

Clinical Response of EMLA Cream in Decreasing Peripheral Cannulation Pain in Children

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ABSTRACT

Objective: To assess the clinical response of EMLA cream (Eutectic Mixture of Local Anaesthetics; 2.5% Lidocaine/2.5% Prilocaine) in decreasing peripheral cannulation pain in children.

Study Design: Quasi-experimental study.

Place and Duration of Study: Combined Military Hospital, Rawalpindi Pakistan, from May to Aug 2021.

Methodology: This study was conducted on 80 paediatric patients who were classified as American Society of Anesthesiologists (ASA) Grades I and II and selected using non-probability consecutive sample. They underwent peripheral cannulation to maintain intravascular access for surgical procedure. The forty children in EMLA Group (Group-A) were applied 2.5 ml EMLA cream for 60 min, covered by Tegaderm® over suitable vein, while the 40 children in Control Group (Group-B) received no local anesthetic cream. Participants rated pain during venipuncture on Visual Analog Scale (VAS 0–10; 0, no pain; 10, intolerable pain).

Results: Out of 80 patients equally divided into two groups, 40(50%) were males, while 40(50%) were females. The patients included in our study had mean age of 7.35 ± 1.5 years. In EMLA group the mean score of pain was 1.5 ± 0.87 compared to the Control group (mean score = 7.4 ± 1.4 ; $p=0.001$).

Conclusion: The result of our study suggests that EMLA cream is more efficacious in decreasing venipuncture pain than if no local anaesthetic cream is applied.

Keywords: Anaesthesia, Cannulation, Eutectic, Peripheral, Venipuncture

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INTRODUCTION

The anxiety arising from anticipation of medical procedures and pain experienced by invasive medical procedures is one of the most frequently faced problems by healthcare professionals particularly anaesthetists, in relation to child health management. Needle phobia and fear of needle prick is far more prevalent in children than in adults¹, which becomes a major hurdle while administering medical treatments and undergoing diagnostic procedures. Control of pain arising from diagnostic and therapeutic interventions is very important in pediatric population²⁻³. Intravenous catheterization, which is also called venipuncture, is one of the commonest and comparatively more painful procedures that is done routinely in medical setups. It is deemed as one of the most distressing event for children⁴.

There are various methods by which venipuncture pain can be decreased. One of them is administering 1% lidocaine subcutaneously, before

going forward with venipuncture attempt. However, this procedure in itself is quite painful, and can result in additional distress for children⁵. Another method that can be used is applying topical anesthetic cream, such as EMLA, before proceeding with any intervention. EMLA stands for "Eutectic Mixture of Local Anaesthetics", in which prilocaine and lidocaine are mixed to form a lipid emulsion at room temperature. Earlier studies showed that when EMLA cream is used under occlusion and applied for longer than 60 min, it penetrates the epidermis and decreases the pain response to venipuncture. It also has very good cutaneous absorption⁶. There are studies that have confirmed the success of EMLA cream in causing reduction in pain during medical procedures, however no study towards assessing its efficacy in decreasing peripheral cannulation pain in our setup has been conducted. The need to discover an affective analgesic for such procedures in children has been emphasized in studies⁷.

Since limited local data has been available regarding role of EMLA in pain reduction during cannulation especially in children⁸, this study's aim

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was to assess and document efficacy of EMLA cream for pain relief during venipuncture as compared to control

METHODOLOGY

The quasi-experimental study was conducted at the Anaesthesia Department of the Combined Military Hospital, Rawalpindi Pakistan, from May to August 2021, after obtaining approval from Ethical Review Board Committee (IREB Letter No. 231).

Inclusion Criteria: Children aged 5 to 10 years with ASA physical Status I-II undergoing elective surgery and required maintenance of intravascular line were included.

Exclusion Criteria: Children with a history of allergic reaction to local anaesthetic, and with any inflammation or signs of any kind of skin disease at intravascular cannulation site and children having compromised cardiac, hepatic or renal functions were excluded.

