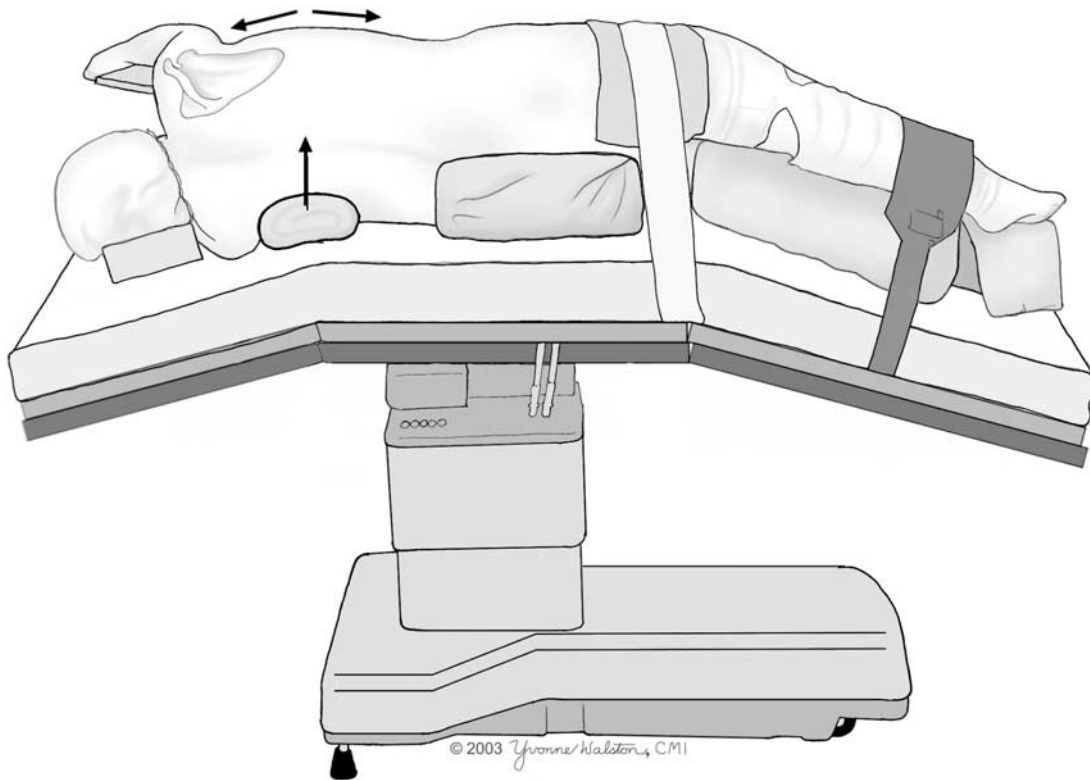

Posterolateral Thoracotomy

Jean Deslauriers and Reza John Mehran

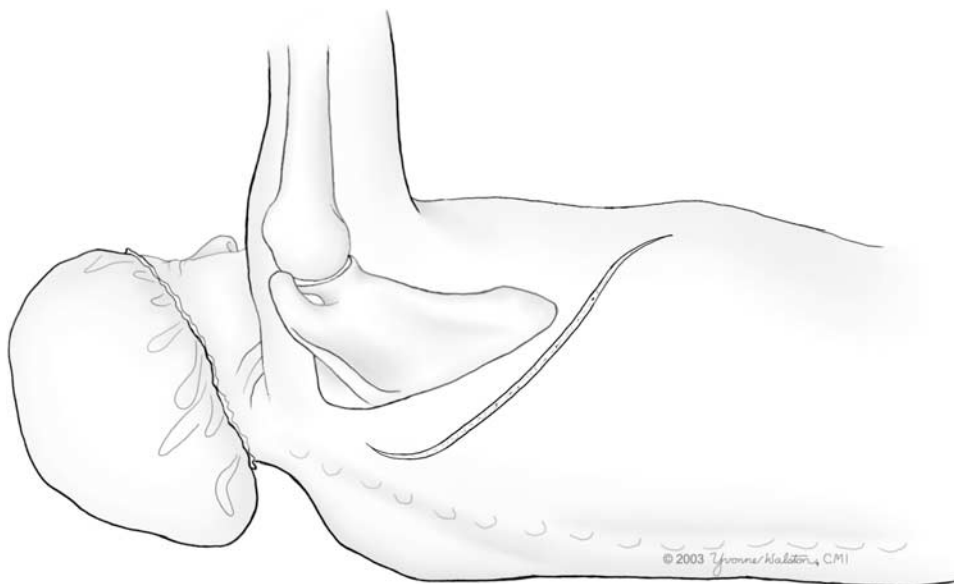
The posterolateral thoracotomy is still probably the most commonly used incision in general thoracic surgery. It provides not only excellent access to the lung, hilum, middle and posterior mediastinum, endothoracic trachea, and endothoracic esophagus, but it also allows for the safe control of pulmonary blood vessels during pulmonary resection. Posterolateral thoracotomy offers more accessibility to all areas of the hemithorax than any other incision.

