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**ORIGINAL ARTICLE**

# Postoperative Pain Management: Neurosurgical Vs General Surgical Approaches

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## ABSTRACT

**Background:** To compare postoperative pain levels, analgesic use, and recovery outcomes between neurosurgical and general surgical patients, with a focus on optimizing pain control while minimizing opioid reliance.

**Methods:** A total of 73 patients undergoing either neurosurgical or general surgical procedures were enrolled between August 2022 and July 2023 in Neurosurgery and General Surgery Units, Saidu Group of Teaching Hospitals, Swat. Pain was assessed using the Visual Analog Scale (VAS) at 6 and 24 hours postoperatively. Data on analgesic use, time to ambulation, patient satisfaction, and complications were collected. Group comparisons were made using appropriate statistical tests, with significance set at $p < 0.05$.

**Results:** Neurosurgical patients reported significantly higher pain scores at both 6 and 24 hours postoperatively and required more opioid analgesics. Patient-controlled analgesia was more frequently used in this group. General surgical patients, who received more non-opioid analgesics and regional blocks, demonstrated faster ambulation and shorter hospital stays. Despite these differences, overall satisfaction with pain management was comparable between the groups.

**Conclusion:** Pain experiences and management needs differ significantly between neurosurgical and general surgical patients. Tailoring postoperative analgesia through multidisciplinary, procedure-specific protocols can improve outcomes and reduce opioid dependency.

**Keywords:** Postoperative pain, neurosurgery, general surgery, opioid use, regional anesthesia, multimodal analgesia, pain recovery

## INTRODUCTION

Pain following surgery is one of the most anticipated and feared aspects of the postoperative experience for patients. Despite advancements in surgical techniques and anesthesia, the management of postoperative pain continues to pose significant clinical challenges. Effective pain control is not only crucial for patient comfort but also plays a central role in early mobilization, prevention of complications, and overall recovery[1-3].

Surgical procedures differ widely in the intensity and duration of postoperative pain they produce. Neurosurgical operations, particularly those involving the brain or spine, often result in complex pain patterns due to the involvement of sensitive neural structures. On the other hand, general surgical procedures, which typically involve abdominal or superficial tissues, are increasingly managed with enhanced recovery protocols and regional anesthesia techniques[4-6].

There is growing concern 'globally over opioid overuse in postoperative settings'. While opioids are effective, their side effects including nausea, sedation, respiratory depression, and potential for dependence have led to calls for safer, multimodal approaches to pain management. 'Comparing different surgical populations provides insight into how pain strategies can be optimized across specialties'[7-9].

This study aims 'to evaluate and compare postoperative pain levels, analgesic requirements, and recovery outcomes in patients undergoing neurosurgical versus general surgical procedures'. The goal is to identify patterns that can inform cross-disciplinary pain management protocols, reduce opioid exposure, and promote safer recovery practices.

## METHODOLOGY

This comparative observational study was conducted over a one-year period, from August 2022 and July 2023, at Neurosurgery and General Surgery Units, Saidu Group of Teaching Hospitals, Swat. The objective was 'to evaluate and compare postoperative pain management strategies in patients undergoing neurosurgical procedures versus those undergoing general surgical procedures'.

A total of 73 adult patients were included in the study through non-probability consecutive sampling. 'Patients were divided into two groups based on the type of surgery they underwent: Group A (Neurosurgical group) and Group B (General surgical group)'. Group A included patients who underwent cranial or spinal surgeries, while Group B included those undergoing abdominal or soft tissue procedures such as cholecystectomy, appendectomy, or hernia repair.

Inclusion criteria were adults aged 18 years or older who underwent elective or emergency surgical procedures under general anesthesia and remained admitted for at least 48 hours postoperatively. Patients with pre-existing chronic pain syndromes, cognitive impairments affecting pain reporting, or those on long-term opioid therapy were excluded from the study.

After obtaining informed consent, baseline demographic data including age, gender, body mass index (BMI), and comorbid conditions such as diabetes and hypertension were recorded. Preoperative ASA physical status classification and type of procedure (elective or emergency) were also noted. Details regarding anesthesia techniques, including the use of general or regional anesthesia, duration of surgery, and intraoperative analgesic administration, were collected.

Postoperative pain was assessed using the Visual Analog Scale (VAS) at 6 hours and 24 hours following surgery. Analgesic protocols were recorded, including the use of opioids (converted to morphine milligram equivalents), non-opioid medications (NSAIDs, paracetamol), and the use of patient-controlled analgesia (PCA) devices. The timing of the first dose of analgesia and total analgesic requirement over the first 24 hours were documented.

Recovery parameters included time to first ambulation, incidence of nausea and vomiting, pain-related sleep disturbance, patient-reported satisfaction with pain management, and total length of hospital stay. Complications related to analgesia, if any, were also noted.

