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A Prospective Study to Assess the Efficacy of Perianal Infiltration of Methylene Blue with Bupivacaine to Control Pain After Haemorrhoidectomy

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Abstract

Background: Postoperative pain is one of the major concerns following haemorrhoidectomy and may delay recovery and affect patient comfort. Local infiltration with methylene blue and bupivacaine may provide an effective approach to postoperative analgesia.

Aim: To evaluate the efficacy of perianal intradermal infiltration of methylene blue combined with bupivacaine in reducing postoperative pain following haemorrhoidectomy.

Materials and Methods: This prospective interventional study included 70 patients undergoing haemorrhoidectomy at GCS Medical College, Hospital and Research Centre, from January 2024 to January 2026. Following haemorrhoidectomy, 2 mL of 1% methylene blue combined with 8 mL of 0.5% bupivacaine (total volume 10 mL) was administered through circumferential intradermal perianal infiltration. Postoperative pain was assessed using the Visual Analogue Scale (VAS) at the 2nd, 6th and 12th hours and on postoperative days 1, 3 and 7. Analgesic requirements and postoperative complications were also recorded. Statistical analysis was performed using SPSS version 25.0.

Results: Among 70 patients, 59 (84.3%) were male and 11 (15.7%) were female. The mean VAS scores were 3.67 at 2 hours, 3.91 at 6 hours, 2.83 at 12 hours, 3.01 on postoperative day 1, 2.49 on day 3 and 1.90 on day 7. The difference in pain scores across assessment intervals was statistically significant (Friedman test, $\chi^2 = 88.28$, p less than 0.001). Six patients (8.6%) required intravenous rescue analgesia within 6 hours, while one

(1.4%) required additional oral analgesia after 24 hours. No postoperative complications were observed in 66 patients (94.3%). Urinary retention occurred in two patients (2.9%), while urine discolouration and localised pruritus occurred in one patient each (1.4%).

Conclusion: Perianal intradermal infiltration of methylene blue combined with bupivacaine demonstrated encouraging postoperative pain control, relatively low additional analgesic requirements and a favourable observed safety profile following haemorrhoidectomy. Further controlled studies are required to establish its comparative efficacy.

Keywords: Haemorrhoidectomy; Methylene Blue; Bupivacaine; Postoperative Pain; Visual Analogue Scale; Local Infiltration; Analgesia.

Introduction

Haemorrhoidal disease is one of the most common anorectal disorders encountered in general surgical practice. It develops due to symptomatic enlargement and displacement of the normal anal vascular cushions and commonly presents with bleeding per rectum, prolapse, constipation, irritation and discomfort. The severity of symptoms varies according to the degree of haemorrhoidal disease and may significantly affect the patient's quality of life. Although conservative management and office-based procedures are effective in many patients, surgical intervention remains an important treatment option for advanced haemorrhoids, particularly Grade III and Grade IV disease and cases refractory to conservative treatment [1,2].

Haemorrhoidectomy is considered an established surgical treatment for advanced haemorrhoidal disease. Different surgical techniques, including open, closed, stapled and laser haemorrhoidectomy, are used depending on the clinical condition and surgeon's preference. Despite its effectiveness in removing pathological haemorrhoidal tissue, postoperative pain remains one of the major challenges associated with haemorrhoidectomy. The pain may result from surgical trauma, inflammation, exposure of sensitive perianal tissues and reflex spasm of the internal anal sphincter. It can interfere with early mobilisation, defecation, wound care and routine daily activities, thereby affecting postoperative recovery and patient satisfaction [3,4].

Effective postoperative pain management is therefore an essential component of haemorrhoidectomy. Various approaches have been investigated, including systemic analgesics, non-steroidal anti-inflammatory drugs, local anaesthetic infiltration, pudendal nerve blocks and topical medications. Bupivacaine is a long-acting amide local anaesthetic that produces analgesia by reversibly blocking voltage-gated sodium channels and preventing the generation and conduction of nerve impulses. Its local infiltration around the operative site may provide prolonged postoperative analgesia and reduce the requirement for additional systemic analgesics [5].

