

Efficacy of Lidocaine/Prilocaine Cream During Dry Needling of Upper Trapezius Myofascial Trigger Points: A Double-blinded Randomized Controlled Trial

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ABSTRACT

OBJECTIVE This study aimed to evaluate the efficacy of a eutectic mixture of local anesthetics (EMLA) cream in reducing pain during dry needling (DN) of active myofascial trigger points (MTrP) in the upper trapezius muscle.

METHODS This prospective, randomized, double-blind, placebo-controlled trial was conducted with participants aged 20 years and older who had active MTrP in the upper trapezius muscle. Recruitment occurred from 11 July 2023 to 4 March 2024. Participants were randomly assigned to receive either EMLA cream (n = 32) or a placebo cream (n = 32) which was applied over the active MTrP 60 minutes prior to the DN procedure. After the DN procedure, patients rated their pain using a 100-mm visual analog scale during DN (VAS_{TrP}) as the primary outcome and during the needle's skin penetration (VAS_{skin}) as the secondary outcome.

RESULTS Patients in the EMLA group reported significantly lower scores for VAS_{TrP} and VAS_{skin} than those in the placebo group ($p < 0.05$). Specifically, 53.1% of patients in the EMLA group reported 'moderate to severe pain' according to VAS_{TrP}, significantly lower than the 78.10% in the placebo group ($p = 0.035$). Moreover, 65.63% of patients in the EMLA group reported 'no pain' on the VAS_{skin} scale, compared to just 15.63% in the placebo group ($p < 0.001$). Importantly, no significant adverse events associated with EMLA were observed.

CONCLUSION EMLA cream is effective in providing analgesia during DN of an active MTrP in the upper trapezius muscle.

KEYWORDS EMLA, local anesthetic, upper trapezius, dry needling, myofascial trigger point

INTRODUCTION

Myofascial pain syndrome (MPS) is a disorder characterized by pain stemming from myofascial trigger points (MTrP). These trigger points are hyperirritable nodules found within taut muscle bands. When these points are palpated, they can cause a local twitch response (LTR), a quick con-

traction of muscle fibers accompanied by pain radiating from the area (1). MTrP can lead to patterns of pain that are referred to other areas, as well as autonomic symptoms, motor dysfunction, and a reduced range of motion. MTrPs are categorized into two types: active MTrPs, which cause spontaneous pain complaints, and latent MTrPs,

which are usually inactive but can become painful when stimulated (2). Previous studies indicate that between 30.00% and 85.00% of patients with musculoskeletal pain are affected by MPS (3). According to epidemiological studies conducted in Thailand, MPS was diagnosed in 36.00% of patients with musculoskeletal pain (4), and the trapezius is the most commonly found MTrP (5).

One of the well-known and effective treatments for MTrP is dry needling (DN), which consists of inserting a thin, solid, dry needle into the muscle where the MTrPs are located and moving it in and out using a circular fan-like and fast-in and fast-out technique (2, 6-8). Common adverse effects of DN include bruising, bleeding, pain during treatment, and post-needling soreness (PNS). During the intervention, most patients do not feel the insertion of the needle but sometimes have a painful sensation from the LTR that lasts less than a second. Some patients describe this as a little electric shock, while others consider it a cramping sensation. However, LTRs generated by DN have been linked to pain relief, enhanced range of motion, and decreased levels of nociceptive and inflammatory mediators at MTrP (9). Although the pain during DN is mild, it has been linked to patient dissatisfaction, decreased adherence to treatment, and an increase in PNS (9-11). While various strategies and therapies have been studied to reduce PNS, to the best of our knowledge, no research has focused on methods to alleviate pain during DN (10, 11).

A eutectic mixture of local anesthetics (EMLA) cream, which combines 2.50% lidocaine and 2.50% prilocaine, provides safe and effective local analgesia for several invasive procedures, including venipuncture, vaccination, totally implantable venous access devices (TIVADs), fine-needle aspiration biopsy, and spinal needle insertion (12-17). Despite the limited penetration depth, many studies have found that it effectively reduces the pain of both subcutaneous and intramuscular injections (14, 18-21).

Because of uncertainty about whether EMLA can effectively relieve pain associated with the DN procedure, this study aimed to evaluate the effectiveness of EMLA cream compared to a placebo in alleviating pain during DN of an active MTrP in the upper trapezius muscle. This study hypothesized that EMLA cream is effective in decreasing pain during the DN procedure.

METHOD

Study design and participants

This study was a prospective, randomized, double-blind, placebo-controlled analysis conducted at the Department of Rehabilitation Medicine at Phramongkutklao Hospital in Bangkok, Thailand. Patients with MPS affecting the upper trapezius muscle were recruited between 11 July 2023 and 4 March 2024.

