Video-Assisted Thoracic Surgery (VATS) for Spontaneous Pneumothorax

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Abstract

Video-assisted thoracic surgery (VATS) involves using a thoracoscope with a camera chip attached to a video monitor which allows certain thoracic procedures to be performed with limited incisions. Using VATS, 170 procedures have been performed on 158 patients including 42 procedures on 39 patients with spontaneous pneumothorax. There were 24 males and 15 females with age ranging from 17 to 84 yr (mean 36.7). Indication for operation included recurrent pneumothorax in 20 (51 per cent), persistent pneumothorax in 16 (41 per cent) and bilateral pneumothorax in 3 (8 per cent). The main therapeutic strategies were apical pleurectomy in all (42) and blebectomy/bullectomy in 38 (90 per cent). There was one hospital death (hospital mortality 2.5 per cent) in an elderly patient who developed multi organ failure post bullectomy and persistent air leak. One patient (2.5 per cent) required conversion to formal thoracotomy. Mean post-operative chest tube duration was 2.7 days and mean post-operative hospital stay was 5.1 days. There has been no recurrence of pneumothorax in this series during short term follow up (mean 18 months). Our experience indicates an expanding role for video-assisted thoracic surgery in the management of patients with spontaneous pneumothorax.

Introduction

Spontaneous pneumothorax (SP) is still one of the most common clinical conditions referred to the thoracic surgeon. Its incidence is estimated at 6 to 7 per 100,000 males and 1 to 2 per 100,000 females annually. Initial management generally consists of tube thoracostomy, which is successful in most patients, or less commonly observation if the SP is less than 25 per cent, or occasionally aspiration of the air space. Up to 20 per cent of patients with SP may eventually require surgical treatment because of a recurrent pneumothorax, persistent bronchopleural fistula, or failure to fully expand the lung. Previously this has been accomplished through a formal thoracotomy. With the relatively recent introduction of the camera chip and the advent of Video-Assisted Thoracic Surgery this technology may now be used to manage SP.

Technique

All VATS procedures were performed under general anaesthesia. Double lumen endotracheal intubation was used to allow contralateral ventilation of 1 lung and ipsilateral collapse of the other lung. Pulse oximetry and arterial pressure monitoring were used in all. Patients were positioned in a lateral decubitus position and draped in standard fashion for formal thoracotomy. Video optics consisted of a 10 mm, zero degree panoview diagnostic thoracoscope, a camera and camera head and video monitor. An initial incision 15 to 20 mm in length was made in the sixth intercostal space for insertion of the thoracoscope, after digital exploration of the cavity had been performed to verify lung deflation and check for absence of lung adhesions. Following insertion of the scope and visualisation of the thoracic cavity further incisions were made. Generally only one more incision was required - a 10 cm incision in the 4th intercostal space. No ribs were divided and rib separation was minimal. This allowed use of some conventional instruments and staplers without the necessity for lung retractors. Specially adapted instruments were also used. Blebs or bullae were excised using either an Endo-GIA 30 stapler (endoscopic stapler inserted through a 10 mm port) or GIA 90 stapler (standard stapler for open surgery). Then an apical pleurectomy was performed from the 4th intercostal space both anteriorly and posteriorly. Indication for operation included recurrent pneumothorax in 20 (51.3 per cent), persistent pneumothorax in 16 (41.0 per cent) and bilateral pneumothorax in 3 (7.7 per cent). The 2 therapeutic strategies were apical pleurectomy in all procedures (42) and blebectomy/bullectomy in 38 (90 per cent). Three patients had staged bilateral procedures.

Materials and Methods

Between 1 January 1992 and 1 July 1995, 39 consecutive patients with spontaneous pneumothorax have been managed with VATS. There were 24 males and 15 females. Age ranged from 17 to 84 yr (mean 36.7). All patients gave informed consent and were advised of the possibility of converting the procedure to formal thoracotomy. Indication for operation included recurrent pneumothorax in 20 (51.3 per cent), persistent pneumothorax in 16 (41 per cent) and bilateral pneumothorax in 3 (8 per cent).
was placed through the first incision the lung was expanded under endoscopic visualisation and the other incision was closed in standard fashion.

