European Journal of Clinical Pharmacy
Print ISSN: 2385-409X **Online ISSN**: 3105-0409
Website: https://farmclin.com/

Original Research Article

Post-operative Analgesic Effect of Methylene Blue in Perianal Surgeries: A Prospective Observational Study

Article History:

Name of Author:
Dr. Anjali M. Aghera [1], Dr. Arpan Shah [2] and Dr. Shyam R Zalavadia [3], Dr. Mehul M. Tadvi[4]

Affiliation: *[1]3rd Year Resident Parul University) General Surgeon*
[2](HOD General Surgery, Parul Sevashram Hospital)
[3]General Medicine
[4](Associate Professor, Parul institute of medical science and research, Parul university).

Corresponding Author:
Dr. Anjali M. Aghera

Received: 07-10-2025
Revised: 21-10-2025
Accepted: 18-11-2025
Published: 30-12-2025

Abstract: ***Background:*** Post-operative pain following perianal surgeries is often significant and may delay recovery. Conventional analgesic methods have limitations. Methylene blue has been proposed as a local agent with prolonged analgesic effects in perianal procedures. ***Methods*** This prospective observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital. A total of 72 adult patients undergoing conventional perianal surgeries were included. Methylene blue was infiltrated locally at the surgical site at the end of the procedure. Post-operative pain was assessed using the visual analogue scale on the day of surgery and on post-operative days 1, 3, 5, and 7. The requirement for rescue analgesia, post-operative complications, urinary discoloration, and wound healing time were recorded. ***Results*** The mean age of patients was 44.6 years, with a male predominance. Bleeding per rectum was the most common presenting symptom. Mean VAS scores showed a progressive decline from 5.64 on day 0 to 2.50 on day 7, indicating sustained pain relief. Only 26.39% of patients required rescue parenteral paracetamol. Transient urinary discoloration was observed in 62.5% of patients on day 0 and resolved completely by day 3. Most patients (87.5%) had no post-operative complications. The mean wound healing time was 19.9 days. ***Conclusion*** Methylene blue provides effective and sustained post-operative analgesia following perianal surgeries. It reduces pain scores and the need for rescue analgesia while demonstrating a favorable safety profile. It appears to be a useful adjunct for post-operative pain management in perianal procedures.

Keywords: Methylene blue; Perianal surgery; Post-operative pain; Visual analogue scale; Analgesia.

INTRODUCTION

Perianal surgeries are commonly associated with significant postoperative pain. Pain after these procedures affects patient comfort and delays recovery. Adequate analgesia is therefore an essential component of perioperative care.

Pain following perianal surgery is influenced by the complex anatomy and physiology of the anal canal. The region has rich sensory innervation and a dense vascular supply. These factors contribute to heightened pain perception after surgical manipulation [2,5]. The internal anal sphincter plays a key role in resting tone and pain generation. Spasm of this muscle is a major contributor to postoperative discomfort [3].

Conventional methods of postoperative pain control include systemic analgesics and local anesthetic

infiltration. However, systemic analgesics are associated with adverse effects. Local anesthetics have limited duration of action. Hence, there is a need for agents that provide prolonged analgesia without significant side effects.

Methylene blue has been studied for its analgesic properties in perianal procedures. It is believed to act by inhibiting nerve conduction at the local level. It may also reduce sphincter spasm and inflammatory response. Recent randomized controlled trials have demonstrated its effectiveness in reducing post-operative pain and analgesic requirement in perianal surgeries [1].

The safety profile of methylene blue has also been reported to be acceptable. Transient urinary discoloration is the most commonly observed effect. Serious complications are rare. Understanding the local anatomy and physiological response of the anorectal region is important when evaluating such interventions [4,6].

This study was undertaken to evaluate the postoperative analgesic effect of methylene blue in patients undergoing perianal surgeries. The study also aimed to assess pain trends, need for rescue analgesia, and associated adverse effects in the postoperative period.

Aim

To evaluate the postoperative analgesic effect of methylene blue in patients undergoing perianal surgeries.

Objectives

Primary Objective

To assess postoperative pain following perianal surgeries after local infiltration of methylene blue using the visual analogue scale.

Secondary Objectives

- To evaluate the trend of postoperative pain over the first postoperative week.
- To assess the requirement of rescue analgesia in the postoperative period.
- To evaluate the safety and tolerability of methylene blue by documenting postoperative adverse effects.
- To assess wound healing following perianal surgeries after methylene blue administration.

Materials and Methods

Study Design and Setting

This was a prospective observational study. The study was conducted in the Department of General Surgery at a tertiary care teaching hospital. The study duration was one year.

