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VIDEO-ASSISTED MINIMAL INVASIVE THORACIC SURGERY:A REVIEW OF 81 SURGICAL PROCEDURE

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SUMMARY

Video-assisted minimally invasive thoracic surgery (VAMIS) is a new procedure that allows visualisation of and access to the intrathoracic organs without a thoracotomy incision. 81 consecutive patients are operated with this technique (group I n=66; group II n=15). We recently performed 54 pulmonary wedge and bulla excision using videothoracoscopic techniques. Average age 30.5 years (range 15 to 67 years). Indications were pneumothorax in 54 patients, small peripheral solitary nodule in 1, diffuse pulmonary infiltrate in 1, neurinoms in 3, pleural malignancies in 2, pulmonary cyst in 1, pleural thickening in 1, mediastinaly masses in 2, pleural fibrom in 1, pleural metastases in 1, pulmonary metastases in 13. There were no operative death. Intraoperative complications were 8 intercostal vessels bleeding, one patient required blood transfusion. Average hospitalisation was 7.2 days. Patients undergoing video-assisted thoracic operations seem to have reduced postoperative pain, shorter hospitalisation, and quicker recovery times. This new modality appears to have beneficial value for patients, but further evaluation and prospective studies are indicated.

Zusammenfassung:

Eine neu Methode des video-assistierten thorakoskopischen Operieren erlaubt die Betrachtung der Thoraxhöhle und Eingriffe an den inneren Thoraxorganen ohne Thorakotomie.

81 Patienten wurden minimal invasiv chirurgisch behandelt, von diesen 66 Patienten der Gruppe 1 und 15 patienten der Gruppe II zugeordnet. Das Durchschnittsalter betrug 30.5 Jahre (zwischen 15 und 67 Jahren). 54 Patienten unterzogen sich Keil und Bullaresesektionen.

Folgende Indikationen wurden minimal invasiv chirurgisch (MIC) behandelt: Pneumothorax 54, Kleiner peripherer Rundherd 1, Diffuse pulmonale 1, Neurinom 3, Pleuramalignome 2, Lungenzysten 1, Pleuraverdickung 1, Mediastinale Raumforderungen 2, Pleurafibrom 1, Pleurametastasen 13. As gab

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keine Todesfalle. Intraoperativ traten folgende Komplikationen auf: 8 Blutungen aus Intercostalgefassen. Ein Patient benötigte eine Bluttransfusion. Die durchschnittliche Krankenhausaufenthaltsdaurer betrug 7,2 Tage. Patienten die video-assistiert thorakoskopissch operiert wurden schienen unter weginer postoperativ bedingten Schmerzen zu leiden, hatten einen kürzeren Krankenhausaufenthalt und eine schnellere Rekonvaleszens.

Die neue Methode scheint einen grossen Vorteil fur den Patienten zu bringen. Weitere Studien sind notwendig.

INTRODUCTION

Diagnostic and therapeutic thoracoscopies were introduced 80 years ago (1). Despite this early start, thoracoscopy never gained wide acceptance and was used only sporadically in a limited fashion. Over the last several years, general thoracic surgeons have been developing a minimally invasive approach to the chest. Video-assisted thoracic surgery is an extension of the time-honoured diagnostic approach to mediastinal, pulmonary and pleural disease, thoracoscopy. With the advent of improvements in instrumentation and optics, endoscopic procedures have continued to be performed with increased frequency. Video-assisted minimal invasive thoracic surgery has been no exception. Superior endoscopic image with a broader field and improved resolution have expanded the role of conventional endoscopy in a variety of medical and surgical fields (2,3,4). Thoracotomies now are accomplished though smaller and less disfiguring incisions which spare the major muscles of the chest. Small axillary thoracotomies, muscle-sparing lateral thoracotomies, and CT-directed minithoracotoies all have improved the postoperative management's and decreased postoperative complications for many patients. VAMIS not only permits complex intrathoracic operations to be performed, but avoids making the traditional thoracotomy incision with its inherent morbidity. Postoperative pain is markedly reduced, intensive medical services are minimised, hospitalisation is shortened, and recovery time is decreased (5,6).

