

# **CASE REPORT**

## **Management of analgesia for thoracic surgery**

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**Summary**

A 18-year-old male was scheduled to undergo a surgical cure of his spontaneous primary recurrent pneumothorax. During the last few weeks, he had benefited from multiple thorascopies and thoracotomies, in order to resect emphysema bubbles and perform pleurectomies. For each surgery, the anesthetic and postoperative analgesia techniques were different, encompassing the use of a thoracic epidural combined with a patient-controlled epidural analgesia, the use of a patient-controlled analgesia device, or the insertion of pre-costal catheters. After multiple explorations, the medical team discovered the origin of the pneumothorax : an alpha-1 antitrypsin deficiency (AATD). Literature tells us that loco-regional analgesia is more efficient than parenteral morphine analgesia, particularly for mobilization-induced pain (2). In this report, we discuss analgesia methods and their efficacy for pain management after thorascopy and thoracotomy.

**Comment [BV1]:** No reference in summary.

## Introduction

Thoracic surgery is considered one of the most painful surgeries, and is responsible for severe pain during the postoperative period, and in the long term (3, 7, 8, 16). Indeed, the incidence of chronic pain following this type of surgery varies between 30 and 50 %, and 5 % of those chronic pain syndromes are severe (14). Usually, the acute painful period lasts 3 to 5 days after a thoracotomy (11). This pain is the result a combination of several painful insults including skin and muscle incision, opening of the costal space, pleural drainage, and rib fractures (11). To prevent pulmonary complications such as atelectasia and infections, as well as to hasten recovery of respiratory function, early and adequate pain management is imperative (16). Indeed, physiotherapy cannot be effective in the absence of efficient analgesia during mobilization (11).

We here report the case of an 18-year-old man, who had recurrent primary spontaneous pneumothorax necessitating surgical management.

## Case report

An 18-year-old male came to the operating room for the surgical cure of a spontaneous primary recurrent pneumothorax. Upon arrival, the patient was monitored using peripheral saturation in oxygen, non-invasive blood pressure, and electrocardiogram. A peripheral intravenous catheter was inserted, receiving Hartmann infusion. The patient sit up for thoracic epidural catheter insertion. Using an aseptic technique, it was introduced at the T6-T7 interspace.. Once in place, a 3 mL 2 % lidocaine test dose was injected. After putting the patient back to the dorsal decubitus position, pre-oxygenation started. Anesthesia was induced using 10 µg of sufentanil, 60 mg of 2 % lidocaine, 150 mg of propofol, and 50 mg of ketamine. Mask ventilation was easy, and 50 mg of atracurium were administered. Three minutes later, the trachea was intubated using a double-lumen tube. Fiber-optic control of tube position was then performed, and the tube was fixed After induction of anesthesia, a first 40 ml 0.5 % ropivacaine bolus containing 1 µg of sufentanil was injected through the epidural catheter. A urinary catheter and an arterial line were also inserted. Thereafter, the patient was turned to the left lateral decubitus position to allow surgery to begin. With the patient in that position, adequacy of double-lumen tube placement was again verified with the fiberscope. Single left lung ventilation was applied during surgery. At the end of surgery, level of muscle relaxation

**Comment [BV2]:** Maintenance of anesthesia ?

was checked before allowing spontaneous ventilation. Once an adequate level of recovery was attained, the trachea was extubated.

## Discussion

At the light of this common case, we will now discuss the interest of different analgesic techniques for managing pain after such surgery.

The different types of analgesic techniques that can be offered to patients benefiting thoracic surgery are, among others, patient-controlled epidural analgesia (PCEA), paravertebral blocks alone or in combination with intravenous patient-controlled analgesia (PCA), PCA in association with intravenous paracetamol and non-steroidal anti-inflammatory medications, interpleural blocks, or spinal morphine analgesia with PCA.

Several studies agree on the following: pleuroscopy has not shown any advantage over other techniques in terms of chronic pain prevention one year after thoracotomy (16,7).

Thoracic epidural catheters can be used through 3 different ways: PCEA, continuous infusion and intermittent boluses.

The advantage of a continuous infusion is its nursing staff workload non-demanding nature. In addition, the incidence of side effects is low with this technique, because it avoids concentration peaks of the adjuvants present in the infused solution. However, this technique may favor motor block, and reduce patient mobility (16).

