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ORIGINAL ARTICLE

Effectiveness of External Oblique Intercostal Plane Block in Managing Acute Postoperative Pain after Laparoscopic Sleeve Gastrectomy

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ABSTRACT

Background: Laparoscopic sleeve gastrectomy (LSG) is a widely performed bariatric procedure that, despite being minimally invasive, results in considerable postoperative pain. Effective pain control is essential for early recovery and opioid reduction.

Objective: To evaluate the impact of EOIP block on postoperative pain scores, opioid consumption, time to ambulation, and patient satisfaction in LSG patients.

Methods: This prospective, randomized controlled trial was conducted at Rahbar Medical and Dental College during June 2022 to May 2023. A total of 80 adult patients scheduled for elective laparoscopic sleeve gastrectomy under general anesthesia were recruited after obtaining informed consent. Eligible participants included male and female patients aged 18 to 60 years, classified as American Society of Anesthesiologists (ASA) physical status I–III.

Results: VAS scores were significantly lower in the EOIP group at all time points ($p < 0.001$). Mean opioid consumption over 24 hours was 6.8 ± 2.1 mg in the EOIP group versus 13.2 ± 3.4 mg in the control group ($p < 0.001$). The EOIP group achieved earlier ambulation (10.6 ± 3.1 hrs vs. 16.2 ± 3.8 hrs, $p < 0.001$) and had shorter hospital stays (2.2 ± 0.6 vs. 2.9 ± 0.8 days, $p = 0.004$). Patient satisfaction was higher (4.5 ± 0.6 vs. 3.7 ± 0.7, $p < 0.001$), and adverse events were minimal, with only one case of transient hematoma.

Conclusion: It is concluded that the EOIP block significantly reduces postoperative pain and opioid requirements while enhancing early recovery and patient satisfaction after LSG. It is a safe and effective addition to multimodal analgesia strategies in bariatric surgery.

Keywords: Laparoscopic, Postoperative pain, Regional anesthesia, Opioid-sparing, ERAS

INTRODUCTION

Obesity, a huge public health challenge is quickly escalating as the prevalence increases alarmingly worldwide. Across the globe, obesity diagnoses in the hundreds of millions fossilize people at risk for comorbidities like type of all the available methods, Bariatric surgery is chiefly proclaimed as a reliable method for long term effective weight reduction in severely overweight people (number 2). Laparoscopic sleeve gastrectomy as one of the most popular operative procedures for morbid obesity can be explained by its easy technique, significant short-term weight loss, and lesser perioperative risks compared with such procedures as Roux-en-Y gastric bypass[3]. Although laparoscopic sleeve gastrectomy is in itself a minimally invasive procedure, patients commonly describe severe postoperational pain, particularly in the upper abdominal region. Pain is caused by the damage at trocar site, gastric stretching, and stapling during construction of gastric sleeve[4]. Effective control of this postoperative pain is critical to minimizing the risk of respiratory complications, early mobilization, rapid discharge of the patient as well as patient general recovery[5]. Comprehensive analgesia is an important aspect of the implementation of enhanced recovery after surgery programmes. Uncontrolled pain can lead to patients becoming less, able to walk, earlier than desired and increasing the reliance on opioids which have numerous side effects including nausea, vomiting, sleepiness, inhibited respiratory rate, and a possibility of becoming addicted[6]. The increased risk of these complications is even greater for obese patients, given their higher predisposition to respiratory complications resulting from the use of opioids. Strenuous attempts to overcome the hurdles have resulted in the use of several regional anesthesia methods, which promote multimodal analgesia and opioid reduction. Conventional methods such as transversus abdominis plane block, rectus sheath block, and erector spinae plane block have had mixed records in abdominal procedures. However, because the majority of these strategies primarily affect dermatomes in the lower thorax, they are insufficient for thorax-to-abdominal surgeries[7]. As a direct consequence of this, there has been an increased level of interest in the design of brand-new blocks immediately in order to guarantee increased muscle coverage of the upper abdominal area. The external oblique intercostal plane block is a new ultrasound-guided fascial plane block aimed to block the anterior branches of thoracoabdominal nerves from T6-T10[8]. The approach requires that local anesthetic be injected into an interspace between the external oblique and intercostal muscles, i.e., midaxillary line below the costal edge. Anatomically, this leads to the anesthetic travelling laterally as well downward ensuring that the dermatomes through which an upper abdominal surgery passes are well covered[9]. This block is simple, requires minimal invasion, and has a lower risk of the adverse effects in comparison to deeper or neuraxial blocks. Earlier anatomical and clinical data have showed potential for this block in laparoscopic cholecystectomy and upper abdominal hernia repairs[10]. Despite the promise of the technique, there has been no thorough investigation of its effectiveness in regard to bariatric surgery. Given that the external oblique intercostal plane block, better correlates with the surgical field dermatome coverage for the laparoscopic sleeve gastrectomy, it can be potentially helpful in the postoperative pain management of patients with latter operation[11].

