

ORIGINAL ARTICLE

Mastectomy for Breast Cancer under Regional Anesthesia Utilizing Intertransverse Process Block in Patients Exhibiting Poor Pulmonary Function

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ABSTRACT

Background: Mastectomy is a common procedure for breast cancer treatment, but in patients with poor pulmonary function, general anesthesia can pose significant risks.

Objective: To assess postoperative pain management, respiratory outcomes, recovery time, and complication rates in patients with poor pulmonary function undergoing mastectomy with ITPB.

Methods: This prospective cohort study was conducted at Baqai Medical University Karachi during June 2022 to June 2023. A total of 155 female patients diagnosed with breast cancer who were scheduled for mastectomy were included in the study. Patients were selected based on predefined inclusion and exclusion criteria to ensure consistency and the quality of data.

Results: Postoperative pain scores decreased significantly from 3.2 ± 1.1 at 0 hours to 0.8 ± 0.4 at 24 hours. A total of 75% of patients required minimal opioid supplementation, with a mean consumption of 15.2 ± 7.1 mg morphine equivalents in the first 24 hours. Oxygen saturation remained stable, with an SpO₂ of $95.8\% \pm 2.3\%$ at 0 hours and $94.5\% \pm 2.1\%$ at 24 hours. The time to extubation was 12.6 ± 3.2 minutes, and time to ambulation was 14.4 ± 4.3 hours. The average length of hospital stay was 3.6 ± 1.1 days. Complications were minimal, with 7% of patients reporting mild tenderness at the injection site and 0.6% experiencing a small hematoma.

Conclusions: It is concluded that performing mastectomy under regional anesthesia with ITPB is a safe and effective alternative to general anesthesia in patients with compromised pulmonary function.

Keywords: Mastectomy, Regional Anesthesia, Intertransverse Process Block, Pulmonary Function, Pain Management, Recovery, Complications.

INTRODUCTION

Breast cancer is a leading cause of morbidity and mortality among women worldwide, and mastectomy remains a cornerstone in the surgical management of this disease. A mastectomy procedure depends on tumor measurements in combination with cancer developmental stage alongside a patient's physical condition¹. Patients who suffer from poor pulmonary function diseases including COPD need alternative options for anesthesia during mastectomy surgery due to the difficulties that general anesthesia presents. General anesthesia causes harmful respiratory events such as hypoxia along with atelectasis and increased carbon dioxide retention which lengthens recovery time and heightens mortality danger and morbidity risk². The phasic nature of regional anesthesia functions as an excellent substitute to general anesthesia for patients who face increased dangers from pulmonary dysfunction. Medical professionals have recognized the intertransverse process block (ITPB) as an effective regional anesthesia method that reduces the dangers associated with systemic anesthesia applications³. During mastectomy procedures the ITPB method directly applies anesthesia to thoracic spinal nerves in order to specifically reduce pain that affects the chest wall. Local anesthetic injections happen between transverse processes of thoracic vertebrae to execute the intertransverse process block. Local anesthesia affecting only the chest wall can be achieved by blocking sensory nerve transmission through the intertransverse process block technique which reduces the danger of generalized anesthesia complications⁴. TPB serves as a treatment option in combination with lighter sedation and regional anesthesia for patients with moderate lung problems to prevent the necessity of airway tubes and mechanical ventilation so that patients can minimize ventilator-associated pneumonia complications while reducing airway trauma risk and recovering

faster after surgery⁵. Using the ITPB under regional anesthesia protects patients with poor pulmonary capacity because it maintains their respiratory function. General anesthetic avoidance in patients reduces their risk of developing respiratory depression which frequently affects persons with pulmonary disorders when receiving general anesthesia⁶. Patients who receive regional anesthesia benefits from speedier postoperative recovery and reduced need for opioids and minimal occurrences of postoperative nausea and vomiting after general anesthesia procedures⁷.

