



Laparoscopic cholecystectomy performed under regional anesthesia in patients with chronic obstructive pulmonary disease

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Abstract

Background: Laparoscopic cholecystectomy has been successfully performed using epidural anesthesia. We evaluated our experience with this surgical approach in high-risk patients.

Methods: We present the results of 29 patients with gallstones who, between 1998 and 1999, underwent laparoscopic cholecystectomy with epidural anesthesia. All but 1 patient had chronic obstructive pulmonary disease.

Results: All 29 surgeries were successfully completed via laparoscopy and with the patients under epidural anesthesia. No patient required endotracheal intubation during surgery or pain medication afterward. Postoperatively, 1 patient developed a wound infection and 3 patients developed urinary retention. At last follow-up (12 months postop), all patients were in good health.

Conclusion: In this series, laparoscopic cholecystectomy was feasible under epidural anesthesia and it eliminated the need for postoperative analgesia. We believe that this approach should be considered for patients who require biliary surgery but who are not good candidates for general anesthesia due to cardiorespiratory problems.

Key words: Cholecystectomy — Epidural — Anesthesia

In the past century, diagnostic laparoscopic procedures with pneumoperitoneum were commonly performed

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using local anesthesia [22]. With the advent of advanced laparoscopic surgical techniques, it has become possible to perform laparoscopic surgery of the gastrointestinal tract using epidural anesthesia [14].

In 1970, Brindernbaugh and colleagues [5] used epidural anesthesia during gynecological laparoscopic procedures. In the past decade, many surgeons published case reports of laparoscopic cholecystectomy that was performed on pregnant and nonpregnant patients while they were under epidural anesthesia [7, 9, 19, 21]. Azurin et al [2] obtained excellent results when they used this type of anesthesia during laparoscopic preperitoneal treatment of inguinal hernias.

Based on our previous experience with open cholecystectomies under epidural anesthesia and encouraged by these reports, we evaluated our experience using epidural anesthesia during laparoscopic cholecystectomies in 29 patients who were poor candidates for general anesthesia due to respiratory problems. This article summarizes the results and discusses them in the context of the literature.

Patients and methods

Between 1998 and 1999, 300 laparoscopic cholecystectomies were performed at the Department of Surgery of the Hospital de Clinicas, University of Cordoba, Argentina. Only 29 patients were selected for laparoscopic cholecystectomy under epidural anesthesia. Inclusion criteria were clinical, sonographic, and laboratory findings that suggested the presence of calculi within the gallbladder and the presence of pulmonary disease. Patients with suspected common bile duct stones were excluded, as were patients who were not cooperative for an awake procedure. The medical charts were analyzed retrospectively to determine the pre-, intra-, and postoperative course.

Of the 29 patients, 18 were women (62%) and 11 were men (38%). The average age was 64 years (range, 39–75 years). All patients were smokers and had been so for at least 20 years. None of the patients were obese or had obstructive jaundice. Epidural anesthesia was indicated in 28 patients (97%) because of chronic obstructive pulmonary

disease (COPD). The youngest patient in our series (39 years old) did not have pulmonary disease, but she refused general anesthesia.

Twenty-eight patients (97%) presented with symptoms of biliary colic. One patient who had type I diabetes mellitus had severe acute cholecystitis that was not discovered until surgery. Ten of the patients (34%) had severe COPD. The most common comorbid illness was arterial hypertension, which was present in 15 patients (52%).

The patients' mental status was evaluated preoperatively because their cooperation was needed during the surgical procedure. We also measured alkaline phosphatase and bilirubin levels, which were within normal limits in all patients, and hepatic enzyme levels as serum glutamic-pyruvic transaminase (SGPT) and serum glutamic-oxaloacetic transaminase (SGOT). The latter were also within normal limits except in the patient with undiagnosed acute cholecystitis: she had mildly elevated levels.

The surgical risk of each patient was estimated using the American Society of Anesthesiology classification system. One patient (3.4%) was classified as class 1, 15 patients (51.6%) were classified as class 3, and 13 patients (45%) were classified as class 4.