The 2 potential disadvantages of posterolateral thoracotomy are that it is painful, and that it may disturb the respiratory mechanics through division of respiratory muscles and decreased mobility of the chest wall. Obviously, these disadvantages are magnified in older patients with compromised cardiopulmonary function. However, these difficulties can be minimized using modern techniques of postoperative care, such as epidural analgesia.

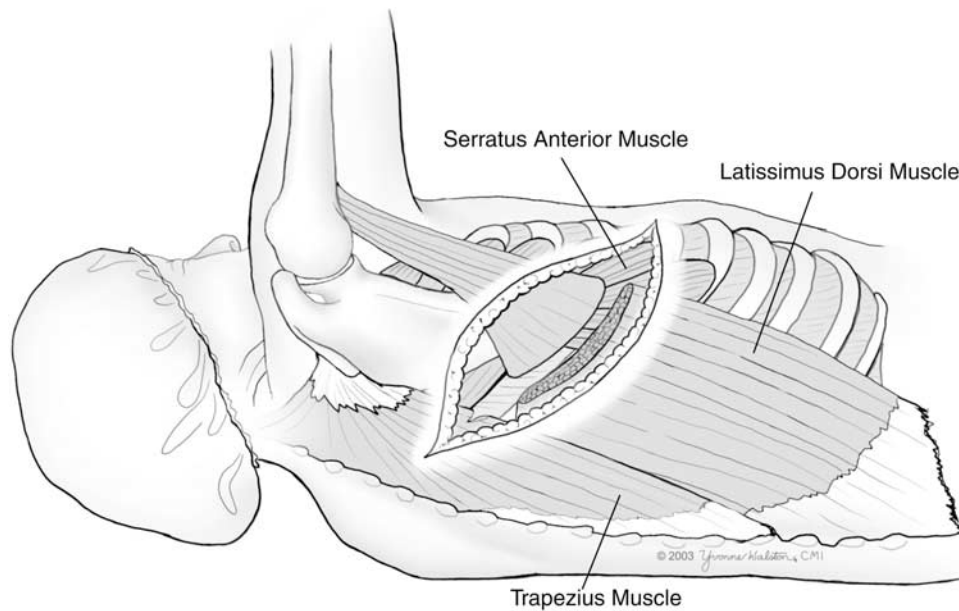
SURGICAL TECHNIQUE



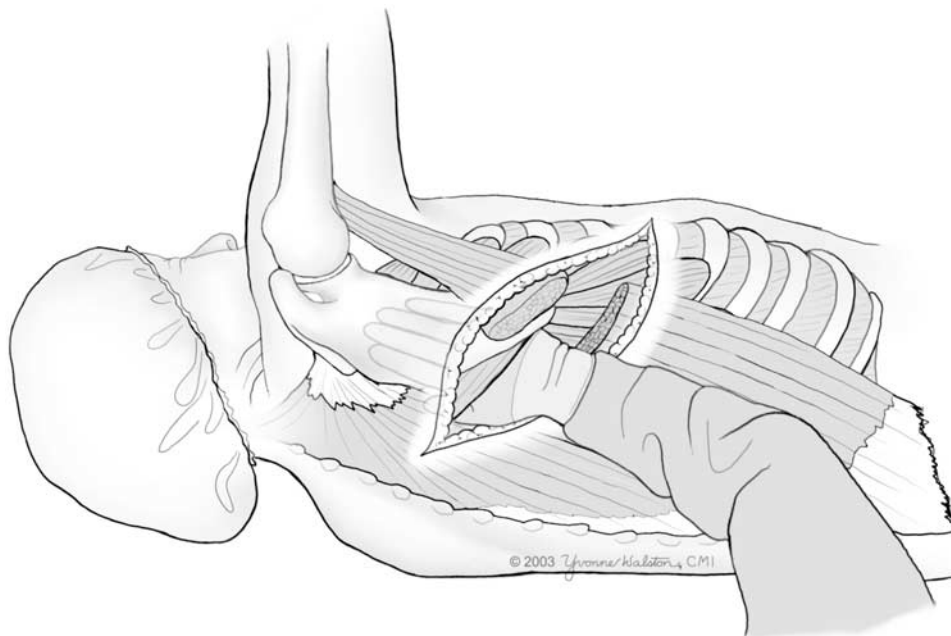
1 The patient is positioned in the lateral decubitus with the operated side up. He is immobilized with sandbags or a beanbag that is used to support the back and abdomen. Strips of adhesive tape and/or a belt are passed over the hips and secured to the table. The lower arm is on an arm board at a right angle with the table, while the upper arm is rotated forward and upward, and fixed at the elbow. The legs are separated with a pillow. The lower leg is flexed at the knee, while the upper leg lies straight on top of the pillow. To increase the spread of the intercostal space and, thus, facilitate entry into the pleural space, the table can be angulated, or a roll can be inserted under the patient's chest. During positioning, it is important to support the arm and shoulder to prevent brachial plexus or shoulder injuries. These injuries are not uncommon, and they can be the source of pain or immobility of the shoulder postoperatively.