Methylene blue has also gained attention as an adjunct in the management of post-haemorrhoidectomy pain. It is believed to exert analgesic effects through local neurolytic activity, inhibition of nerve impulse transmission and modulation of nitric oxide-related pathways. Intradermal administration around the perianal surgical site may reduce peripheral nociceptive transmission and provide additional pain relief. Sim and Tan demonstrated significantly lower postoperative pain scores and reduced paracetamol consumption following intradermal methylene blue administration during open haemorrhoidectomy [6]. Similarly, a randomised controlled trial by Azhough et al. reported reduced postoperative pain following intradermal methylene blue

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application, supporting its potential role in postoperative analgesia [7].

The combination of methylene blue and bupivacaine may provide complementary analgesic effects through different mechanisms. While bupivacaine produces reversible local anaesthetic blockade, methylene blue may provide additional modulation of peripheral nerve-related pain. Previous evidence has also highlighted the potential benefits of combining bupivacaine with other agents for improving postoperative analgesia following haemorrhoidectomy [8]. However, the effectiveness and safety of this particular combination, especially when administered through circumferential intradermal perianal infiltration, require further clinical evaluation.

Considering the importance of postoperative pain control and the need to minimise additional analgesic requirements, the present study was undertaken to assess the efficacy of perianal intradermal infiltration of methylene blue combined with bupivacaine in patients undergoing haemorrhoidectomy. The study evaluated postoperative pain intensity using the Visual Analogue Scale (VAS), additional analgesic requirements and postoperative complications during the follow-up period.

Materials And Methods

Study Design

The present study was designed as a prospective interventional study to evaluate the effectiveness of local infiltration of methylene blue combined with bupivacaine in providing postoperative pain relief among patients undergoing haemorrhoidectomy.

Study Setting

The study was conducted in the Department of General Surgery at GCS Medical College, Hospital and Research Centre (GCSMC & RC). Patients attending the surgical outpatient department (OPD) and inpatient department (IPD) with a clinical diagnosis of haemorrhoids and scheduled for haemorrhoidectomy were considered for inclusion.

Study Population

The study population comprised patients diagnosed with haemorrhoids who underwent haemorrhoidectomy during the study period from January 2024 to January 2026.

Inclusion Criteria

Patients fulfilling the following criteria were included in the study:

1. Patients clinically diagnosed with haemorrhoids.
2. Patients aged 20 years or above.
3. Patients scheduled for haemorrhoidectomy at GCSMC & RC during the study period.
4. Patients willing to participate and providing written informed consent.

Exclusion Criteria

Patients were excluded if they met any of the following criteria:

1. Age below 20 years.
2. Known allergy or hypersensitivity to methylene blue or bupivacaine.
3. Presence of other associated perianal diseases, such as anal fissure, fistula-in-ano or perianal abscess.
4. Patients unwilling to participate in the study.

Sample Size

A total of 70 patients undergoing haemorrhoidectomy were included in the study. The sample size was determined considering institutional patient flow, the anticipated number of eligible cases during the study period, study feasibility and statistical requirements.

Intervention and Drug Preparation

Following completion of haemorrhoidectomy, a combination of methylene blue and bupivacaine was

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administered through local perianal infiltration to evaluate its effect on postoperative pain relief.

The intervention consisted of:

- Methylene blue: 2 mL of 1% solution.
- Bupivacaine: 8 mL of 0.5% solution.
- Total volume: 10 mL.

The prepared combination was used for circumferential intradermal infiltration around the perianal surgical site.

Injection Technique and Method of Administration

The infiltration was performed using a 25–27 gauge needle inserted at an angle of approximately 10–15° to the skin surface. The injections were administered intradermally rather than into the deep muscular or intravascular planes.

A circumferential, multi-point infiltration technique was employed, involving approximately 6–8 injection sites distributed evenly around the perianal circumference. The injection sites were selected approximately 0.5–1 cm away from the mucocutaneous junction.

The infiltration was performed systematically across the posterior, lateral and anterior perianal quadrants to ensure adequate distribution of the drug combination around the operative site. Approximately 0.5–1 mL of the solution was administered at each injection point, with the formation of blue-tinged intradermal wheals indicating appropriate superficial infiltration.