Sample size was calculated using WHO sample size calculator with the reported prevalence of EMLA with no pain being 0.189. After informed written consent from the parents of participating individuals, patients who fulfilled the inclusion criteria were included.

Non-probability consecutive sampling was used to recruit participants. Children were divided into Groups A and B randomly, using computerized lottery method Figure-1. Group-A consisted of patients on whom EMLA cream 2.5 ml of 5% EMLA cream®, containing 25 mg of prilocaine and 25 mg of lignocaine per gram, was applied on the area where suitable vein was recognized and covered with Tegaderm® transparent film dressing 60 minutes before cannulation and Group-B, to which no medical intervention was done before cannulation. Just before intravenous cannula placement, the cream was removed and 20-gauge intravenous catheter was inserted at the locally anesthetized area. After intravascular cannula placement, the children rated the pain felt by them on a visual analog scale (VAS 0-10; 0, no pain; 10, intolerable pain). Any adverse effect on the area where the cream was applied was also noted (e.g., skin flare, color change). Figure-2 shows the visual analog scale in our study.

All statistical analysis were performed using the Statistical Package for the Social Sciences (SPSS) version 25. For qualitative variables frequency and percentages, while for quantitative variables mean and

standard deviation were calculated. Paired sample t-test was applied to look for a statistically significant difference in the measured parameters. The *p*-value of ≤ 0.05 were taken as significant.

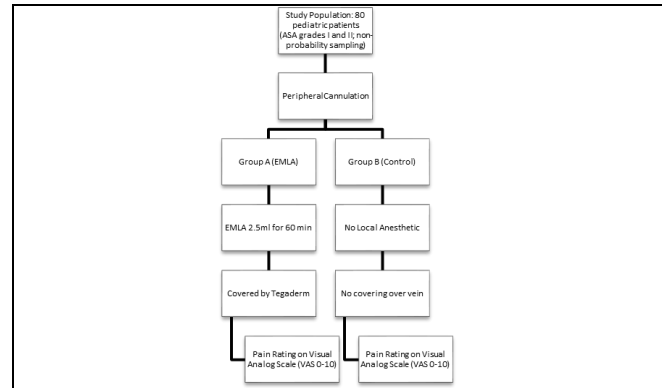


Figure-1: Patient Flow Diagram (n=80)

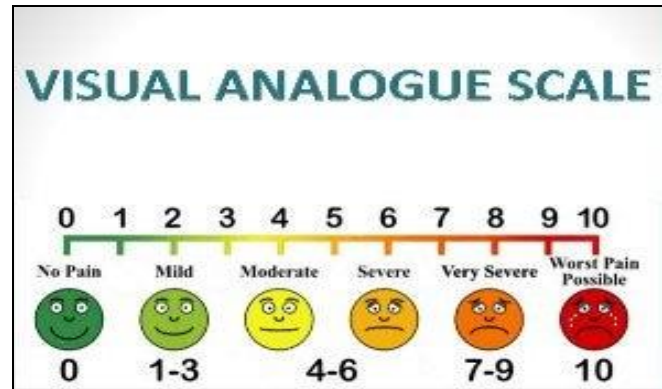


Figure-2: Visual Analogue Pain Scale

RESULTS

A total of 80 patients who underwent general anesthesia for various surgical procedures were included in the study. Out of 80 patients, equally divided into two groups, 40(50%) were males, while 40(50%) were females. The mean age of patients was 7.35±1.52 years for control group and 7.30 ± 1.43 years for EMLA group. Table-I showed the general characteristics of study participants. Out of 80, 40(50%) were applied EMLA cream, while a similar number of patients did not receive any local anaesthetic. In our study, 67(83.7%) were ASA I, while 13 (16.2%) were ASA II.