MATERIAL AND METHODS

Patients

Eighty-one patients underwent video-assisted minimal invasive thoracic surgery at the Lungenklinik Heckeshorn, Department of Thoracic Surgery between January 1992 and May 1993. Patients divided into two different groups; The first group(n=66) were managed with VAMIS between January 1992 and February 1993, and the second group (n=15) were have been treated by this approach from March 1993 to May 1993. There were 35 male (44 %) and 46 female patients (56 %) with a mean age of 30.5 years (range, 15 to 67 years). The indications for thoracoscopic surgery were undiagnosed pleural opacity,

pneumothorax, bulla dedected on the CT, with suspected metastatic pulmonary spread from known visceral malignancies, investigation of a peripheral and mediastinaly mass visible on the chest roentgenogram. Every other patient in this series was informed that a conventional thoracotomy might be necessary.

Operative Technique

After institution of general anaesthesia, the patient was intubated with a double lumen endotracheal tube and placed in a lateral decubitus position. A 2.0 cm incision was made in the mid-axillary line in the seventh intercostal space. After single-lung ventilation was instituted, an open-ended cylindrical metal trocar was introduced through the incision and a rigid video thoracoscope was inserted. After thoracoscopic examination determined where the manipulation and excision was to be performed, additional intercostal incisions were placed for instrument manipulation. Generally two more incisions were required, both in the fifth intercostal space at the anterior and posterior margin of the scapula. Generally tree ports were used. An attempt was made to keep these incisions on an imaginary standard thoracotomy incision so if a thoracotomy was required, the small thoracoscopy incisions could be incorporated into one thoracotomy incision. Lung clamps were than introduced through the upper incisions, and the lung and thoracic cavity were completely inspected.

After pulmonary lesion detection, adjacent lung was grasped with a variety lung clamp, and a wedge excision was performed using a percutaneous stapling device (EndoGIA). Localisation of the area involved by diffuse lung disease was similarly determined by computed tomography, perfusion scintigrapy and direct visualisation. Once the lesion was identified, the wedge excision was performed near the edge of the disease process to include a portion of normal lung parenchyma in the resected specimen. The specimen was removed through one of the incisions and sent for histopathologic examination.

The visceral pleura in patients with pneumothorax was thoroughly inspected, especially in the apex of upper lobe and superior segment of the lower lobe. After identification of the air leak and bulla, wedge excision was performed with the endostapler. Pleurectomy or dry gauze abrasive pleurodesis was then performed. The entire parietal pleura including the diaphragm and mediastinum, was rubbed. After then a pair of chest tube was inserted and lung re expanded.

RESULTS

Indications of the video-assisted minimally invasive procedures are listed in table 1. All the patients had a preoperative computed tomographic scan, and perfusion scintigraphy. All the patients (except pneumothorax and bulla) had a bronchoscopy. Operating time for group I. patients ranged from 40 to 190 minutes (median, 91 minutes), and group II. patients ranged 45 to 115 minutes

(median, 69 minutes). Mean operating bleeding was 125 ml for group I, minimum 20 ml and maximum 800 ml. Intraoperative bleeding ranged 20 to 500 ml (median 127 ml). Postoperative pain was managed with either oral and rectal nonsteroidal antiinflammatory in all patients for 2 to 3 days routinely (Pritramid 15-30 mgr injection every 4-6 hours. Paracetamol 1-2 gr./day as needed).

Table 1. Video-Assisted thoracic surgery:Indication for operation.

Indication	groupe I (n)	group II (n)	Total	Percentage %
Pneumothorax	44	10	54	66.5
Neurinom	2*	1	3	3.75
Pleural carcinom	2	-	2	2.5
Pulmonary cyst	1	-	1	1.25
Pleural thickening	1	-	1	1.25
Pleural cyst	1*	-	1	1.25
Mediastinal mass	1*	1	2	2.5
Pleural fibrom	1	-	1	1.25
Pleural metastases	1	-	1	1.25
Pulmonary met.	11	2	13	16.-
metastases	(5)*	(1)*		
Sarcoidosis	-	1	1	1.25
Hamartom	1	-	1	1.25
TOTAL	66	15	81	100

* The diagnosis confirm at thoracothomy.

If it necessary, parenteral narcotics were given for the remainder of the hospitalisation (Intravenous morphine sulphate, 3 mgr/as needed).

Chronic pain syndrome did not developed in any patient. Parenteral pain medication was seldom required after chest tube removal.