Results

There was 1 hospital death (hospital mortality 2.5 per cent) in an 84 yr old patient who following resection of a ruptured emphysematous bulla developed an empyaema and septicaemia following a prolonged post-operative air leak. Three other patients, all with severe chronic obstructive pulmonary disease, required intensive care stay, all of whom had excision of emphysematous bullae. One patient (2.5 per cent) required conversion to formal thoracotomy because of camera failure. One patient required repeat VATS 4 h post-operatively for bleeding, a bleeding point on the chest wall where adhesions had been divided was easily controlled with diathermy. Mean post-operative chest tube duration was 2.7 days (range 0.5-9 days) and mean post-operative hospital stay was 5.1 days. During follow up (mean 18 months, range 1-31 months) there has been no recurrence of pneumothorax in this series.

Discussion

Spontaneous pneumothorax may be subdivided into primary SP occurring in young otherwise healthy adults, caused by rupture of a subpleural bleb, or secondary SP, which occurs in middle aged and elderly patients with underlying lung disease, commonly bullous emphysema. Approximately 80 per cent are primary SP and 20 per cent are secondary SP. The aim of any treatment is to fully expand the lung, restore pulmonary function, and to prevent recurrence of the pneumothorax. Initial management may consist of observation (if small), aspiration or tube thoracostomy which is all that is required in most patients. Chemical sclerotherapy is still used as a second line treatment. However, disadvantages include technical difficulty of instillation, severe pain and a significant rate of recurrence. The timing of more invasive but also more definitive, therapy is still somewhat controversial.

Surgery is generally indicated in those with persistent air leaks, recurrent SP, contralateral SP or at initial presentation in certain high risk groups, i.e. aviators. The principles of surgical intervention are to manage the lung, i.e., the source of air leak and to manage the pleural space. Thus, bullae or blebs are resected or ligated, and a mechanical pleureodesis can be performed, giving a recurrence rate of 2.5 per cent. When pleurectomy is performed this recurrence rate is reduced to less than 1 per cent. These results have been accomplished using a formal thoracotomy. Thoracoscopy was introduced over 80 yr ago for the diagnosis of pleural disease. Recent advances, chiefly in video-camera technology, which allow many individuals to view the procedure simultaneously, combined with the development of percutaneous endoscopic instruments, have resulted in expansion in the role of thoracoscopy and the advent of video-assisted thoracic surgery (VATS). The major cause of morbidity in all thoracotomies is the incision, and spreading of the ribs.

Video-assisted thoracic surgery provides access to the thoracic cavity by a less invasive approach. Major muscles are not divided, ribs are not spread with consequent trauma to the neurovascular bundle, and morbidity is minimised.

While there are potential advantages of using VATS in the surgical management of SP it is important that the efficacy of the operation is not compromised. Some authors have advocated using a pure endoscopic procedure without a limited incision, but they have had recurrences even on short term follow up. While this pure endoscopic approach may be cosmetically more appealing we believe that it may compromise the adequacy of pleurectomy and thus we have continued to make a small incision which allows us to use some conventional instruments and thus perform a similar pleurectomy to that obtained with the open method. We performed parietal pleurectomies on all patients because this has been historically associated with the lowest incidence of recurrent pneumothorax. We believe that this is the most important step in the procedure. We are encouraged by not having any recurrence in this series to date, but our follow up at a mean of 18 months is still too short to establish firm conclusions about the long term efficacy of this procedure. However, since the procedure mimics the procedure performed at thoracotomy, we would expect similar long term results with respect to recurrence.

These early results of video-assisted pleurectomy are encouraging. The hospital stay has been reasonably short, despite our caution because of it being a new procedure, post-operative pain has been minimal and the cosmetic result is satisfactory. There has been few complications, and these have been limited to the group with secondary SP, and the procedure appears to be safe.

In conclusion, video-assisted pleurectomy for managing spontaneous pneumothorax is feasible. Early results with this procedure are comparable to those with the open method. We believe that the long term results of video-assisted pleurectomy using a limited incision will also compare with the open method. Proof of this hypothesis and this procedure's place in thoracic surgical practice will require careful audit of its results over the next decade.

References

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