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## Updated evidence for optimal anesthesia following laparoscopic cholecystectomies

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The gold standard surgical treatment for symptomatic gallstone disease is laparoscopic cholecystectomy (LC) [1], which is a minimally invasive procedure to remove the gallbladder. Compared to conventional open cholecystectomy, evidence of a significantly shorter hospital stay and faster patient recovery has been shown worldwide with LC [2].

LC is classically performed under general anesthesia (GA) with controlled ventilation using endotracheal intubation, which can help prevent aspiration, dyspnea, and hypercapnia resulting from carbon dioxide pneumoperitoneum [3]. Pneumoperitoneum during laparoscopy, which can cause abdominal and respiratory discomfort, is not well tolerated in patients who are awake during the procedure. The 2018 PROSPECT guidelines on LC recommended that wound/port infiltration be used as the routine regional technique, while the other available techniques were not recommended because of limited trial evidence, the rate of failure, or the potential for complications. However, several recent studies [4-7] have verified the availability and safety of regional anesthesia (RA), including spinal and epidural anesthesia, for LC. Under RA, patients are awake and oriented at the end of the procedure and are able to ambulate earlier than patients receiving GA. Other advantages include less postoperative pain, nausea, and vomiting and a reduced neuroendocrine stress response compared with GA [4-7]. In addition, the risk of mortality, venous thromboembolism, myocardial infarction, and several other complications is lower with RA [8]. However, RA, such as spinal anesthesia, may cause abdominal discomfort and shoulder pain [9,10]. Therefore, various studies have assessed the feasibility of using RA for patients undergoing LC [4,7,9-13].

In this issue of the *Korean Journal of Anesthesiology*, we would like to introduce a systematic review and network meta-analysis on the effect of single-dose RA for LC conducted by De Cassai et al. [14]. This study showed that most RA techniques are effective in reducing postoperative opioid consumption, pain on the first postoperative day, and postoperative nausea and vomiting (PONV), which is consistent with previously published guidelines. The authors concluded that all the RA techniques assessed in patients undergoing LC in the 46 included studies were superior to placebo in reducing opioid consumption. Among the included techniques, the paravertebral block, which significantly reduced morphine consumption, was the most effective. Postoperative pain was also evaluated at 12 h after surgery in 53 studies and 24 h after surgery in 65 studies. Compared to placebo, the subcostal transversus abdominis plane (TAP) block showed the greatest reduction in postoperative pain at 12 h, and the erector spinae plane (ESP) block showed the greatest reduction in postoperative pain compared to placebo at 24 h. Additionally, PONV was significantly reduced compared to placebo or no intervention in 40 studies evaluating the ESP block; TAP block; intraperitoneal instillation; and wound/port invasion, excluding the rectus sheath block, with the TAP block showing the greatest

effect on PONV. Additionally, the need for rescue analgesics after LC was reduced by all interventions in the 28 studies evaluating this outcome, with the quadratus lumborum block being the most effective.

Regrettably, differences in the hospital length of stay was not assessed in this study due to a lack of appropriate performance studies. Nevertheless, the strength of this study was the inclusion of various outcomes besides postoperative pain to evaluate the effect of RA on patients undergoing LC.

Although GA has potential advantages over RA in patients undergoing LC, the challenges of RA will continue to develop, particularly with advances in medical devices and RA techniques, and more diverse results will be expected from ongoing clinical studies.

## Funding

None.

## Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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