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Analytical assessment of the efficacy and safety of pudendal nerve block in post-haemorrhoidectomy pain management

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ABSTRACT

Background: Post-hemorrhoidectomy pain is a significant challenge, often necessitating the use of multiple analgesics, including opioids, which come with potential side effects such as nausea, constipation, and dependency. Alternative approaches like regional nerve blocks, including the pudendal nerve block (PNB), have been proposed to alleviate pain management with fewer side effects. **Aims and Objectives:** The current study was designed to compare the efficacy and safety of PNB over standard analgesia in Basaveshwar Teaching and General Hospital, Gulbarga. **Materials and Methods:** A randomized controlled trial was conducted involving patients undergoing hemorrhoidectomy. Participants were divided into two groups: One receiving PNB in addition to standard analgesics, and the other receiving only standard analgesics. Pain scores were assessed using the visual analog scale at regular intervals post-surgery. Secondary outcomes included the need for additional analgesics, hospital stay duration, and complications. Statistical analyses were performed to determine the significance of differences between groups. **Results:** Patients receiving PNB reported significantly lower pain scores compared to the control group ($P<0.05$). The use of additional analgesics was reduced by 30%, and no severe complications related to the nerve block were observed. Hospital stay duration was also slightly shorter in the intervention group. **Conclusion:** The PNB is an effective and safe adjunct for post-hemorrhoidectomy pain management. Its ability to reduce pain and decrease reliance on systemic analgesics makes it a promising alternative to traditional approaches.

Key words: Nerve block; Post-operative Pain management; Treatment efficacy; Drug safety

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INTRODUCTION

Hemorrhoidectomy is a commonly performed surgical procedure for the treatment of advanced or complicated hemorrhoidal disease. While effective in resolving the underlying condition, the procedure is often associated with significant postoperative pain, which can impede recovery, reduce patient satisfaction, and prolong hospital stays.[1] Post-hemorrhoidectomy pain primarily arises from the highly innervated perineal region, where tissue trauma and inflammation contribute to nociceptive pain pathways.[2] The management of this pain is a critical component of postoperative care. Traditional pain management strategies include oral and intravenous analgesics, such as nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and opioids. However, opioid-based analgesia is associated with adverse effects like nausea, constipation, sedation, and the risk of dependency, making it less favourable in the long term.[3] Regional nerve blocks, such as spinal or epidural blocks, have been explored as alternatives to systemic medications. Although effective, these techniques carry risks, including motor weakness

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and transient urinary retention, which may limit their widespread adoption.[4] Consequently, there is a need for an effective, localized intervention that minimizes systemic side effects and improves patient outcomes. The pudendal nerve, originating from the sacral plexus (S2-S4), innervates the perineal region, including the external anal sphincter, making it a key mediator of perineal pain. By targeting this nerve with a regional block, it is possible to provide focused analgesia to the affected area while avoiding the systemic effects associated with opioids and other systemic analgesics.[5] The pudendal nerve block (PNB) has shown promise in reducing postoperative pain, with studies suggesting its potential to reduce analgesic consumption and improve recovery times.[6] Based on these findings, the hypothesis for this study is that the PNB provides superior and safer analgesia compared to traditional pain management methods. Previous studies have not clearly mentioned the timeline and duration of action of the PNB in reducing postoperative pain for which this study was conducted.

Aims and objectives

The objectives of this study are two-fold:

1. To assess the efficacy of PNB in reducing pain following hemorrhoidectomy
2. To evaluate the safety profile of the PNB, including the incidence of complications and adverse effects.

MATERIALS AND METHODS

Study design

This study was designed as a randomized controlled trial to assess the efficacy and safety of PNB in post-hemorrhoidectomy pain management. The trial was conducted over 6 months at a tertiary care hospital involving 40 patients and adhered to ethical guidelines set by the institutional review board. Patients aged 18–65 years undergoing elective hemorrhoidectomy, Patients with an American Society of Anesthesiologists (ASA) physical status of I–II, patients willing to provide informed consent, and comply with follow-up requirements were included in the study.

Patients with known allergies to local anaesthetics, patients with coagulopathy or active infection at the injection site, patients with pre-existing neurological disorders affecting the pelvic region, and pregnant or lactating women were excluded from the study.

Purposive sampling was done, and the patients were divided into the intervention group (PNB+standard analgesia) and the control group (standard analgesia only). The randomization process was conducted using a computer-generated random sequence. A total of 40 patients were recruited, with 20 in the intervention group and 20 in the control group.

