

Postoperative Pain Management in Umbilical Hernia Surgery: A Review

Dr. N. Junior Sundresh¹, M.S., FRCS., FACS., Ph.D., Kiruthika N^{2*}, Maheswari K³.

¹*Professor, Department of Surgery, Government Cuddalore Medical College and Hospital, Annamalai nagar, Chidambaram.*

²³*Pharm. D, Department of Pharmacy, Annamalai University, Annamalainagar, Chidambaram.*

[²*kiruthika18natanam@gmail.com*](mailto:kiruthika18natanam@gmail.com), [³*mahekamaraj004@gmail.com*](mailto:mahekamaraj004@gmail.com).

Abstract

Umbilical hernia repair is a common surgical procedure performed worldwide, and effective postoperative pain management is crucial for improving clinical outcomes, facilitating early mobilization, and reducing opioid dependence. Pain following umbilical hernia surgery can be moderate to severe due to tissue dissection, mesh placement, and midline fascial incision. This review evaluates current evidence on analgesic strategies including systemic analgesics, local anesthetic wound infiltration, rectus sheath block (RSB), transversus abdominis plane (TAP) block, and multimodal analgesia protocols. Opioid-based regimens alone are no longer recommended due to adverse effects such as sedation, nausea, and respiratory depression, which delay recovery. Non-opioid analgesics such as paracetamol, NSAIDs, and gabapentinoids provide significant opioid-sparing benefits and are considered first-line therapy. Local infiltration is simple and cost-effective but limited by shorter duration of action. Regional anesthesia techniques, particularly ultrasound-guided RSB, provide superior midline analgesia by blocking terminal thoracolumbar nerves within the rectus sheath and significantly reduce postoperative opioid requirements. TAP block has demonstrated effectiveness in ventral and peri-umbilical surgery, improving pain scores and promoting enhanced recovery pathways. Current evidence supports the integration of regional blocks into ERAS-based multimodal protocols as the most effective strategy for postoperative pain control after umbilical hernia repair.

Keywords: Umbilical hernia, postoperative pain, rectus sheath block, TAP block, multimodal analgesia.

Introduction

Umbilical hernia repair is a commonly performed surgical procedure worldwide, indicated for congenital defects in children, as well as primary or acquired abdominal wall weaknesses in adults. The incidence of umbilical hernias continues to rise due to factors such as obesity,

pregnancy, ascites, and conditions associated with elevated intra-abdominal pressure. Postoperative pain following umbilical hernia surgery can significantly influence patient outcomes, as poorly controlled pain may impair respiratory function, delay ambulation, prolong hospital stay, and increase the risk of chronic postsurgical pain. Therefore, effective postoperative pain management is critical in promoting early mobilization, enhancing patient satisfaction, reducing opioid dependence, and supporting rapid return to daily activity. Modern surgical care frameworks, including Enhanced Recovery After Surgery (ERAS) protocols, emphasize the importance of structured multimodal analgesia combining systemic analgesics, regional anesthesia techniques, and opioid-sparing strategies to optimize recovery and minimize adverse effects. Consequently, identifying the most effective analgesic modalities tailored for umbilical hernia repair remains a priority in improving perioperative outcomes and overall quality of care [1].

Methods

A narrative review of relevant randomized controlled trials, guidelines, and systematic reviews was conducted using PubMed, Google Scholar, and MEDLINE from inception to 2025. Keywords included “umbilical hernia,” “postoperative pain,” “rectus sheath block,” “TAP block,” and “analgesia.” Studies focused on abdominal wall surgery and midline analgesia techniques were prioritized [2].

