Thoracoscopic Placation for Eventration of the Diaphragm

14

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Abstract

The major advantage of the thoracoscopic approach for the repair of eventration of the diaphragm is that it avoids the morbidity of a thoracotomy, including: pain, opioid analgesia, chest drainage, intensive care admission, a prolonged hospital stay, a large scar, and scoliosis. The indications for surgery include: respiratory distress, failure to wean from invasive ventilation and continuous positive airway pressure (CPAP), recurrent chest infections, and phrenic nerve palsy.

Keywords

Eventration • Diaphragm • Thoracoscopic

14.1 General Information

The major advantage of the thoracoscopic approach for the repair of eventration of the diaphragm is that it avoids the morbidity of a thoracotomy, including: pain, opioid analgesia, chest drainage, intensive care admission, a prolonged hospital stay, a large scar, and scoliosis. The indications for surgery include: respiratory distress, failure to wean from invasive ventilation and continuous positive airway pressure (CPAP), recurrent chest infections, and phrenic nerve palsy.

14.2 Working Instruments

A 5-mm, 0° scope is used in all cases, as it provides optimum visualisation. For infants weighing less than 7 kg, 3-mm working instruments are preferred; 5-mm instruments are used for larger children.

- 5-mm or 3-mm ports
- 5-mm 0° scope
- Straight and curved graspers
- Needle holder
- Scissors
- Knot pusher
- Sutures: 4-0 Ticron or 2-0 Ticron (ski needle)

14.3 Positioning, Port Siting, and Ergonomic Considerations

General anaesthesia with central endotracheal intubation is maintained. Infiltration with local anaesthetic prior to port insertion or paravertebral blocks can provide effective analgesia intraoperatively.

The patient is placed in the lateral decubitus position with the affected side up and a roll under the dependent axilla. The patient's head should be at the foot of the table, away from the anaesthetic machine. The monitor is placed over the patient's pelvis. The surgeon stands at the foot of the table.

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14.4 Relevant Anatomy

Figures 14.1 and 14.2 show an example of the affected anatomy.

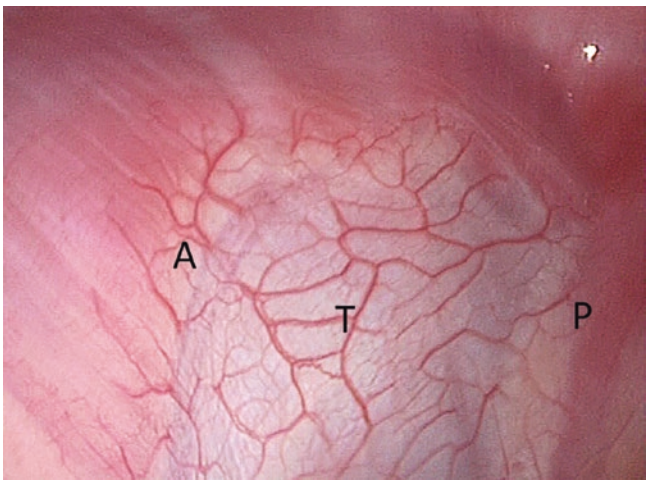

Fig. 14.1 Right-sided eventration, showing the anterior musculotendinous rim (*A*), central diaphragm (*T*), and posterior musculotendinous rim (*P*)