The injection was administered after completion of haemorrhoid excision and before application of anal packing or dressing. Patients were generally under spinal or general anaesthesia during the procedure.

Data Collection

Data were collected prospectively from patient interviews, clinical examinations, operative records and postoperative follow-up assessments. All patients were screened according to the predefined inclusion and exclusion criteria, and written informed consent was obtained before enrolment.

The following information was recorded:

1. **Demographic and Clinical Characteristics:** Age, relevant medical history, family history of diseases, previous surgical history and presenting clinical features were documented.
2. **Operative Details:** Details regarding the haemorrhoidectomy procedure, intraoperative findings, type of anaesthesia and administration of the methylene blue–bupivacaine combination were recorded.
3. **Postoperative Assessment:** Patients were monitored during the postoperative period, with particular emphasis on pain relief, postoperative recovery and any complications associated with the surgical procedure or local drug infiltration.
4. **Treatment and Follow-up:** Information regarding postoperative management, analgesic requirements, duration of hospital stay, wound healing, need for additional interventions and postoperative complications was collected from medical records and follow-up visits.

Study Duration

The study was conducted over a period of two years, from January 2024 to January 2026.

Statistical Analysis

All collected data were systematically entered, coded and analysed using Statistical Package for the Social Sciences (SPSS), version 25.0. Descriptive statistics were used to summarise demographic and clinical characteristics. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Appropriate statistical tests were applied according to

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the distribution and nature of the data. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of GCS Medical College, Hospital and Research Centre. Written informed consent was obtained from all participants before enrolment. Patients were informed about the objectives, procedures, potential benefits and possible risks associated with the intervention. Confidentiality was maintained throughout the study by anonymising patient information and ensuring secure storage of clinical data.

Observations And Results

The present study included 70 patients who underwent haemorrhoidectomy under spinal anaesthesia between January 2024 and December 2025. The study evaluated postoperative pain relief following perianal intradermal infiltration of a combination of methylene blue and bupivacaine. The observations were analysed with respect to demographic characteristics, clinical presentation, comorbidities, surgical findings, postoperative complications, pain scores and analgesic requirements.

Table 1: Demographic and Occupational Profile of Study Participants (N=70)

Variables	Frequency (n)	Percentage (%)
Gender		
Male	59	84.3
Female	11	15.7
Age group (years)		
Below 40	28	40.0
40–60	27	38.6
Above 60	15	21.4
Occupational profile		
Labourers	20	28.6
Desk-based occupations	18	25.7
Other occupations	32	45.7
Total	70	100.0

The study population showed a marked male predominance, with males accounting for 84.3% of participants. The majority were below 40 years of age (40%), followed by patients aged 40–60 years (38.6%). Labourers constituted 28.6% of the study population, while 25.7% were engaged in desk-based occupations.

Table 2: Distribution According to Clinical Presentation and Duration of Symptoms (N=70)

Clinical characteristics	Frequency (n)	Percentage (%)
Chief complaints		
Constipation	65	92.9

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Bleeding per rectum	62	88.6
Prolapse	40	57.1
Itching	8	11.4
Duration of symptoms		
Below 6 months	25	35.7
6 months–1 year	20	28.6
1–2 years	15	21.4
Above 2 years	10	14.3
Total	70	100.0

Constipation was the most frequently reported presenting complaint (92.9%), followed by bleeding per rectum (88.6%) and prolapse (57.1%). Regarding symptom duration, 35.7% of patients presented within six months of symptom onset, while 28.6% had symptoms for 6 months to 1 year.

Table 3: Distribution According to Severity and Duration of Bleeding Per Rectum (N=70)

Characteristics	Frequency (n)	Percentage (%)
Severity of bleeding		
Mild	20	28.6
Moderate	30	42.9
Severe	20	28.6
Total	70	100.0
Duration of bleeding		
Below 6 months	25	35.7
Above 1 year	25	35.7
Other duration categories	20	28.6
Total	70	100.0

Moderate bleeding was the most common presentation, accounting for 42.9% of patients, whereas mild and severe bleeding were each observed in 28.6%. The reported distribution of bleeding duration showed equal proportions (35.7%) among patients with symptoms lasting less than six months and those with symptoms exceeding one year.