Study Population

Patients undergoing elective perianal surgeries were included. A total of 72 patients were enrolled in the study.

Inclusion Criteria

- Adult patients aged 18 years and above.
- Patients undergoing perianal surgeries such as hemorrhoidectomy, fissurectomy, fistulectomy, or drainage of perianal abscess.
- Patients willing to participate in the study.

Exclusion Criteria

- Patients with known hypersensitivity to methylene blue.
- Patients with chronic pain disorders.
- Patients on long-term analgesic therapy.
- Patients with psychiatric illness affecting pain assessment.

Surgical Procedure and Intervention

All surgeries were performed under standard surgical protocols. At the end of the procedure, methylene blue was infiltrated locally at the surgical site. The dose and technique of infiltration were uniform for all patients.

Post-operative Pain Assessment

Post-operative pain was assessed using the visual analogue scale. Pain scores were recorded on the day of surgery and on post-operative days 1, 3, 5, and 7. Pain assessment was explained to all patients before surgery.

Rescue Analgesia

Parenteral paracetamol was used as rescue analgesia. The requirement for rescue analgesia was documented during the post-operative period.

Safety and Tolerability Assessment

Patients were monitored for post-operative adverse effects. Urinary discoloration was specifically observed. Post-operative complications were recorded during hospital stay and follow-up visits.

Wound Healing Assessment

Wound healing was assessed during follow-up. The number of days required for complete wound healing was recorded.

Statistical Analysis

Data were entered into a spreadsheet. Statistical analysis was performed using standard statistical software. Continuous variables were expressed as mean and standard deviation. Categorical variables were expressed as frequency and percentage.

Ethical Considerations

The study was approved by the institutional ethics committee. Informed consent was obtained from all patients. Confidentiality of patient data was maintained throughout the study.

RESULTS

1.Study cohort and baseline characteristics

A total of 72 patients undergoing conventional perianal surgery were included. The cohort showed a mid-adult age distribution with a male predominance. Most patients presented with either bleeding per rectum or pain as the primary symptom. Baseline demographic details and symptom profiles are shown in Table 1 and Table 2, and the distribution of age groups in the cohort is shown in Figure 1.

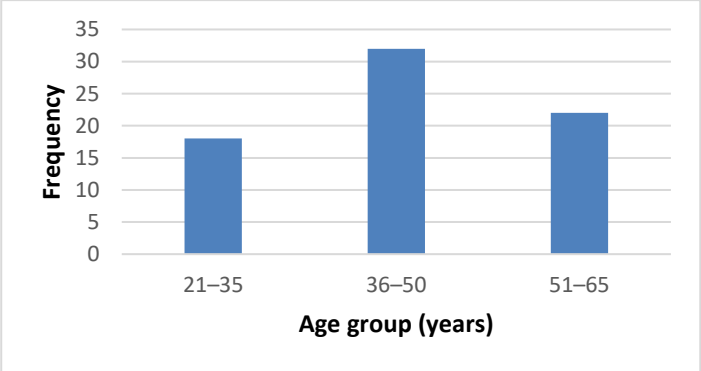
Table 1. Baseline characteristics of participants (n = 72)

Variable	Frequency	Percent
Age group (years)		
21–35	18	25.00
36–50	32	44.44
51–65	22	30.56
Age (years), mean ± SD	44.6 ± 6.8	—
Sex		
Male	47	65.28
Female	25	34.72

Table 2. Presenting symptom distribution (n = 72)

Symptom	Frequency	Percent
Bleeding per rectum (Bleeding PR)	46	63.89
Pain	26	36.11

Figure 1: Distribution of age groups in the cohort



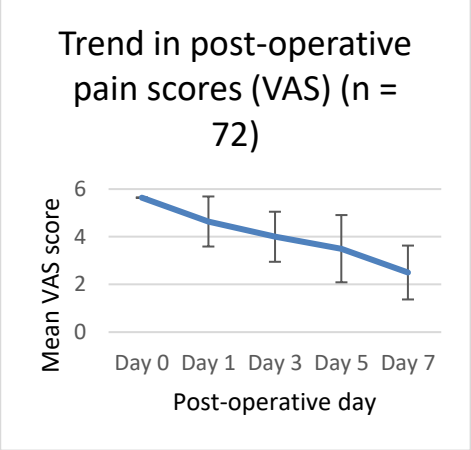
2. Post-operative pain outcomes

Post-operative pain was assessed using the visual analogue scale at predefined time points following surgery. Pain scores demonstrated a consistent and progressive reduction during the postoperative period, indicating a sustained analgesic effect. The trend in mean pain scores from the day of surgery through the first postoperative week is summarized in Table 3 and illustrated in Figure 2.

