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Original Research Article

Ultrasound-Guided TAP Block vs Epidural Analgesia for Postoperative Analgesia in Lower Abdominal Surgeries: A Comparative Study

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Abstract:

Background: Postoperative pain significantly affects recovery, mobilization and patient satisfaction after lower abdominal surgeries. Epidural analgesia is the traditional gold standard but is associated with hemodynamic instability and procedure-related complications. Ultrasound-guided transversus abdominis plane (TAP) block has emerged as a safer regional technique, though comparative efficacy remains uncertain.

Aim: To compare analgesic efficacy, rescue analgesic requirement, hemodynamic changes and complications between ultrasound-guided TAP block and epidural analgesia for postoperative pain control.

Methodology: A prospective randomized comparative study was conducted in 70 ASA I–II patients (20–65 years) undergoing elective lower abdominal surgery under general anesthesia. Patients were allocated into two groups: epidural analgesia (Group E, n=35) and ultrasound-guided bilateral TAP block (Group T, n=35). Pain scores (NRS), hemodynamics, rescue analgesia and complications were assessed for 48 hours.

Result: Baseline characteristics were comparable. Epidural group showed significantly lower pain scores at rest (4–24 h) and on coughing (1–24 h). Rescue analgesic requirement and tramadol consumption were higher in TAP group (78±36 mg vs 46±28 mg). Epidural group showed lower mean arterial pressure and higher urinary retention, while complications otherwise were similar.

Conclusion: Epidural analgesia provides superior postoperative analgesia but with more hemodynamic effects and urinary retention. Ultrasound-guided TAP block offers stable hemodynamics and safety, making it a useful alternative when epidural is contraindicated.

Keywords: TAP block, epidural analgesia, postoperative pain, lower abdominal surgery, regional anesthesia, multimodal analgesia.

Introduction

Postoperative pain has of late been recognized as the fifth vital sign besides the familiar vital signs pulse, blood pressure, respiratory rate, and body temperature. The parameters that are monitored regularly in critical care settings include blood pressure, pulse, respiratory rate, and the level of consciousness. To guarantee a higher level of awareness among medical workers and to make assessment and monitoring easier, the concept of pain has become a vital sign that needs to be evaluated regularly [1].

Sound pain evaluation is thus one of the pillars of patient management during the peri-operative period. Poor assessment often leads to under-treatment that can cause patient recovery delays, long hospitalization, and decreased patient satisfaction. Today, the anesthetics market is concerned not simply with the survival after the operation, but also with the quality of the postoperative process, postoperative mobilization, and the prevention of complications, all of which are directly linked to the successful postoperative analgesia [2].

Post-surgical pain is the classical type of acute pain, pathophysiologically and therapeutically. The inflammatory mediators released as a result of surgical tissue injury include prostaglandins, histamine, serotonin, bradykinin, and substance P leading to nociceptor stimulation and nociceptive pain. Also, neuropathic pain can be caused by injury of peripheral or central neural structures in the course of surgery. Postoperative pain occurs in nearly 86 percent of patients who are subjected to surgery, most of them complain that it is moderate to severe. It is also important to note that almost 75 percent of patients still complain of pain after leaving the hospital [3].

Uncontrolled pain after operations is associated with serious physiological and psychological effects. Sympathetic stimulation can result in tachycardia, hypertension, elevated myocardial oxygen requirement and cardiac event risk. The affected respiratory complications may include shallow breathing, atelectasis, and pneumonia because of the compromised cough and deep breathing. Wound healing

can be slowed down by endocrine and metabolic imbalance, such as hyperglycemia and high catabolism. What is more, poorly managed acute pain enhances chances to develop chronic persistent pain after surgery and negatively influences the quality of life in the long-term. Therefore, pain control in the postoperative time is not only a comfort treatment, but also a required treatment goal.

The pain after the operations is in many ways preventable and there are many modalities that anesthesiologists can adopt to manage postoperative pain. These are non-pharmacological approaches, systemic pharmacological treatment, locoregional treatment, multimodal analgesia and preemptive or preventive approaches. Each of them specifically addresses various processes in the transmission and perception of pain. The non-pharmacological interventions comprise reassurance, immobilization, positioning, and psychological support. Pharmacological interventions include systemic opioids, non-steroidal anti-inflammatory drugs and adjuvant agents. Locoregional methods, like neuraxial and peripheral nerve blocks, block the pathways of pain along certain anatomical points.