All data were compiled and analyzed using IBM SPSS Statistics version 26. Continuous variables were expressed as means with standard deviations, and comparisons between the two groups were made using the independent samples t-test.

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Categorical variables were expressed as frequencies and percentages, and analyzed using the chi-square or Fisher's exact test, where appropriate. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Review Board prior to data collection. Confidentiality and anonymity of patient data were strictly maintained throughout the research process.

## RESULTS

The study included a total of 73 patients, with 36 undergoing neurosurgical procedures and 37 undergoing general surgical operations. The mean age of neurosurgical patients was 49.2 ± 14.1 years, while general surgical patients had a slightly lower mean age of 45.6 ± 13.4 years; this difference was not statistically significant (p = 0.221). Gender distribution was fairly balanced between the groups, with no significant difference observed (p = 0.609). Similarly, body mass index (BMI), prevalence of diabetes and hypertension, and ASA physical status classification were also comparable between the two cohorts, indicating a well-matched baseline across groups.

Table 1: Demographic Characteristics of Patients (n = 73)

| Variable | Neurosurgical (n=36) | General Surgical (n=37) | p-value |
|---|---|---|---|
| Mean Age (years) | 49.2 ± 14.1 | 45.6 ± 13.4 | 0.221 |
| Gender (Male/Female) | 22 / 14 | 20 / 17 | 0.609 |
| BMI (kg/m²) | 26.7 ± 3.9 | 25.9 ± 4.2 | 0.382 |
| Diabetes (%) | 9 (25%) | 11 (29.7%) | 0.658 |
| Hypertension (%) | 13 (36.1%) | 14 (37.8%) | 0.875 |
| ASA Grade III or above (%) | 12 (33.3%) | 9 (24.3%) | 0.388 |

A majority of surgeries in both groups were elective, with no significant difference in urgency (p = 0.695). Neurosurgical procedures had a significantly longer mean operative time of 154.7 ± 39.2 minutes compared to 128.5 ± 45.6 minutes for general surgeries (p = 0.011). While general anesthesia was used in nearly all patients, regional blocks were significantly more frequent among general surgical patients (29.7%) compared to only 11.1% in neurosurgical patients (p = 0.043).

Table 2: Surgical and Anesthetic Details

| Variable | Neurosurgical (n=36) | General Surgical (n=37) | p-value |
|---|---|---|---|
| Elective Procedures (%) | 30 (83.3%) | 32 (86.5%) | 0.695 |
| Duration of Surgery (minutes) | 154.7 ± 39.2 | 128.5 ± 45.6 | 0.011* |
| General Anesthesia (%) | 36 (100%) | 35 (94.6%) | 0.150 |
| Regional Block Used (%) | 4 (11.1%) | 11 (29.7%) | 0.043* |

Pain scores were notably higher in the neurosurgical group during the early postoperative period. At 6 hours postoperatively, the mean visual analog scale (VAS) score was 5.9 ± 1.1 among neurosurgical patients, compared to 4.7 ± 1.4 in the general surgical group (p < 0.001). Even at 24 hours, neurosurgical patients continued to report higher pain scores (p = 0.048). Total opioid consumption over 24 hours was significantly higher in neurosurgical cases (38.6 ± 11.2 MME) versus general surgical cases (29.4 ± 10.8 MME) (p < 0.001). The use of non-opioid analgesics such as NSAIDs and paracetamol was significantly more common in general surgical patients (83.8%) compared to neurosurgical patients (61.1%) (p = 0.021). Additionally, patient-controlled analgesia (PCA) was more frequently employed in the neurosurgical group (72.2% vs. 37.8%, p = 0.002).

Patients in the general surgical group showed faster recovery profiles. The time to ambulation was significantly shorter in this group (16.8 ± 5.9 hours) compared to neurosurgical patients (22.5 ± 6.3 hours), with p < 0.001. Although nausea and vomiting were more common among neurosurgical patients (30.6% vs. 16.2%), this difference did not reach statistical significance (p = 0.138). Pain-related sleep disturbances were significantly higher in neurosurgical patients (47.2% vs. 24.3%, p = 0.033). Despite these differences, there was no statistically significant variation in overall patient satisfaction with pain control (p = 0.239). Length of hospital stay was notably longer in neurosurgical cases (5.2 ± 1.7 days) than in general surgical patients (3.7 ± 1.5 days), which was statistically significant (p < 0.001).