Table 3. Post-operative pain scores over time assessed using Visual Analogue Scale (VAS) (n = 72)

Post-operative day	Mean VAS score	Standard deviation
Day 0	5.64	1.05
Day 1	4.64	1.05
Day 3	4.00	1.41
Day 5	3.50	1.13
Day 7	2.50	1.13
Post-operative day	**Mean VAS score**	**Standard deviation**
Day 0	5.64	1.05

Figure 2. Trend in post-operative pain scores (VAS) (n = 72)



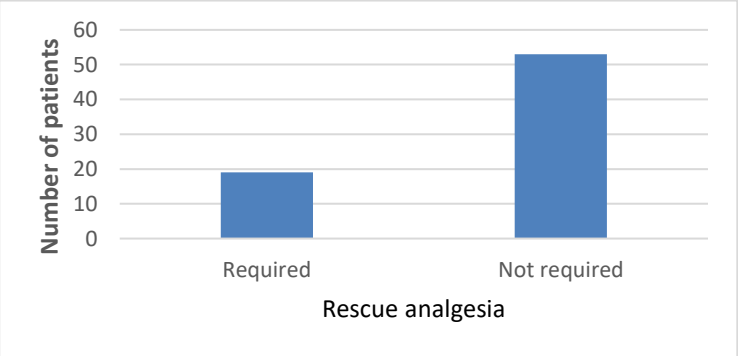
3. Requirement of rescue analgesia

The need for additional postoperative analgesia was assessed to evaluate the adequacy of pain control following methylene blue infiltration. Most patients did not require rescue analgesia during the postoperative period, indicating a satisfactory analgesic effect. The proportion of patients requiring parenteral paracetamol injection is summarized in **Table 7** and illustrated in **Figure 3**.

Table 7. Requirement of rescue analgesia (post-operative paracetamol injection) (n = 72)

Rescue analgesia	Frequency	Percentage
Required	19	26.39
Not required	53	73.61

Figure 3: Requirement of rescue analgesia following perianal surgery (n = 72)



4. Safety and tolerability outcomes

Safety and tolerability of methylene blue infiltration were assessed by monitoring postoperative adverse effects and local complications. Overall, the intervention was well tolerated. Most observed effects were mild and self-limiting. No serious adverse events were reported.

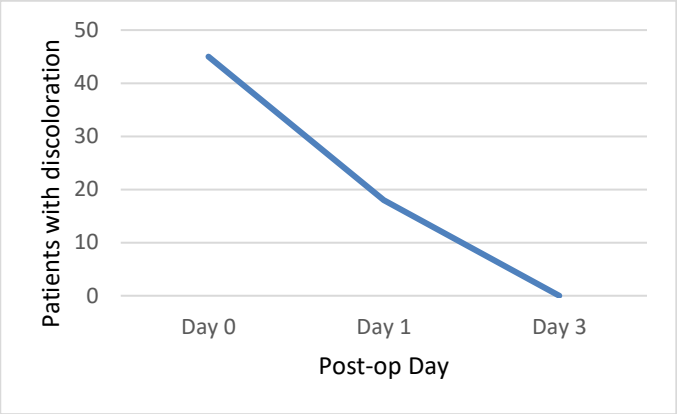
4.1 Urinary discoloration following methylene blue

Transient urinary discoloration was observed in a proportion of patients during the early postoperative period. The frequency decreased rapidly over time and resolved completely by the third post-operative day. The temporal pattern of urinary discoloration is summarized in Table 4 and illustrated in Figure 4.

Table 4. Urinary discoloration following methylene blue administration (n = 72)

Post-operative day	Present	Absent
Day 0	45	27
Day 1	18	54

Figure 4. Trend in urinary discoloration following methylene blue administration



4.2 Post-operative complications

Post-operative complications were infrequent. The majority of patients had an uneventful recovery. Acute urinary retention was the most commonly observed complication. Other complications were rare and transient. The distribution of postoperative complications is shown in Table 5.

Table 5. Post-operative complications (n = 72)

Complication	Frequency	Percentage
None	63	87.50
Acute urinary retention	6	8.33
Temporary incontinence	2	2.78
Pruritus	1	1.39

5. Wound healing outcome

Wound healing was assessed during the postoperative follow-up period. The time taken for complete wound healing was consistent across the study cohort, with no evidence of delayed healing attributable to methylene blue infiltration. The mean duration required for wound healing is summarized in Table 6.

