury: early or delayed indication? Acta Biomed Ateneo Parmense 75: 158-163, 2004.
16) Inoue H, Shohtsu A, Ogawa J, *et al.*: Endotracheal tube with movable blocker to prevent aspiration of intratracheal bleeding. Ann Thorac Surg 37: 497-499, 1984.