Because of the multifaceted surgical pain, use of only one analgesic agent may not be sufficient enough and come with more side effects. It has been shown that multimodal analgesia is the most effective pain management method and prevention of chronic pain syndrome in several clinical trials. They can also be used to administer doses of single drugs at low levels hence less side effects of drugs. Despite the fact that systemic opioids are considered the foundations of opioid pain management in postoperative settings, overuse of opioids must be prevented because of their side effects nausea, vomiting, sedation, lethargy, confusion, and delirium [4].

Over the last few years, the techniques that involve regional anesthesia have become popular as part of multimodal analgesia. Of them, epidural analgesia has become the backbone in the management of acute pain. Since Corning first described epidural space in 1901, and Edwards, Hingson, Pages, Dogliotti, Tuohy and Bromage have subsequently made further contributions, epidural methods have become a common anesthetic modality [5]. Epidural analgesia is also effective in pain relief by blocking the escape of nerve roots through the spinal cord therefore inhibiting the transmission of nociceptive. It provides good dynamic analgesia, early mobilization, and enhances pulmonary functioning especially after a significant operation on the abdomen.

In surgeries of the lower abdomen, epidural analgesia has traditionally served as the gold standard in the treatment of post-surgery pain. Nevertheless, it may be contraindicated or technically difficult to use. Epidural analgesia is the process that requires the local anesthetics to be injected into the epidural space, which produces reversible sensory and motor blockage. Notwithstanding its effectiveness, it is linked to the following complications: poor analgesia, excessive blockage, unintentional intrathecal or intravascular injection, infection and hematoma at the epidural location that can cause neurological damage. Its applicability to all patients because of technical challenge in obese patients, spinal deformities and patients undergoing anticoagulant therapy, and hemodynamic instability and urinary retention caused by sympathetic blockade also limit its applicability.

Peripheral fascial plane blocks have entered into the limelight in the quest of safer and equally effective options. The Transversus Abdominis Plane (TAP) block is one of these methods, and it is directed to the nerves that serve the anterior wall of the abdomen. Thoracolumbar nerves (T6-L1) that cause somatic pain following lower abdominal surgery are inhibited by depositing local anesthetic between internal oblique and transversusa abdominis muscles in the fascial plane. TAP block offers an effective analgesia without a high sympathetic blockage hence hemodynamic stability.

The transversus abdominis plane can be entered through the landmark-based method of the so-called double-pop, or ultrasound guidance. Using palpation, the triangle of Petit is located around the iliac crest in the double-pop technique. As the needle passes through the tissue layers, one may feel two distinct pushes which mean that the needle is in the right place at the plane after which local anesthetic is administered [6]. The procedure, however, has the dangers of peritoneal puncture, visceral injury, and variable drug distribution with this method of blind procedure.

TAP block that is directed by ultrasound enables visualization of the muscle's layers of the abdomen wall and needle progression, peritoneum and local anesthetic diffusion in real-time [7]. The method increases accuracy, block success, decreases drug dosage, and minimizes complications. Since TAP block majorly treats somatic and not visceral sensation, the relative effectiveness of the epidural analgesia which inhibits both somatic and visceral pain is still of clinical significance.

Surgeries of the lower spine, such as hernia repair, appendectomy, gynecological, and urological surgeries take a substantial percentage of work. Proper analgesia of patients after surgery facilitates early ambulation, decreases pulmonary complications, and short-term hospitalization. Even though the practice of epidural analgesia is still mostly in use, TAP block by ultrasound has become an easier, safer, and less technical procedure. Nevertheless, the comparative evidence of the two methods on analgesic efficacy, opioid-sparing effect, hemodynamic stability and complication profile is incongruent.

