Epidural Hematoma and Abscess Related to Thoracic Epidural Analgesia: A Single-Center Study of 2,907 Patients Who Underwent Lung Surgery

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Objective: **To report the major complications (epidural hematoma and abscess) of postoperative thoracic epidural analgesia in patients who underwent lung surgery.**

Design: **Prospective, monocentric study.**

Setting: **A university hospital.**

Participants: **All lung surgical patients who received postoperative thoracic epidural analgesia between November 2007 and November 2015.**

Interventions: **Thoracic epidural analgesia for patients who underwent lung surgery.**

Measurements and Main Results: **During the study period, data for 2,907 patients were recorded. The following 3 major complications were encountered: 1 case of epidural hematoma (0.34 case/1,000; 95% confidence interval 0.061-1.946), for which surgery was performed, and 2 cases of epidural abscesses (0.68 case/1,000; 95% confidence interval 0.189-2.505), which were treated medically.**

Conclusions: **The risk range of serious complications was moderate; only the patient who experienced an epidural hematoma also experienced permanent sequelae.**

KEY WORDS: *thoracic epidural analgesia, postoperative analgesia, lung surgery, epidural hematoma, epidural abscess*

SINCE THE INITIAL REPORT of Davies et al,[1] several systematic reviews and meta-analyses have shown that paravertebral analgesia produces equivalent analgesia to epidural analgesia with, in most of the studies, a lower incidence of adverse effects, including mainly hypotension, urinary retention, nausea, and vomiting.[2–5] Yeung et al[6] recently published a Cochrane Database Systematic Review of a comparison of these techniques in adults undergoing elective thoracotomy. Fourteen studies with a total of 698 participants were included in their analysis, and their principal conclusions confirmed previous reports—risks of developing minor complications are lower when a paravertebral blockade is performed and both techniques control acute pain. In a review of regional analgesia for video-assisted thoracic surgery by Steinthorsdottir et al,[7] these authors could not reach a conclusion because the studies were heterogeneous, with a small number of participants. Consequently, thoracic epidural analgesia is no longer considered to be the gold standard for preventing or treating post-thoracotomy pain. However, some anesthesiology teams continue to use thoracic epidural analgesia, perhaps in part because of its non favorable analgesic effects.[8] To propose a technique to a patient requires information that is as reliable and complete as possible regarding its risks and benefits. Information on the major risks of thoracic epidural analgesia (epidural hematoma and epidural abscess) before a thoracotomy for lung surgery remains limited because few studies have focused on these risks. Cameron et al[9] reported on 999 among 8,000 thoracic surgical patients and observed 2 epidural hematoma abscesses and no epidural hematomas. Pöpping et al[10] reported on a large series of 14,223 patients who received controlled epidural analgesia. Of these, 14% underwent a thoracic surgical procedure, and no epidural hematomas or epidural abscesses occurred among these patients.

The aim of this study was to report the authors' experience regarding the risk of major complications (epidural hematoma and abscess) after postoperative thoracic epidural analgesia in a population of patients undergoing lung surgery and to compare their findings with those of similar studies.

METHODS

Study

This retrospective analysis of a prospectively maintained institutional database received approval from the Ethical Committee of the Société Française d'Anesthésie-Réanimation; the requirement for written informed consent was waived by the Ethical Committee.

Patients

All patients who received postoperative thoracic epidural analgesia in the thoracic surgery ward between November 2007 and November 2015 were included in the study. During this period, institution policy was to recommend thoracic postoperative epidural analgesia to thoracic surgical patients who were scheduled for lung resection in the absence of any contraindications, including patient's refusal, treatment interfering with hemostasis, thrombocytopenia (patients with fewer than 80,000 platelets/mm^3), systemic sepsis, local cutaneous infection, allergy to any local anesthetic, and efficient anticoagulation.

Since 2007, a specific database was compiled by pain nurses for each of these patients. The database contained information on the epidural catheter insertion; the twice-daily evaluation of the efficacy and side effects of the catheter until its removal; and the last pain evaluation, including a neuropathic component before the patient left the hospital. The pain nurse was

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instructed to look for any abnormal neurologic signs, in particular, and to alert a senior anesthesiologist if any was present.