Objective: To evaluate the impact of EOIP block on postoperative pain scores, opioid consumption, time to ambulation, and patient satisfaction in LSG patients.

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METHODOLOGY

This prospective, randomized controlled trial was conducted at Rahbar Medical and Dental College during June 2022 to May 2023. Total of 80 adult patients scheduled for elective laparoscopic sleeve gastrectomy under general anesthesia were recruited after obtaining informed consent. Eligible participants included male and female patients aged 18 to 60 years, classified as American Society of Anesthesiologists (ASA) physical status I–III. The study did not include any patients who had an allergy to local

anesthetics, coagulopathy, and infection at the injection site, a history of chronic opioid use or pain disorders, or difficulty comprehending pain scoring systems.

Participants were randomly allocated into two groups (n=40 per group) using a computer-generated randomization sequence:

- **Group A (EOIP group):** Patients received an ultrasound-guided bilateral external oblique intercostal plane block with 20 mL of 0.25% bupivacaine on each side at the end of surgery, in addition to standard multimodal analgesia.
- **Group B (Control group):** Patients received only standard multimodal analgesia without any regional block.

All patients underwent surgery under standardized general anesthesia with propofol, fentanyl, and rocuronium. Anesthesia was maintained with sevoflurane in a 50:50 air-oxygen mixture. Standard monitoring was applied throughout the perioperative period. The EOIP block was performed under strict aseptic precautions using a high-frequency linear ultrasound probe placed at the midaxillary line just below the costal margin. A 22-gauge block needle was advanced in-plane to reach the plane between the external oblique and intercostal muscles, and correct needle placement was confirmed by hydro dissection before administering the local anesthetic. Postoperative pain was assessed using the Visual Analog Scale (VAS) at rest and during movement at 2, 6, 12, and 24 hours after surgery. During the first 24 hours after surgery, total opioid consumption (intravenous morphine equivalents) was recorded. Additional outcomes included time to first ambulation, length of hospital stay, and any block-related complications such as local anesthetic toxicity, hematoma, or pneumothorax. Data were analyzed using SPSS v17. Quantitative variables (pain scores, opioid consumption) were expressed as mean ± standard deviation and compared using independent t-tests. Categorical variables were compared using chi-square test. It was considered statistically significant if the p-value was less than 0.05.

RESULTS

A total of 80 patients were included in the study. The mean age in the EOIP group was 38.4 ± 9.6 years, while in the control group it was 39.1 ± 8.7 years ($p = 0.72$). The proportion of male patients was similar in both groups (55% vs. 50%, $p = 0.64$). Mean BMI values were also closely matched (42.7 ± 5.2 kg/m² in EOIP vs. 43.1 ± 4.9 kg/m² in control; $p = 0.58$), and the distribution of ASA II status did not differ significantly (60% vs. 65%, $p = 0.65$), indicating successful randomization.

Table 1: Baseline Characteristics of the Study Population

Parameter	EOIP Group (n=40)	Control Group (n=40)	p-value
Mean Age (years)	38.4 ± 9.6	39.1 ± 8.7	0.72
Male (%)	22 (55%)	20 (50%)	0.64
Mean BMI (kg/m²)	42.7 ± 5.2	43.1 ± 4.9	0.58
ASA II (%)	24 (60%)	26 (65%)	0.65

Postoperative pain scores, as measured by the Visual Analog Scale (VAS), were significantly lower in the EOIP group at all recorded time points. At 2 hours post-op, the EOIP group reported a mean score of 3.2 ± 1.1 compared to 5.6 ± 1.3 in the control group ($p < 0.001$). This trend continued at 6 hours (2.8 ± 0.9 vs. 5.1 ± 1.1), 12 hours (2.1 ± 0.8 vs. 4.2 ± 1.0), and 24 hours (1.6 ± 0.6 vs. 3.5 ± 0.9), all with statistically significant differences ($p < 0.001$).

Table 2: Postoperative Pain Scores (VAS) at Different Time Points

Time Post-Op	EOIP Group (Mean ± SD)	Control Group (Mean ± SD)	p-value
2 hours	3.2 ± 1.1	5.6 ± 1.3	<0.001
6 hours	2.8 ± 0.9	5.1 ± 1.1	<0.001
12 hours	2.1 ± 0.8	4.2 ± 1.0	<0.001
24 hours	1.6 ± 0.6	3.5 ± 0.9	<0.001

Total opioid consumption over 24 hours was nearly halved in the EOIP group (6.8 ± 2.1 mg vs. 13.2 ± 3.4 mg, $p < 0.001$). Patients also ambulated earlier, with a mean time to first ambulation of 10.6 ± 3.1 hours versus 16.2 ± 3.8 hours in the control group ($p < 0.001$). Additionally, the EOIP group had a shorter hospital stay (2.2 ± 0.6 days vs. 2.9 ± 0.8 days, $p = 0.004$) and reported higher satisfaction scores (4.5 ± 0.6 vs. 3.7 ± 0.7, $p < 0.001$), indicating a smoother and more comfortable postoperative course.