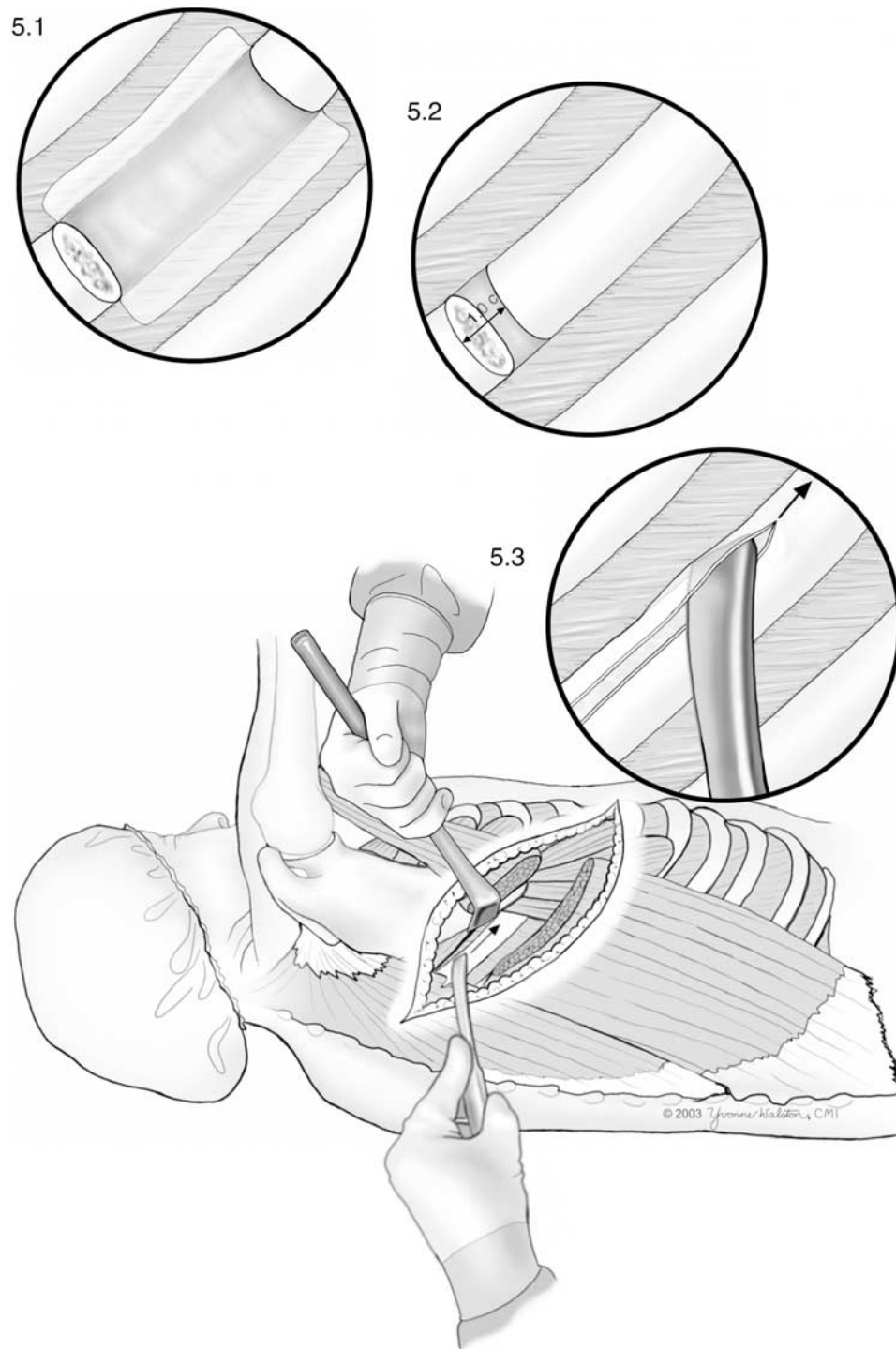
2 The skin incision is started at the level of the anterior axillary line over the fifth or sixth intercostal space. It is gently curved around the tip of the scapula and continued posteriorly along a line between the medial aspect of the scapula and the spine. It is carried upwards to the level of T4 or even higher when necessary. Anteriorly, the skin incision follows the rib outline, which has an oblique rather than a horizontal direction. It is noteworthy that individual ribs are 2 spaces lower anteriorly than posteriorly, and this is why a horizontal incision will create a bulky, upward flap that will impair exposure throughout the whole operation.



