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Comparative Study of Topical Ethyl Chloride Spray & Eutectic Mixture of Lignocaine and Prilocaine Cream for Management of Pain in Minor Surgical Procedure

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Abstract: ***Aim: To assess and compare the clinical efficacy & safety of Topical Ethyl chloride spray & Eutectic mixture of Lignocaine and Prilocaine (EMLA) cream for management of pain in minor surgical procedure i.e. platelet rich plasma intradermal injections. Methods: Total 50 patients who underwentplatelet rich plasma injections on scalp in skin department were included in this study. Patients were randomly allocated into two groups, with 25 patients in each group. We applied topical ethyl chloride spray in group "A" and EMLA cream in group "B". Pain intensity was noted as visual analogue score (VAS) just after procedure and after 30 minutes of procedure. Results: During procedure, VAS was (3.36 ± 1.29) and (2.12 ± 0.93) in group A & B respectively. After 30 minutes, VAS was (6.64 ± 0.95) and (5.44 ± 0.77) in group A & B respectively. There was significant difference in pain intensity between group A & B. Conclusion: Although both modalities were effective in patients but efficacy of EMLA cream was better with longer lasting effect than ethyl chloride spray.***

Keywords: Pain, Ethyl chloride spray, EMLA Cream, Visual analogue score

1. Introduction

Pain is both a physical and a psychological phenomenon. The pain experience is subjective. In minor dermatological procedures like laser procedures; small excisions; electrocautery; dermaroller; filler; botulinum toxin injection; platelet rich plasma injection, pain is to be expected. Sometimes, pain can be associated with a number of symptoms including anxiety, nausea, cardiovascular complications etc. So it is better to suppress pain before initiation. Once pain is started, it is difficult to suppress. Topical anesthetic agents are effective and safe in dermatologic procedures. Topical anesthetics also alleviate anxiety and distress of patients due to the procedure.[1] They have low risk of adverse effects, which are commonly found with other measures of anaesthesia.

Ethyl chloride spray is a refrigerant spray. It causes a transient hypoesthesia of the skin. It works by freezing and numbing the skin. The ethyl chloride spray cools the skin by rapid evaporation of the volatile liquid itself. The cooling effect decreases nerve conduction velocity of A-delta and C fibres which decreases transmission of pain.[2] The duration of decreased sensation lasts between 30 and 60 seconds; hence procedure should be done immediately after evaporation of the liquid from the skin surface. It can cause significant "frost" of skin as permanent skin changes, if spray is done for longer than 10 seconds.[3]Direct inhalation of vapour can cause narcotic and general anesthetic like effects.

In eutectic mixture of lidocaine & prilocaine (EMLA) cream, 2.5% lidocaine & 2.5% prilocaine are mixed in equal proportion at 25^0 C. This leads to lowering of melting point of both solids.[4] After removal its effect lasts for 30-60 minutes. After 60 minutes of cutaneous application under occlusion, the local effect of EMLA is sufficient for needle insertion and minor superficial skin surgery. Pain threshold depth is about 3 mm after 60 minutes of application, about 4 mm after 90 minutes of application, and about 5 mm after 120 minutes of application.[5]

In our current study, we evaluated the efficacy and safety of Topical ethyl chloride spray and EMLA cream in Platelet rich plasma injections on scalp in androgenetic alopecia patients. Platelet rich plasma injections which are intradermal injections are painful and cause discomfort to the patients. Topical ethyl chloride spray and EMLA cream provide an advantage to the patients because they are non-invasive and safe.

2. Materials and Method

2.1. Study design

We conducted a single center, prospective randomized study with two parallel groups at a tertiary care hospital after taking institutional ethical committee approval and written informed consent.

2.2. Study population

We recruited 50 patients of platelet rich plasma injections to participate in this study. Patients were divided into two groups equally with 25 patients in each group. We applied Ethyl chloride spray in first group (A) and EMLA cream in

second group (B). All eligible patients, who were enrolled in the study, were aged between 20 and 50 years. Patients, aged less than 20 years and more than 50 years; history of hypersensitivity to either ethyl chloride spray or eutectic mixture of lignocaine and prilocaine; presence of active infection or any open wound at site of procedure; use of analgesic, anesthetic, or sedative in the 12 hours before the procedure; history of congenital or idiopathic methemoglobinemia; history of other diseases like diabetes, peripheral neuropathy; patients with unrealistic expectations were excluded from our study.

All the patients were informed about the procedure and their written consent were recorded. Complete history, clinical examination and routine investigations were also done for all the patients.

2.3. Procedure

We applied Ethyl chloride spray in group A in a well-ventilated room. Area of Injections which was scalp, was prepared with alcohol swab. Ethyl chloride spray was then applied at a distance of 3-5 inches from the skin. To apply Ethyl Chloride spray, we held the bottle upright over the treatment area and valve was pressed completely allowing spray from the bottle. Duration of application of spray was 4-6 seconds or until overlying skin turned white. We inserted injections immediately after evaporation of liquid from skin within 30-60 seconds.

