

ORIGINAL RESEARCH

Comparative study of EMLA cream vs ethyl chloride spray in reducing pain during venepuncture in pediatric population

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Abstract

Background: A vital part of anaesthesia services is venepuncture. Children frequently undergo venepuncture (VP), a normal nursing technique that has the potential to cause pain, anxiety, fear, and distress if precautions are not taken. Pain from obtaining intravenous access can be eliminated with a quick technique employing a topical spray or cream. Regarding pharmacological therapies, a number of medications, including ethyl chloride, lignocaine, Eutectic mixture of local anesthetics (EMLA) cream and lidocaine, are shown better results in lowering pain.

Objectives: To compare the effectiveness of EMLA cream and Ethyl Chloride spray in reduction of pain during venipuncture in paediatric population.

Methodology: This randomised control study was conducted at Department of Anaesthesia in SRM medical college, Trichy. This study was conducted among paediatric age group six years and above up to twelve years of age group. They were randomly allocated in to two groups with n=30 each, in which group A received EMLA topical cream before venepuncture and Group B received Ethyl chloride spray before venepuncture. The effectiveness of anesthesia was assessed by VAS scores and heart rate changes during venepuncture. Data analysis was done using SPSS and continuous variables and categorical variables were interpreted using frequencies (mean±SD) and proportions (%).

Results: Among the study participants the mean age among Group A participants was 9.13±1.85 years and the mean age of Group B participants was 9.47±1.907 years. The mean VAS scores (1.03) was lower in Group A compared with Group B the mean value of VAS scores was (1.53) and the p value was found to be statistically significant (p<0.05). The heart rate changes was lower in Group A (82 bpm) compared with Group B (95 bpm) and the p value was found to be statistically significant (p<0.05)

Conclusion: EMLA cream was effective in reducing pain among children of age group 6-12 years undergoing intravenous injection.

Keywords: EMLA cream, ethyl chloride spray, VAS score

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Introduction

Pain is the most common, intricate, and individualised feeling. Pain is an unpleasant sensation that is frequently brought on by strong or harmful stimuli. Painful procedures, such as venepuncture, intravenous (IV) cannulation, intramuscular (IM) injection, laceration repair, and lumbar puncture (LP) are common in paediatrics and cause distress to children and their caretakers.^[1,2] If it isn't treated, it might cause pre-procedural anxiety at subsequent treatments. Early childhood exposure to painful injections may also cause anxiety and fear.^[3,4] Minimizing pain during childhood injection can help to prevent distress and

promote trust in health care providers and high patient satisfaction.^[5]

Local anesthetics work by reversibly blocking sodium channels within the nerve fibres, which prevents transmission of pain signals by disrupting depolarization of the In the skin, these nerve fibres are located in the dermis and epidermis and are covered by the water impermeable stratum corneum.^[6, 7] Topical anesthetics overcome this barrier by either passive diffusion from creams or gels or the use of needle-free methods such as pressured gas drug delivery, heat-enhanced diffusion, or iontophoresis.^[8]

Ethyl chloride is a refrigerant spray causes a transient hypoesthesia of skin by freezing and numbing the skin whereas EMLA cream is a eutectic mixture of 2.5% lidocaine and 2.5% prilocaine in equal proportion.^[9]Recent research articles have shown that both these drugs are equal in reducing pain during venepuncture. Hence we proposed this study to assess the efficacy of both these drugs in reducing the pain intensity among paediatric population.

Objective

To compare the effectiveness between Ethyl chloride spray and EMLA cream as the local anesthetic agent during intravenous injections.

Material and Methods

Study design

A Prospective randomised controlled trail study

Study area

Department of Anaesthesia, SRM medical college, Trichy

Study duration

Sixmonths

Study population

Paediatric patients posted for elective surgeries.

Inclusion criteria

- Children within the age group of 6-12 years.
- Children who are admitted in paediatric ward and posted for elective surgeries
- Both sexes

Exclusion criteria

- Parents not willing to give consent
- Terminally ill child

- Children who are having history of allergy towards the study medicines
- Children with systemic illness

Sampling technique

Non- Probability Convenient sampling

Sample size: 60

Measurement of variables

- Age was a continuous variable expressed in numbers.
- Gender was a categorical variable (male/female)

Data collection

Data was collected in Department of Anesthesia in SRM College, Trichy. After getting informed written consent from the parents, this study was conducted among 60 paediatric patients. They were randomly allocated in to two groups Group A and B with n=30 each.