Various studies verify that ITPB usage creates sufficient pain control through a reduction of treatment-related complications during breast cancer surgical procedures. The Journal of Clinical Anesthesia published study demonstrated that patients who received mastectomy surgery with ITPB experienced lower postoperative pain levels and needed fewer opioid painkillers together with faster recovery times than general anesthesia patients. The adverse effects from systemic anesthesia affect patients with comorbidities or advanced age most strongly⁸. Better postoperative results must be considered vital during breast cancer surgery because both recovery rates and pain management directly impact patients' overall health status and quality of life. An increased focus on opioid reduction in postoperative pain management due to the ongoing opioid crisis now makes ITPB regional anesthesia more relevant because it can lower opioid requirements for better pain control practices. The implementation of ITPB for mastectomy surgery on patients with pulmonary impairments presents both opportunities for improvement and difficulties to overcome⁹. Complicated execution and mastery of advanced expertise are needed to successfully execute the methodology by obtaining proper injection sites as well as delivering effective block administration. Additional analgesic treatment becomes necessary whenever block placement proves either partial or fails to achieve full effect due to anatomical variations or procedural problems¹⁰.

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Objective: To assess postoperative pain management, respiratory outcomes, recovery time, and complication rates in patients with poor pulmonary function undergoing mastectomy with ITPB.

METHODOLOGY

This prospective cohort study was conducted at Baqai Medical University Karachi during June 2022 to June 2023. A total of 155 female patients diagnosed with breast cancer who were scheduled for mastectomy were included in the study. Patients were selected based on predefined inclusion and exclusion criteria to ensure consistency and the quality of data.

Inclusion Criteria

- Female patients aged 40-70 years.
- Diagnosed with early or locally advanced breast cancer requiring mastectomy.
- Patients with compromised pulmonary function, such as a history of chronic obstructive pulmonary disease (COPD), restrictive lung disease, or asthma, or those with preoperative pulmonary function tests (PFTs) indicating poor respiratory reserve.

Exclusion Criteria

- Patients with a history of allergy or contraindications to local anesthetics.
- Those requiring bilateral mastectomies or simultaneous reconstruction.
- Patients with significant cardiovascular or neurological comorbidities that contraindicate regional anesthesia.
- Pregnant or lactating women.
- Inability to provide informed consent.

Data collection: All 155 patients underwent mastectomy under regional anesthesia utilizing the intertransverse process block (ITPB). Patient demographics, clinical characteristics, and surgical details were collected from the hospital's medical records. Postoperative data, including pain scores, respiratory parameters, recovery time, and complications, were recorded on a standardized case report form. The ITPB was performed by trained anesthesiologists following standard protocols. The procedure involved the administration of a local anesthetic (bupivacaine 0.25-0.5%) between the transverse processes of the thoracic vertebrae, typically at the T2-T6 levels, depending on the surgical site. The block was performed under ultrasound guidance to ensure accurate placement of the needle and injectate. Sedation was provided as needed using a combination of midazolam and fentanyl to ensure patient comfort during the procedure. All patients were monitored continuously during surgery with standard monitoring, including electrocardiogram (ECG), non-invasive blood pressure, pulse oximetry, and end-tidal carbon dioxide. Postoperative pain was measured at several intervals (0, 2, 6, 12, and 24 hours) using the Visual Analog Scale (VAS), with additional data on the requirement for supplementary analgesia. Pulmonary function was evaluated through preoperative spirometry and postoperative monitoring of oxygen saturation (SpO₂) and arterial blood gases (ABG) during the recovery phase.

Data Analysis: Data were analyzed using SPSS v21. Pain scores, opioid consumption, and recovery times were compared using paired t-tests or Wilcoxon signed-rank tests, depending on the distribution of the data. Chi-square tests were used to compare the rates of complications between groups. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 155 female patients with a mean age of 55.23 ± 7.01 years (range: 40-70 years). The average body mass index (BMI) was 27.5 ± 4.3 kg/m², indicating that most patients were within the overweight range. Based on the American Society of Anesthesiologists (ASA) classification, 65% of patients were classified as ASA II, while 35% were classified as ASA III,

highlighting a moderate to high surgical risk. Regarding pulmonary conditions, the majority of patients (88%) had chronic obstructive pulmonary disease (COPD) or restrictive lung disease, while 12% had asthma.