During this same period, 2 patients undergoing thoracoscopic exploration for neurinom, 1 patient undergoing VAMIS for pleural cyst, one patient for mediastinal mass, and 6 patients for pulmonary metastases went on to

thoracotomy and resection because the margins were considered to be inadequate. The reasons for conversion tothoracotomy are listed in Table 2. The interstitial lung disease was benign in one patient (sarcoidosis). Fifty-four patients were treated with minimally invasive surgery for pneumothorax and blebs.

Table 2. Video-Assisted Thoracic Surgery:Reasons for Conversion to Thoracotomy.

Causes	Group I	Group II
Unable to confirm the diagnosis	5	1
Unable to find lesion	1	-
Lesion too large to remove	2	-

The wide variety of potential applications of VAMIS is represented in table 3. Wedge resection and bulla resection represents the most common procedure that performed (54 patients) for pneumothorax group. For 11 patients which having benign or metastatic malign nodules were resected. Totally 54 patients had an accompanying parietal pleurectomy from the apex of the chest to the fifth rib. There has been no intraoperative and postoperative mortality. All the patients were extubated immediately after the operation and observed intensive care unit for 2 or 3 days. There were 9 complications intraoperative period. All these patients had bleeding from intercostal vessels. Air leak is seen as the most frequent complication at postoperative period (Table 3). Residue pneumothorax has only been reported in 4 cases. Chest tubes were used in all procedures. Chest tube irritation and infection is seen rearly. Only one patient needed rethoracotomy for persistent air leak. Antibiotic drugs were administered during the operation and continued for approximately 5 additional days.

The postoperative hospitalisation period ranged between 5 and 15 days (mean 7.2). Follow-up period was between 2 and 13 months. All the patients had resumed their normal activity with 3 weeks.

Table 3. Video-Assisted thoracic Surgery:Complications.

Complication	Group I intraoperative	Group I postoperative	Group II intraoperative	Group II postoperative
Bleeding (intercostal vein)	2	-	2	-
Bleeding (intercos.artery)	3	-	1	-
Bleeding (required transf.)	1	-	-	-
Rezidüv Pneumothorax	-	2	-	2
Rethoracotomy (bleeding)	-	1	-	-
Air leak)5 days	-	4	-	2
Irritation	-	1	-	-
Wound infection	-	1	-	1
TOTAL	6	9	3	5

DISCUSSION

Video-assisted thoracic surgery, at this time appears to have expanding applications in the field of thoracic surgery and it is a new and existing adjunct in the management of intrathoracic disease, full potential of which has not yet been fully realised. It requires a methodical and well thought out approach, as well as extreme patience on the part of thoracic surgeon. There times that VAMIS can be more tedious and time cosuming than open thoracotomy. Procedures such as lung biopsy; bullous ablation; resection of benign and malignant primary tumours of the lung; recurrent pneumothorax; metastatic lung tumours; bronchial cysts; and neurogenic tumours; pericardial window; thoracic sympathectomy; truncal vagotomy; lobectomy; and pleural sclerosis for recurrent malignant effusions have already been performed using this technique(3,5,7,8). Improved visualisation of the intrathoracic anatomy is one of the primary advantages of this method. Image magnification results in improved resolution that allows tedious percuteneous dissection. Presently, however, VAMIS should be used only in a prudent and highly selective manner for primary malignant disease of the lung. Recognising that thoracotomy and wedge excision for metastatic pulmonary nodules is controversial treatment (2,9). We also believe

that when wedge excision is incidated, thoracoscopic wedge excision may be inadequate treatment. This method may be therapeutic in a specific group of patients such as those with compromised pulmonary function, who would not tolerate thoracotomy. Lung biopsy, resection of pleuralbased masses can all be accomplished safely with this technique (4). Some investigators demonstrated that in patient with metastatic colon adenocarsinoma to the lungs, there was a 9 % incidence of malignant nodules found at thoracotomy that were not detected by preoperative computed tomography (1). Because video-assisted surgery limits pulmonary palpation, these nodules most likely would not have been detected and eventually would have resulted in reduced long-term survival. Hazelrig and co-workers pointed that more than 20 % of VAMIS cases were eventually converted to a thoracotomy (2). In our study group, six pulmonary metastases were converted to thoracotomy for further resection (e.g., lobectomy, segmentectomy). Totally the incidence of conversion to thoracotomy is 12.5 % Reasons for thoracotomy include inability to find a lesion, the lesion too large or in a difficult location for thoracoscopic resection.