Pain Characteristics in Umbilical Hernia Surgery

Pain following umbilical hernia repair arises from multiple anatomical structures and surgical manipulations, contributing to both somatic and visceral pain components. Tissue trauma involving the skin, subcutaneous tissue, fascia, rectus sheath, peritoneum, and muscle layers plays a major role in postoperative discomfort. In addition, when mesh is used for reinforcement, mesh fixation using sutures or tacks can further irritate the surrounding tissue and amplify pain severity during the early postoperative period. The characteristics of postoperative pain also differ based on the surgical technique employed. Open hernia repair typically results in localized midline incisional pain due to larger external incisions, extensive tissue dissection, and direct handling of the abdominal wall layers. In contrast, laparoscopic repair is associated with pain originating from trocar insertion sites, stretching of the abdominal wall, and pneumoperitoneum-related diaphragmatic irritation, which may cause referred shoulder-tip pain due to phrenic nerve stimulation. Moreover, the visceral pain component arising from peritoneal manipulation plays an important role, particularly in minimally invasive procedures. Therefore, postoperative pain management strategies should be designed to address both somatic and visceral pain sources to ensure optimal patient comfort, early mobilization, and prevention of chronic postoperative pain. Targeted regional anesthesia, local infiltration, and multimodal systemic therapy collectively help achieve effective analgesia tailored to individual surgical approaches and pain characteristics [3].

Effect of Surgical Approach

Open hernia repair typically produces greater postoperative pain due to the larger incision size and extensive tissue manipulation required to access and repair the defect. The surgical approach involves dissection of skin, subcutaneous fat, and fascia, which activates inflammatory pathways and nociceptors, leading to more intense early postoperative pain. Additionally, sutured or mesh fixation directly through muscle and fascia can cause prolonged discomfort and increase opioid requirements during recovery. Compared to laparoscopic repair, the wider exposure and greater mechanical handling of tissues contribute significantly to heightened somatic pain [4]. Laparoscopic repairs typically result in lower postoperative pain and faster recovery because they require smaller incisions and cause less tissue disruption. Patients usually experience reduced analgesic requirements and earlier mobilization. However, pneumoperitoneum used during laparoscopy may irritate the diaphragm and phrenic nerve, occasionally leading to shoulder-tip pain in the early postoperative period [5].

Multimodal Analgesia Principles

Multimodal analgesia involves the combined use of different pharmacological and regional analgesic techniques to target multiple pain pathways simultaneously, thereby improving pain control while minimizing reliance on opioids. This approach integrates non-opioid systemic agents—such as acetaminophen, NSAIDs, and COX-2 inhibitors—with adjuvant drugs and regional techniques like local anesthetic infiltration, rectus sheath block, and TAP block. By reducing opioid consumption, multimodal strategies help limit opioid-related adverse effects including nausea, vomiting, ileus, respiratory depression, and postoperative dependence. Current professional guidelines strongly recommend routine incorporation of non-opioid analgesics and regional anesthesia as foundational components of postoperative pain management in abdominal wall surgery to enhance recovery and patient comfort.

Systemic Analgesics

Acetaminophen

Acetaminophen is considered a safe and effective first-line analgesic and is recommended as a baseline component of postoperative pain management in patients undergoing umbilical hernia repair. It provides reliable pain relief with minimal adverse effects and lacks the gastrointestinal, renal, and bleeding risks associated with NSAIDs. When used regularly in scheduled dosing rather than on demand, acetaminophen significantly enhances analgesic outcomes and contributes to an opioid-sparing effect, particularly when incorporated into a multimodal analgesia regimen.

NSAIDs and COX-2 Inhibitors

NSAIDs significantly reduce postoperative pain and opioid consumption by inhibiting peripheral and central prostaglandin production, making them an important component of

multimodal analgesia following umbilical hernia repair. Their use contributes to improved pain scores and faster mobilization, but clinicians must carefully evaluate patient-specific risk factors such as renal impairment, gastrointestinal irritation, and surgical bleeding tendency, especially in high-risk populations. COX-2 selective inhibitors provide comparable analgesic benefits while offering a more favorable gastrointestinal safety profile and lower risk of platelet inhibition, making them a preferred option when traditional NSAIDs are contraindicated.

Adjunct Medications

Routine gabapentinoid use is generally discouraged for minor and ambulatory surgical procedures, including uncomplicated umbilical hernia repair, due to limited evidence of meaningful analgesic benefit and an increased risk of adverse effects such as sedation, dizziness, and visual disturbances. Although gabapentin and pregabalin have been widely studied for their potential opioid-sparing effects, current clinical guidelines indicate that their routine administration does not significantly improve clinical outcomes in low-pain procedures and may delay postoperative mobilization. Conversely, a single perioperative dose of intravenous dexamethasone has been shown to provide modest reductions in postoperative pain intensity and opioid consumption, while also decreasing the incidence of postoperative nausea and vomiting. This dual benefit makes dexamethasone a valuable adjunct within multimodal analgesia strategies when used cautiously and tailored to individual patient profiles [6].