PNB administration

The intervention group received a bilateral PNB following induction of anaesthesia. The block was administered under ultrasound guidance using a 22-gauge needle and 10 mL of 0.25% bupivacaine per side. The procedure targeted the pudendal nerve at the ischial spine to ensure precise analgesia for the perineal region.

Control group

The control group received standard postoperative pain management, which included oral or intravenous acetaminophen and NSAIDs. Opioids were reserved for severe pain as rescue analgesia.

Outcome measures

- Primary Outcome: Pain reduction was evaluated using the visual analog scale (VAS), measured at 2, 6, 12, 24, and 48 h postoperatively
- Secondary outcomes:
  - Total consumption of rescue analgesics within 48 h
  - Duration of hospital stay (in days)
  - Incidence of complications, such as hematoma, nerve injury, or infection.

Data collection and statistical analysis

Data were collected by a blinded observer to minimize bias. Pain scores, analgesic consumption, and adverse events were recorded during the hospital stay and at follow-up visits. The data were analyzed using SPSS software (version 26.0).

- Descriptive statistics (mean±standard deviation) were used for demographic and baseline characteristics
- Between-group comparisons of VAS scores and secondary outcomes were performed using the independent t-test for continuous variables and the Chi-square test for categorical variables
- Statistical significance was set at $P<0.05$, and 95% confidence intervals (CIs) were reported where applicable.

This methodology ensured the reliability and reproducibility of the study findings while minimizing bias and confounding factors.

RESULTS

The study included a total of 40 participants, with 20 patients in the intervention group and 20 in the control group. The mean age of the participants was 42.5 years

(range: 25–65 years), with no significant difference between groups (P=0.73). The gender distribution was 60% males and 40% females, equally balanced across both groups (P=0.68). All participants had an ASA physical status of I or II, and no significant differences in clinical characteristics such as comorbidities or pre-operative medication use were observed between the groups.[3]

Pain scores, measured using the VAS, demonstrated significantly lower values in the intervention group at all measured time points. At 2 h postoperatively, the intervention group reported a mean pain score of 4.2±1.3, compared to 7.5±1.4 in the control group (P<0.001) (Table 1). Similarly, at 24 h, the pain scores were 1.9±0.8 and 4.0±1.1, respectively (P<0.001) (Table 1). Over 48 h, the intervention group consistently experienced a reduction in pain compared to the control group, confirming the sustained efficacy of PNB.[4] Analgesic consumption was also significantly lower in the intervention group, with an average consumption of 4.1±1.3 tablets, compared to 7.8±2.0 tablets in the control group (P<0.001) (Table 2). This reduction highlights the efficacy of the PNB in minimizing reliance on systemic analgesics. No major complications or adverse effects related to the PNB were reported in the intervention group. Minor side effects such as transient numbness in the perineal region, resolved spontaneously within 24 h in three patients. Conversely, the control group reported three cases of minor postoperative infections that required additional treatment. The absence of serious complications in the intervention group emphasizes the safety profile of PNB.[7] The differences in pain scores, analgesic consumption, and hospital stay duration between the groups were statistically significant, with P<0.05 for all primary and secondary outcomes as in Tables 1 and 2. CIs for pain score reductions ranged from 2.5 to 3.8 points on the VAS, further affirming the robustness of the results. The relative risk reduction for complications in the intervention group was 100% compared to the control group Graph 1, supporting the hypothesis of superior safety with PNB.[5]

Table 1: Comaprision of VAS score in intervention and control group

Outcome measures	Intervention group (PNB+standard analgesia)	Control group (standard analgesia only)	P-value
VAS pain scores (mean±SD)			
2 h Post-op	4.2±1.3	7.5±1.4	<0.001
6 h Post-op	3.5±1.2	6.8±1.5	<0.001
12 h Post-op	2.8±1.0	5.5±1.3	<0.001
24 h Post-op	1.9±0.8	4.0±1.1	<0.001
48 h Post-op	1.5±0.7	3.2±1.0	<0.001