Patients undergoing video-assisted pulmonary wedge excision for solitary pulmonary nodule (SPN) must be highly selected. Preoperative evaluation should include chest roentgenograms, computed tomography, radio nuclide imagines, tumour markers, and pulmonary function tests. The nodule should have a smooth contour, be less than 3.0 cm in diameter, and be located near the periphery of the lung (1,3). We have only one solitary pulmonary nodule (hamartome). Diffuse interstitial lung diseases are well suited for thoracoscopic wedge excision to confirm tissue diagnosis. Videoscopic excision obtain an adequate sample of tissue for both histology and microbiology examination (1,4,9). There was a sarcoidosis histopathologicaly after pulmonary excision. Preoperative diagnosis was considered a fibrous lung disease in this patient.

Patients with pneumothorax are able to undergo VAMIS and wedge excision with pleurodesis only if prior thoracotomy has not been performed (1,5,10). When indicated, however, inspection of the entire visceral pleura should be routinely performed to ensure identification of all blebs, especially in the apex of the upper lobe and in the superior segment of the lower lobe. When VAMIS are performed, major muscles are not divided, ribs are not spread, dislocated, or broken, and ligaments, nerves and blood vessels are not severely damaged (5,6,9,10). According to Friedel there were no intraoperative or postoperative complications in their patients. And also Miller reported no intraoperative complications and operative deaths (1,11). Their single postoperative complication was a prolonged air leak. There were 6 cases suffered from prolenged air leak in our patients.

The advantages of the thoracoscopic surgical treatment are obvious:rapid full expansion of the lung, decreased postoperative pain, short postoperative

hospital stay, and early return to normal activity. Median hospitalisation time nearly the same the other series (3,4,7). Pain, however, was less than after standard thoracotomy.

Video-assisted thoracic surgery is still in its embryonic stages of development. Patient comfort and recovery have been gratifying. Future prospective studies with long-term follow-up are necessary to determine if early enthusiasm is long lasting.

REFERENCES

1- Miller DL., Allen MS., Trastek VF., Deschamps C., Pairolero PC.:Videothoracoscopic Wedge Excision of the Lung. Ann Thorac Surg 54:410-4, 1992.

2- Hazelrigg SR., Nunchuck SK., LoCicero J.:Video Assisted Thoracic Surgery Study Group Data. Ann Thorac Surg 56:1039-44, 1993.

3- Lo Cicero J.:Minimally Invasive Thoracic Surgery, Video-assisted Thoracic Surgery and Thoracoscopy. Chest 102:330-1, 1992.

4- Landreneau RJ., Hazelrigg SR., Ferson PF., Johnson JA., Nawarawong W., Boley TM., Curtis JJ., Bowers CM., Herlen DB., Dowling RD.:Thoracoscopic Resection of Pulmonary Lesions. Ann Thorac Surg 54:415-20, 1992.

5- Kaiser D.:Videoassistiertes thorakoskopisches operieren ist bereits gut etabliert. Med Report 18:1-4, 1993.

6- Wakabayashi A.:Expanded applications of diagnostic and therapeutic thoracoscopy. J Thorac Cardiovasc Surg 102:721-3, 1991.

7- Coltharp WH., Arnold JH., Alford WC., Burrus GR., Glassford DM., Lea JW., Petracek MR., Starkey TD., Stoney WS., Thomas CS., Sadler RN.:Videothoracoscopy:Improved Technique and Expanded Indications. Ann Thorac Surg 53:776-9, 1992.

8- Lewis RJ., Caccavale RJ., Sisler GE.:Imaged Thoracoscopic Surgery:A new Thoracic Technique for Resection of Mediastinal Cysts. Ann Thorac Surg 53:318-20, 1992.

9- Lewis RJ., Caccavale RJ., Sisler GE., Mackenzie JW.:One Hundred Consecutive Patients Undergoing Video-Assisted Thoracic Operations. Ann Thorac Surg 54:421-6.

10- Nathanson LK., Shimi SM., Wood RAB., Cuschieri A.:Videothoracoscopic Ligation of Bulla and Pleurectomy for Spontaneous Pneumothorax. Ann Thorac Surg 52:316-9, 1991.

11- Friedel G., Linder A., Toomes H.:Selective Video-Assisted Thoracoscopic Sympathectomy. Thorac. Cardiovasc.Surgeon 41:245-48, 1993.