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Enhanced recovery after surgery and thoracic spinal anesthesia in major surgery: an underestimated synergy

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Over the past two decades, the introduction of Enhanced Recovery After Surgery (ERAS) protocols has represented not only an organizational innovation but also a cultural shift in perioperative care for major surgery.[1] Based on multidisciplinary evidence, these protocols aim to reduce the surgical stress response, preserve physiological function, and enhance postoperative recovery. At the same time, renewed interest has emerged in advanced regional anesthetic techniques,[2] including thoracic spinal anesthesia (TSA), now applied even in major abdominal, urologic, and gynecological surgery – fields traditionally managed in general anesthesia. It is important to emphasize that TSA is applicable not only in open surgery but also in minimally invasive techniques, including laparoscopic and robotic[3] approaches, which constitute fundamental milestones within the ERAS pathway. The potential synergy between ERAS and TSA deserves critical reflection.

General anesthesia remains the standard of care for most major surgical procedures due to its reliability, airway control, and versatility in complex and prolonged surgeries. However, it is inevitably associated with non-negligible systemic effects, including respiratory complications (*e.g.*, atelectasis, pneumonia), postoperative cognitive dysfunction, paralytic ileus, and a higher incidence of postoperative nausea and vomiting. Moreover, the use of intra- and postoperative opioids may hinder key ERAS components such as early mobilization and rapid resumption of oral intake.

TSA, when performed with appropriate techniques and dosing, provides a targeted segmental block with a controllable hemodynamic impact and a significant reduction in systemic opioid requirements. Advances in anesthetic expertise and a better understanding of functional anatomy have made this technique safer and more reproducible than previously considered.[4]

TSA can be applied to major abdominal surgery (*e.g.*, colorectal resections, gastric resection, wall disaster), urologic surgery (*e.g.*, prostatectomy, nephrectomy), and gynecological surgery (*e.g.*, hysterectomy, adnexectomy) either in laparotomy or laparoscopy, the latter requiring more expertise because of the extension of the anesthetic request. When combined with light sedation, TSA allows the patient to remain awake or in a state of conscious comfort, preserving spontaneous ventilation and minimizing systemic pharmacological impact.

The principles of ERAS find a natural ally in regional anesthesia. First, the reduction of the neuroendocrine response to surgical stress – already a cornerstone of ERAS – could be further modulated by the segmental sympathetic block achieved with TSA. This results in decreased catecholamine and cortisol release, with beneficial effects on metabolism, immunity, and organ function.

Second, TSA, like all anesthetic regional techniques, allows for a marked reduction in opioid use, promoting faster recovery of gastrointestinal function and reducing the incidence of postoperative ileus, one of the main barriers to ERAS success in abdominal surgery and reducing intensive care unit admissions.

Another important synergy lies in the preservation of respiratory function. By avoiding mechanical ventilation and anesthetic-induced respiratory depression, TSA reduces the risk of pulmonary complications[5] and supports early mobilization, a key pillar of ERAS pathways.

Emerging evidence – although still heterogeneous and often limited to high-experience centers – suggests that the use of TSA in major surgery may lead to reductions in hospital length of stay, postoperative complications, and healthcare costs. In particular, benefits have been observed in terms of faster recovery, lower incidence of delirium in elderly patients, and greater patient satisfaction. Obviously, randomized studies are required to confirm and validate these findings.

However, these outcomes are highly dependent on careful patient selection,[4] the experience of the anesthesiology team, and the full integration of the technique within a structured ERAS pathway. TSA should not be viewed as a simple technical alternative, but rather as part of a complex, multidisciplinary strategy.

Despite growing interest, the adoption of TSA remains limited. Major barriers include concerns about the potential injury of the spinal cord and the hemodynamic effects, the learning curve, and the management of potential intraoperative conversion to general anesthesia. Furthermore, not all patients are suitable candidates, particularly in the presence of contraindications to neuraxial techniques or highly complex surgical conditions.

It is equally important to avoid an ideological approach: the goal is not to indiscriminately replace general anesthesia, but to identify the clinical scenarios in which TSA can offer genuine added value, in alignment with ERAS principles.

The integration of TSA in ERAS protocols represents a promising frontier in major abdominal, urologic, and gynecological surgery. This synergy has the potential to redefine perioperative standards by placing the patient at the center of a more physiological, less invasive, and recovery-oriented pathway. We summarized how minimally invasive surgery and TSA act on complementary physiological pathways, reinforcing ERAS goals and potentially leading to superior perioperative outcomes compared to conventional approaches using general anesthesia alone.

However, to translate this perspective into consolidated clinical practice, large randomized trials, technical standardization, and investment in training are required.[6] Only through a rigorous, multidisciplinary scientific approach will it be possible to fully understand the role of TSA within modern ERAS pathways and define a new balance between innovation and safety.

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