Hence, the current study was conducted to compare the epidural analgesia and ultrasound-guided TAP block in the postoperative pain treatment of lower abdominal surgery patients. The study aims to assess analgesic efficacy, duration of pain relief, rescue analgesia, adverse effects, and overall patient recovery, thereby determining whether ultrasound-guided TAP block can serve as an effective alternative to epidural analgesia in contemporary perioperative pain management.

Methodology

Study Design: The present study was designed as a prospective, randomized, comparative clinical study conducted to evaluate and compare the efficacy of ultrasound-guided Transversus Abdominis Plane (TAP) block and epidural analgesia for postoperative pain management in patients undergoing lower abdominal surgeries under general anesthesia.

Study Area: This study was carried out in the Department of Anesthesia, Sadar Hospital, Koderma, Jharkhand, India.

Study Duration: The study was conducted over a period of six months from August 2024 to January 2025.

Sample Size: A total of 70 patients were included in the study. The patients were randomly divided into two equal groups consisting of 35 patients each. Group E received epidural analgesia and Group T received ultrasound-guided bilateral TAP block.

Study Population: Adult patients aged between 20 and 65 years belonging to American Society of Anesthesiologists (ASA) physical status I and II scheduled for elective lower abdominal surgeries under general anesthesia were considered eligible for the study.

Inclusion Criteria

Patients fulfilling all of the following criteria were included:

- Age between 20 and 65 years
- ASA Physical Status I and II
- Patients undergoing elective lower abdominal surgery
- Patients willing to participate and provide written informed consent

Exclusion Criteria

Patients with any of the following were excluded:

- Cardiac, renal, hepatic or respiratory disease
- Coagulation disorders
- Infection at the injection site
- BMI > 30 kg/m²
- Chronic analgesic or opioid use
- Allergy to local anesthetics
- Psychiatric illness affecting pain assessment
- Age < 20 years or > 65 years
- Refusal to participate

Randomization: Patients were randomly allocated into two groups using a computer-generated random number table. Group E patients received epidural analgesia and Group T patients received ultrasound-guided TAP block.

Preoperative Assessment: All patients were evaluated one day prior to surgery with detailed clinical history and physical examination. Routine investigations including hemoglobin estimation, bleeding time, clotting time and urine examination were performed in all patients. Additional investigations such as blood urea, serum creatinine, serum electrolytes and electrocardiography were performed wherever required. Patients were kept nil per oral for six hours before surgery.

Anaesthesia Technique: After arrival in the operating room, standard monitoring including electrocardiography, pulse oximetry and non-invasive blood pressure monitoring was established, and baseline vital parameters were recorded. Intravenous access was secured using an appropriate size cannula. Premedication was administered with intravenous ranitidine 50 mg, glycopyrrolate 0.2 mg and ondansetron 8 mg. Induction of anesthesia was achieved using propofol 2 mg/kg and fentanyl 2 µg/kg intravenously. Endotracheal intubation was facilitated using atracurium 0.5 mg/kg. Anesthesia was maintained with sevoflurane in a mixture of oxygen and nitrous oxide. Neuromuscular blockade was reversed at the end of surgery using neostigmine 50 µg/kg and glycopyrrolate 10 µg/kg. All patients were operated under general anesthesia.

Epidural Analgesia Procedure (Group E): In patients allocated to Group E, a lumbar epidural catheter was inserted at the L1–L2 or L2–L3 interspace in the sitting position prior to induction of general anesthesia using an 18-gauge Tuohy needle and loss of resistance to air technique. The catheter was advanced 3–4 cm into the epidural space and correct placement was confirmed using a test dose of 3 ml of 1.5% lignocaine with adrenaline (1:200,000). The catheter remained inactive during surgery. At the end of surgery, a bolus dose of 10 ml of 0.125% bupivacaine was administered followed by continuous infusion of 0.125% bupivacaine at 3–5 ml per hour for 48 hours postoperatively. Patients were monitored for block progression and complications.

Ultrasound-Guided TAP Block Procedure (Group T): Patients in Group T received bilateral ultrasound-guided TAP block at the end of surgery using a high-frequency linear probe. With the patient in supine position, the probe was placed transversely over the anterolateral abdominal wall above the iliac crest in the mid-axillary line. The fascial plane between the internal oblique and transversus

abdominis muscles was identified. After confirming correct needle placement using hydro-dissection with saline, 20 ml of 0.125% bupivacaine was injected bilaterally and the spread of local anesthetic was visualized in real time. Continuous infusion was maintained at 4 ml per hour bilaterally for 48 hours.