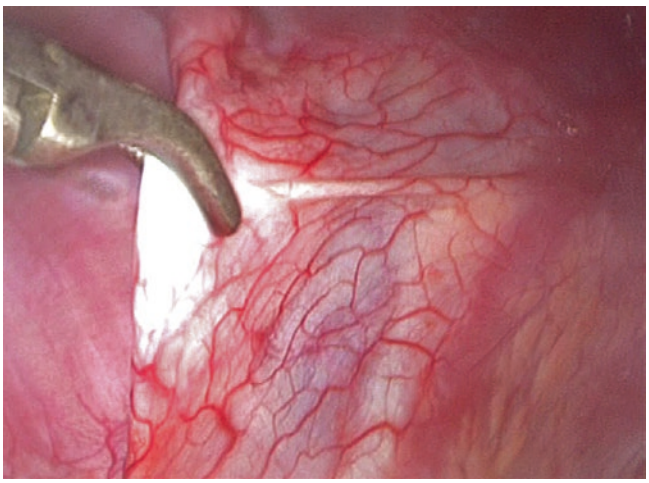

Fig. 14.2 The lax diaphragm is easily picked up

14.5 Surgical Technique

1. The first port is placed just anterior to the inferior angle of the scapula (Fig. 14.3). A pneumothorax of 5–6 mmHg with flows of 1.5–2 L/min is maintained.
2. Two working ports are inserted under vision between the anterior and midaxillary line and posteriorly to achieve effective triangulation (Fig. 14.4).
3. The plication starts laterally. After the needle is placed at the junction of the muscular rim and the tendinous part, it is then passed through the central tendinous part of the diaphragm and the opposite musculotendinous portion (Fig. 14.5). The knot can then be tied extracorporeally or intracorporeally.
4. Plication is continued medially with further interrupted sutures (Fig. 14.6).
5. The pneumothorax is evacuated by inserting a 16 Fr nasogastric tube via the 5-mm port and immersing the other end in a dish of saline. The anaesthetist is then asked to manually ventilate the patient to re-expand the lung. The nasogastric tube is removed and the wounds closed. It is not necessary to insert a chest drain.
6. Postoperatively, oral analgesia is prescribed. A chest x-ray is performed the following day. If there is adequate lung re-expansion, the patient can be discharged.

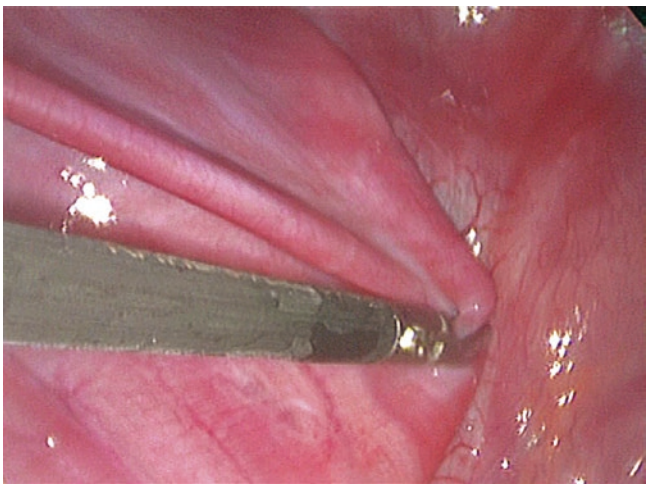

Fig. 14.3 The first port is placed just anterior to the inferior angle of the scapula

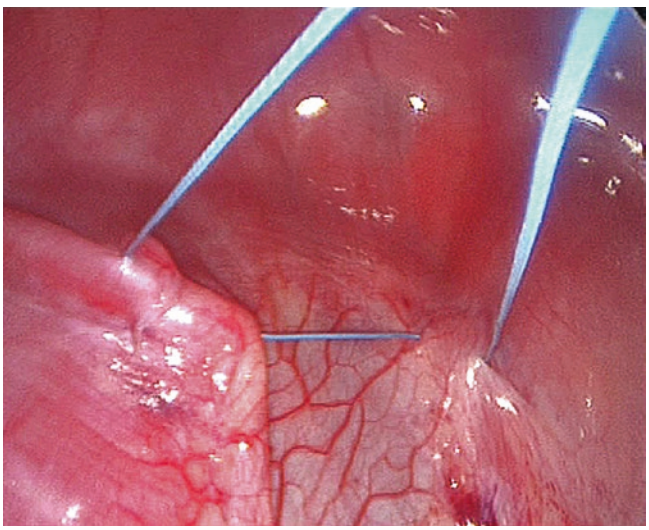

Fig. 14.4 Two working ports are inserted under vision between the anterior and midaxillary line and posteriorly to achieve effective triangulation