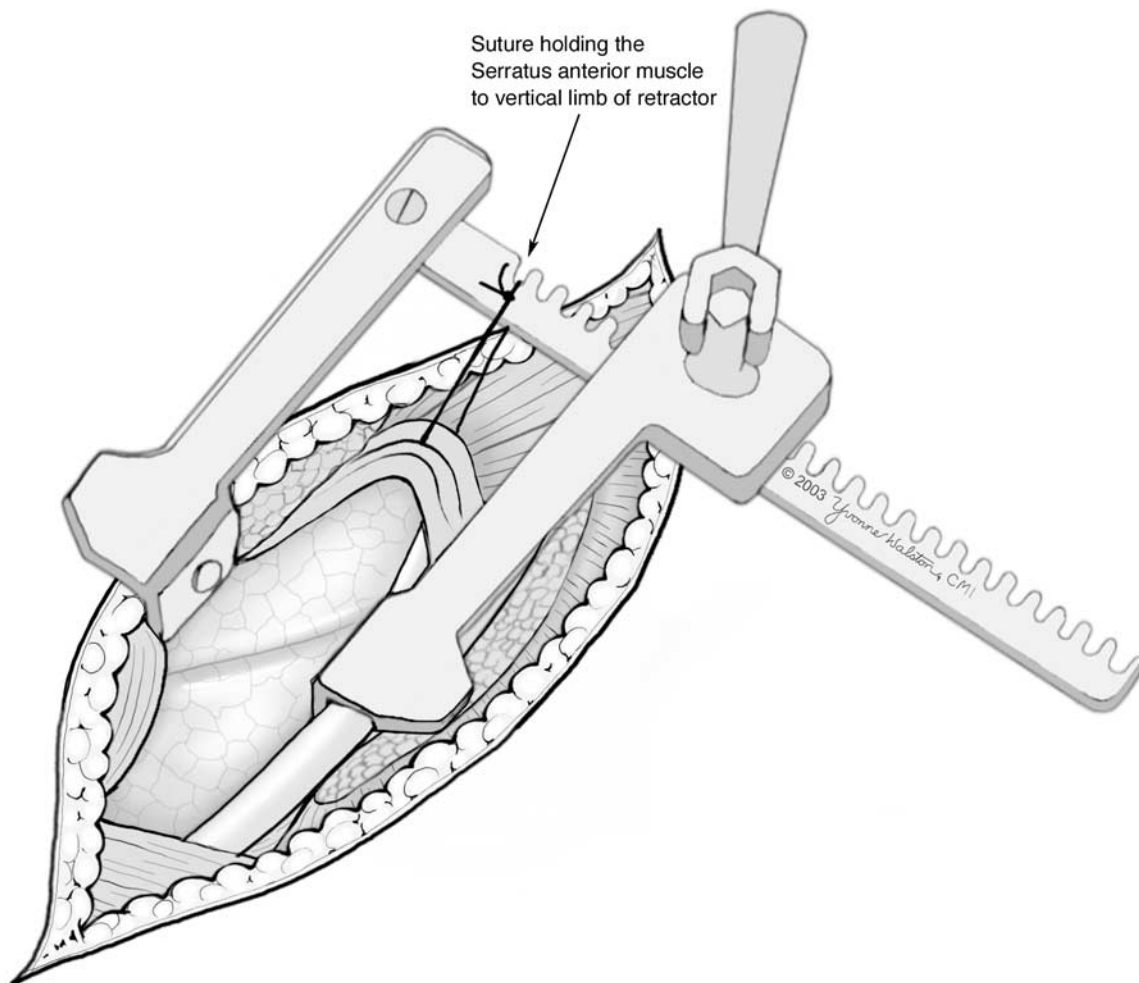
3 The latissimus dorsi is first opened with electrocautery. It is a large muscle that originates from the spinous processes of T6 to T12, iliac crest, and inferior 3 to 4 ribs and inserts over the intertubercular groove of the humerus. The cautery incision of this muscle must be perpendicular to its fibers so that reapproximation at the end of the procedure is easier. If additional scapula mobility is required, the anterior portion of the trapezius and rhomboid muscles can be divided posteriorly. To limit postoperative disability, the serratus anterior muscle is usually spared. It is elevated and retracted anteriorly (Fig 6). This muscle can also be used to close a bronchopleural fistula should it develop postoperatively. The serratus anterior muscle has its origins over the external surfaces of the first 8 ribs anteriorly and its insertion over the anterior surface of the scapula.



