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RESEARCH ARTICLE

Comparison of Vapocoolant and Eutectic Mixture of Local Anaesthetic (EMLA) Cream for Epidural Injection.

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Abstract: ***Background:*** Pain during epidural needle insertion can cause significant anxiety and discomfort, adversely affecting patient experience. Although subcutaneous local anesthetic infiltration is common, it may itself cause discomfort or adverse reactions. Eutectic Mixture of Lidocaine and Prilocaine (EMLA) cream and vapocoolant spray are non-invasive alternatives, but their comparative efficacy for epidural procedures remains understudied. ***Objective:*** To compare the analgesic efficacy of EMLA cream versus vapocoolant spray in reducing pain during epidural needle insertion. ***Methods:*** A prospective, randomized controlled trial was conducted at a tertiary center in 2024. A total of 140 adults (aged 18–65 years, ASA I–II) undergoing elective procedures requiring epidural anesthesia were randomized to receive either EMLA cream (2.5 g, applied 60 minutes prior; n = 70) or vapocoolant spray (ethyl chloride, applied for 60 seconds; n = 70) before 18G epidural needle insertion. Pain intensity was assessed using the Numeric Rating Scale (NRS, 0–10). Secondary outcomes included patient movement, satisfaction (5-point Likert scale), and adverse events. ***Results:*** The mean NRS pain score was significantly lower in the EMLA group (1.86 ± 1.27) compared with the vapocoolant group (2.51 ± 1.42; p = 0.005). Patient movement was also reduced (90.0% vs. 77.1%; p = 0.040). Satisfaction scores were higher in the EMLA group but did not reach significance. Adverse events were infrequent and mild in both groups. ***Conclusion:*** EMLA cream provided superior analgesia and reduced patient movement during epidural needle insertion, making it preferable for elective procedures. Vapocoolant remains a practical, rapid-onset option in urgent or time-sensitive settings.

Keywords: EMLA cream, vapocoolant spray, epidural injection, analgesia, pain management.

INTRODUCTION

Effective pain management during neuraxial procedures is essential to reduce anxiety and improve procedural comfort [1]. Subcutaneous infiltration with local anesthetic, though widely used, may itself cause discomfort [2] and carries the risk of hypersensitivity reactions [3].

Topical non-invasive alternatives such as EMLA cream (lidocaine–prilocaine eutectic mixture) and vapocoolant sprays have shown promise in reducing pain associated with needle insertion. Previous work has reported favorable outcomes with EMLA cream in obstetric anesthesia [4], though its efficacy for larger-gauge needle procedures remains debated [5]. In contrast, vapocoolant spray offers rapid onset and ease of use, and has demonstrated comparable effects to EMLA in procedures such as venipuncture [6,7].

However, few studies have directly compared EMLA cream with vapocoolant spray for epidural needle insertion. This randomized controlled trial was therefore designed to evaluate and compare their analgesic efficacy in adult patients undergoing elective procedures requiring epidural anesthesia.

MATERIAL AND METHODS

Study Design

This prospective, randomized controlled trial was approved by the Institutional Ethics Committee (approval no. SGRR/IEC/04/24) and registered with the Clinical Trials Registry (CTRI/2024/07/070084). The study was conducted between July 2024 and February 2025, in accordance with CONSORT guidelines.

Participants

Adults aged 18–65 years, ASA I–II, scheduled for elective procedures under epidural anesthesia were enrolled. Exclusion criteria included contraindications to epidural anesthesia, allergy to study agents, pregnancy or lactation, and neurological/psychiatric conditions affecting pain perception.

Sample Size and Randomization

A sample of 140 participants (70 per group) was calculated to provide 80% power at a 5% significance level to detect a clinically meaningful difference in pain scores [8]. Randomization was computer-generated in a 1:1 ratio to Group E (EMLA) or Group V (vapocoolant). Outcome assessors were blinded to group allocation.

Interventions

- **Group E:** 2.5 g EMLA cream applied under occlusive dressing for 60 minutes prior to procedure.
- **Group V:** Vapocoolant spray (ethyl chloride) applied from 10 cm distance for 60 seconds immediately before procedure.

All patients subsequently underwent epidural injection with an 18G Tuohy needle under aseptic precautions, performed by anesthesiologists with ≥6 years' experience.

Outcome Measures

- **Primary:** Pain during needle insertion, assessed using the NRS (0 = no pain, 10 = worst pain).
- **Secondary:** Patient movement (present/absent), satisfaction with pain management (5-point Likert scale), and adverse events (skin irritation, allergy, or itching).

Statistical Analysis

SPSS v21.0 was used. Continuous data were expressed as mean ± SD and analyzed with the Mann–Whitney U test. Categorical variables were compared using chi-square or Fisher's exact test. A p-value <0.05 was considered significant.