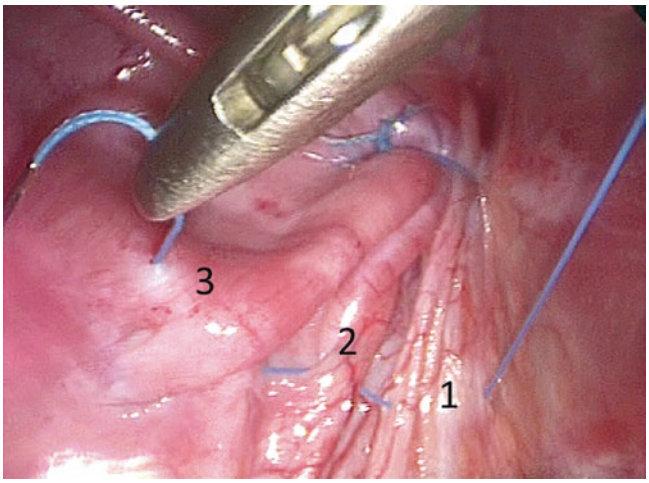

Fig. 14.5 The plication begins by placing the needle at the junction of the muscular rim and the tendinous part (*1*). The needle is then passed through the central tendinous part of the diaphragm (*2*) and the opposite musculotendinous portion of the diaphragm (*3*)

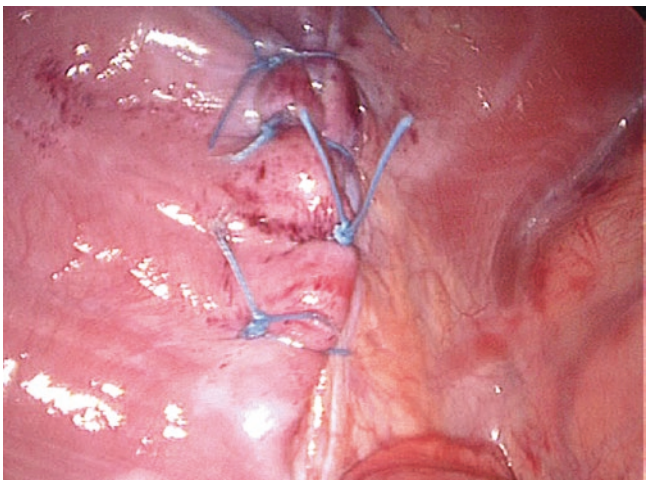

Fig. 14.6 Plication is continued medially with further interrupted sutures

14.6 Alternatives

Laparoscopic repair is more complicated, owing to the presence of the abdominal viscera, and it has a higher recurrence rate.

14.7 Highlights and Pitfalls

- The first port should be inserted cautiously, as the diaphragm can be quite elevated, presenting a risk of injury to the abdominal viscera underneath. A head-up position is helpful during this stage, as it allows the diaphragm to fall inferiorly.
- To perform a secure repair, the surgeon should use the suturing technique that he or she is most comfortable with.
- Caution should be exercised medially, as the inferior vena cava and aorta are in close proximity.

Suggested Reading

Becmeur F, Talon I, Schaarschmidt K, Phillippe P, Moog R, Kauffmann I, et al. Thoracoscopic diaphragmatic eventration repair in children: about 10 cases. J Pediatr Surg. 2005;40:1712–5.

Crabbe DCG. Diaphragmatic eventration and phrenic palsy. In: Parikh DH, Crabbe DCG, Auldist AW, Rothenberg SS, editors. Pediatric thoracic surgery. London: Springer; 2009. p. 501–8.