Table 1: Demographic and Clinical Characteristics of Study Participants

| Characteristic | Value (n=155) |
|-------------------------------|----------------------------------|
| Age (mean \pm SD) | 55.23 ± 7.01 years |
| Range | 40-70 years |
| BMI (mean \pm SD) | 27.5 ± 4.3 kg/m ² |
| ASA Classification | |
| ASA II | 65% |
| ASA III | 35% |
| Pulmonary Conditions | |
| COPD/Restrictive Lung Disease | 88% |
| Asthma | 12% |

The mean VAS score was 3.2 ± 1.1 immediately post-surgery, decreasing to 2.1 ± 0.8 at 2 hours, 1.4 ± 0.7 at 6 hours, and further reducing to 1.0 ± 0.5 at 12 hours. By 24 hours, the mean VAS score was 0.8 ± 0.4 , indicating well-controlled pain with minimal discomfort. These findings suggest that ITPB provided long-lasting analgesia, reducing the need for additional opioid use. Respiratory function remained stable throughout the perioperative period, with a preoperative forced expiratory volume in one second (FEV₁) of $58\% \pm 10\%$ (range: 40-70%), reflecting moderate pulmonary impairment. Despite this, postoperative oxygen saturation (SpO₂) remained well-maintained at $95.8\% \pm 2.3\%$ at 0 hours and $94.5\% \pm 2.1\%$ at 24 hours. Additionally, arterial blood gas analysis at 6 hours post-surgery showed a mean partial pressure of oxygen (PaO₂) of 80 mmHg ± 5.2 mmHg (range: 72-90 mmHg), with no cases of hypoxia (SpO₂ < 90%).

Table 2: Postoperative Pain Scores (VAS) and Respiratory Function

| Time Point | Mean VAS Score (\pm SD) | Range |
|---|----------------------------|------------|
| 0 Hours (immediately post-surgery) | 3.2 ± 1.1 | 2-6 |
| 2 Hours | 2.1 ± 0.8 | 1-5 |
| 6 Hours | 1.4 ± 0.7 | 0-3 |
| 12 Hours | 1.0 ± 0.5 | 0-2 |
| 24 Hours | 0.8 ± 0.4 | 0-2 |
| Respiratory function | | |
| Preoperative FEV ₁ (% predicted) | $58\% \pm 10\%$ | 40-70% |
| Postoperative SpO ₂ (0 hours) | $95.8\% \pm 2.3\%$ | 90-100% |
| Postoperative SpO ₂ (24 hours) | $94.5\% \pm 2.1\%$ | 89-99% |
| Postoperative PaO ₂ (6 hours) | 80 mmHg ± 5.2 mmHg | 72-90 mmHg |
| Hypoxia (SpO ₂ < 90%) | 0% | N/A |

Postoperative opioid consumption was significantly reduced in patients undergoing mastectomy with the intertransverse process block (ITPB), demonstrating the effectiveness of regional anesthesia in pain management. Within the first 6 hours after surgery, 75% of patients required minimal opioid supplementation, with an average consumption of 10 mg morphine equivalents. Between 6 and 12 hours postoperatively, only 12% of patients needed additional opioids, averaging 3 mg, while in the 12-24-hour period, just 13% of patients required further analgesia, with an average consumption of 2 mg morphine equivalents. The total opioid consumption over the first 24 hours was 15.2 ± 7.1 mg, highlighting the analgesic efficacy of ITPB in reducing the need for systemic pain relief.

Table 3: Supplementary Analgesia and Opioid Consumption

| Time Period | Percentage of Patients (%) | Average Opioid Consumption (mg Morphine Equivalents) |
|----------------------------|----------------------------|--|
| 0-6 Hours | 75% | 10 mg |
| 6-12 Hours | 12% | 3 mg |
| 12-24 Hours | 13% | 2 mg |
| Total Consumption (24 hrs) | N/A | 15.2 ± 7.1 mg |

The mean time to extubation was 12.6 ± 3.2 minutes (range: 8–18 minutes), with all patients successfully extubated in the operating room without complications. This rapid extubation reflects the advantage of regional anesthesia in avoiding prolonged airway management, a critical benefit for patients with compromised pulmonary function. Early mobility was also observed, with a mean time to ambulation of 14.4 ± 4.3 hours (range: 8–24 hours). A majority of patients (92%) were able to ambulate independently within the first 24 hours, reducing the risk of postoperative complications such as deep vein thrombosis and pulmonary embolism. Additionally, the mean length of hospital stay was 3.6 ± 1.1 days (range: 2–5 days), with 80% of patients discharged within three days.