In group B, after preparation of injection area, we applied a thick layer of EMLA cream in a dose of 1gm/10cm^2 skin surface area under occlusive dressing. After 1 hour, we removed the cream and cleaned the area. We noted any local skin changes such as erythema, pallor or oedema. Then we injected platelet rich plasma in patients.

Pain intensity was assessed during procedure and after 30 minutes on a 10-cm horizontal Visual Analogue scale with the extremes of "no pain" (left end) and "worst imaginable pain" (right end). The result was expressed as the percentage of worst imaginable pain. Overall patient satisfaction which included both efficacy and tolerability of the treatment, also noted, according to a 4-point verbal rating scale (very satisfied, satisfied, dissatisfied, and very dissatisfied). Safety profile of the treatment methods were assessed by monitoring adverse effects and by measuring vital signs.

2.4. Statistical analysis

Numeric data (demographics, pain intensity, vital signs) were reported as mean (SD), whereas categoric efficacy data (patient satisfaction) and categoric safety results (adverse effects) were presented as frequency distributions (numbers of patients and incidence rates). Statistical comparison between treatment groups was done by a chi-square test, *t* - test and *z* - test using 'p' value < 0.05 for categoric data.

3. Results

3.1. Demographic characteristics

A total of 50 patients were enrolled in the study and randomly assigned to receive either ethyl chloride spray (n = 25) or EMLA cream (n = 25).

Table 1.summarizes the demographic data of the 27 male patients and 23 female patients who participated in the study. The treatment groups were comparable with respect to baseline characteristics; both groups were statistically significant and clinically relevant.

Table 1: Demographic characteristics of patients

Characteristics	Group A	Group B	P value
Age, mean (SD), years	35.84 (7.42)	36.4 (8.10)	0.8 (z-test)
Sex, no. (%)			
Male	14 (56%)	13 (52%)	0.78
Female	11 (44%)	12 (48%)	(chi-square)
Weight, mean (SD), kg	65.24 (8.63)	62.6 (9.08)	0.29 (z-test)

3.2. Anesthetic efficacy and patient satisfaction

Total 50 patients in which platelet rich plasma injections were given after application of ethyl chloride spray or EMLA cream. Assessment of pain intensity during procedure (T0) and after 30 minutes of procedure (T30) was done by Visual analogue score (VAS) in patients. During procedure, VAS (Mean ± SD) was (3.36 ± 1.29) and (2.12 ± 0.93) in group A & B respectively. After 30 minutes, VAS (Mean ± SD) was (6.64 ± 0.95) and (5.44 ± 0.77) in group A & B respectively. The *z* – test confirmed significant difference in pain intensity during procedure ($p < 0.001$) and after 30 minutes ($p < 0.0001$) between group A & B. Group B showed better efficacy than group A. Table 2 and Figure 1 shows comparison of VAS (mean & SD) between group A & B.

Comparison of satisfaction in patients of both group A and B is presented in figure 2. Patients were asked about the satisfaction with treatment whether they were very satisfied, satisfied or dissatisfied. In group A, 20% (n=5); 60% (n=15) and 20% (n=5), of patients were dissatisfied; satisfied; and very satisfied respectively while in group B, 12% (n=3); 56% (n=14) and 32% (n=8), of patients were dissatisfied; satisfied; and very satisfied respectively.

Table 2: Visual analogue score in group A & group B

	Group A		Group B		P value
	Mean	SD	Mean	SD	(z-test)
During procedure (T_0)	3.36	1.29	2.12	0.93	< 0.001
After 30 min of procedure (T_{30})	6.64	0.95	5.44	0.77	< 0.0001

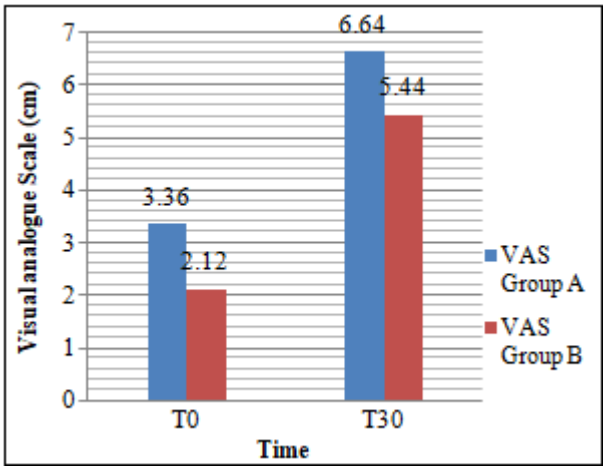

Figure 1: Comparison of visual analogue score between group A and group B, at the time of the procedure and 30 minutes after the procedure