Postoperative Assessment and Data Collection: Postoperative pain was assessed using the Numeric Rating Scale (NRS) at 1, 2, 4, 6, 8, 10, 12, 16, 18, 24 and 48 hours after surgery. Pain was recorded at rest and on coughing. Pain intensity was graded as no pain (0), mild (1–3), moderate (4–6) and severe (>6). Hemodynamic parameters including heart rate, blood pressure and respiratory rate were recorded preoperatively, intraoperatively, at 5, 10, 15, 30 and 45 minutes postoperatively and subsequently at each assessment interval up to 48 hours.

Rescue Analgesia: Intravenous paracetamol 1 g was administered as first-line rescue analgesic when NRS score exceeded 3. If adequate analgesia was not achieved after one-hour, intravenous tramadol 50 mg was administered slowly over 10 minutes. Total analgesic consumption over 48 hours was recorded

Procedure: All enrolled patients underwent lower abdominal surgery under general anesthesia followed by either epidural analgesia or ultrasound-guided TAP block depending on group allocation. Pain scores, hemodynamic parameters and rescue analgesic requirements were recorded for 48 hours postoperatively and compared between the two groups.

Statistical Analysis: All collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation and categorical variables as frequency and percentage. Intergroup comparison was performed using Student's unpaired t-test. A p-value less than 0.05 was considered statistically significant."

Result

Table 1 compares demographic characteristics between Group T (TAP block, n = 35) and Group E (epidural, n = 35). The mean age was similar (41.8 ± 9.6 vs 42.3 ± 10.1 years; p = 0.81) and body weight was comparable (61.5 ± 7.8 vs 62.1 ± 8.2 kg; p = 0.74). Gender distribution was nearly equal with 19 males/16 females (54.3%/45.7%) in Group T and 18 males/17 females (51.4%/48.6%) in Group E (p = 0.81). The duration of surgery was also comparable (88.4 ± 15.2 vs 90.1 ± 16.7 minutes; p = 0.66). Overall, both groups were demographically similar at baseline.

Table 1: Demographic Characteristics

Parameter	Group T (TAP Block) n=35	Group E (Epidural) n=35	P value
Age (years)	41.8 ± 9.6	42.3 ± 10.1	0.81
Weight (kg)	61.5 ± 7.8	62.1 ± 8.2	0.74
Gender (M/F)	19 (54.3%) / 16 (45.7%)	18 (51.4%) / 17 (48.6%)	0.81
Duration of surgery (min)	88.4 ± 15.2	90.1 ± 16.7	0.66

Table 2 shows the distribution of ASA physical status between Group T (n = 35) and Group E (n = 35). In Group T, 21 patients (60.0%) were ASA I and 14 patients (40.0%) were ASA II, while in Group E, 22 patients (62.9%) were ASA I and 13 patients (37.1%) were ASA II. The difference between groups was not statistically significant (p = 0.8), indicating comparable baseline physical status.

Table 2: ASA Physical Status Distribution

ASA Grade	Group T (n=35)	Group E (n=35)	P value
ASA I	21 (60.0%)	22 (62.9%)	0.8
ASA II	14 (40.0%)	13 (37.1%)	

Table 3 compares postoperative pain scores at rest (NRS) between Group T and Group E over time. Pain scores were similar during the early period at 1 hr (1.2 ± 0.8 vs 0.9 ± 0.7; p = 0.12) and 2 hr (1.5 ± 0.9 vs 1.1 ± 0.8; p = 0.09). However, Group E showed significantly lower pain from 4 hr onward: 4 hr (2.1 ± 1.1 vs 1.4 ± 0.9; p = 0.01), 6 hr (2.4 ± 1.2 vs 1.6 ± 1.0; p = 0.002), 8 hr (2.7 ± 1.3 vs 1.8 ± 1.1; p = 0.001), 12 hr (2.5 ± 1.2 vs 1.7 ± 1.0; p = 0.003), and 24 hr (2.0 ± 1.0 vs 1.5 ± 0.9; p = 0.04). By 48 hr (1.4 ± 0.8 vs 1.2 ± 0.7; p = 0.28), the difference was no longer significant. Overall, Group E provided significantly better postoperative pain control at rest between 4 and 24 hours.

