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The autoclavable semirigid thoracoscope: the way forward in pleural disease?

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ABSTRACT

Background: Medical thoracoscopy is a valuable tool in the investigation and management of pleural disease. It has considerable advantages over conventional blind pleural biopsy and video-assisted thoracoscopic surgery (VATS). Despite this, the practice of this technique in the UK is limited. Most operators use the rigid thoracoscope, which may be an unfamiliar instrument to respiratory physicians. A semirigid thoracoscope is available but its use has not been possible in the UK as it requires sterilization with ethylene oxide, which is not approved in this country. We present our experience with the first ever autoclavable semirigid thoracoscope.
Methods: Medical thoracoscopy using the new instrument was performed in 56 patients between June 2004 and May 2006. All patients had been referred with a unilateral pleural effusion of unknown aetiology, where blind pleural aspiration had failed to yield an answer. Diagnostic samples were taken and talc poudrage performed where appropriate.
Results: The instrument was easy to handle and excellent views were obtained. Histologically adequate biopsy samples were obtained in 54 patients. The combination of clinical features, CT findings and thoracoscopic biopsy enabled a definite diagnosis in 49 (90.7%) of these. There were no complications.
Conclusions: The autoclavable semirigid thoracoscope has immense potential in the diagnosis and management of pleural disease. Its diagnostic yield in pleural disease is comparable to the conventional rigid thoracoscope. It is similar in design to the fibreoptic bronchoscope and respiratory physicians should be able to adapt to its use easily. It is also compatible with existing video processors and light sources available in most endoscopy suites. The fact that this instrument is autoclavable should open the field for its use in the UK as well as in other countries.

The accurate diagnosis of pleural disease can present a considerable challenge. After thoracocentesis and/or blind pleural biopsy, approximately 25 to 40 percent of pleural abnormalities remain undiagnosed.[1][2] Medical thoracoscopy refers to the examination of the pleural space in a nonintubated patient under conscious sedation.[3] It enables inspection of the pleural surfaces, taking of pleural biopsies under direct vision, therapeutic drainage of effusions and pleurodesis in one sitting. It enables a positive diagnosis in over 90 percent of pleural effusions.[4][5] It is very well tolerated and there is no requirement for a general anaesthetic, as opposed to video assisted thoracoscopic surgery (VATS).

Despite its obvious benefits, the practice of thoracoscopy in the United Kingdom- and indeed in most parts of the world- is not widespread.[6][7] A reason suggested for this is that most respiratory physicians are not familiar with the use of the more commonly used rigid thoracoscope.[8] The procedure has been attempted with the flexible bronchoscope but this is difficult to manipulate within the pleural cavity and results have been inferior to the rigid instrument.[9][10]

The semirigid thoracoscope was developed in an attempt to combine the best features of the flexible and rigid instruments.[3] However the use of this instrument in the United Kingdom has not been possible as it requires ethylene oxide sterilization which is not allowed in this country.

We present our experience with the first-ever autoclavable semirigid thoracoscope. This instrument is compatible with the video processors and light sources available in most bronchoscopy units

MATERIALS AND METHODS

This was a single centre study and included consecutive patients referred over an eighteen-month period with a unilateral pleural effusion and a negative or unsuccessful blind pleural fluid aspirate. All patients had a contrast CT scan of the thorax before entry. Patients with 'highly suspicious' pleural fluid cytology were not entered into the study unless the cytological diagnosis was at variance with clinical features and CT findings. All patients with merely 'suspicious' or 'normal' cytology were included in the study group.

The instrument employed was a prototype semirigid thoracoscope (LTF-160Y1; Olympus; Tokyo, Japan; supplied by Olympus KeyMed UK; Southend-on-Sea). It has controls similar to that of a flexible fibreoptic bronchoscope. The total length of the instrument is 52cm, with the insertion portion being 27cm long. Of this, the proximal 22cm are rigid and the distal 5cm flexible. The external diameter of the insertion portion is 7mm. The tip is bendable in one plane, with an upward angulation of 160° and downward angulation of 130° (Figure 1). The 2.8mm inner working channel accommodates the biopsy forceps and other instruments. It has YAG 810nm diode laser and high frequency compatibility. It is compatible with the EVIS EXERA 160 and 145 and EVIS 100 and 140 Series video processors and light sources (Olympus). Sterilization is by autoclaving.