Table 3: Postoperative Opioid Consumption and Recovery Parameters

Outcome	EOIP Group (n=40)	Control Group (n=40)	p-value
Total Opioid Use (mg/24 hrs)	6.8 ± 2.1	13.2 ± 3.4	<0.001
Time to First Ambulation (hrs)	10.6 ± 3.1	16.2 ± 3.8	<0.001
Length of Hospital Stay (days)	2.2 ± 0.6	2.9 ± 0.8	0.004
Patient Satisfaction (1–5)	4.5 ± 0.6	3.7 ± 0.7	<0.001

One patient (2.5%) in the EOIP group developed a minor hematoma at the block site, which resolved without intervention ($p = 0.31$). Notably, the incidence of postoperative nausea and vomiting was significantly lower in the EOIP group (10%) compared to the control group (27.5%), with a p-value of 0.04. There were no cases of respiratory depression in the EOIP group, whereas two cases (5%) occurred in the control group, though the difference was not statistically significant ($p = 0.15$).

Table 4: Adverse Events

Adverse Event	EOIP Group (n=40)	Control Group (n=40)	p-value
Hematoma at Block Site	1 (2.5%)	0 (0%)	0.31
Nausea/Vomiting (Post-op Day 1)	4 (10%)	11 (27.5%)	0.04
Respiratory Depression	0 (0%)	2 (5%)	0.15

DISCUSSION

The results show that the application of an EOIP block in the patients of laparoscopic sleeve gastrectomy significantly gives better control over the postoperative pain. During the course of study, there was a reported high number of significant pain reduction scores at each measured point on the VAS scale for the EOIP group where majority of values were within the mild to moderate band. Meanwhile, the control group complained of moderate to severe pain, in the early hours after surgery, especially, which provided evidence that block had targeted upper abdominal pain[12]. One of the outcomes, the EOIP block, had the best result in the consumption of opioids. During the first 24 hours post op, the intervention group consumed substantially less opioid medication than the control group. Such decrease in the consumption of opioids is clinically relevant particularly in obese patients at higher risk of complications including sedation, respiratory depression, and bowel delay in recovery[13]. Results of this study are consistent with past studies that emphasize the importance of regional tricks of the trade in minimising the demand of opioids for pain management in bariatric and upper abdominal operations. The metrics on functional recovery showed that, in the EOIP group, patients ambulated earlier and were discharged from the hospital sooner than in the standard group[14]. Ten hours earlier to the patients in the control group (which corresponded to better pain control and faster movement) the patients being treated with the EOIP block stood up[15]. Also, patient satisfaction was significantly better in the EOIP group; it is possible to point out the more positive experience in the perioperative period. These results support the recommendation of including the EOIP block into ERAS protocols that minimize postoperative stress, minimize opioid dependency, and promote faster recovery[16]. Further

analysis of the VAS scores shows that 82.5% of patients who received the block complained of mild-moderate pain 24 hours after surgery compared to 32.5% in the control group. There was also a reduced incidence of 'rescue' analgesia in the EOIP group at all assessment intervals, and particularly in the first 6 hours where a continuing analgesic advantage was demonstrated from the block. In total, excellent safety prevailed in the EOIP block. Only one patient had developed a small hematoma, which dissipated spontaneously without the need for treatment[17]. Safety was depicted by the lack of such severe events as pneumothorax, infection, or local anesthetic systemic toxicity when the block was performed under the guidance of ultrasound[18]. Although, the study provided positive outcomes, there are certain limitations. A limitation is that the research was conducted only in one facility, and as the sample was suitable for a pilot investigation, not all findings can be applied broadly. Second, the value of the 24-hour results is noteworthy, but long-term monitoring is desirable a question can be answered, does the EOIP block produce long term relief from chronic post surgical pain.

CONCLUSION

It is concluded that the external oblique intercostal plane (EOIP) block is an effective and safe regional anesthesia technique for managing acute postoperative pain following laparoscopic sleeve gastrectomy. Patients who received the EOIP block demonstrated significantly lower pain scores, reduced opioid consumption, faster mobilization, and higher satisfaction compared to those managed with standard analgesia alone. The block was also associated with minimal adverse effects, making it a suitable component of multimodal analgesia and enhanced recovery protocols in bariatric surgery.

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