Epidural anesthesia technique

Before the epidural anesthetic procedure was started, each patient received a 20-min infusion of 15 ml/kg of normal saline to prevent hypotension during the anesthetic procedure. Each patient was then placed in a seated or lateral decubitus position. Local anesthesia (30 mg of 2% lidocaine) was injected into the skin. An 18-gauge epidural needle was introduced into one of the following spinal spaces: D9–D10 or D10–D11. The anesthesia (6 mg/kg Xylocaine with 2% epinephrine and 1 µg/kg Fentanyl) was injected into the epidural space using the Gutierrez technique [8]. An intramuscular sedative (Midazolam, 0.10–0.15 mg/kg) was also administered to each patient to relieve anxiety. At this dose, the drug has a mild hypnotic and sedating effect and enables the patient to continue breathing spontaneously.

Surgical technique

Approximately 15 min after the epidural anesthesia was administered, but before starting the surgical procedure, the level of analgesia was checked to ensure it was sufficient.

A three-trocar technique was used. The abdominal cavity was entered through a 1-cm infraumbilical incision. A Verres needle was used to create a pneumoperitoneum; carbon dioxide (CO₂) was insufflated to an intraabdominal pressure of 10 mmHg. To avoid stimulating the vagal nerve and causing bradycardia, the CO₂ was insufflated slowly, at 2 L/min, using the low-flow setting of the insufflator (Karl Storz, Buenos Aires, Argentina).

A 10-mm trocar was placed in the umbilicus. A telescope angled at 30° was placed into the abdominal cavity, and accessory trocars were placed in the right flank (5 mm) and epigastrium (10 mm). After all trocars were in place and the intraabdominal pressure reached 10 mmHg, the insufflator was turned off. In 10 patients, no further insufflation was needed, and the procedure was completed with the residual gas and pressure. The remaining 19 patients required intermittent insufflations to keep the intraabdominal pressure at 10 mmHg.

In all 29 patients, blunt dissection of the cystic duct was performed using a Maryland dissector, avoiding any dissection with electrocautery, to prevent thermal injury to the hepatoduodenal structures. Intraoperative cholangiography was performed selectively in 14 patients (48%). The abdominal cavity was drained in the patient with acute cholecystitis.

Pulse oximetry and blood pressure were continuously monitored during the anesthesia and surgical procedures. Throughout surgery, patients' oxygenation was maintained with 100% oxygen by mask at a rate of 2 L/min. If a patient's blood pressure dropped, it was corrected by decreasing the intraabdominal pressure, increasing the infusion rate of crystalloids, or using vasopressor drugs. When a patient experienced shoulder pain, an additional 1 µg/kg Fentanyl was administered intravenously. To prevent infection, we administered one dose of a first-generation cephalosporin before the surgery and two doses afterward.

Results

All 29 surgeries were successfully completed via laparoscopy and with the patients under epidural anesthesia. We did not experience any difficulties performing this surgical approach, and it did not alter our surgical technique.

In 28 patients, the mean insufflation time was 40 min (range, 20–65 min). Insufflation lasted 120 min in the patient with acute cholecystitis.

All patients tolerated the procedure well, although 14 (48%) reported intraoperative shoulder pain. The blood pressure and heart rate of all 29 patients remained stable during the procedure, and their breathing remained spontaneous. No patient required endotracheal intubation at any time during the surgery.

Postoperatively, patients experienced minimal pain. Thus, pain medication was not required. All patients recovered quickly. The patients were started on a liquid diet immediately after surgery, and they were mobilized as soon as they had adequate sensibility in and motility of their lower extremities—a few hours after surgery (mean time, 3.5 h).

Postoperative complications developed in four patients (14%). In one patient (3%), the complication was wound infection, which was related to the surgical procedure. Three patients (10%) developed urinary retention, which was related to the epidural anesthesia.

In this study, the average cost of the epidural anesthesia was \$35 for 4 h per 70 kg of patient weight. In comparison, the cost of general anesthesia was \$50 per hour, which is almost 500% more if one calculates the cost per hour and 80% more if one calculates the cost per procedure. At last follow-up (12 months postop), all patients were in good health.

Discussion

The main findings of this review are that laparoscopic cholecystectomy can be safely performed using epidural anesthesia and that this surgical protocol can eliminate the need for postoperative pain medication.

