Video-assisted thoracoscopic lung biopsy in children

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ABSTRACT

Minimal invasive surgical techniques have gained high acceptance in thoracic surgery during the last 10 years. Video-assisted thoracoscopy (VATS) is less invasive than open thoracotomy and its development is associated with expansion of indication for lung biopsies. Lung biopsy remains an important investigation in the diagnosis of few of the lung disorders despite improved diagnostic yield of high resolution computed tomography scanning. Thoracoscopic lung biopsy is becoming the procedure of first choice for the diagnosis of many localized and diffuse lung diseases. We report a small series of eight patients who underwent VATS lung biopsy to demonstrate the safety and efficacy of this procedure.

KEY WORDS: Lung biopsy, video-assisted thoracoscopic surgery

INTRODUCTION

Tissue diagnosis is essential in determining the further course of treatment in selected patients with lung disorders. The desire to obtain definitive diagnosis before commencing potent long term medical drugs such as corticosteroids or immunosuppressive drugs has increased the demand for lung biopsy. Surgical lung biopsy has demonstrated proven accuracy when non-invasive diagnostic methods have been unsuccessful (must have references). More recently, Video-assisted thoracoscopic surgery (VATS) lung biopsy has become an increasingly accepted approach for the diagnosis in a few lung disorders like interstitial lung disease, indeterminate pulmonary nodules and non-resolving pneumonia. Video-assisted thoracoscopic techniques allow operative access to the pleural cavity without thoracotomy. Video-assisted thoracoscopic lung biopsy reduces post-operative pain and functional disability, allowing earlier discharge. We present our experience of eight cases of video-assisted thoracoscopic lung biopsy.

METHODS AND RESULTS

In a period of 2 years between June 2003 and June 2005, eight children underwent VATS lung biopsy. All the children were admitted with history of chronic cough and breathlessness. The patients were completely evaluated by paediatrician and chest physician and were referred for lung biopsy in view of their failure to respond to treatment. The age group varied from 3 months to 14 years [Table 1]. Pre-operative evaluation includes relevant hematology, arterial blood gases, chest X-ray, high resolution computed tomography thorax and pulmonary function tests.

VATS lung biopsy technique

General anesthesia with endotracheal intubation was used. The patient was placed in a full lateral position. A 5 mm trocar was inserted in mid-axillary line in seventh intercostal space for the telescope. CO₂ insufflation was done with 1-liter flow and pressure of 6 cm of water. Two 5 mm secondary trocars were inserted under vision, one in anterior axillary line and other in the posterior axillary line in 4th or 5th intercostal space keeping in mind the principle of triangularization. In four cases we used endoloops of vicryl and in two we used endostapler to obtain the biopsy. Endoloop was prepared with Vicryl[8] 2-0 suture. Endoloop was mounted on 5 mm knot pusher. Endoloop with knot pusher was inserted. Using a 5 mm atraumatic grasper, biopsy site of the lung was grasped through the endoloop. The site of the biopsy was decided by the findings of computed tomography scan. Endoloop was tightened and the lung biopsy taken after cutting with 5 mm endoscissors [Figure 1]. In four cases where endostapler was used, one of the secondary trocars was of 12 mm. A 10 mm endoscopic stapling device (TR 35W Ethicon[2]) was placed across the part of lung to be biopsied and fired, transecting the lung with placement of double staple line [Figure 2]. The specimen
Table 1: Showing summarized case details

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>History</th>
<th>Chest X-ray and CT thorax</th>
<th>Loop/stapler</th>
<th>Time for surgery (min)</th>
<th>HPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Chronic cough and breathlessness</td>
<td>Bilateral reticular opacities</td>
<td>Endostapler</td>
<td>40</td>
<td>SRD</td>
</tr>
<tr>
<td>6</td>
<td>Chronic cough, fever</td>
<td>Persistent right upper lobe consolidation</td>
<td>Endoloop</td>
<td>45</td>
<td>TB</td>
</tr>
<tr>
<td>3</td>
<td>Chronic cough</td>
<td>Bilateral reticular opacities [Figure 3]</td>
<td>Endoloop</td>
<td>45</td>
<td>ILD</td>
</tr>
<tr>
<td>3 months</td>
<td>Fever, chronic cough</td>
<td>Persistent left upper lobe consolidation breathlessness</td>
<td>Endostapler</td>
<td>35</td>
<td>TB</td>
</tr>
<tr>
<td>4</td>
<td>Fever, chronic cough</td>
<td>Persistent right upper lobe</td>
<td>Endoloop</td>
<td>45</td>
<td>TB</td>
</tr>
<tr>
<td>14</td>
<td>Fever, chronic cough</td>
<td>Persistent right upper lobe</td>
<td>Endostapler</td>
<td>45</td>
<td>TB</td>
</tr>
<tr>
<td>11</td>
<td>Fever, chronic cough</td>
<td>Bilateral reticular opacities breathlessness</td>
<td>Endoloop</td>
<td>45</td>
<td>ILD</td>
</tr>
<tr>
<td>8</td>
<td>Chronic cough and breathlessness</td>
<td>Bilateral reticular opacities</td>
<td>Endostapler</td>
<td>40 mins</td>
<td>ILD</td>
</tr>
</tbody>
</table>

