The induction of anesthesia in a patient with a bronchopleural fistula (BPF) postpneumonectomy can be quite difficult. This is because positive pressure ventilation can force gas through the fistula and lead to inadequate ventilation. The choice of endotracheal tube and insertion technique are important considerations in these patients. The placement of a double lumen tube or a single lumen tube inside the normal main stem bronchus may be technically difficult after a lung resection and is at risk of being malpositioned through the bronchial stump. A single lumen tube can be placed above the carina in a patient breathing spontaneously (awake or asleep), however, positive pressure ventilation, if needed, may impair ventilation. Also, it will not prevent contamination of the remaining lung. A bronchial blocker proximal to the fistula risks perforating the bronchial stump if it migrates distally.

We report a case of a patient with a BPF postpneumonectomy who had a thoracoscopy, mini thoracotomy, and rib resection performed under thoracic epidural anesthesia and intravenous sedation without instrumenting the airway and without positive pressure ventilation.

**Case Report**

A 68-yr-old male was readmitted to hospital 1 week after discharge after an uneventful right pneumonectomy for squamous cell carcinoma. He presented with worsening dyspnea, hemoptysis, and productive cough. Examination revealed a respiratory rate of 22, heart rate of 100, and blood pressure of 130/78. The trachea was midline and there was good air entry to the left lung with some rales in the left lower lobe. Oxygen saturation was 83% on room air and 91% on 2 l of nasal prong oxygen. The chest x-ray revealed a right hydropneumothorax, a midline trachea and mediastinum, and no air space disease.

The patient was started on intravenous ampicillin and gentamicin. On the third day, a right-sided chest tube was inserted that drained 250 ml of fluid in the first 24 h and demonstrated a persistent air leak. Follow-up chest x-rays revealed persistent loculated air fluid levels on the right hemithorax and a clear left lung field. The chest tube was left open to air to drain any remaining empyema. Throughout this period, the patient did not show signs of sepsis.

Bronchopleural fistula caused by a persistent bronchial stump leak was diagnosed. The patient was scheduled to undergo a thoracoscopy and rib resection to allow for the insertion of a large caliber drainage tube. The surgeon preferred that the patient’s airway not be instrumented. After reviewing the anesthetic options with the surgeon and patient, the decision was made to proceed using a thoracic epidural for anesthesia and postoperative analgesia.

A thoracic epidural catheter was inserted at the T7-8 interspace using the paramedian approach in the sitting position. Carbonated lidocaine (equivalent to 2%) was titrated in 2 ml aliquots to a total dose.
of 8 ml to which 25 μg fentanyl was added. The patient had loss of pin
prick sensation from T2-T10 within approximately 15 min. As a pre-
cautions, an additional 15 ml of 0.5% bupivacaine was injected locally
by the surgeon to the skin and subcutaneous tissue covering the
surgical site immediately before initiating the surgery. A total of 2.5 mg
midazolam and 50 μg fentanyl was given intravenously for sedation
and 200 μg phenylephrine was given intravenously to treat epidural
induced hypotension.

The chest tube was removed and a thoracoscopic performed through
this opening with the patient in the left lateral reverse Trendelenberg
position. Loculations of fibrinous exudate was suctioned out of the
thorax. The surgeon was unable to visualize the bronchial stump. Ten
milliliters of saline was introduced into the thorax which resulted in
immediate coughing up of the saline into the patient’s mouth, con-
fiming the bronchial stump leak. A seventh rib resection was then
performed in the posterior axillary line in the most dependent position
of the cavity. This was performed by a mini thoracotomy incision with
removal of approximate 4 cm of rib and then dissection through the
pleura and into the cavity. A large permanent drainage tube was
inserted and sutured in place. A dry dressing was applied to the
drainage tube which was left open to air. The total operating room time
was 1 h and 20 min. The procedure was well tolerated, respiratory status
was stable, and oxygen saturation was maintained above 95%.

The patient was then transferred to the postanesthesia care unit,
awake, pain free, breathing oxygen by face mask and in stable condi-
tion. He was nursed in the right lateral semi-sitting position. In the
postanesthesia care unit, an epidural bolus of 4 ml 0.5% bupivacaine
was administered and an infusion of ropivacaine 0.2% was started at 4
ml/h. The epidural was discontinued on the third postoperative day, at
which time the patient’s oxygen saturation had improved to 95% on
room air. The patient was discharged home on the 14th postoperative
day and was doing well on his 6-month follow-up visit despite persis-
tence of the BPF.