Regional Anesthesia Techniques

Local Wound Infiltration

Intraoperative local anesthetic infiltration into the fascia, rectus sheath, and subcutaneous layers has been demonstrated to significantly reduce early postoperative pain and decrease the requirement for rescue opioid analgesia following umbilical hernia repair. By directly targeting nociceptors at the site of surgical trauma, local infiltration provides effective somatic pain control during the immediate postoperative period, when pain intensity is typically highest. This technique is simple to perform, requires minimal additional operative time, and is associated with a very low complication rate, making it an accessible analgesic option across a wide range of surgical settings. Local infiltration is particularly valuable in open hernia surgery, where midline incisional pain is prominent and regional anesthesia may not always be feasible. Due to its safety profile, cost-effectiveness, and clinically meaningful analgesic benefit, local wound infiltration continues to be widely recommended as part of multimodal postoperative pain management protocols [7].

Rectus Sheath Block (RSB)

RSB targets anterior branches of T7–T12 within the rectus sheath, making it anatomically ideal for midline incisions.

- In pediatric patients, RSB significantly reduced pain intensity and rescue analgesic use [1].

An adult randomized controlled trial demonstrated that RSB provided superior analgesia compared with local infiltration [2].

RSB is strongly recommended for open umbilical hernia surgery due to midline coverage.

Transversus Abdominis Plane (TAP) Block

TAP block anesthetizes the fascial plane between the oblique and transversus abdominis muscles Figure 1 [8].

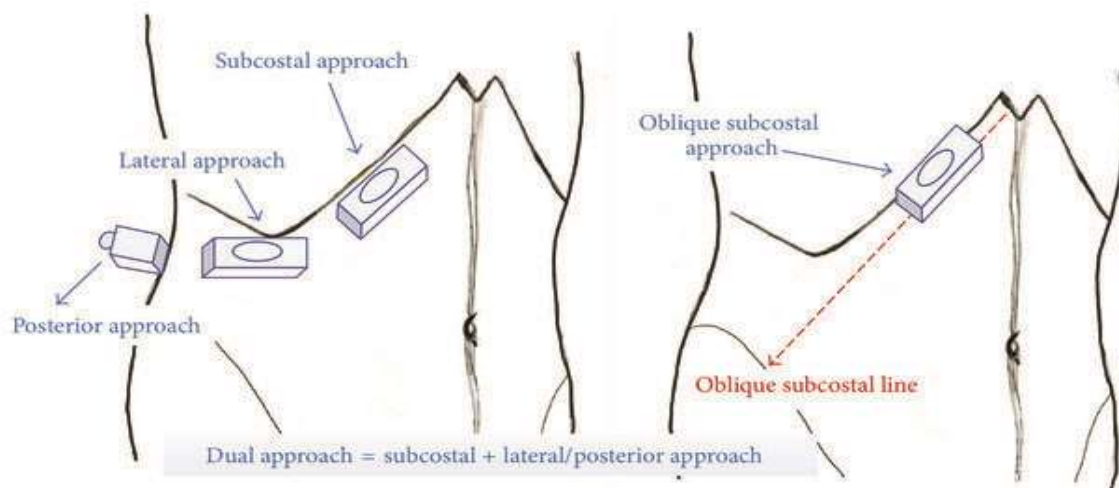


Figure 1 Four ultrasound-guided TAP block techniques, with the red dashed line marking the oblique subcostal route from the xiphoid to the anterior iliac crest.

- Systematic reviews show TAP block reduces early postoperative pain and opioid consumption in hernia surgery [9].
- A randomized study in ventral hernia surgery found significantly improved analgesia with TAP block [10].

TAP block is advantageous for wider or lateral hernia repairs and for laparoscopic approaches involving multiple ports.

Comparative Evidence: RSB Vs TAP Block

- RSB provides superior analgesia for midline incisions typical of umbilical hernia surgery [10].

- TAP block offers wider lateral abdominal wall coverage and reduced opioid usage in ventral hernia repair patients [11].