Each anesthesiologist followed a well-codified institutional procedure for the insertion of the catheter, particularly sterile precautions; the types of administered agents (local anesthetic and sufentanil) and their mode of administration (patient-controlled epidural analgesia); the administration of coanalgesics; and the procedures to follow in case of adverse events. All epidural catheters were placed in the operating room just before induction of anesthesia. After a 3-part skin disinfection, including alcohol-povidone, the physician wore sterile gloves, cap, mask, and gown to insert the epidural catheter. A large area was prepared, and a large drape allowed the physician to work in sterile conditions. Moreover, the catheter was subcutaneously tunneled to prevent early infection of the puncture site and to limit its displacement. Concerning the choice of drugs, local anesthetic comprised levobupivacaine with a bolus at the insertion of the epidural catheter according to the patient's size (4-6 mL of levobupivacaine 0.25%) followed by a continuous infusion of levobupivacaine 0.125% (5-7 mL/hour) plus sufentanil (0.25 μg/mL). This epidural infusion began before surgical incision and was followed postoperatively using a patient-controlled epidural analgesia mode of administration (3-mL bolus every 20 minutes).

A systematic prophylactic antibiotic was given about 30 minutes before skin incision as recommended by the Société Française d'Anesthésie-Réanimation.

All epidurals were performed either by a resident under the supervision of an experienced anesthesiologist or by the latter. In cases in which the resident experienced difficulty, the anesthesiologist took over for the resident. The number of attempts and the occurrence of a hemorrhagic tap always were documented in the database.

The management of thromboembolic prophylaxis was standardized and consisted of a subcutaneous administration of unfractionated heparin that began 4 to 6 hours after surgery in the absence of bleeding > 50 mL/hour in the chest tube or any disorder in coagulation tests. The only variable in the prescription was the dose, which was related to the patient's comorbidity and weight. Therefore, the first dose could be from 0.2 mL to 0.5 mL. Heparin was administered twice daily to ensure a short interruption of treatment the day of removal of the epidural catheter, in either the morning or the afternoon.

The catheter and the last chest tube were removed on the same day, and pain was treated with oral analgesics. However, in case of fever not related to an obvious other cause (eg, pneumonia), the catheter was removed systematically and bacteriology was performed.

Statistical Analysis

Categorical variables are expressed as percentages and continuous variables as median (interquartile range, min-max) values because their distribution was non-normal. The predicted minimum and maximum risks of complications were calculated using the lower and upper bounds of the 95% confidence interval based on Simpson's formula.[11]

A literature search was performed in PubMed (MEDLINE) using the following terms: "thoracic epidural analgesia," "epidural hematoma," and "epidural abscess." The full texts of articles identified from potentially relevant titles and abstracts were reviewed. Two authors (MF, MLG) independently screened the retrieved reports and excluded irrelevant data. The authors chose to report only single-center studies because they hypothesized that their results were not affected adversely by the different practices of the centers included in multicenter studies. However, the authors acknowledge that this was a personal choice leaving out studies reporting very large numbers of patients. The results of all cited references of the included studies were recalculated using Simpson's formula to present homogeneous data, thus facilitating the comparison of this study's results with those of other studies.

RESULTS

A total of 2,907 patients received thoracic epidural analgesia during the study period. Patient characteristics are summarized in Table 1.

The following 3 major complications were encountered: 1 epidural hematoma, for which surgery was performed, and 2 epidural abscesses, which were treated medically.

A compressive epidural hematoma after a lower lobectomy (1:2,907 or 3.4/10,000) was observed on the third postoperative day. This complication occurred in an 82-year-old male who had a history of mucinous adenocarcinoma of the right lung. A midline puncture, using a 16-gauge Tuhoy needle, was performed at the T5-T6 level followed by a paramedian

Table 1. Patient Characteristics

Characteristics	
Men/women, %	57.8/42.2
Age, median (IQR, min-max)	60 y (46.0-69.0, 15-93)
ASA score, %	
ASA 1	16.2
ASA 2	59.4
ASA 3	20.5
ASA 4	3.9
Type of surgery, %	
Pneumonectomy	3.1
Lobectomy	57.6
Wedge resection	16.4
Transplantation	7.9
Other	15.0
Duration of epidural analgesia, median (IQR, min-max)	5 d (4.0-5.0, 1.0-8.0)
Duration of epidural analgesia, %	
1 d	2.5
2 d	3.7
3 d	11.0
4 d	29.9
5 d	47.9
6 d	4.2
7 d	0.7
8 and 9 d	0.1

NOTE. Data are presented as percentages or as the median (IQR, min-max).

Abbreviations: ASA, American Society of Anesthesiologists; IQR, interquartile range.