Discussion

The incidence of postpneumonectomy BPF has been
reported to be 3.1 to 11%.

Although initial management includes chest tube insertion and parenteral anti-
biotics, these patients will often return to the operating
room for a more definitive procedure. Respiratory re-
serves is decreased in these patients because of their
underlying pulmonary disease, recent pneumonectomy,
BPF, and potential pneumonia from soiling by the con-
tralateral empyema.

Case reports describing the use of thoracic epidurals in
different types of thoracic procedures have been previ-
sely published. However, we could not find a docu-
mented case using this technique in a patient with a
bronchial stump leak postpneumonectomy undergoing a
thoracoscopy and rib resection. Kempen described the
use of a thoracic epidural and interpleural block for
pleurodesis in a patient with a recurrent pneumotho-
rax.

Mukaida et al. described four cases of high-risk
patients undergoing video-assisted thoracic surgery
using a thoracic epidural. Four patients had severe
emphysema with bilateral bullae and recurrent pneumo-
thoraces and the fourth patient had pulmonary fibrosis
with a left pneumothorax.

When deciding the appropriateness of using a thoracic epidural, awareness both of the innervation of the tho-
cratic structures and the potential drawbacks of using an
epidural must be considered. The chest wall and parietal
pleura are innervated by the intercostal nerves. The lungs
and visceral pleura are innervated by the anterior
and posterior pulmonary plexuses which contain both
vagal (parasympathetic) and sympathetic fibers. A tho-
racic epidural or a stellate ganglion block can block
sympathetic fibers thus decreasing the cough reflex from
manipulation of the hilum.

The sympathetic fibers of the thorax originate from the T1–T5 level. However,
the vagal fibers, which also supply afferent innervation from the lungs and visceral pleura, will not be blocked.
The mediastinal pleura has sensory innervation from the
phrenic nerve which will not be blocked by a thoracic epidural. Sensation to the diaphragm originates from
two different sources. The upper and lower surfaces of
the central portion of the diaphragm are supplied by the
phrenic nerve. Stimulation to this portion of the dia-
aphragm will not be blocked by an epidural and will be
felt in the shoulder tip area as referred pain. The lower
six intercostal nerves innervate the peripheral parts of
the diaphragm and can be blocked by a thoracic epi-
dural. The pericardium has sensory fibers from the
phrenic nerve and vagus nerve, both of which will not
be blocked by a thoracic epidural.

Therefore, the potential drawbacks of using a thoracic epidural alone for anesthesia include limitation of block-
ade. If a complication arises intraoperatively requiring
more extensive surgery, then the epidural may not be
adequate in blocking the necessary structures including
tissue pleura, lung, airways, diaphragm, and pericar-
dium. Converting to a general anesthetic with a secure
airway plus or minus lung isolation may be difficult to
perform in the lateral position. The possibility of con-
taminating the remaining lung from the contralateral
empyema must also be considered in deciding on the
anesthetic technique.

In the case presented, the surgical plan consisted only
of visualizing the bronchus without any plans to repair it.
Stimulation arising from the vagus and phrenic nerves
therefore was minimized. Aggressive suctioning of the
remaining fluid from the patient’s hemithorax was done
at the beginning of the case to minimize the leakage of
empyema into the dependent lung. Supplementation local

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infiltration of the skin and subcutaneous tissue was performed by the surgeon just before incision. The benefit of this is unclear as surgery started before the onset of blockade from the 0.5% bupivacaine used. However, the additional risk of supplementing with a field block is quite low. A field block alone would not have adequately anesthetized the ribs and parietal pleura to enable a rib resection and thoracotomy. Similarly, to anesthetize the right hemithorax using intercostal nerve blocks, a large volume of anesthetic would have been required in this case and would not have blocked the sympathetic supply to the lungs. In addition, this technique would have provided a shorter duration of postoperative analgesia compared to a continuous thoracic epidural.

In conclusion, we describe the use of a thoracic epidural for a thoracoscopy, rib resection, and large drainage tube insertion in a patient with a BPF postpneumectomy. It is crucial to discuss the surgical plan with the surgeon before deciding on the anesthetic. If the empyema has been adequately drained and the surgery does not involve the thoracic structures innervated by vagal and phrenic nerves, then thoracic epidural anesthesia may be considered as an option.

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