Table 4: Distribution of Associated Comorbidities and Previous Surgical History (N=70)

Variables	Frequency (n)	Percentage (%)
Associated comorbidities		
No systemic comorbidity	45	64.3
Hypertension	10	14.3
Hypertension with diabetes mellitus	8	11.4
Other associated conditions	7	10.0

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Previous surgical history		
No previous surgery	52	74.3
Previous perianal surgery	8	11.4
Previous abdominal surgery	6	8.6
Other surgeries	4	5.7
Total	70	100.0

Most patients (64.3%) had no associated systemic comorbidities. Hypertension alone was the most frequently reported individual comorbidity (14.3%), followed by combined hypertension and diabetes mellitus (11.4%). Regarding surgical history, 74.3% had no previous surgical intervention, while 11.4% had undergone previous perianal surgery.

Table 5: Distribution of Previous Perianal Surgical Interventions

Previous perianal surgery	Frequency (n)	Percentage (%)
Fistulectomy	4	50.0
Lateral anal sphincterotomy	2	25.0
Incision and drainage	2	25.0
Total	8	100.0

Among the eight patients with a history of previous perianal surgery, fistulectomy was the most common procedure (50%), followed by lateral anal sphincterotomy and incision and drainage, each accounting for 25%.

Table 6: Distribution of Haemorrhoids According to Goligher's Classification at Different Positions (N=70)

Goligher grade	3 o'clock n (%)	7 o'clock n (%)	11 o'clock n (%)
Grade I	2 (2.9)	6 (8.6)	4 (5.7)
Grade II	27 (38.6)	21 (30.0)	21 (30.0)
Grade III	28 (40.0)	19 (27.1)	24 (34.3)
Grade IV	3 (4.3)	4 (5.7)	6 (8.6)
Total	60*	50*	55*

Grade III haemorrhoids were most frequently observed at the 3 o'clock position (n=28), followed by Grade II disease (n=27). At the 7 and 11 o'clock positions, Grade II and Grade III disease were also commonly observed. Grade IV haemorrhoids were comparatively less frequent.

Table 7: Distribution According to Type of Haemorrhoidectomy (N=70)

Surgical technique	Frequency (n)	Percentage (%)
Open haemorrhoidectomy	46	65.7
Laser haemorrhoidectomy	9	12.9
Stapler haemorrhoidectomy	8	11.4
Closed haemorrhoidectomy	7	10.0
Total	70	100.0

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Open haemorrhoidectomy was the most frequently performed surgical procedure, accounting for 65.7% of cases. Laser haemorrhoidectomy was performed in 12.9%, stapler haemorrhoidectomy in 11.4%, and closed haemorrhoidectomy in 10% of patients.

Table 8: Comparison of Mean Postoperative Pain Scores at Different Time Intervals (VAS Score)

Postoperative assessment	Mean VAS score
2nd hour	3.67
6th hour	3.91
12th hour	2.83
POD 1	3.01
POD 3	2.49
POD 7	1.90

Statistical analysis: Friedman test, $\chi^2 = 88.28$, p less than 0.001.

The mean VAS score was highest at the 6th postoperative hour (3.91), followed by the 2nd hour (3.67). Thereafter, pain scores demonstrated an overall declining trend, reaching 1.90 by postoperative day 7. The Friedman test demonstrated a statistically significant difference in pain scores across the postoperative assessment intervals (p less than 0.001).

Table 9: Postoperative Analgesic Requirement Following Methylene Blue and Bupivacaine Infiltration (N=70)

Analgesic requirement	Frequency (n)	Percentage (%)
IV rescue analgesia within 6 hours	6	8.6
Oral supplemental analgesia after 24 hours	1	1.4
No additional analgesic requirement reported	63	90.0
Total	70	100.0

Only six patients (8.6%) required intravenous rescue analgesia within the first six postoperative hours, while one patient (1.4%) required additional oral analgesia after 24 hours. The remaining 63 patients (90%) had no additional analgesic requirement documented in the supplied data.

