Minithoracoscopy*
A Less Invasive Approach to Thoracoscopy
Gianfranco Tassi, MD; and Gianpietro Marchetti, MD, FCCP

Study objectives: To evaluate minithoracoscopy using 3-mm instrumentation for diagnosis of pleural effusions. In the initial phase of the study, minithoracoscopy was used only for small loculated effusions not accessible with standard-sized endoscopes. Indication was later extended to larger nonloculated effusions that could have been examined using conventional thoracoscopy. Patients: A total of 30 patients were studied, including 12 patients with nonloculated effusions of undetermined etiology, 17 patients with loculated effusions, and 1 patient with bilateral effusion. Technique: The double-entry site technique was used with placement of two trocars, ie, one for the telescope and one for the biopsy forceps or accessory instruments. All procedures were performed under local anesthesia with mild sedation (midazolam). Results: Minithoracoscopy provided high diagnostic yield (93.4%). Visualization using minithoracoscopy instrumentation was equal to that obtained using conventional thoracoscopy instrumentation. Tolerance and cosmetic results were good. Conclusions: Minithoracoscopy is safe and effective for routine diagnostic applications.

Key words: diagnostic thoracoscopy; minithoracoscopy; pleural effusions

In our everyday experience, we have observed that approximately 10% of pleural effusions are too small for endoscopic examination with a standard 7-mm thoracoscope. To solve this problem, we have used a minimally invasive technique with smaller telescopes designed for laparoscopy. After initial success on small loculated effusions, we extended the use of this technique to larger effusions often in lieu of conventional thoracoscopy. The term minithoracoscopy has been chosen in order to emphasize the minimally invasive character of the procedure, and to acknowledge the fact that the original technique was developed by Malthaner and Inculet1 and was based on experience with minilaparoscopy,2,3 which is now in widespread use.4

Materials and Methods

Instrumentation
The basic components for minithoracoscopy are two 3.8-mm trocars, one 3.3-mm telescope, and one 3.0-mm biopsy forceps. The key instrument is the telescope (Karl Storz Endoskope; Karl Storz; Tuttlingen, Germany), which is 25 mm in length and has viewing angles of 0° and 45°. Connection of the telescope to a videocamera with a zoom lens allows image enlargement. All components are reusable after autoclave sterilization at 121°C for 15 min.

Technique
The minithoracoscopy technique is basically the same as the conventional medical thoracoscopy technique with two entry points.5 Two trocars, one for the telescope and one for biopsy forceps or accessory instruments, are positioned in two adjacent intercostal spaces or in the same intercostal space at a distance of 4 cm apart (Fig 1). The procedure is carried out under local anesthesia with sedation using 2 mg of midazolam immediately before the examination and up to 10 mg as needed during the examination. The patient is placed in the lateral decubitus position on the unaffected side. Trocar placement technique depends on the volume of the effusion. For small loculated effusions, entry points are determined by ultrasonography, and pneumothorax is induced on the endoscopy table. For larger nonloculated effusions, pneumothorax is usually induced under fluoroscopic control in a prior procedure as for conventional thoracoscopy.6

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After thorough inspection of the pleural cavity, biopsy samples are obtained under visual control through the second trocar, either from lesions (e.g., nodules with a neoplastic appearance) or from multiple areas of the parietal pleura if there are no visible lesions. If indicated, lung biopsies can be performed using electrically insulated coagulating forceps. At the end of the procedure, a small drain (8F) should be inserted for a few hours. The drain can be removed as soon as chest radiography demonstrates complete re-expansion of the lung.

Patients

Thirty patients (21 men and 9 women; age range, 30 to 81 years) underwent minithoracoscopy between January 2000 and December 2001. The indication for minithoracoscopy was nonloculated effusions of undetermined etiology in 12 patients, loculated effusion in 17 patients, and bilateral effusion in 1 patient. Minithoracoscopy was initially used only for loculated effusions and subsequently for larger nonloculated effusions that could have been examined using conventional thoracoscopy.