Group A – EMLA cream was applied at a dose of 1gm/10 cm² skin surface area.

Group B- Ethyl chloride spray was sprayed at a distance of 3-5 inches away from skin surface.

Following the application of local anesthetics, venepuncture was done by an anaesthesiologist. The investigator assessed the pain of the child after intravenous injection. Any local skin changes like edema, erythema or irritation is noted.

We used Visual Analogue Scale (VAS) is a validated, subjective measure for pain. It consists of a 10cm horizontal line with two ends points representing 0 (no pain) and 10 (worst pain). We used the same chart card with a pain graded facial picture to assess the severity of the pain if the patient found it difficult to communicate with us directly.

Heart rate changes between two groups was also compared both before during procedure.

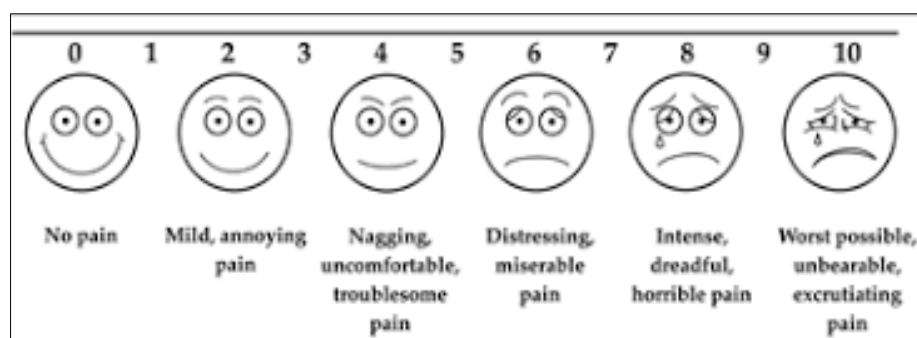


Fig 1: VASscore

Data was entered in Microsoft excel 2019 and analysed using software SPSS (Statistical Package of Social Sciences) version 21. Continuous variables and categorical variables were interpreted using frequencies (mean±SD) and proportions (%). Student t-test is used to compare the statistical difference between the two groups.

Ethical issues

- Parents were informed about the study and informed consent was obtained
- This study was presented to Institutional Ethical Committee of SRM Medical College, Trichy.

Results

This study was conducted among paediatric age group six years and above up to twelve years of age group. The mean age among Group A participants was 9.13±1.85 years and mean age of Group B participants was 9.47±1.907 years. The difference

among mean age was not statistically significant (p value <0.05).

Table 1 shows the baseline characteristics of participants. There was an equal distribution of age group and gender among both the groups. 20% and 23.3% of participants experienced venepuncture in the past in group A and group B respectively.

Table 1: Baseline characteristics of participants (n = 60)

S. No.	Variables	Group A	Group B
1	Age	6 years	2 (6.7%)
		7 years	5 (16.7%)
		8 years	5 (16.7%)
		9 years	5 (16.7%)
		10 years	5 (16.7%)
		11 years	4 (13.3%)
		12 years	4 (13.3%)
2	Gender	Male	14 (46.7%)
		Female	16 (53.3%)
3	Previous experience of venepuncture	Yes	6 (20%)
		No	24 (80%)

Table 2 shows the clinical utility of topical anesthetics among participants. 24 (80%) and 23 (76.7%) participants were had good clinical vein visibility and

they were easily cannulated in first attempt respectively among Group A and Group B.

Table 2: Clinical utility of the topical anesthetics (n = 60)

S. No.	Variables	Group A	Group B
1	Good vein visibility	Yes	24 (80%)
		No	6 (20%)
2	Easy cannulation	Yes	24 (80%)
		No	6 (20%)
3	Attempts until successful cannulation	1	24 (80%)
		2	3 (10%)
		3	3 (10%)

Table 3: Heart rate comparison between groups

Group	BaselineHR	During Procedure HR
A	Mean	82.03
	Std. Deviation	4.033
B	Mean	82.13
	Std. Deviation	4.008
P value between groups		0.178

There was rise in heart rate during procedure in group B than group A with statistical significance and this suggest Group B has significant heart rate changes

from baseline suggesting Group A has better response than Group B.

Figure 1 shows the comparison of mean VAS scores among groups.