Pediatric Considerations

Pediatric umbilical hernia repair benefits greatly from ultrasound-guided rectus sheath block (RSB), which has been shown to significantly reduce postoperative pain intensity and the need for rescue analgesics compared to conventional wound infiltration techniques. Because children are more sensitive to postoperative discomfort and may experience difficulty cooperating with early mobilization and breathing exercises, effective pain control plays a critical role in enhancing recovery quality and reducing hospital stay duration. Ultrasound guidance improves accuracy of local anesthetic placement within the rectus sheath, increasing block reliability while reducing the risk of inadvertent peritoneal puncture or vascular injury. However, correct dosing is essential, as children have lower thresholds for local anesthetic systemic toxicity due to differences in drug metabolism and plasma protein binding capacity. Therefore, weight-based dosing strategies, strict monitoring, and adherence to maximum safe dosage guidelines are crucial to ensure safety and efficacy. When used appropriately, ultrasound-guided RSB represents a highly valuable component of multimodal analgesia for pediatric umbilical hernia repair [1].

Enhanced Recovery After Surgery (ERAS)

Enhanced Recovery After Surgery (ERAS) protocols emphasize a comprehensive perioperative care pathway that prioritizes multimodal analgesia, opioid-sparing strategies, regional anesthesia techniques, early oral nutrition, and early mobilization to optimize surgical outcomes. These evidence-based guidelines aim to reduce the physiological stress response to surgery, minimize postoperative complications, and accelerate functional recovery. In the context of hernia surgery, the adoption of ERAS-driven analgesic strategies—integrating non-opioid systemic agents with techniques such as rectus sheath block, transversus abdominis plane block, and local wound infiltration—has been associated with improved postoperative pain control, reduced opioid consumption, shorter hospital stays, and enhanced patient satisfaction. Studies evaluating ERAS implementation in abdominal wall repair consistently demonstrate reduced postoperative fatigue, faster ambulation, lower incidence of postoperative nausea and vomiting, and improved discharge readiness. As a result, ERAS principles are increasingly considered the standard of care in umbilical and ventral hernia procedures, supporting safer recovery and better long-term outcomes [4].

Safety and Adverse Effects

Regional blocks are generally safe with ultrasound guidance but may cause rare complications such as hematoma or peritoneal puncture. NSAIDs require renal and bleeding risk assessment. Opioids should be used sparingly to avoid nausea, sedation, and dependence [6] [7].

Future Directions

Further research should compare RSB and TAP block specifically in adults undergoing umbilical hernia repair, as most existing comparative trials are limited to pediatric populations or focus on broader categories of ventral or abdominal wall hernias rather than isolated umbilical repairs. There remains a need for high-quality randomized controlled studies evaluating optimal dosing, timing of block administration, ultrasound-guided techniques, and long-term outcomes such as persistent postoperative pain and opioid reduction. Additionally, emerging technologies in regional anesthesia—such as long-acting liposomal bupivacaine formulations, extended-release local anesthetic delivery systems, and continuous wound infusion catheters—show promising potential for prolonging analgesic effects beyond the immediate postoperative period and reducing the reliance on systemic opioids. These innovations may improve patient comfort, decrease hospital admissions, support same-day discharge, and enhance recovery in both open and laparoscopic umbilical hernia procedures. Future research should also investigate cost-effectiveness, patient-reported outcomes, and safety profiles to guide evidence-based implementation of advanced analgesic strategies in routine surgical practice [9].

Conclusion

Effective postoperative pain management plays a fundamental role in enhancing recovery and improving outcomes following umbilical hernia surgery. Uncontrolled postoperative pain may delay mobilization, prolong hospitalization, impair respiratory function, and increase the risk of chronic postsurgical pain and opioid dependence. Evidence strongly supports a multimodal analgesia strategy combining systemic non-opioid analgesics, regional anesthesia techniques, and targeted adjuncts to achieve optimal analgesic outcomes while minimizing opioid exposure. Rectus sheath block (RSB) has emerged as a particularly effective technique for midline incisions typical of open umbilical hernia repair, providing superior analgesia compared to local infiltration and significantly reducing the need for rescue analgesics. Transversus abdominis plane (TAP) block offers valuable alternatives, especially for wider incisions or laparoscopic approaches, by reducing pain intensity and opioid consumption. Local wound infiltration remains a reliable, safe, and cost-effective component of analgesic care. Enhanced Recovery After Surgery (ERAS) protocols further reinforce the importance of opioid-sparing pain management, early ambulation, and structured recovery pathways. Continued research is needed to determine the optimal integration of regional blocks and emerging technologies, such as long-acting anesthetics and continuous infusion catheters, to further improve patient satisfaction and long-term postoperative outcomes. Multidisciplinary collaboration and individualized analgesia planning remain essential for improving the quality of care in umbilical hernia surgery.