Table 3: Post-operative Pain Score (NRS at Rest)			
Time (hrs)	**Group T (Mean ± SD)**	**Group E (Mean ± SD)**	**P value**
1	1.2 ± 0.8	0.9 ± 0.7	0.12
2	1.5 ± 0.9	1.1 ± 0.8	0.09
4	2.1 ± 1.1	1.4 ± 0.9	0.01*
6	2.4 ± 1.2	1.6 ± 1.0	0.002*
8	2.7 ± 1.3	1.8 ± 1.1	0.001*
12	2.5 ± 1.2	1.7 ± 1.0	0.003*
24	2.0 ± 1.0	1.5 ± 0.9	0.04*
48	1.4 ± 0.8	1.2 ± 0.7	0.28

Table 4 compares pain scores on coughing between Group T and Group E over time. Pain scores were consistently lower in Group E at most intervals: 1 hr (2.3 ± 1.1 vs 1.7 ± 0.9; p = 0.01), 2 hr (2.6 ± 1.2 vs 1.9 ± 1.0; p = 0.008), 4 hr (3.4 ± 1.4 vs 2.5 ± 1.2; p = 0.002), 6 hr (3.8 ± 1.5 vs 2.8 ± 1.3; p = 0.001), 8 hr (4.0 ± 1.6 vs 3.0 ± 1.4; p = 0.001), 12 hr (3.7 ± 1.5 vs 2.7 ± 1.3; p = 0.002), and 24 hr (3.0 ± 1.3 vs 2.3 ± 1.1; p = 0.01), all showing statistically significant differences. At 48 hr (2.2 ± 1.1 vs 1.8 ± 0.9; p = 0.09), the difference was not significant. Overall, Group E experienced significantly less pain on coughing during the first 24 hours postoperatively.

Table 4: Pain Score on Coughing			
Time (hrs)	**Group T**	**Group E**	**P value**
1	2.3 ± 1.1	1.7 ± 0.9	0.01*
2	2.6 ± 1.2	1.9 ± 1.0	0.008*
4	3.4 ± 1.4	2.5 ± 1.2	0.002*
6	3.8 ± 1.5	2.8 ± 1.3	0.001*
8	4.0 ± 1.6	3.0 ± 1.4	0.001*
12	3.7 ± 1.5	2.7 ± 1.3	0.002*
24	3.0 ± 1.3	2.3 ± 1.1	0.01*
48	2.2 ± 1.1	1.8 ± 0.9	0.09

Table 5 shows the rescue analgesic requirement in Group T and Group E. A higher proportion of patients in Group T required paracetamol (24 patients, 68.6%) compared with Group E (16 patients, 45.7%) (p = 0.05). Similarly, tramadol was needed in 14 patients (40.0%) in Group T versus 7 patients (20.0%) in Group E (p = 0.04). The mean total tramadol consumption was also significantly greater in Group T (78 ± 36 mg) than in Group E (46 ± 28 mg) (p = 0.001). Overall, Group E demonstrated significantly lower postoperative analgesic requirements.

Table 5: Rescue Analgesic Requirement			
Parameter	**Group T**	**Group E**	**P value**
Patients requiring Paracetamol	24 (68.6%)	16 (45.7%)	0.05*
Patients requiring Tramadol	14 (40.0%)	7 (20.0%)	0.04*
Total Tramadol Consumption (mg)	78 ± 36	46 ± 28	0.001*

Table 6 compares mean arterial pressure between Group T and Group E at different time intervals. At baseline, values were similar (93.2 ± 7.4 vs 92.8 ± 7.9 mmHg; p = 0.83). However, Group E showed significantly lower pressures at 1 hour (91.5 ± 6.8 vs 86.1 ± 8.2 mmHg; p = 0.01), 2 hours (92.4 ± 7.1 vs 85.3 ± 7.8 mmHg; p = 0.001), 6 hours (94.6 ± 7.3 vs 87.2 ± 7.5 mmHg; p = 0.001), and 24 hours (95.1 ± 6.9 vs 90.2 ± 7.1 mmHg; p = 0.01). Overall, mean arterial pressure remained comparable initially but was consistently and significantly lower in Group E during the postoperative period.