Table 6. Time taken for wound healing following perianal surgery (n = 72)

Outcome	Mean (days)	Standard deviation
Time to complete wound healing	19.90	5.41

DISCUSSION

The present study evaluated the analgesic efficacy and safety of methylene blue in patients undergoing conventional perianal surgeries. A total of 72 patients were included. Pain scores, need for rescue analgesia, and post-operative adverse effects were assessed during the first post-operative week.

The mean age of the study population was 44.6 years. Most patients belonged to the 36–50 year age group (44.44%), followed by 51–65 years (30.56%) and 21–35 years (25%). This age distribution is comparable to earlier studies. Baldiwala and Trivedi reported a similar mean age of 46.2 years in patients undergoing hemorrhoidectomy with methylene blue injection [7]. Fransiska et al. also observed a higher prevalence of anorectal disorders in patients aged 40–60 years [8]. These findings suggest that perianal conditions requiring surgical intervention are more common in middle-aged individuals.

Male patients constituted 65.28% of the cohort. Female patients accounted for 34.72%. A similar male predominance has been reported in previous studies. Fransiska et al. documented a male prevalence of 68% [8]. Long et al. reported a male-to-female ratio of approximately 2:1 in patients treated with methylene blue after hemorrhoidectomy [9]. These observations indicate a higher burden of perianal disease among males.

Bleeding per rectum was the most common presenting symptom in the present study (63.89%). Pain was the presenting symptom in 36.11% of patients. These findings are consistent with earlier

reports. Baldiwala and Trivedi reported rectal bleeding in 62% of patients and pain in 38% [7]. Long et al. reported a similar symptom distribution [9]. This pattern reflects the predominance of hemorrhoidal disease among patients undergoing perianal surgery.

A sustained reduction in post-operative pain was observed in the present study. The mean VAS score decreased from 5.64 on Day 0 to 2.50 by Day 7. Pain scores showed a steady decline throughout the follow-up period. Similar trends have been reported in previous studies. Sim and Tan demonstrated a reduction in VAS scores from 5.4 on Day 0 to 2.8 by Day 7 following methylene blue injection [10]. Azhough et al. also reported a significant reduction in pain scores by the end of the first post-operative week [11]. These findings support the sustained analgesic effect of methylene blue.

Transient urinary discoloration was observed in 62.5% of patients on Day 0 and 25% on Day 1. No patients had discoloration by Day 3. This finding is consistent with the known renal excretion of methylene blue. Luca et al. reported urinary discoloration in 60–65% of patients within the first 24 hours, with complete resolution within 48–72 hours [12]. Fransiska et al. described this effect as harmless and self-limiting [8]. Proper patient counselling is therefore sufficient.

Post-operative complications were infrequent in the present study. 87.5% of patients had no complications. Acute urinary retention occurred in 8.33%. Temporary incontinence occurred in 2.78%. Pruritus was noted in 1.39%. These findings are comparable to earlier reports. Sutherland et al. reported no major complications in 85% of patients treated with methylene blue, with urinary retention being the most common minor adverse effect [13]. Mentes et al. reported temporary incontinence in 2–3% of patients, which resolved spontaneously [14]. The low complication rates observed in the present study indicate good tolerability.

Only 26.39% of patients required post-operative parenteral paracetamol. The remaining 73.61% did not require any rescue analgesia. This finding indicates effective post-operative pain control. Similar reductions in additional analgesic requirement have been reported in other studies evaluating methylene blue infiltration in perianal surgeries [15]. Reduced dependence on conventional analgesics following methylene blue use has also been demonstrated in patients undergoing hemorrhoidectomy, supporting its analgesic efficacy and analgesic-sparing potential [16].

Overall, the findings of the present study support the use of methylene blue as an effective and safe adjunct for post-operative analgesia in perianal surgeries. The sustained reduction in pain scores, low requirement for rescue analgesia, and minimal adverse effects highlight its clinical utility.

Limitations

This was a single-center study; therefore, the findings may have limited generalizability. The sample size was relatively small. In addition, the study lacked a control group for comparison. Pain assessment was subjective despite the use of a standardized visual analogue scale. Furthermore, long-term outcomes beyond the early postoperative period were not evaluated.

Conclusion

Methylene blue provided effective postoperative analgesia in patients undergoing perianal surgeries. A sustained reduction in pain scores was observed throughout the first postoperative week. Consequently, the requirement for rescue analgesia was low. Adverse effects were mild and transient, and no serious complications were noted. Overall, methylene blue appears to be a safe and useful adjunct for postoperative pain control in perianal surgeries.

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