Table 3: Postoperative Pain Scores and Opioid Use

| Variable | Neurosurgical (n=36) | General Surgical (n=37) | p-value |
|---|---|---|---|
| VAS Pain Score at 6 hours | 5.9 ± 1.1 | 4.7 ± 1.4 | <0.001* |
| VAS at 24 hours | 3.8 ± 1.2 | 3.2 ± 1.3 | 0.048* |
| Opioid Use (MME in 24 hrs) | 38.6 ± 11.2 | 29.4 ± 10.8 | <0.001* |
| Non-opioid Analgesics (%) | 22 (61.1%) | 31 (83.8%) | 0.021* |
| PCA Use (%) | 26 (72.2%) | 14 (37.8%) | 0.002* |

Table 4: Recovery Parameters and Pain-related Outcomes

| Variable | Neurosurgical (n=36) | General Surgical (n=37) | p-value |
|---|---|---|---|
| Time to Ambulation (hours) | 22.5 ± 6.3 | 16.8 ± 5.9 | <0.001* |
| Nausea/Vomiting (%) | 11 (30.6%) | 6 (16.2%) | 0.138 |
| Pain Interfered with Sleep (%) | 17 (47.2%) | 9 (24.3%) | 0.033* |
| Patient Satisfaction (High %) | 24 (66.7%) | 29 (78.4%) | 0.239 |
| Length of Stay (days) | 5.2 ± 1.7 | 3.7 ± 1.5 | <0.001* |

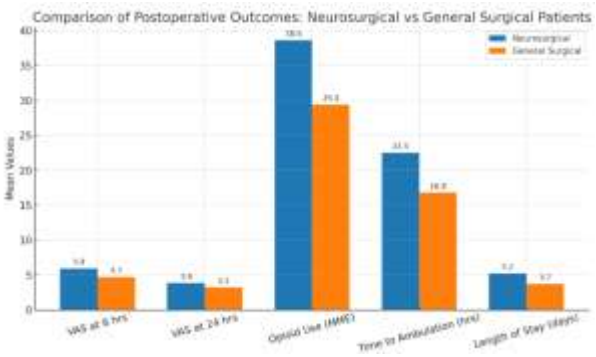


Figure 1: bar graph comparing key postoperative outcomes between neurosurgical and general surgical patients.

## DISCUSSION

Effective management of postoperative pain is essential for promoting recovery, preventing complications, and improving patient satisfaction. This study compared pain control strategies and outcomes between neurosurgical and general surgical patients, revealing important differences in analgesic requirements, recovery profiles, and patient experiences.

The findings demonstrated that neurosurgical patients experienced significantly higher pain scores in the immediate postoperative period, particularly at 6 and 24 hours after surgery. This was consistent with previous research, such as the studies, which reported heightened nociceptive sensitivity following cranial procedures due to the involvement of scalp and periosteal tissues[10-12]. In contrast, general surgical patients benefited from more frequent use of regional anesthesia and non-opioid analgesics, which may have contributed to lower pain scores.

'A key observation in our study was the greater reliance on opioids in the neurosurgical group, both in terms of total consumption and use of patient-controlled analgesia (PCA)'. 'While opioids remain the cornerstone of postoperative pain control, excessive use is associated with adverse effects such as respiratory depression, nausea, and delayed mobilization'. Similar concerns have been raised in studies, which emphasized the need for opioid-sparing strategies through multimodal analgesia[13-15].

'General surgical patients in our study demonstrated a faster recovery, marked by earlier ambulation and shorter hospital stay'. This supports the growing body of evidence favoring enhanced recovery after surgery (ERAS) protocols, which advocate for early

mobilization and reduced opioid dependency. The use of regional blocks, including transversus abdominis plane (TAP) blocks and spinal anesthesia, may have facilitated this accelerated recovery. Studies also found that non-opioid strategies could shorten recovery time and reduce complications[16-18].

Sleep disturbance due to pain was more commonly reported by neurosurgical patients in this study, possibly due to insufficient regional analgesia or higher baseline pain. Although patient satisfaction scores were not significantly different between the groups, this suggests that subjective perceptions of pain and comfort may not always align with objective pain scores and should be explored further. Notably, the duration of surgery was significantly longer in the neurosurgical group. Prolonged surgical time is known to correlate with increased tissue trauma and postoperative pain, as described in studies[19,20]. This may partly explain the higher opioid requirements in that cohort. Despite these differences, both groups had broadly similar demographic profiles, allowing for a fair comparison. The study highlights the need to tailor postoperative pain strategies not only to the type of procedure but also to the expected recovery trajectory and patient-specific risks.

## CONCLUSION

This study reveals that neurosurgical patients are more likely to experience intense early postoperative pain and higher opioid requirements compared to general surgical patients. 'General surgical patients, on the other hand, benefit from broader use of regional anesthesia and non-opioid analgesics, contributing to faster recovery and fewer opioid-related complications'.

The findings support the development of cross-disciplinary, procedure-specific pain management protocols that promote multimodal analgesia and reduce reliance on opioids. Implementing such strategies can enhance recovery, reduce hospital stay, and improve the overall quality of care. Further research is needed to evaluate the long-term outcomes of these pain management approaches and to explore individualized patient-centered interventions.

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