

Laparoscopic cholecystectomy under general and thoracic spinal anesthesia

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ABSTRACT

Although general anesthesia is typically used for laparoscopic cholecystectomy, many individuals with serious medical conditions occasionally find that they are unable to tolerate it. In these cases, thoracic spinal anesthesia may be helpful. Under spinal anesthetic and

low-pressure CO₂ pneumoperitoneum, laparoscopic cholecystectomy can be safely completed. In comparison to lumbar spinal anesthesia with normal doses, the use of thoracic puncture and modest doses of hyperbaric bupivacaine resulted in greater hemodynamic stability, less hypotension, and a shorter period of sensory and motor blockage.

Key Words: *Regional anesthetic; Spinal anesthesia; Combined spinal epidural; Laparoscopic cholecystectomy; Cardiac illness*

INTRODUCTION

Several surgeons now routinely perform laparoscopic cholecystectomy, which Phillippe Mouret pioneered in 1987 [1,2]. This approach, which is far less invasive than earlier open surgery, provides advantages like reduced pain, a shorter hospital stay since less tissue damage occurs, and a quicker return to normal activities because of a quick recovery [3]. However, significant challenges in anesthetic administration may arise because pneumoperitoneum and position changes can cause extensive hemodynamic fluctuation.

Due to CO₂ absorption and an increase in venous return brought on by pneumoperitoneum, these effects are felt throughout the body [4]. Initial CO₂ absorption causes a rise in the gas's elimination in exhaled air, arterial blood, and venous blood [5,6]. By causing metabolic and respiratory acidosis, this carboxamide lowers arterial and mixed venous pH as well as arterial PO₂ [5]. In contrast to inert gases like helium and argon, absorption of CO₂ has a deleterious impact on respiratory function [6]. The following parameters all rise: minute ventilation, peak inspiratory pressure, pulmonary vascular resistance, estimated physiological short circuit, alveolar CO₂ concentration, central venous pressure, diastolic and systolic blood pressure, systemic vascular resistance, and cardiac index [4].

Effect of regional anesthetic

The surgical stress response is decreased during laparoscopic cholecystectomy by the regional anesthetic. No airway

instrumentation and a low incidence of deep vein thrombosis are present during regional anesthesia [7]. Despite this, because of the severe thoracic nerve block, regional anesthetic runs the risk of causing insufficient breathing. Due to its innervation at the cervical level and the fact that expiration is typically a passive process, the diaphragm, which is the primary inspiratory muscle, will be untouched. However, as they are predominantly produced by the muscles of the anterior abdominal wall, which are innervated by the thoracic nerves, vigorous expiration and coughing will be impacted.

Regulation of the CO₂ concentration

In patients with obstructive airway disease, which depends on vigorous expiration to sustain lung ventilation, the use of relatively large doses of local anesthetics can have devastating results. By employing an adequate dose of local anesthetics, it is therefore important to reduce the degree of nerve block and muscular paralysis. Controlling the pneumoperitoneal pressure precisely during surgery to guarantee appropriate diaphragmatic excursion is another issue. Because CO₂ insufflation can create pneumoperitoneum and stimulate the vagal nerve, which can reduce the heart rate, it is important to inhale CO₂ gently and keep the maximum intra-abdominal pressure below 14 mmHg. Numerous studies have looked into the detrimental effects of pneumoperitoneum with CO₂ on respiratory function [8]. Due to its high water solubility and a great capacity for exchange in the lungs, CO₂ is typically employed for

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safety. By using capnography and ventilation, it is simple to monitor and regulate the CO₂ concentration [9].

Thoracic spinal anesthesia can be safe for laparoscopic cholecystectomy in patients without associated respiratory depression because the respiratory control mechanism is still intact and allows patients to adjust their minute ventilation. SpO₂ and PETCO₂ remained within normal limits (no hypoxemia or retention of CO₂) throughout the procedure. When reduced intra-abdominal pressure and minimal patient tilt are employed during the surgical operation, it appears that regional anesthesia may be an alternative to general anesthesia for laparoscopic cholecystectomy in patients with cardiac illness [10].

DISCUSSION

At the low thoracic level, the Combined Spinal Epidural (CSE) method was carried out without too much trouble. The 2nd sacral nerve roots to 5th sacral nerve roots are located in the dural sac at L3-L4, which is the typical location for lumbar puncture. It is simple to comprehend why the thoracic puncture causes lumbar paresthesia given that the lower nerves are of higher origin and that the lumbar nerves originate from a thoracic level (L1-S4). Two patients did feel some paresthesia when the spinal needle was first inserted, but these symptoms went away when the needle was removed and did not cause any postoperative sequelae. Any approach of spinal anesthesia can cause paresthesia, but they have the potential to be more significant when the needle is put above the spinal cord's termination. The risk of contact with neural tissue should be reduced if a CSE system is used, as it is here, to limit the length of the needle that can extend past the tip of the epidural needle. However, the presence of paresthesia in two patients suggested that this could be important. When low thoracic spinal needles were inserted, noticed a 6.6% incidence of paresthesia without any long-term neurologic damage [11].

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