Table 6: Hemodynamic Parameters (Mean Arterial Pressure)			
Time	**Group T**	**Group E**	**P value**
Baseline	93.2 ± 7.4	92.8 ± 7.9	0.83
1 hr	91.5 ± 6.8	86.1 ± 8.2	0.01*
2 hr	92.4 ± 7.1	85.3 ± 7.8	0.001*
6 hr	94.6 ± 7.3	87.2 ± 7.5	0.001*
24 hr	95.1 ± 6.9	90.2 ± 7.1	0.01*

Table 7 compares post-operative complications between Group T (n = 35) and Group E (n = 35). Nausea/vomiting occurred in 6 patients (17.1%) in Group T and 8 patients (22.9%) in Group E (p = 0.54), showing no significant difference. Hypotension was observed in 1 patient (2.9%) in Group T versus 5 patients (14.3%) in Group E (p = 0.08), which was not statistically significant. Urinary retention occurred only in Group E (4 patients, 11.4%) and none in Group T (0%), demonstrating a statistically significant difference (p = 0.04). Local site pain was comparable between groups, seen in 3 patients (8.6%) in Group T and 2 patients (5.7%) in Group E (p = 0.64). Overall, urinary retention was the only complication significantly higher in Group E.

Table 7: Post-operative Complications

Complication	Group T (n=35)	Group E (n=35)	P value
Nausea/Vomiting	6 (17.1%)	8 (22.9%)	0.54
Hypotension	1 (2.9%)	5 (14.3%)	0.08
Urinary Retention	0 (0%)	4 (11.4%)	0.04*
Local Site Pain	3 (8.6%)	2 (5.7%)	0.64

Discussion

The current comparative analysis showed that the demographic profile was similar in both TAP and epidural groups, whereby mean age were 41.8 ± 9.6 years and 42.3 ± 10.1 years in the TAP and epidural groups, respectively (p = 0.81), body weight, gender distribution and length of surgery. Such homogeneity enhances the validity of analgesic comparison and is consistent with other studies that have been published before, in which the characteristics of patients did not have a significant effect on postoperative analgesic outcomes (Iyer et al., 2017) [8]. Similar ASA physical status of our patients (ASA-I: 60% vs 62.9) also confirms that the observed differences in analgesia were rather technique but not patient related. Previous studies also raised the theme that the most effective way to interpret the regional analgesic outcome is when the baseline traits are comparable (Hopkins, 2015) [9]."

We found that pain at rest between the first and second postoperative hours was similar but after 4-24 hours epidural analgesia resulted in significantly lower pain scores (i.e. 6 h: 1.6 ± 1.0 vs 2.4 ± 1.2, p = 0.002). This finding has been observed to be in line with the work of Iyer et al. (2017) who noted a similar early analgesia although epidural analgesia was better at 24 h and 48 h (p = 0.001 and 0.004 respectively) [8]. This was probably due to the unremitting neuraxial blockade provided by epidural infusion, but TAP block principally provides somatic wall analgesia that is slowly replaced upon further absorption of the local anesthetic. Nevertheless, there are other studies that provide opposite results. The works of Adeel et al. (2017) did not find any statistically significant difference in TAP and epidural procedures in postoperative pain scores [10], which indicates that the type of surgery and medication use can impact the results. On the same note, Kanazi et al. (2010) also described a protracted duration of first analgesic request when using intrathecal morphine (median 8 h) than when using TAP block (4 h) indirectly supporting the idea that neuraxial techniques have a longer duration of visceral analgesia than fascial plane blocks [11].