Table 5: Recovery Time

| Parameter | Mean \pm SD | Range |
|--------------------------------|------------------------|--------------|
| Time to Extubation (min) | 12.6 ± 3.2 minutes | 8–18 minutes |
| Time to Ambulation (hours) | 14.4 ± 4.3 hours | 8–24 hours |
| Length of Hospital Stay (days) | 3.6 ± 1.1 days | 2–5 days |

DISCUSSION

The results of this study suggest that performing mastectomy under regional anesthesia utilizing the intertransverse process block (ITPB) in patients with poor pulmonary function is a viable and effective alternative to traditional general anesthesia. The major study findings showed that ITPB produces substantial benefits for patients with compromised lung function because it enhances various surgical outcomes including pain management and postoperative respiratory function and recovery duration and complication frequency. Effective pain management was a major discovery among the research findings regarding ITPB use¹¹. The Visual Analog Scale (VAS) showed effective postoperative pain management because patients experienced significant reductions from an early mean score of 3.2 VAS units to 0.8 VAS units at hour twenty-four after surgery¹². The long-term analgesic effects of ITPB technique resulted in pain-free recuperation throughout the recovery phase. The data showing 15.2 mg morphine equivalents indicate that ITPB successfully lowered postoperative opioid requirements within the first 24 hours. The benefits of lower opioid consumption after surgery extend to risk reduction of opioid-related side effects including nausea and vomiting with sedation effects that usually accompany general anesthesia¹³.

The research findings match previous investigations demonstrating that ITPB blocks alongside other regional methods deliver powerful pain reduction while cutting down opioid prescriptions after surgery. A comparable study by Rafi et al. (2001) confirmed that thoracic epidural anesthesia served as an adequate regional method for breast cancer surgery pain management while lowering opioid requirements after surgery¹⁴. Our findings demonstrate that the decrease in opioid needs shows ITPB represents a suitable anesthetic option which patients tolerate better than standard general anesthesia during mastectomy surgeries. Patients who suffer from COPD or restrictive lung disease or asthma need respiratory protection during surgical procedures because their lung function is already impaired. The majority of patients presented moderate-to-severe pulmonary conditions according to their preoperative pulmonary function tests¹⁵. The patients showed positive outcomes regarding postoperative respiratory function despite their preoperative respiratory issues. Patients experienced no significant changes in SpO₂ levels throughout the entire perioperative time frame as indicated by mean SpO₂ readings at 0 hours ($95.8\% \pm 2.3\%$) which slightly declined to $94.5\% \pm 2.1\%$ at 24 hours. Measurement of oxygenation levels showed stable readings throughout the perioperative period thus indicating ITPB did not produce adverse effects on breathing capacity despite general anesthesia concerns about patients with poor lungs¹⁶.

Observations of 80 mmHg as the mean partial pressure of oxygen (PaO₂) measurement at 6 hours follow-up confirm ITPB procedures present low risk to patients with respiratory disabilities

without hypoxic incidents (SpO₂ < 90%). The research by Smith et al. (2016) supports these findings because they established that regional blocks maintained better respiratory function outcomes in patients under similar operative conditions. Rapid recovery times emerged as the main notable advantage in the reported study. The patients needed an average of 12.6 ± 3.2 minutes to remove their endotracheal tube which displayed faster results than traditional general anesthesia cases¹⁷. For patients with high medical risks the fast anesthesia recovery time helps decrease both ventilator-associated pneumonia and airway injury complications which commonly occur after general anesthesia treatments. The procedures showed minimal risks since no major adverse reporting occurred¹⁸. The research showed that local site tenderness was the most frequent side effect since it occurred in 7% of the patients. Local tenderness at the injection site represents a known minor complication of regional blocks but usually heals by itself without needing other medical treatment. A minor hematoma appeared at the injection site in a single patient among the study participants while requiring no specific treatment¹⁹. The analgesic procedure resulted in no adverse events besides localized tenderness at the injection site which affected only 7 percent of patients and no patients experienced severe complications requiring reintubation or developing significant respiratory problems²⁰. The study has some limitations also. Because the study had an observational design without a comparison group such as patients undergoing general anesthesia it becomes difficult to directly evaluate ITPB versus traditional anesthetic approaches. More conclusive evidence regarding the superiority of regional anesthesia in this context can only be achieved through randomized controlled trials. The results could not easily be generalized since the research took place at a single healthcare facility. Multicenter research will determine the usability of ITPB among various healthcare facilities and groups of patients.

CONCLUSION

It is concluded that mastectomy performed under regional anesthesia utilizing the intertransverse process block (ITPB) is a safe and effective technique for patients with compromised pulmonary function. The results of this study demonstrated that ITPB provided adequate postoperative pain management with low opioid consumption, supported stable respiratory function throughout the perioperative period, and resulted in faster recovery times compared to traditional general anesthesia.

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