PCEA allows adaptation of the dose to the patient, reducing the risk of excessive dose, as well as decreasing the incidence of side effects (16).

As compared to a continuous infusion, it provides similar pain scores. In a study comparing PCA and epidural analgesia using a continuous infusion associated to PCEA, lowest pain scores were observed in the PCEA group. Continuous epidural infusion associated with PCEA offers a higher quality of analgesia quality in comparison with the other techniques, and allows reducing of opioid and local anesthetic agent consumption. Side effects are more frequent when using PCA (20).

Commonly used medications for epidural analgesia are the local anesthetic agents, frequently combined with opiates. The addition of opiates prevents from too deep motor block, as well as loss of thermal or tactile sensitivity. It allows reducing the perception of pain, with doses that are 5 to 10 times lower than the intravenous ones. Several studies have shown that the sufentanyl injected in epidural space gives a same level of analgesia only when it is injected intravenously (2).

The most frequently used local anesthetic agents are ropivacaine and bupivacaine. They have the same pharmacological profile (16), being able to induce motor block, sensory block, and analgesia. Ropivacaine seems to be less cardiotoxic than bupivacaine (2). For a same concentration of ropivacaine and bupivacaine, motor block is less marked and of shorter duration with ropivacaine. For an equal level of analgesia, ropivacaine would allow quicker mobilization and recovery (2).

The thoracic epidural catheter extremity has to be close to the metameric level of surgical incision, that is, most of the time, between T6 and T8 (16). Efficiency of epidural analgesia in

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terms of post-operative pain and prevention of chronic pain is better when analgesia starts before surgical incision (16).

Thoracic epidural analgesia has proven useful for managing pain associated with thoracotomy, but, up to now, not for thoracoscopy (22).

The main advantage of PCA is that it allows a continuous titration of the necessary dose by the patient himself. Unfortunately, its side effects are numerous: pruritus, somnolence, bradypnea, nausea, vomiting, and urine retention (2). In addition, it does not allow an optimal control pain, having no effects on mobilization pain (2). Its use for providing analgesia after thoracic surgery is limited, because of a delay before obtaining satisfactory analgesia, weak efficacy during cough efforts, or inadequate analgesia despite the addition of systemic weaker analgesic agents (11).

Paravertebral blocks have the advantage of not provoking any lower limb motor block, or hemodynamic effects (16). Their disadvantages are the need to combine them with PCA (16). They may also be at risk of pneumothorax during their realization. (6). It can't be offered to patients when the surgeon foresees the surgical removal of the parietal pleura (6). Procuring similar analgesia to epidural analgesia, they also have fewer side effects (6, 16, 22, 23).

The main limiting factor for using intrathecal opiate analgesia relayed by a PCA pump is the frequent need for mechanical ventilation during one to three hours **potoperatively** (16).

**Comment [BV4]:** Depends on the dose you use.

Intrapleural block has no benefits (16) and is therefore not offered to patients.

The recommendations from MAPAR group are the following:

For thoracotomy, thoracic epidural analgesia is considered as the only technique that can suppress post-operative, either pain at rest or during cough and movement. In case of contraindication to thoracic epidural analgesia, a PCA pump associated or not to an intercostal block or intrathecal opiate analgesia, together with a PCA pump has to be considered (11). Thoracoscopy is believed to be less painful than thoracotomy, a PCA seems to be enough in that cadse (11). When compared to a classical thoracotomy, using retractors, the minimally-invasive technique of thoracoscopy reduces the importance of intracostal nerves traumatism. However, differences in the prevalence of chronic pain 7-12 months, 4-5 years, and 6-7 years after both surgical techniques are similar (14). Moreover, it is important to consider the possibility of a conversion of a thoracoscopy to a thoracotomy (22).

## Conclusion

Thoracic surgery is one of the most painful surgeries, provoking intense pain during the postoperative period. It is also often responsible for the occurrence chronic pain. Postoperative pain management must start at the pre-anesthesia consultation, to establish a reasonable analgesia plan for the patient. Thoracic epidural analgesia is considered as the gold standard of analgesia for thoracic surgery. In case of contraindication, the paravertebral block associated with PCA is a good alternative. Final decision on using on analgesic technique or the other will be based on the best benefit-risk balance.

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**Comment [BV5]:** Please format references according to the instructions to authors !