In our study, dynamic pain during coughing had stronger improvement with epidural analgesia, especially in the first 24 hours (6 h: 2.8 1.3 vs 3.8 1.5, p = 0.001). This is in line with Iyer et al. (2017) who observed a large proportion of patients who reported nil or mild pain whenever coughing in the epidural group [8]. Rapid management of dynamic pain is indicative of visceral and motor blockage that TAP block cannot deliver the full block since it predominantly blocks nerves of the anterior abdominal wall. However, Kandi (2015) found longer pain-free intervals with TAP block in 24 hours of post-surgery and fewer patients on >200 μg/kg morphine than with epidural [12], which indicates inconsistency in the results according to the concentration of drugs and block method.

In our study, there was a substantial difference in analgesic use between the TAP group where the use of tramadol, and the total consumption, was 40 and 78 +, respectively, and 20 and 46 +, respectively (p = 0.001). These results correspond to Iyer et al. (2017) whereby the tramadol use was an order of magnitude higher in the TAP group at 48 hours [8]. The decrease in the effect of TAP block beyond the 8 hours' time period could be the cause of the augmented opioid requirement. On the same note, Baaj et al. (2010) actually showed a lower 24-hour morphine dose with TAP block than with placebo (26 ± 5 mg vs 63 ± 5mg, p < 0.05) [13] but the two treatments were compared to no regional technique over epidural analgesia hence the explanation of why epidural is superior in opioid-sparing effect when it is directly compared to epidural analgesia. The same Belavy et al. (2009) findings also found reduced morphine use with TAP block following cesarean section [14] but no neuraxial analgesia in controls so they cannot be directly compared with epidural-based protocols.

Mean arterial pressure was significantly lower in the epidural group at various times (2 h: 85.3 ± 7.8 vs

92.4 ± 7.1, p = 0.001) in the hemodynamic assessment of our patients. This is indicative of sympathetic blockade which is a well-known physiological outcome of epidural analgesia (Rawal, 2012) [15]. Similar tendencies have been observed by other researchers, and the level of blood pressure was lower in epidural groups, and TAP block did not interrupt the hemodynamic stability (Niraj et al., 2014) [16]. This is a clinical benefit of TAP block that offers hemodynamic stability especially to cardiovascular-compromised or elderly patients.

Concerning adverse effects, we found greater urinary retention in our epidural group (11.4, p = 0.04) and had more instances of hypotension (14.3% vs 2.9) but not significantly. Similar complication rates have been reported in the past because of autonomic blockades related to epidural analgesics (Rawal, 2012) [15]. The incidence of postoperative nausea and vomiting was also similar in each group, which aligns with Kadam et al. (2013) who discovered a consistent incidence of PONV between TAP catheter and epidural methods [17]. On the contrary, Rao et al. had lower PONV with TAP block without statistical significance [17], indicating the influence of multifactorial etiology based on the use of opioids and stress of surgery.

In general, our data supports the idea that epidural analgesia is more effective in postoperative analgesia and reduces the use of opioids, but with the cost of sympathetic blockade-related effects like hypotension and urinary retention. TAP block, though the one a little less potent in analgesic effect especially against dynamic pain, is more hemodynamically stable with fewer neuraxial complications. Other studies have made similar conclusions in systematic reviews of the abdominal surgery analgesia where epidural is considered the gold standard in treating intense pain but TAP block is safer in patients who selectively receive treatment (Charlton et al., 2010) [18]. Therefore, the selection of techniques is also to be personalized in the ratio of the analgesic effect to adverse effects.

Conclusion

The research shows that UGTA-TAP block and epidural analgesia are both effective in relieving postoperative pain following lower abdominal surgeries in similar groups of patients. Nevertheless, epidural analgesia was characterized by excellent pain control during rest and coughing during the first and middle postoperative stages as well as decreased rescue analgesics. Although epidural analgesia was more effective in analgesia, it was associated with increased propensity to hemodynamic changes and accompanying complications of the procedure including urinary retention and hypotension. However, the TAP block had more consistent hemodynamics and fewer systemic side effects, albeit with increased requirements of supplemental analgesics. Overall, while epidural analgesia remains more effective for postoperative pain control, ultrasound-guided TAP block represents a safer and simpler alternative, particularly in patients where epidural analgesia may be contraindicated or undesirable.

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