The inclusion criteria for the study were as follows: patients must be 20 years or older, consent to participate, and present with at least one active MTrP in the upper trapezius muscle. The diagnosis of an active MTrP was based on the following criteria: 1) the presence of a palpable taut band in the muscle; 2) the existence of a hyper-sensitive tender spot within this taut band; 3) the presence of spontaneous pain; and 4) increased pain in response to intense digital pressure which mimicked the patient's original pain experience (2, 22, 23).

Exclusion criteria were any of the following: 1) presence of a contraindication for DN, such as needle phobia, coagulopathy, thrombocytopenia, or psychiatric disorder; 2) previous use of analgesic or non-steroidal anti-inflammatory drugs (NSAIDs) within 24 hours; 3) inability to comprehend questions; 4) presence of a contraindication for EMLA cream such as hypersensitivity to local anesthetics of the amide type or any ingredients in EMLA cream, or congenital or idiopathic methemoglobinemia (24); 5) pregnant or breast-feeding women; 6) the presence of denuded or broken skin over the MTrPs site.

Randomization

Patients were randomly assigned to one of two groups: the EMLA group or the placebo group. A block of four randomization processes ensured that both groups had a balanced number of participants. The randomization sequence was created by an independent physiatrist, and allocation concealment was achieved using opaque, sealed envelopes.

Ethical considerations

The study protocol received approval from the Institutional Review Board, Royal Thai Army Medical Department (R062h/66), and was registered with the Thai Clinical Trials Registry

(TCTR20240323002). All subjects provided written informed consent for their participation in the study.

Sample size calculation

Based on data from a previous study on the effectiveness of EMLA cream in reducing pain associated with vaccination (14), the Visual Analog Scale (VAS) was chosen as the primary outcome measure. Considering a power of 0.8 and an alpha level of 0.05, the target population per group was calculated to be 32.

Study procedures

The placebo cream in the study was Siriraj Daily Cream, a white lotion similar in appearance and consistency to EMLA cream. A total of 1 mL of either EMLA cream or placebo cream was measured using a 1 mL disposable syringe. This amount was then uniformly applied in a thick layer over the active MTrP of each subject 60 minutes prior to the DN procedure.

To begin, the first researcher marked the DN site over the most painful active MTrP in the upper trapezius muscle using a circular template 3.5 cm in diameter. The cream was applied within this marked circle and secured with a Tegaderm patch. Importantly, the physiatrist performing the DN was not involved in applying the creams, ensuring that neither the patient nor the physiatrist knew which cream had been used.

The Tegaderm patch was removed immediately before the needle insertion, and the first researcher wiped off the remaining cream. The physiatrist was then called on to perform the DN. Before the needle insertion, the patient was positioned face down and informed about the possibility of sharp pain and muscle twitching.

After disinfecting the area, the DN procedure was performed using a single 0.25 × 40 mm solid filament needle (EACU™, Maanshan Bond Medical Instruments Co., Ltd., Maanshan City, China) using a circular fan-like and fast-in-and-fast-out technique (2, 8) for 10 repetitions. When the needle was withdrawn, a cotton ball was pressed on the treatment area for approximately 90 seconds. The number of LTRs and side effects from the cream or DN were assessed and recorded. In this study, seven physiatrists with at least five years' experience in DN who were staff members in the

Department of Rehabilitation Medicine at Phramongkutklao Hospital, performed the procedures.

Outcome measures

The primary outcome was pain intensity during DN. The most painful intensity during DN occurred during needling manipulation using a fanning technique. The secondary outcome was pain intensity while the needle penetrated the skin. Because of its high reliability for assessing acute pain intensity (25), both outcomes were assessed using a 100 mm vis VAS with a range of 0 mm (no pain) to 100 mm (worst imaginable pain). Before performing the DN procedure, the patient was instructed to complete the pain survey form, in which the patient was asked to rate his or her pain intensity during DN (VAS_{Trp}) and while the needle penetrated the skin (VAS_{skin}) using a VAS. Immediately after completing the DN procedures, patients were asked to mark the horizontal 100 mm VAS line representing their pain intensity.

Baseline patient characteristics were collected, including age, sex, MPS pain intensity in the upper trapezius muscle using a 100 mm VAS, and history of DN, in addition to the number of needle insertions, number of LTRs, and any adverse events from the DN or the creams.

Statistical analysis

Analysis was performed on an intention-to-treat basis. Descriptive statistics were used to analyze demographic and clinical characteristics. Continuous data are presented as mean and standard deviation or median and interquartile range (IQR), and categorical data are presented as numbers and percentages. Differences in age, pain intensity of MPS, number of LTRs, VAS_{Trp}, and VAS_{skin} were compared between groups using the Mann-Whitney U test. The chi-square test or Fisher's exact test was used to compare categorical data, including gender and history of DN. Statistical significance was set at $p < 0.05$. Statistical analyses were performed using STATA version 14.