REFERENCE

- [1] R. S. Dingeman *et al.*, “Ultrasonography-Guided Bilateral Rectus Sheath Block vs Local Anesthetic Infiltration After Pediatric Umbilical Hernia Repair: A Prospective

- Randomized Clinical Trial,” *JAMA Surg.*, vol. 148, no. 8, pp. 707–713, Aug. 2013, doi: 10.1001/jamasurg.2013.1442.
- [2] “Prospective randomized observer-blinded study comparing the analgesic efficacy of ultrasound-guided rectus sheath block and local anaesthetic infiltration for umbilical hernia repair - PubMed.” Accessed: Nov. 24, 2025. [Online]. Available: <https://pubmed.ncbi.nlm.nih.gov/21856778/>
- [3] A. Kartalov *et al.*, “The Effect of Rectus Sheath Block as a Supplement of General Anesthesia on Postoperative Analgesia in Adult Patient Undergoing Umbilical Hernia Repair,” *Pril. Makedon. Akad. Na Nauk. Umet. Oddelenie Za Med. Nauki*, vol. 38, no. 3, pp. 135–142, Dec. 2017, doi: 10.2478/prilozi-2018-0014.
- [4] O. Ljungqvist, M. Scott, and K. C. Fearon, “Enhanced Recovery After Surgery: A Review,” *JAMA Surg.*, vol. 152, no. 3, pp. 292–298, Mar. 2017, doi: 10.1001/jamasurg.2016.4952.
- [5] “Laparoscopic versus Open Repair of Para-Umbilical Hernia- A Prospective Comparative Study of Short Term Outcomes - PMC.” Accessed: Nov. 24, 2025. [Online]. Available: <https://pmc.ncbi.nlm.nih.gov/articles/PMC5620836/>
- [6] “Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists’ Committee on Regional Anesthesia, Executive Committee, and Administrative Council - The Journal of Pain.” Accessed: Nov. 24, 2025. [Online]. Available: [https://www.jpain.org/article/S1526-5900\(15\)00995-5/fulltext?utm_source=chatgpt.com](https://www.jpain.org/article/S1526-5900(15)00995-5/fulltext?utm_source=chatgpt.com)
- [7] J. B. Dahl, S. Møiniche, and H. Kehlet, “Wound infiltration with local anaesthetics for postoperative pain relief,” *Acta Anaesthesiol. Scand.*, vol. 38, no. 1, pp. 7–14, Jan. 1994, doi: 10.1111/j.1399-6576.1994.tb03830.x.
- [8] “Four approaches of ultrasound-guided transversus abdominis plane (TAP)... | Download Scientific Diagram.” Accessed: Nov. 24, 2025. [Online]. Available: https://www.researchgate.net/figure/Four-approaches-of-ultrasound-guided-transversus-abdominis-plane-TAP-blocks-Red-dashed_fig5_320743896
- [9] “European Journal of Anaesthesiology | EJA.” Accessed: Nov. 24, 2025. [Online]. Available: https://journals.lww.com/ejanaesthesiology/fulltext/2022/07000/The_analgesic_efficiency_of_transversus_abdominis.6.aspx
- [10] S. H. Flack *et al.*, “Ultrasound-guided rectus sheath block or wound infiltration in children: a randomized blinded study of analgesia and bupivacaine absorption,” *Pediatr. Anesth.*, vol. 24, no. 9, pp. 968–973, Sep. 2014, doi: 10.1111/pan.12438.
- [11] “Postoperative analgesic efficiency of transversus abdominis plane block after ventral hernia repair: a prospective, randomized, controlled clinical trial - PMC.” Accessed: Nov. 24, 2025. [Online]. Available: <https://pmc.ncbi.nlm.nih.gov/articles/PMC5642852/>