Table 10: Distribution of Postoperative Complications (N=70)

Postoperative complications	Frequency (n)	Percentage (%)
No complications	66	94.3
Urinary retention	2	2.9
Discolouration of urine	1	1.4
Localised pruritus	1	1.4
Total	70	100.0

The majority of patients (94.3%) experienced no postoperative complications. Urinary retention was observed in two patients (2.9%), while urine discolouration and localised pruritus were reported in one patient each (1.4%). Overall, the recorded postoperative adverse events were relatively uncommon.

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Discussion

Postoperative pain remains an important concern following haemorrhoidectomy and may influence postoperative recovery, patient comfort and satisfaction. The present prospective interventional study evaluated the analgesic outcomes of perianal intradermal infiltration of a combination of methylene blue and bupivacaine in 70 patients undergoing haemorrhoidectomy. The findings demonstrated an overall reduction in postoperative pain scores, relatively low additional analgesic requirements and a low frequency of recorded postoperative complications.

In the present study, males constituted 84.3% of the study population, whereas females accounted for 15.7%. The majority of patients were below 40 years of age (40%), followed by the 40–60-year age group (38.6%). This demographic distribution indicates that haemorrhoidal disease requiring surgical intervention was frequently encountered among younger and middle-aged adults in the present cohort. Constipation was the most common presenting complaint, reported by 92.9% of patients, followed by bleeding per rectum (88.6%) and prolapse (57.1%). These findings are consistent with the established clinical presentation of symptomatic haemorrhoidal disease, in which bleeding and prolapse are among the major indications for clinical assessment and treatment [1,2].

Regarding associated medical conditions, 64.3% of patients had no systemic comorbidities, while hypertension was reported in 14.3% and combined hypertension and diabetes mellitus in 11.4%. A previous history of surgery was absent in 74.3% of patients. These findings indicate that most patients undergoing haemorrhoidectomy in the present study had no significant documented systemic comorbidity or previous surgical intervention.

Goligher's classification demonstrated that Grade II and Grade III haemorrhoids were frequently observed at the assessed anatomical positions. At the 3 o'clock position, Grade III haemorrhoids were most common (n=28), followed by Grade II (n=27). This distribution reflects the clinical spectrum of haemorrhoidal disease encountered in the study population. However, the position-wise totals differed from the overall sample size, and these observations should be interpreted according to the available recorded data.

Open haemorrhoidectomy was the most frequently performed procedure, accounting for 65.7% of cases, followed by laser haemorrhoidectomy (12.9%), stapler haemorrhoidectomy (11.4%) and closed haemorrhoidectomy (10%). Conventional excisional haemorrhoidectomy is associated with postoperative tissue trauma and inflammation, which contribute to postoperative discomfort. Balciscueta et al., in their systematic review and network meta-analysis, reported differences in postoperative pain according to the surgical technique, with conventional open haemorrhoidectomy generally associated with greater pain than several alternative approaches [9]. The variation in surgical techniques in the present study should therefore be considered when interpreting postoperative pain outcomes.

The principal finding of the present study was the overall reduction in postoperative pain following perianal infiltration of methylene blue and bupivacaine. The mean VAS score was 3.67 at the second postoperative hour and increased slightly to 3.91 at the sixth hour. Subsequently, the mean score decreased to 2.83 at 12 hours, 3.01 on postoperative day 1, 2.49 on

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postoperative day 3 and 1.90 on postoperative day 7. The Friedman test demonstrated a statistically significant difference in pain scores across the assessment intervals ($\chi^2 = 88.28$, p less than 0.001). These findings indicate a significant temporal variation in postoperative pain intensity, with an overall reduction during the follow-up period.

The initial increase in pain during the sixth postoperative hour may be associated with the gradual resolution of the effects of spinal anaesthesia and the development of postoperative inflammatory responses. The subsequent reduction in VAS scores may reflect postoperative tissue recovery and the analgesic contribution of the administered local infiltration. Gallo et al. highlighted that postoperative pain following haemorrhoidal surgery is multifactorial and requires a multimodal approach to achieve satisfactory pain control [3]. Similarly, the prospect recommendations emphasise the importance of combining appropriate analgesic and anaesthetic interventions to improve postoperative pain management[4].