RESULTS

Visualization using minithoracoscopic instrumentation was excellent allowing thorough inspection of the pleural space. Figure 2 shows the same lesions observed using minithoracoscopy and conventional thoracoscopy. There were no complications in this series. Suture was never required for closure, and scarring was minimal. Based on evaluation using a patient questionnaire, tolerance was considered as good in 24 patients and fair in 6 patients. No patients reported poor tolerance.

The main technical problem involved removal of adhesions, which was more difficult using minithoracoscopy than conventional thoracoscopy. The mean duration of minithoracoscopy was 20% longer than conventional thoracoscopy. In three patients with empyema, conversion to conventional thoracoscopy was necessary to ensure complete cleansing of the pleural cavity.

The performance of minithoracoscopy with regard to biopsy was also comparable to that of conventional thoracoscopy (forceps open to 7 mm; mean histologic sample, 5 mm × 10 mm). Diagnostic yield was very high (93.4%). Biopsy of the parietal pleura provided adequate tissue samples in all cases. Histologic examination demonstrated nonspecific pleurisy (n = 9), neoplastic metastasis (n = 7), mesothelioma (n = 5), tuberculosis (n = 3), and empyema (n = 6). There were two false-negative findings in the nonspecific pleurisy group. The first case involved a patient in whom dense adhesions prevented biopsy of lung tumor metastasis that was confirmed by CT scan. The second case involved a patient with pleural tuberculosis confirmed by culture of fibrin fragments.

Lung biopsy was performed using coagulating forceps (mean power setting, 50 W) in three patients. In two patients with mesothelioma, lung biopsy samples obtained by minithoracoscopy allowed diagnosis of invasion from the visceral pleura. In the remaining patient, the sample was not interpretable due to coagulation-related artifacts.

Table 1—Pros and Cons of Minithoracoscopy

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<tr>
<th>Pros</th>
<th>Cons</th>
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<tr>
<td>Good visibility</td>
<td>Small size of biopsy samples</td>
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<td>Reliable instrumentation</td>
<td>Fragile instruments</td>
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<tr>
<td>Easy maneuverability</td>
<td>Need for experience in standard</td>
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<td>Less pain during and after</td>
<td>thoracoscopy required</td>
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<td>the examination</td>
<td>Conversion to conventional</td>
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<td>Less local anesthetic</td>
<td>thoracoscopy sometimes required</td>
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<tr>
<td>required</td>
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<tr>
<td>No stitches required</td>
<td>Lung biopsy specimens sometimes</td>
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<tr>
<td></td>
<td>uninterpretable</td>
</tr>
<tr>
<td>Better cosmetic results</td>
<td>20% longer procedure time</td>
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advantage of minithoracoscopy in comparison with conventional medical thoracoscopy is pain reduction. Unlike conventional 7-mm trocars, minithoracoscopy 3.3-mm trocars do not cause pressure pain against chest wall. This advantage is especially notable in patients with small chests or narrow intercostal spaces. As a result, patient tolerance is better and local anesthesia is safer. Minithoracoscopy enables examination of small loculated effusions not accessible to conventional thoracoscopy.

Problems associated with a reduced field of vision can be solved by introducing the telescope through the second trocar to extend the range of the examination. The problem of smaller biopsy specimens can be easily overcome by increasing the number of samples. Minithoracoscopy telescopes are fragile and require greater handling care than conventional thoracoscopy telescopes. Minithoracoscopy is not indicated in patients with massive pleural effusions requiring talc pleurodesis and aspiration through a large gauge drain (20F to 24F), ie, the same diameter as that of the conventional thoracoscope.

CONCLUSION

Our experience indicates that, like minilaparoscopy, minithoracoscopy can be used for routine diagnostic applications. Minithoracoscopy is most useful for assessment of small effusions not accessible to conventional medical thoracoscopy; however, it can also be considered as a complement or even an alternative to conventional thoracoscopy. In many cases, minithoracoscopy would probably be adequate with conversion to conventional thoracoscopy only if necessary.

REFERENCES