RESULTS AND OBSERVATIONS:

Demographic Characteristics

Baseline demographics (age, gender distribution) were comparable between groups with no significant differences (Table 1).

Procedural Outcomes

Pain scores were significantly lower in Group E compared with Group V (1.86 ± 1.27 vs. 2.51 ± 1.42; p = 0.005). Patient movement was also less frequent in Group E (10.0% vs. 22.9%; p = 0.040). Satisfaction scores were higher in Group E but not statistically significant (p = 0.094) (Table 2).

Adverse Events

Adverse events were mild and uncommon, with no significant difference between groups. Group E reported itching, allergy, and irritation in a small proportion of patients; Group V reported occasional itching and irritation. Most participants had no adverse events (Table 3).

Tables

- **Table 1:** Demographic characteristics

Characteristic	Group E (n = 70)	Group V (n = 70)	*p*-value
Age (years, mean ± SD)	44.59 ± 12.11	41.93 ± 10.77	0.172
Gender, n (%)			0.608
Female	31 (44.3%)	28 (40.0%)	-
Male	39 (55.7%)	42 (60.0%)	-

Values are expressed as mean ± SD for continuous variables and number (%) for categorical variables. Age was compared using the Mann–Whitney U test, and gender distribution was compared using the Chi-square test. No statistically significant differences were observed between groups. Hyphens (-) indicate cells where data are not applicable, such as subgroup totals for gender percentages, and are included for clarity.

- **Table 2:** Procedural outcomes (pain, movement, satisfaction)

Outcome	Group E (n = 70)	Group V (n = 70)	*p*-value
Pain intensity (NRS, mean ± SD)	1.86 ± 1.27	2.51 ± 1.42	0.005
Patient movement during insertion, n (%)			0.040
Absent	63 (90.0%)	54 (77.1%)	-
Present	7 (10.0%)	16 (22.9%)	-
Patient satisfaction (Likert scale), n (%)			0.094
1	4 (5.7%)	9 (12.9%)	-
2	28 (40.0%)	37 (52.9%)	-
3	10 (14.3%)	7 (10.0%)	-
4	28 (40.0%)	17 (24.3%)	-

Pain intensity measured using 11-point Numeric Rating Scale (NRS). Patient movement assessed as absent or present during epidural insertion. Patient satisfaction assessed using a 5-point Likert scale (1 = very dissatisfied, 5 = very satisfied). Pain compared using Mann–Whitney U test; movement and satisfaction compared using Chi-square test. p < 0.05 considered statistically significant. Hyphens (-) denote cells where subgroup-specific p-values are not applicable and are used to indicate that no separate statistical comparison was performed for these rows.

- **Table 3:** Adverse events

-		Group E		Group V		Total	Chi-square value	p-value
Adverse Events	-	No. of cases	%age	No. of cases	%age	-	5.869	0.118
	Itching	2	0.0%	2	2.9%	2		
	Nil	64	91.4%	67	95.7%	131		
	Skin allergy	2	2.9%	0	0.0%	2		
	Skin irritation	4	5.7%	1	1.4%	5		
Total		70	100.0%	70	100.0%	140	-	

Adverse events recorded included itching, skin allergy, and skin irritation. Values are presented as number (%). Chi-square test was used to compare incidence between groups. No statistically significant differences were observed. Hyphens (-) represent cells where data are not applicable or not calculated, such as overall totals in certain columns; these are included to maintain table structure and clarity

DISCUSSION

This randomized controlled trial demonstrated that EMLA cream provided superior analgesia during epidural needle insertion, with significantly lower mean pain scores and reduced patient movement compared with vapocoolant spray. These findings align with prior studies demonstrating effective analgesia with EMLA in neuraxial and obstetric procedures [4,11,12].

Reduced movement is an important clinical benefit, as patient instability during epidural placement can increase technical difficulty and complications. Our findings parallel reports in pediatric and venipuncture studies where EMLA reduced withdrawal responses [13].

Although satisfaction scores favored EMLA, the difference did not reach statistical significance, suggesting that patient perceptions may also depend on practicality and expectations. Vapocoolant spray, with its rapid onset and ease of application, has previously been shown to improve comfort in pediatric and outpatient settings [7,14].

Adverse events in both groups were rare and mild, consistent with earlier literature [6,7]. Importantly, both interventions were safe and well-tolerated.
Overall, this study suggests that EMLA is more effective for planned elective procedures, while vapocoolant may be better suited for urgent or resource-limited settings.

CONCLUSION

EMLA cream is superior to vapocoolant spray in reducing pain and patient movement during epidural needle insertion, supporting its use in elective cases. Vapocoolant spray, however, remains a valuable alternative for urgent or time-sensitive settings.

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