Procedure

All procedures were performed by a single operator (MM) in the endoscopy suite of our institution (Royal Preston Hospital; Fulwood; Preston; Lancashire; UK; PR2 9HT). Informed consent was obtained in writing. A single puncture technique was used. Full surgical aseptic technique was adhered to. The lateral decubitus position was employed, with the diseased side up. All patients received combination sedation with intravenous midazolam and alfentanil; oxygen saturations and heart rate were monitored throughout. Patients received supplementary oxygen by nasal cannulae routinely.

Lignocaine was employed for local anaesthesia. The presence of fluid was first confirmed by aspiration- if this failed, the patient's position was changed and aspiration attempted again. After fluid was obtained, an incision was placed in the midaxillary line and a 10mm trocar inserted. The thoracoscope was then inserted and following drainage of all fluid to dryness, the pleural surfaces were inspected. Pleural fluid and parietal pleural biopsy samples were obtained where indicated. Between 6 and 10 biopsies were taken per patient. An FB-240K oval fenestrated biopsy forceps (Olympus) was used. Talc poudrage with 5g sterile talc (Novatech) was done where appropriate. A 24F chest drain (Portex) was inserted through the trocar. All patients underwent a chest x-ray afterward. The chest tube was removed as soon as full expansion of the lung was confirmed radiologically.

The operator recorded the image quality, the presence of pleural abnormalities on inspection, duration of chest drainage after the procedure, and the occurrence of complications.

RESULTS

Between June 2004 and May 2006, 60 procedures were attempted on 59 patients. Three procedures were abandoned before insertion of the trocar as no fluid was obtained on initial aspiration despite multiple attempts. Hence, 57 procedures were performed on 56 patients. The indication in all the procedures was a unilateral pleural effusion of unknown cause, with no diagnosis on blind pleural fluid aspiration. The median age of the patients was 68.5 years. The range of ages was 20 to 90 years, with 19 patients aged 75 years or above. There were 37 men and 19 women.

The thoracoscope was found to be easy to handle. The image quality was uniformly excellent (Figure 2) and fluid was suctioned without difficulty. In two patients, extensive adhesions precluded satisfactory inspection and hence adequate biopsies could not be taken. Several other patients had moderate adhesions but the flexible tip was easily manoeuvred round them, enabling inspection and biopsy. Adequate inspection of the pleural cavity was undertaken in 54 patients- in all but one of these, histologically satisfactory biopsy samples were obtained. This patient, who was only the third to be examined, underwent a repeat procedure at which a satisfactory sample was taken.

In the end, satisfactory biopsy samples were obtained in 54 patients. The combination of clinical features, contrast CT scanning and thoracoscopic inspection/biopsy enabled a definite diagnosis in 49 of these, giving a positive yield of 90.7%. (Table 1)

Diagnosis	**Frequency (total=54)**
Mesothelioma	15
Bronchogenic carcinoma	8
Metastatic carcinoma	7
Tuberculosis	3
Non-Hodgkin's lymphoma	1
Sarcomatoid carcinoma of pleura	1
Empyema	2
Inflammation	7
Fibrosis/Fibrin	3
Pleural plaque	1
Normal pleura	1
No diagnosis from thoracoscopy	5

Table 1- Final diagnosis in patients undergoing thoracoscopy with adequate sampling

In the two patients found to have empyema, this diagnosis had not been suspected before thoracoscopy and was only established after purulent fluid was obtained with the instrument. In all the patients with a non-malignant diagnosis on histology, there was no reason to suspect malignancy on clinical or CT grounds and hence no indication for further investigation with thoracotomy.

The patients with histological diagnoses of inflammation, fibrosis and normal pleura had a prior history suggestive either of infection or of asbestos exposure, except one who was known to have rheumatoid arthritis. The final clinical diagnoses in these patients were therefore post-pneumonic effusion, benign asbestos-related pleural effusion and rheumatoid effusion. The subsequent clinical course of these patients has given no cause to believe otherwise.

With reference to the five patients where no diagnosis was obtained from thoracoscopy despite satisfactory sampling:

- The first patient had considerable adhesions. Metastatic adenocystic salivary gland carcinoma was ultimately diagnosed on ultrasound-guided pleural biopsy;
- In the second patient, there was a prior history of colorectal carcinoma. Metastatic colorectal carcinoma was ultimately diagnosed by gastrointestinal and gynaecological investigations;
- The third patient was known to have had gastric non-Hodgkin's lymphoma in the past. With no answer forthcoming from thoracoscopy, a clinical decision to treat for relapsed lymphoma was made. With treatment, the patient's pleural disease completely resolved.
- One patient was diagnosed with non-small cell lung cancer by transbronchial needle aspiration (TBNA).
- The remaining patient proceeded to a VATS biopsy, which was also negative. He eventually underwent a thoracotomy. Adenocarcinoma of the lung was diagnosed.