Table-II shows the comparison of mean pain scores on visual analog scale between Control (Group-B) and EMLA (Group-A) groups. The mean pain score of the EMLA group (1.5±0.8) were statistically valid and significantly lower as compared to the mean score

of Control group (7.4±1.4) after peripheral cannulation. Fewer patients in EMLA group, as compared to Control group, reported pain scores of ≥3. There was a statistically significant difference ($p < 0.001$) in pain scores as depicted by VAS, between control (Group-B) and EMLA group (Group-A).

Table-I: Age, Weight and ASA Status of the Patients (n=80)

	Age		Weight		ASA Status	
	Control (Group-B)	EMLA (Group-A)	Control (Group-B)	EMLA (Group-A)	CONTROL (Group-B)	EMLA (Group-A)
Total Number	40	40	40	40	40	40
Mean	7.30	7.35	27.22	24.60	1.15	1.17
Std. Deviation	±1.53 years	±1.45	±6.14 kg	±4.96	±0.36	±0.38

Table-II: Comparison of Mean Pain Scores of EMLA Group and Control Group after Insertion of IV Cannulae using Visual Analogue Scale (VAS) (n=80)

	Control Group (Group-B)	EMLA Group (Group-A)	p-value
Visual Analog Scale	7.40±1.44	1.55±0.87	0.001

DISCUSSION

In our study, the effectiveness of EMLA cream was depicted in decreasing intravenous cannulation pain, which is a challenge faced by most anesthetists during their daily routine especially in pediatric population. Anxiety and fear of a child getting ready for the operating theatre, and facing an alien environment with a possibility of some sort of painful stimuli, is not only an unpleasant experience for the children, but also cause systemic negative consequences,¹⁰⁻¹² such as activation of sympatho-adrenal system which may lead to hemodynamic compromise in susceptible individuals, causing hysteria and decline in compliance of the child in his later medical care.^{14,15} These studies show that use of analgesic agents help reduce pain and its sequelae in children undergoing painful procedures,¹⁶ which is consistent with the results of our study.

EMLA is eutectic mixture of lignocaine and prilocaine, manufactured for topical use, which reduces pain¹⁷ It blocks the pain receptors in the epidermis and causes localized numbness of the epidermis in the affected area, thereby reducing pain. This is accordance with our findings, as the use of EMLA reduced pain scores.

A study carried out by Eichenfield *et al.* showed that effectiveness of applying EMLA cream 30 or 60 minutes before venipuncture was comparable. They

also found that ELA-Max (4% liposomal lidocaine) has been proven to show equivalent analgesia as compared to EMLA and can be used as its alternative.¹⁸ This is in line with our findings. In a study done by Chugh *et al.*¹⁴ the authors evaluated the analgesic effect of EMLA cream compared to the local injection of lignocaine for removal of warts using radiofrequency waveguide. This study compared the efficacy of EMLA and Lignocaine and suggests that EMLA cream is a very effective substitute to lignocaine for reduction of pain during wart removal. In addition patients preferred topical application of medications instead of injectable.¹⁸ Our study also showed that EMLA is an effective topical analgesic. EMLA is a relatively safe and effective option for local anaesthesia, with a very good safety profile.¹⁸

LIMITATIONS OF STUDY

There are some limitations to our study. The first one is the issue of unavailability of EMLA cream in our region for routine use. The second is that the evaluation of pain was done only subjectively. For objective evaluation, blood pressure and heart rate could be measured before venipuncture and afterwards. However, emotional factors also have a prominent influence on these parameters, so the accuracy for evaluating venipuncture pain of these parameters would be limited. The third limitation of this study is that the blood serum concentration of the individual local anesthetics were not measured to elucidate the safety of EMLA cream.

CONCLUSION

In the end we come to the conclusion that EMLA cream which includes mixture of 2.5% lignocaine and 2.5 % prilocaine was efficacious in decreasing intravenous cannulation pain in children. In the light of our study and previous literature, EMLA cream should be inculcated in routine premedication protocol before venipuncture especially in children.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

ST & RASK: Data acquisition, critical review, approval of the final version to be published.

AS & HT: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

TAK ABK: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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