One of the feared complications of performing laparoscopic (or open) abdominal surgery without general anesthesia is that the abdominal wall will not relax enough to allow surgeons to visualize the abdominal contents. In fact, many authors have encountered this problem [2, 5]. In contrast, abdominal relaxation was sufficient in all 29 of our patients.

The negative effects of CO₂ pneumoperitoneum on lung respiratory function have been widely studied [4]. With general anesthesia, mechanical ventilation prevents acidosis by washing the excess CO₂ out of the lungs [6]. Because patients under epidural anesthesia do not normally receive mechanical ventilation, CO₂ partial pressure increases during surgery, which could potentially cause acidosis, which in turn could cause arrhythmias. However, this risk can be lowered by adequately oxygenating the patient [2, 6]. We did not observe any changes in heart rhythm in any of our patients, and none developed acidosis.

However, in future studies, we will consider using nitrous oxide (N₂O) instead of CO₂ to create the pneumoperitoneum because it can prevent hypercarbia and arrhythmias [13]. It would be an especially helpful alternative for patients with severe COPD who retain CO₂ because it would prevent systemic CO₂ absorption during surgery, avoiding further assault to their already compromised respiratory status. N₂O could also help prevent pain because it does not irritate the peritoneum [13].

Anesthetic agents interfere with mucociliary transport. Mechanical ventilation and upper abdominal surgery both have adverse effects on respiratory mechanics (e.g., functional residual capacity, vital capacity, tidal volume, and closing volume) [11, 19]. Because mucociliary clearance is an important pulmonary defense mechanism against infection, general anesthesia that uses inhalational or intravenous agents may harm patients with COPD. Furthermore, it has been shown that patients with COPD are at risk of developing pulmonary complications after upper abdominal surgery [3]. Therefore, these patients may benefit from laparoscopic surgery performed under epidural anesthesia.

The goals of anesthesia management in patients with COPD should be to (1) avoid anesthetics that depress mucociliary transport, (2) provide postoperative pain relief that can adequately prevent deterioration of respiratory mechanics, and (3) ambulate the patient as early as possible [19]. Epidural anesthesia fulfills all of these criteria and aids in the quick and uneventful recovery of these patients.

In our study, no patient required postoperative pain medication—a remarkable finding that was also reported by Pursnani et al. [19], who performed laparoscopic cholecystectomy under epidural anesthesia in patients with chronic respiratory disease. The significance of preemptive anesthesia in postoperative pain relieve is controversial. Several studies have reported that epidural anesthesia diminishes postoperative analgesic medication consumption [1, 20]. However, several other authors failed to show any benefit with preemptive analgesia [15, 16]. The use of epidural anesthesia (which acts as preemptive analgesia) in addition to the use of very low-pressure pneumoperitoneum could explain why our patients' postoperative pain was minimal and why their recovery period was quick and pleasant. This theory is supported by the literature [12, 19].

Epidural anesthesia is more advantageous than general anesthesia because it decreases anesthesia respiratory complications, specifically pneumonia, atelectasis, and hypoxemia, in patients at risk for pulmonary complications [10]. This results in a quicker recovery and less postoperative pain for patients and a better cost-benefit ratio.

However, epidural anesthesia is not free from complications [18]. Dural puncture and inadvertent spinal anesthesia may lead to the need for endotracheal intubation [17]. Neither complication occurred in our patients. Vomiting, migraines, and urinary retention might occur after epidural anesthesia, but only urinary retention developed in 3 of our 29 patients (10%).

We believe that our results are related to many factors. We used a low CO₂ pressure combined with in-

termittent insufflation. Our surgical team was experienced, and operative times were short. In addition, patient selection was based on the patients' ability to cooperate during the procedure and on noncomplicated biliary pathology.

Although we limited this review to high-risk patients, further studies of epidural anesthesia may lead to its use in other patients as well. Meanwhile, patients with contraindications to general anesthesia may benefit from this safe, low-cost, minimally invasive alternative.

Conclusions

This article has demonstrated that laparoscopic cholecystectomy is not only feasible under epidural anesthesia but also decreases the need for postoperative analgesia. This approach should be considered as a valid option for patients with biliary colic who are poor candidates for general anesthesia due to cardiorespiratory or airway problems as well as for patients with other contraindications for general anesthesia [10, 14].

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