HPD: Histopathological diagnosis, SRD: Sarcoidosis, ILD: Interstitial lung disease, TB: Tuberculosis, CT: Computed tomography

was removed through 5 mm port. The biopsy site was inspected for bleeding and air leak. An intercostal drain (ICD) was placed in the midaxillary line trocar site and the other two-trocar sites were sutured. ICD was removed 24 hours post-operatively after confirming the non-occurrence of pneumothorax and air leak. Patient was kept for observation for 48 hours. None of our patients had air leak or bleeding and there was no mortality.

DISCUSSION

Initially, the applications of thoracoscopy were confined primarily to diseases of the pleura due to the limitations of available equipment. Fiona et al concluded that the sufficient tissue could be provided for both microbiologic and histologic study such that the diagnostic accuracy of the two techniques was essentially equal. In VATS lung biopsy, there is a reduction in operative time, analgesic requirement, duration of hospitalization and post-operative morbidity associated with muscle-cutting thoracotomy. In addition, VATS offers the surgeon the potential advantage of selecting biopsy site guided by the thoracoscopic visualization of the most diseased portion of lung. The typical “non-invasive” methods of obtaining the diagnosis, which include percutaneous...
aspiration needle biopsy, percutaneous cutting needle biopsy and transbronchial biopsy, have tissue yields of only 29-59% in these patients. Thus, surgical lung biopsy is often required.\[7\]

Blewitt et al have reported their experience with open lung biopsy performed through a limited left anterolateral thoracotomy. They did not use chest tube drains and did not encounter any complications. Given the constraints of the limited incision, biopsies were obtained only from the lingual.\[6\] Despite the presumably less invasive nature of VATS lung biopsy, Miller et al demonstrated no clinical or statistical difference in outcomes in terms of duration of hospitalization, operative time or post-operative analgesic requirement for thoracoscopic and thoracotomy approaches.\[8\]

According to Miller et al, both thoracoscopy and thoracotomy are acceptable procedures for diagnostic lung biopsy. According to Qureshi and Soorae et al, the duration of chest drain is less in VATS compared to that in open biopsy (1 day in VATS compared to 2 days in open group). Even the length of stay was shorter in VATS (3 days in VATS and 4 days in open group).\[10\]

In the series of Ayed and Raghunathan median operative time was 45 min for the thoracoscopic biopsies and 60 min for the open biopsies.\[11\] In our series, mean operating time for VATS lung biopsy was 42.5 min. Analgesic requirement in VATS in the first 24 hours post-operatively is half that required for open biopsies. Median duration of insertion of a chest tube in days and 24 hours of pleural drainage was not statistically significant between the two groups.\[12\] In our series median duration of chest tube drainage was 24 hours. Duration of hospital stay was less for VATS (3 days) compared with an open biopsy (5 days). The diagnostic yield of each method was comparable (thoracoscopic biopsy 31/32; open biopsy 27/29). Multiple studies have shown the diagnostic yield of surgical lung biopsy to be more than 90%, with a resulting management change in 27-73% of patients.\[12\] In our series with VATS, diagnostic yield was 100%.

Rocco et al use uniportal VATS technique for lung biopsy and lung resection: through a single port incision, a videothoracoscope, a lung grasper and a rotulating endostapler are introduced into the pleural cavity.\[13\] The technique of VATS lung biopsy is more efficient as it saves operative time and provides excellent visualization of lung. Reduced post-operative disability in VATS patients further shortened post-operative stay. VATS patients had less post-operative pain.

CONCLUSION

In our experience with five children, post-operative recovery was quick; there were no complications and hospitalization was short with VATS. With the refinement in the endoscopic surgery and the introduction of endoscopic stapling instruments, VATS lung biopsy is a better alternative to thoracotomy.

REFERENCES


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