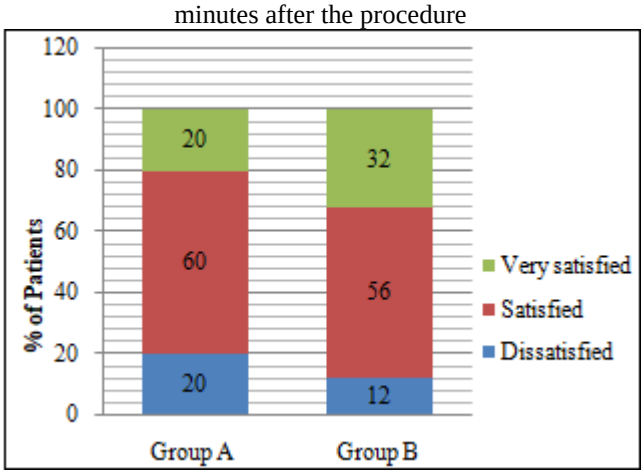

Figure 2: Comparison of patient satisfaction between group A & group B

3.3. Safety profile

Vital signs were recorded in supine position in both treatment groups. Table 3. Shows vital signs which were taken before procedure, just after procedure and after 30 minutes of procedure. There was no significant difference in vital signs and patients remained stable. No significant adverse effects were noted in group A. In group B, pallor was noted in 12% of patients (n = 3) which was transient.

Table 3: Vital signs

Parameter	Group A		Group B	
	Mean	SD	Mean	SD
Before procedure				
PR, bpm	78.48	5.89	78.36	6.58
MAP, mmHg	85.92	5.48	83.12	5.65
RR, per min.	13.96	1.97	14.88	2.74
Temperature, ^{o}F	97.92	0.5	97.95	0.58
Just after procedure				
PR, bpm	78.96	5.26	78.84	6.55
MAP, mmHg	88.28	4.14	85.76	4.92
RR, per min	15.4	1.71	16.32	2.17
Temperature, ^{o}F	97.64	0.43	97.77	0.41
After 30 min.				
PR, bpm	78.68	4.5	78.08	4.06
MAP, mmHg	83.4	5.73	83.36	5.01
RR, per min.	13.92	1.98	14.28	2.01
Temperature, ^{o}F	98.08	0.46	98.01	0.42

4. Discussion

Dermatologists have to frequently manage pain and discomfort associated with minor surgical procedures. There are several options which can be used to reduce pain associated with these procedures. But topical anesthetic agents should be preferred because they are effective and safe with less adverse effects.[6-8] Infiltrative anesthetics can be an alternative agents but they are painful and invasive.[9] Topical anaesthesia alone can be sufficient for excision and cauterization of warts and other small skin lesions.[10,11]

Ethyl chloride is a fast acting and non-invasive agent. It is a skin refrigerant, abstracts heat when it evaporates from the skin after application which blocks sensory nerve conduction & produce anaesthesia.[12,13]There are several studies of ethyl chloride which yield conflicting results. One unblinded randomised study demonstrated no significant pain relief with ethyl chloride vs no intervention in patients undergoing intravenous catheterization.[14] Conversely, 3 unblinded randomised studies demonstrated superior anesthetic efficacy of ethyl chloride vs no intervention in patients undergoing venepuncture.[9,15,16] A randomised unblended crossover study also showed superior anesthetic effect of ethyl chloride spray vs placebo in haemodialysis patients.

EMLA cream is also an efficient and safe topical anesthetic agent which offers an option to dermatologists for reduction of pain in minor surgical procedures. EMLA cream is an oil-in-water emulsion of 2.5% lignocaine and 2.5% prilocaine. The pH level of eutectic mixture is 9.4.[17]Effectiveness of cream may be influenced by skin integrity, race, skin thickness, location and depth of lesion, and the local vascularity.[18] It has no significant adverse effects. A transient erythema can be present locally, attributed to initial peripheral vasoconstriction followed by vasodilatation.[19]

Goodacre et al. demonstrated that EMLA has comparable efficacy as conventional infiltration in split skin grafting with less discomfort.[20]Thune, Faerden, and Minor[21] also found that EMLA cream provided adequate anaesthesia for excisional biopsies after application for 60 to 190 minutes.

Our study had confirmed the effectiveness of Ethyl chloride spray and EMLA cream as a topical anaesthesia. We compared efficacy and safety between them in PRP injections (intradermal injections) which proves EMLA cream is more effective than Ethyl chloride spray.

5. Conclusion

Ethyl chloride spray and EMLA cream were both effective in patients of both groups. Most of the patients were satisfied because of significant reduction in pain intensity with very few adverse effects. In our study which was a randomised and parallel group study design, although both modalities were efficacious but EMLA cream showed better efficacy with long lasting effect than ethyl chloride spray.

6. Conflict of interest

The authors have no conflict of interest to disclose.

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