The findings of the present study can be compared with the randomised controlled trial conducted by Sim and Tan, who evaluated intradermal methylene blue administration during open haemorrhoidectomy. Their study demonstrated significantly lower postoperative pain scores and reduced paracetamol consumption in the methylene blue group during the first three postoperative days compared with the control group receiving bupivacaine without methylene blue[6]. These observations support the potential analgesic contribution of methylene blue in the present study. Azhough et al. also reported lower postoperative pain scores following intradermal methylene blue application, particularly during the first seven postoperative days [7]. The findings of these studies provide supportive evidence for investigating methylene blue as an adjunct in postoperative pain management.

Bupivacaine is widely investigated for postoperative analgesia because of its relatively prolonged duration of action. A meta-analysis by Lu et al. reported that combinations involving bupivacaine and other analgesic agents could improve postoperative pain outcomes compared with individual agents in patients undergoing haemorrhoidectomy [8]. In the present study, the combination of 1% methylene blue and 0.5% bupivacaine was administered through circumferential intradermal infiltration around the perianal surgical site. The combined approach was intended to provide local anaesthetic blockade along with the potential peripheral analgesic effects of methylene blue. However, because the present study did not include separate methylene blue-only and bupivacaine-only comparison groups, the individual contribution of each drug cannot be established.

Analgesic consumption is another important indicator of postoperative pain control. In the present study, six patients (8.6%) required intravenous rescue analgesia within the first six postoperative hours, while one patient (1.4%) required additional oral analgesia after 24 hours. According to the recorded data, 63 patients (90%) had no additional analgesic requirement documented. This relatively low requirement for additional analgesia suggests that the infiltration technique may have contributed to satisfactory postoperative pain control. Previous research has also demonstrated the importance of local anaesthetic techniques and multimodal analgesia in reducing postoperative analgesic requirements [5,8].

The safety profile of the intervention was also encouraging. In the present study, 66 patients (94.3%)

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experienced no recorded postoperative complications. Urinary retention occurred in two patients (2.9%), while urine discoloration and localised pruritus were observed in one patient each (1.4%). Urinary retention is a recognised postoperative complication following haemorrhoidectomy and may be influenced by spinal anaesthesia, postoperative pain and perioperative factors. Methylene blue administration may also account for transient blue or green discoloration of urine due to its excretion. The low frequency of recorded adverse events suggests that the intervention was generally well tolerated in this cohort. Nevertheless, a larger controlled study would be required to establish its safety profile more definitively.

Overall, the present findings support the potential usefulness of combining methylene blue with bupivacaine for postoperative analgesia following haemorrhoidectomy. The reduction in mean VAS scores over the follow-up period, limited requirement for additional analgesics and low frequency of recorded complications are encouraging. However, existing evidence also indicates that postoperative pain management should remain multimodal rather than relying exclusively on a single local infiltration technique [4,10].

The present study has certain limitations. It included a relatively small sample of 70 patients and did not include a separate control group receiving bupivacaine alone or standard postoperative analgesia without methylene blue. Therefore, the observed reduction in pain scores cannot be attributed exclusively to the intervention. Furthermore, differences in surgical techniques and individual postoperative responses may have influenced pain outcomes. The absence of detailed comparative analgesic consumption data and a standardised assessment of pain during defecation also limits the interpretation of the findings. Further randomised controlled studies with larger sample sizes and appropriate comparison groups are recommended to establish the independent and combined effects of methylene blue and bupivacaine.

Conclusion

Perianal intradermal infiltration of methylene blue combined with bupivacaine appears to be a promising approach for postoperative pain management following haemorrhoidectomy. The study demonstrated an overall reduction in VAS pain scores from 3.91 at 6 hours to 1.90 on postoperative day 7, with 90% of patients having no additional analgesic requirement documented. Furthermore, 94.3% of patients experienced no postoperative complications. Thus, this combination may provide effective postoperative analgesia with a favourable observed safety profile. However, controlled comparative studies with larger sample sizes are required to establish its definitive efficacy and safety.

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