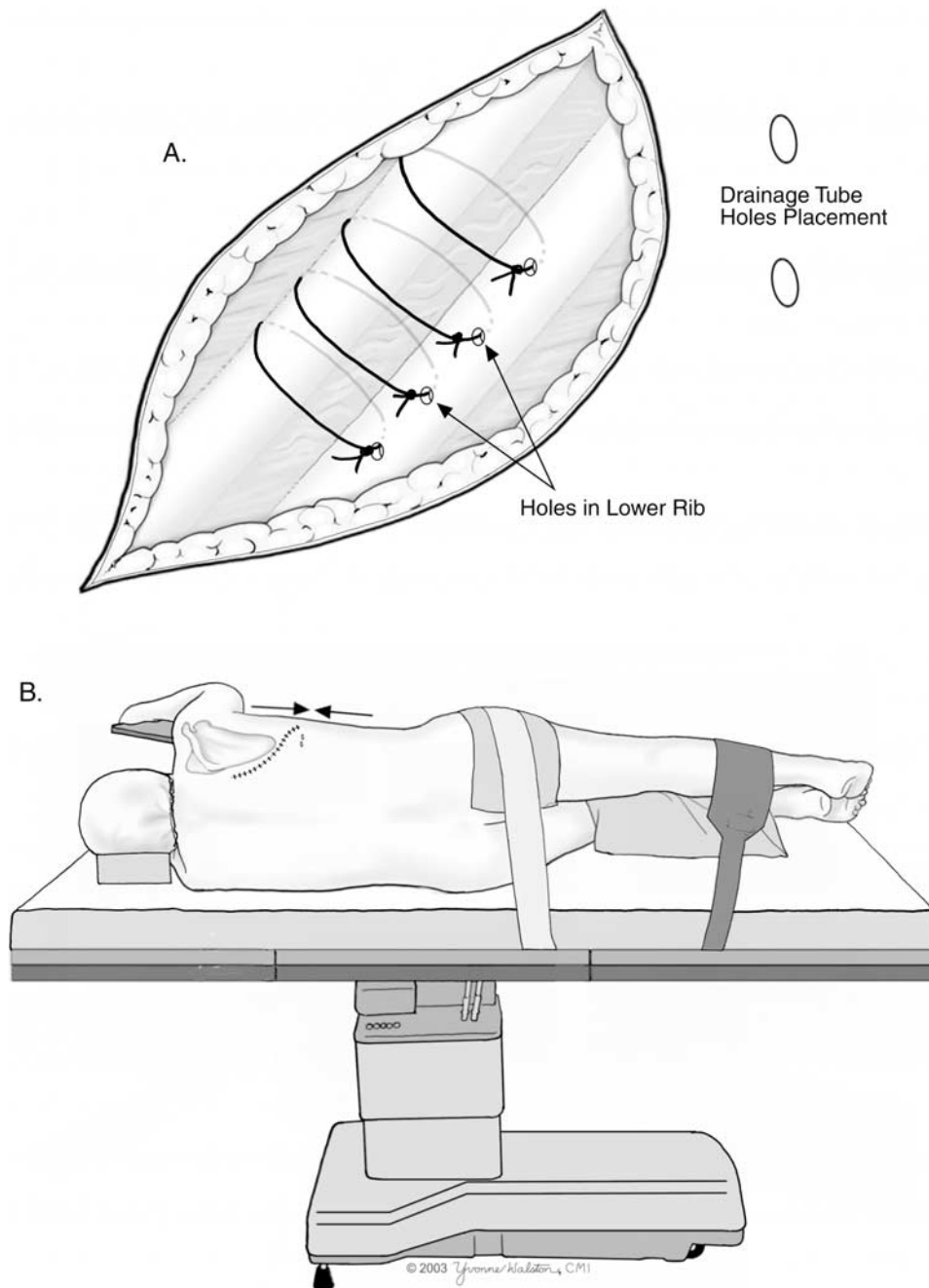
4 Most pulmonary resections are done through the fifth intercostal space. To identify the correct intercostal space, the hand is passed superiorly by developing a plane beneath the scapula until the first rib is felt. In most instances, this rib is easy to identify because it is the broadest and most horizontal rib, at least anteriorly. The ribs and intercostal spaces are then numbered down until the appropriate intercostal space is found.



