Pneumocephalus following thoracic surgery: the implication of the epidural anesthesia is still exceptional

Ariane Gentile, Arnaud Germain*, Alexandre Ouattara, Gérard Janvier

Department of Anesthesiology and Critical Care, Hôpital du Haut-Lévêque, Centre Hospitalier Universitaire (CHU) Bordeaux, Pessac, France

Received 5 May 2010; received in revised form 22 June 2010; accepted 22 June 2010

Abstract

Epidural analgesia is the gold standard for the management of pain after thoracopulmonary surgery. However, it is not without side-effects and complications. We report the case of a 52-year-old man who underwent left lower lobectomy for a carcinoid tumor. He received multimodal anesthesia combining epidural thoracic anesthesia and balanced intravenous general anesthesia. He presented with pneumocephalus on the 10th postoperative day. Etiological assessment consisted of isotopic cisternography and cerebromedullar magnetic resonance imaging (MRI), revealing a breach in the fourth left spinal dural nerve sheath. Although it was initially suspected, the thoracic epidural was eventually excluded as the cause. Management consisted of prompt surgical repair.

Keywords: Epidural anesthesia; Thoracotomy; Pneumocephalus; Cisternography

1. Introduction

Thoracic surgery is often associated with intense postoperative pain. Locoregional anesthesia currently plays an integral part in analgesia after pulmonary resection. Continuous paravertebral or epidural blockades are two effective techniques for the management of post-thoracotomy pain. Serious complications including dural breach, perimedullar hematoma or nerve lesions may be associated with epidural puncture. Fortunately, their incidence remains relatively low and has been estimated at 0.07% [1]. Nevertheless, many perioperative incidents are attributed to epidural analgesia without any physiopathological justification or diagnostic proof. Cases of pneumocephalus following epidural anesthesia have already been described, either after spinal anesthesia or after an epidural using loss of resistance to air [2, 3]. However, during thoracotomy, pneumocephalus may be also due to dura mater lesion secondary to paravertebral dissection near to the intervertebral foram. We report the case of a patient who presented with pneumocephalus following thoracic surgery.

2. Case description

A 52-year-old man underwent left lower lobectomy. A thoracic epidural was proposed for management of perioperative pain. This was introduced preoperatively, in the T5–T6 intervertebral space, using the hanging drop tech-

* This study was supported solely by the Department of Anesthesiology.

*Corresponding author. Service d’Anesthésie-réanimation 2, Hôpital Haut-Lévêque, Avenue Magellan, 33600 Pessac, France. Tel.: +33 5-57656866; fax: +33 5-57656811.
E-mail address: arnaud.germain@chu-bordeaux.fr (A. Germain).

© 2010 Published by European Association for Cardio-Thoracic Surgery
left pleura, without it being possible to identify the exact location (Fig. 1). Thoracic magnetic resonance imaging (MRI) revealed a breach in the meningeal sheath of the fourth left spinal nerve at the level of the intervertebral foramen (Fig. 2). It was decided to reintervene, taking into account the signs of poor tolerance of intracranial hypotension and the high-risk of meningitis. Postoperative follow-up was uneventful and his neurological signs regressed in 48 h.

3. Discussion

The clinical case reported here illustrates the diagnostic difficulty when faced with the appearance of pneumocephalus postlobectomy in the presence of an epidural, taking into account the multiple etiologies, anesthetic and surgical, that could explain it.

Pneumocephalus can complicate epidural anesthesia if the puncture is complicated by a dural breach, either evident or unnoticed [2–4]. In the literature, cases of postepidural pneumocephalus have only been described when identification of the epidural space was carried out by loss of resistance to air [2]. In the majority of cases, cerebral scans reveal a small volume pneumocephalus, amounting to a few, mainly intraventricular bubbles that are reabsorbed in a few days.

In the case reported here, the epidural was at initially incriminated, albeit wrongly. The epidural technique used (loss of resistance to liquid), the chronology of the headaches (late appearance, persistence), the volume of the pneumocephalus and its late persistence made involvement of the epidural unlikely. It was, therefore, necessary to consider of other possible causes of the pneumocephalus. Thoracic surgery is rarely implicated [5–8]. The dura mater can be damaged directly during lymph node removal near to the sympathetic chain neighboring the intervertebral foramen. The meningeal sheath of a spinal nerve can also be detached during the thoracotomy incision, by dislocation of the costotransverse joints [9].

Our case is original because of the etiological assessment carried out. Isotopic cisternography and MRI enabled us to locate a pleural-subarachnoid breach.

The cases described in the literature used myeloscans to locate the fistula [8], but this examination can lack sensitivity [10]. Isotopic cisternography studies the circulation of CSF after lumbar injection of indium 111 labeled DTPA. In our patient, the nasal fossa and external auditory canals were packed with gauze to make the examination more sensitive, in case of a small and old dural breach at the base of the skull. If such a breach is present, the marker will accumulate on the packing. Finally, cisternography demonstrated passage of CSF to the homolateral pleural cavity involved in the thoracotomy (Fig. 1). However, it was not sensitive enough to reveal the exact localization of the breach. Thoracic MRI enabled us to describe the fistula exactly, in relation to a breach in the meningeal sheath of the fourth left thoracic spinal nerve (Fig. 2).

T2-weighted cisterno-MRI revealed evidence of the osteomeningeal breach in the form of a T2 hypersignal, which
showed the subarachnoid space and pulmonary cavity in continuity with excellent sensitivity and specificity [10].

In this patient, knowledge of the origin of the pneumocephalus allowed us to adapt treatment. A neurosurgical team intervened to repair the meningeal sheath of the fourth left spinal nerve. After left hemi-laminectomy in T4–T5 via posterior access, the breach was sutured and watertightness was reinforced by musculoaponeurotic and fatty plastic surgery.

In the literature, conservative treatment is sometimes proposed; hyperhydration and positioning in dorsal decubitus allows complete regression of clinical signs of pneumocephalus [5, 7]. Thoracic drainage, which maintains the fistula, should always be stopped to allow healing of the breach, even if it can initially help the pneumocephalus regress [6].

In conclusion, post-thoracotomy pneumocephalus is a rare but potentially serious complication. Investigations should include sensitive imagery, particularly cisterno-MRI. Specific management depends on the localization of the breach, with early surgical repair in the case of a pleural-subarachnoid fistula.

Acknowledgements

We thank Erwan Floch for reviewing this manuscript.

References