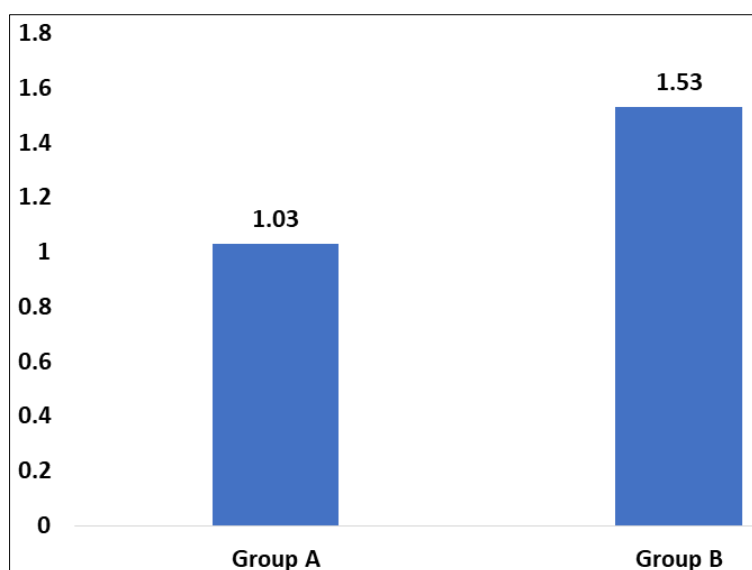


Fig 1: Comparison of mean VAS score among groups

Table 4 shows the difference of mean VAS scores during venepuncture between groups. The mean VAS scores were lower in Group A compared with Group B

and the p value was found to be statistically significant.

Table 4: VAS scores during venepuncture among groups (n = 60)

S. No.	Groups	Mean	Standard deviation	Range	p value
1	Group A	1.03	0.414	0 - 2	0.001
2	Group B	1.53	0.681	1 - 3	

Discussion

Venepuncture discomfort is a frequent but preventable occurrence. [6] The analgesic strategy to lessen this pain is less frequently used as a result of the lack of an efficient, accessible, affordable, and quick-acting medicine or procedure. In the present study it was found that the mean age among Group A participants was 9.13 ± 1.85 years and the mean age of Group B participants was 9.47 ± 1.907 years. The mean VAS scores (1.03) was lower in Group A compared with Group B the mean value of VAS scores was (1.53) and the p value was found to be statistically significant. ($p < 0.05$).

This is similar to a study conducted by Arunkumar *et al* [10] also found that the VAS score was significantly lower in EMLA cream group than ethyl chloride group with the mean score of 2.98 and 4.18 respectively.

Another study conducted by Ostrow *et al* [11] also reviews evidence for the use of eutectic mixture of local anesthetics (EMLA) cream to reduce the pain children experience during venipunctures. EMLA cream was compared with placebo, iontophoresis, and amethocaine cream and was found to be an effective local anesthetic for pediatric venipuncture pain during both intravenous cannulation and phlebotomy which is comparable to our study report.

Another study conducted by Sharma *et al* also found that pain scores were significantly lower in the EMLA group with the mean value of 1.5 than in the lidocaine group with the mean, 3.52 with statistical significance

($p < .001$) which is consistent with our study report. [12]

A study by Manner T *et al* [13] also stated that subjective pain scores, expressed with a visual analogue scale, were significantly lower in the EMLA group compared with both the groups treated with placebo cream and the open control group during iv cannulation and concluded that EMLA cream is effective in producing dermal analgesia in response to venous cannulation which is similar to our study report.

Studies by Co Cordoni A, Cordoni LE *et al* [14] and Hopkins CS *et al* also found that patients in the EMLA group experienced less pain than those in the placebo group assessed by 0 to 10 cm visual analogue scale which is also similar to our study report. [15]

A study was conducted by Moller C *et al* [16] to evaluate the efficacy of EMLA cream. The objectives were to test if EMLA diminishes pain from venepuncture, to evaluate possible adverse reactions and to determine if there is any influence upon the ease with which the insertion procedure is carried out. Pain was evaluated using a three-graded verbal rating scale. EMLA relieved pain significantly better than placebo which is also comparable to our study report.

Conclusion

In our research, we have found that the EMLA cream application for venous cannulation reduces pain and also concluded that EMLA cream is very effective topical analgesic for venepuncture. The primary

benefit is being because of its single dosage and simple application. EMLA cream is a secure and effective way to reduce the pain during venepuncture.

Limitations

- The study can be done in large samples with different age group and different setting to have wider applicability.
- The study can be conducted using other divertional therapy

Conflict of interest

Nil

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