5 There are 3 different ways to open the intercostal space. Some surgeons still resect the full length of a rib to have proper access to the lung (5.1). However, this procedure is performed infrequently unless there is a specific need for better exposure, such as redo surgery or decortication of fibrothoraces. To resect a rib, the periosteum is incised over the rib the length of the incision with electrocautery. It is then reflected from the rib superiorly and inferiorly with a periosteal elevator (ie, anteriorly above the rib and posteriorly below the rib). The rib is then divided anteriorly and posteriorly with a rib cutter and removed. Some surgeons resect the most posterior 1 cm of the lower rib to allow fuller spreading of the intercostal space without breaking the rib (5.2). This concept is important because broken ribs are painful, and the feeling of movement within the chest wall often makes coughing more difficult postoperatively. The authors' technique is to reflect the periosteum from the superior border of the rib with a periosteal elevator (5.3). This procedure is performed to preserve and avoid injury to the intercostal neurovascular bundle that lies in the subcostal groove. Again, periosteal elevation is performed over the superior border of the rib, from the back to the front. All of these techniques are facilitated by upward retraction of the scapula and anterior retraction of the serratus anterior muscle.



6 Access to the pleural space is completed by opening the endothoracic fascia and parietal pleura. A chest spreader retractor is then placed to have its vertical limb anterior to the surgeon. This vertical limb of the retractor is also used to pull and hold the serratus anterior muscle away from the incision. It is important to spread intercostal space slowly to prevent rib fractures. Unfortunately, rib fractures are often unavoidable in older patients or in individuals with osteoporosis.



7 Before closure of the incision, 1 or 2 chest tubes are inserted in the pleural space. These tubes are brought out through small, skin incisions that are located below the incision, usually in line with the ipsilateral, anteriosuperior iliac spine. This location is preferred because patients can lie on their back without kinking or dislodging the tubes. They can also have active physiotherapy without having to be careful not to displace or disturb the tubes. If a chest tube is directed towards the apex, it should be placed above the superior border of the rib so that it rests against the rib and has no tendency to be displaced inferiorly. By contrast, a chest tube directed towards the base of the pleural space should rest against the inferior border of the rib. For closure of the intercostal spaces, we use 4 to 5 absorbable interrupted sutures (2-0 polyglactin 910) that are passed through a hole made with a rib punch in the lower rib and around the upper rib. This procedure is performed to avoid injury to the intercostal neurovascular bundle. The muscle layer, subcutaneous tissue, and skin are then closed in succession.

CONCLUSION

Posterolateral thoracotomy provides excellent exposure to the pleural space and its contents. Unfortunately, it is an incision that has gained the unenviable reputation of being very painful postoperatively and one that surgeons try to avoid. In our view, this reputation is unjustified if one is very meticulous with surgical technique. This technique begins with positioning the patient, which must be done carefully if one is to avoid shoulder or brachial plexus injuries. The skin incision must be placed properly and be slightly oblique in the front. The serratus muscle must not be divided, and the pleural space must be entered through the proper intercostal space. This space should be spread

slowly to avoid rib fractures. Chest tubes must be properly placed and the chest closed in a systematic fashion. Attention to all these details will decrease the amount of postoperative discomfort. Ultimately, it will decrease the incidence of pulmonary complications and postoperative deaths.

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