All patients tolerated the procedure well. Nobody required pharmacological reversal of sedation. There were no complications and no mortality. The chest drain was removed within 24 hours in the majority and 48 hours in all patients.

DISCUSSION

When faced with the need to obtain a pleural biopsy specimen, many UK physicians resort to a blind procedure with the Cope or Abrams needle. Blind pleural biopsy has a notoriously poor yield and patients in whom no result is obtained are often referred for a VATS procedure.[1][2] This is expensive and requires general anaesthesia with single lung ventilation and the use of an operating theatre. In the United Kingdom access to VATS is limited due to the relatively small number of surgeons who practise it and often patients have to wait unacceptably long for a procedure. In addition, patients with advanced pleural disease are often frail with multiple comorbidities and may not be suitable for a general anaesthetic in the first place.

The British Thoracic Society (BTS) recommends thoracoscopy *or* image-guided biopsy (using CT or ultrasound) as the next line of investigation in the event of a nondiagnostic blind pleural aspirate.[11] CT-guided biopsy is safe, with the only reported complications being local haematoma and minor

haemoptysis. It was found to be quite sensitive (87%) in a series of 50 patients.[12] Unfortunately, it does not afford the opportunity for drainage of pleural fluid or pleurodesis in the same sitting. Indeed, the BTS recommends thoracoscopy in the event of image-guided biopsy not yielding an answer. Medical thoracoscopy is extremely safe, with major and minor complication rates of 1.9 and 5.6 percent respectively in one series.[13] Death as a complication is extremely rare, with only one fatality out of 8000 patients in one series.[14] Thoracoscopy also offers the opportunity to perform diagnostic sampling, aspiration of fluid and talc poudrage in the same setting. Inpatient stay is remarkably short.

However, the practice of medical thoracoscopy in the United Kingdom remains limited, for reasons already discussed. Indeed a 2004 survey showed that only 14% of UK respiratory physicians had any exposure to it at all, and only 6% had performed more than 10 procedures.[6]

The semirigid instrument used in our study may offer a way forward. It appears to have some advantages over the rigid thoracoscope. With its similarity in design to the flexible bronchoscope, it is hoped that chest physicians will be able to adapt to its use without too much difficulty, although formal training is essential.[8] It is easy to manoeuvre within the pleural cavity. It is compatible with standard biopsy forceps and can be used with the processors and light sources found in most endoscopy rooms.

Undoubtedly, the biopsy size from the rigid thoracoscope is larger than with the semirigid instrument. This has been quoted as a reason for the former's superiority. However, smaller biopsy size does not necessarily translate to inferior diagnostic yield- indeed, our results, as well as those of other operators, have been excellent.[3][15] The fact that the instrument we have used can be autoclaved is a huge bonus, and it opens the way for its wider use in the United Kingdom and abroad.

Overall, there is immense potential for the use of the autoclavable semirigid thoracoscope in the speedy and accurate diagnosis and effective management of pleural disease.

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COMPETING INTERESTS
None.

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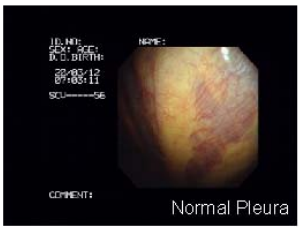
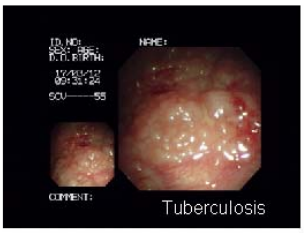
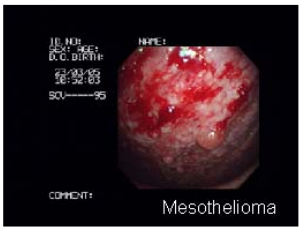
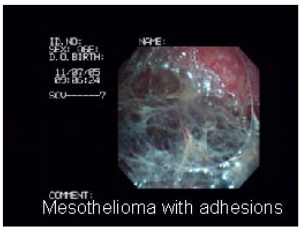
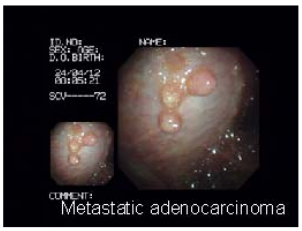
Figure 1











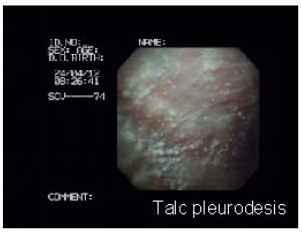


Figure 2