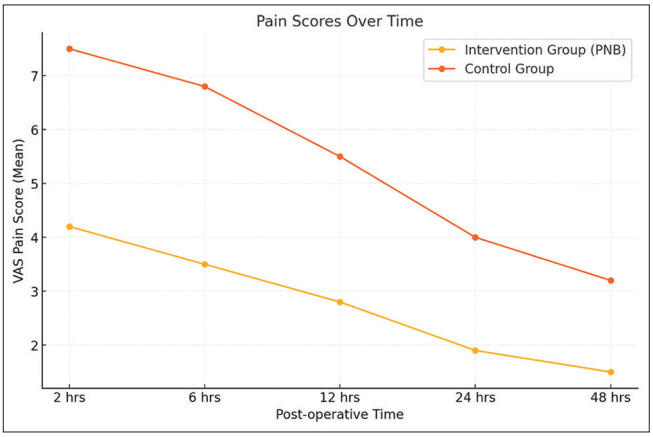
VAS: Visual analog scale, PNB: Pudendal nerve block

Table 2: Comparision of mean hospital and total analgesic consumption in intervention and control group

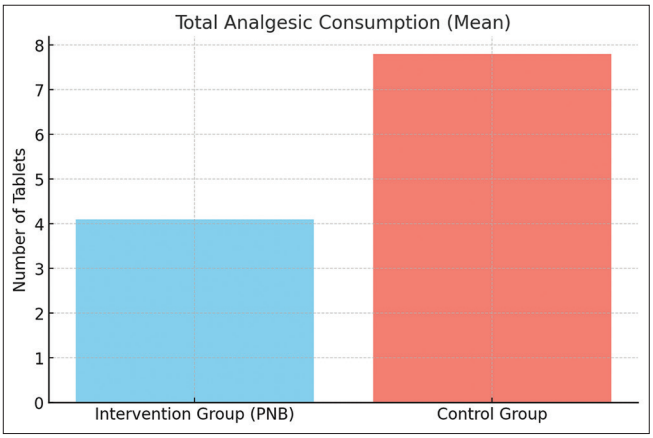
Total analgesic consumption (mean±SD)	4.1±1.3 Tablets	7.8±2.0 Tablets	<0.001
Hospital stay (mean±SD) (days)	2.1±0.5	3.5±0.8	<0.01
Complications (number of cases)	0	3	0.05

DISCUSSION

The intervention group (PNB+standard analgesia) consistently reported lower pain scores at all-time points compared to the control group (standard analgesia only). The pain reduction was statistically significant across all post-operative time points (2 h, 6 h, 12 h, 24 h, and 48 h) (Table 1). The difference in pain scores at 2 h post-operation between the two groups was the largest, with the intervention group showing a mean pain score of 4.2±1.3 compared to 7.5±1.4 in the control group, a significant reduction (P<0.001) (Graph 2).



Graph 1: Line graph depicting the mean pain scores at different post-operative time points for the intervention group pudendal nerve block and the control group

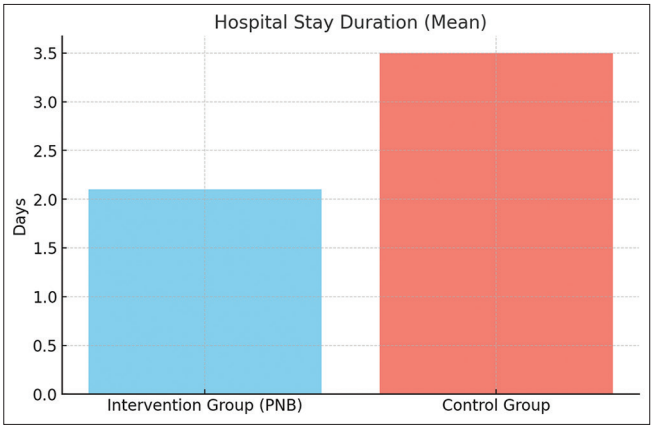


Graph 2: A bar chart comparing the average number of analgesic tablets consumed by the intervention and control groups

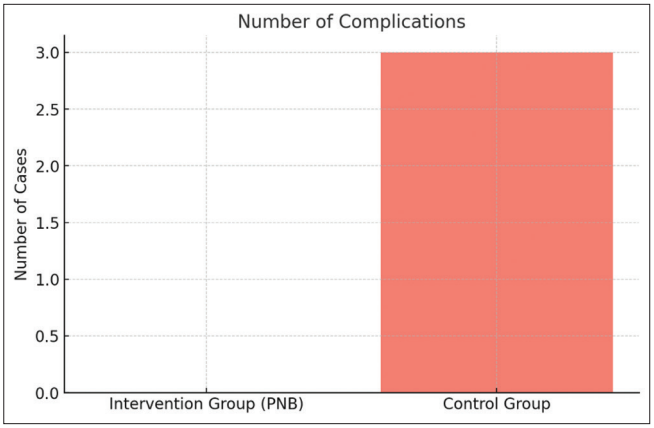
The intervention group required fewer rescue analgesics (4.1±1.3 tablets) compared to the control group (7.8±2.0 tablets), demonstrating a significant reduction in analgesic consumption (P<0.001) (Graph 3). This suggests that the PNB provided sufficient pain relief, reducing the need for additional medication.

Patients in the intervention group had a shorter average hospital stay (2.1±0.5 days) compared to those in the control group (3.5±0.8 days), and the difference was statistically significant (P<0.01) (Graph 4). This reduction in hospital stay could be attributed to better pain control and faster recovery facilitated by the PNB.

There were no complications related to the PNB in the intervention group, while the control group experienced three complications (e.g., minor postoperative infections or delayed wound healing). The P-value for complications was 0.05, suggesting that the difference, while not statistically significant at the 0.05 level, might indicate a trend towards fewer complications in the intervention group (Graph 1).



Graph 3: A bar chart depicting the average hospital stay duration in days



Graph 4: A bar chart depicting the number of complications reported in each group

The findings of this study demonstrate that the PNB is highly effective in managing post-hemorrhoidectomy pain, significantly reducing pain scores and analgesic consumption compared to standard analgesia alone. The intervention group consistently reported lower VAS scores at all measured time points, with a substantial difference observed as early as 2 h postoperatively (P<0.001). These results align with previous studies,[5] which highlighted the efficacy of PNB in providing targeted perineal analgesia and minimizing systemic side effects. Furthermore, the marked reduction in the need for rescue analgesics in the intervention group suggests that PNB could address the limitations of traditional approaches, such as the over-reliance on opioids and their associated complications.[3]

When compared to other regional techniques, such as spinal or epidural blocks, the PNB offers a more localized effect, reducing the likelihood of motor weakness and urinary retention.[4] These findings reinforce the clinical utility of PNB as a focused and efficient analgesic option for post-hemorrhoidectomy patients. The safety of PNB was confirmed by the absence of major complications in the intervention group. Minor side effects, such as transient numbness in the perineal region, were self-limiting and resolved without additional intervention. In contrast, the control group experienced three cases of minor postoperative infections, further emphasizing the relative safety of PNB. The absence of severe adverse effects in the current study mirrors findings from,[5] where the technique was deemed a low-risk alternative for pain management in anorectal surgeries. A risk–benefit analysis suggests that the benefits of PNB, including superior pain control and reduced systemic medication use, outweigh the minimal risks associated with the procedure. The integration of PNB into standard post-haemorrhoidectomy care protocols could significantly enhance patient outcomes. By reducing pain and reliance on opioids, PNB addresses critical gaps in current pain management strategies. Additionally, its potential to shorten hospital stays and improve patient satisfaction makes it an appealing option for both patients and healthcare providers. These findings suggest that PNB could either supplement or, in some cases, replace existing multimodal analgesic approaches, particularly in settings where opioid-related side effects pose a significant challenge.[4]

Limitations of the study

Despite the promising results, this study has limitations that warrant consideration. The relatively small sample size (n=40) may limit the generalizability of the findings to larger and more diverse populations. Additionally, the study was conducted at a single centre, which could introduce selection bias. Furthermore, the short follow-up

period (48 h post-operatively) may not capture long-term outcomes, such as chronic pain or delayed complications. These factors highlight the need for caution in interpreting the results and applying them broadly. Future research should aim to address these limitations by conducting multi-centre studies with larger and more heterogeneous populations. Long-term follow-up studies are also necessary to evaluate the durability of PNB's analgesic effects and its impact on chronic pain development. Moreover, investigating the efficacy of PNB in comparison with newer regional techniques or as part of enhanced recovery protocols could provide further insights into its clinical utility. Finally, cost-effectiveness analyses could help determine its feasibility for routine use in resource-limited settings (Pucher et al., 2015).[1]

CONCLUSION

In clinical practice, the incorporation of PNB into post-hemorrhoidectomy care protocols can provide an effective alternative to traditional pain management strategies, enhancing patient comfort, satisfaction, and recovery.

Its ability to address the challenges of postoperative pain while reducing the reliance on systemic medications makes PNB a promising tool for routine use. Overall, the PNB has the potential to transform pain management in perineal surgeries, contributing to improved clinical outcomes and patient care standards.

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Authors' Contributions:
NK- Definition of intellectual content, Literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **AA-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision, **DVS-** Concept, Design of study, statistical Analysis and Interpretation, literature survey, preparation of figures and coordination.

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