RESULTS

Eighty-one patients were evaluated for eligibility. Of these, 17 were excluded because they met at least one of the exclusion criteria: fear of needles ($n = 4$), previous use of NSAIDs within 24 hours ($n = 3$), and denial of participation due

to the time-consuming process ($n = 10$). A total of 64 patients were randomized into either the EMLA group ($n = 32$) or the placebo group ($n = 32$) (Figure 1). As shown in Table 1, there were no statistically significant differences in the patient's sex, age, history of DN, or pain intensity of MPS (VAS_{MPS}) between the two groups. However, the number of LTRs was significantly lower in the placebo group ($p = 0.021$).

Both pain intensity during DN (VAS_{TrP}) and while the needle penetrated the skin (VAS_{skin}) were significantly lower in the EMLA group than

in the placebo group ($p < 0.05$) (Figure 2). Category scales for pain intensity are presented in Table 2. There was a statistically significant difference in VAS_{TrP} categorized by severity between groups ($p = 0.016$), with almost 80% of patients in the placebo group reporting 'moderate to severe pain'. In contrast, only half of the EMLA group rated this pain as moderate to severe. Correspondingly, for VAS_{skin} , the percentage of patients reporting 'no pain' in the EMLA group (65.63%) was significantly higher than that in the placebo group (15.63%) ($p < 0.001$). Additionally, none of the participants

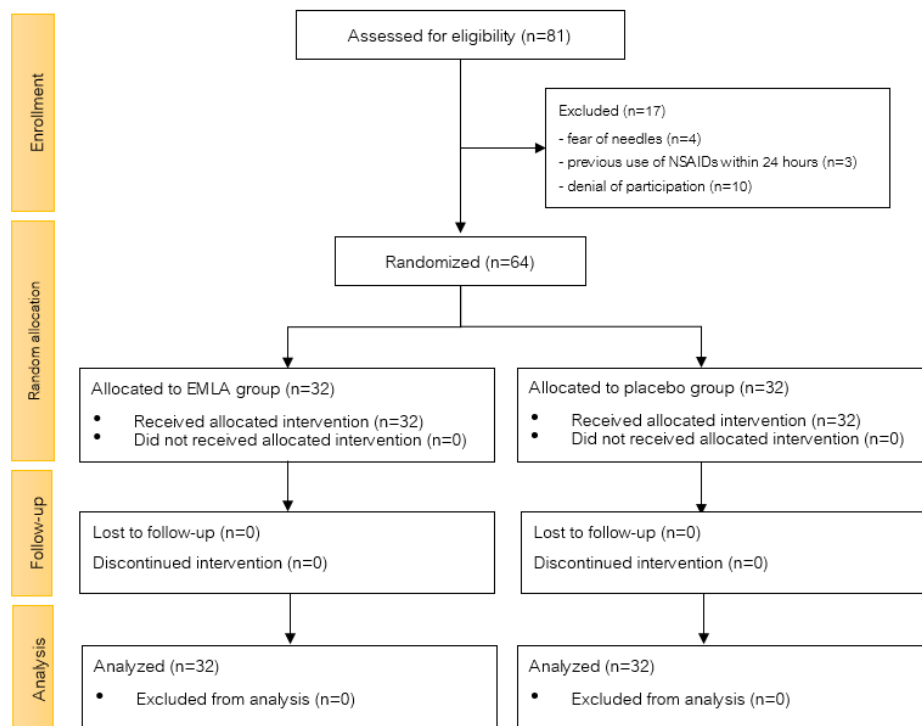


Figure 1. CONSORT flow diagram of the present study

Table 1. Demographic characteristics of participants

	EMLA group (n = 32) n (%) Median (IQR)	Placebo group (n = 32) n (%) Median (IQR)	p-value
Gender			
Female	21 (65.63)	19 (59.38)	0.606
Age (years)	29 (23.0–40.0)	28 (22.0–50.5)	0.598
History of DN			
(Yes)	18 (56.25)	24 (75.00)	0.114
VAS_{MPS} (mm)	50 (40–60)	55 (40–65)	0.353
Number of LTRs	5 (4–8.5)	4 (3–6)	0.021*

EMLA, eutectic mixture of local anesthetics; DN, dry needling; VAS_{MPS} , Visual Analog Scale for myofascial pain syndrome; LTRs, local twitch responses; n, number of participants; IQR, inter-quartile range

Mann-Whitney U test for continuous outcomes and Chi-square test or Fisher's exact test for categorical data were performed.

*Statistically significant ($p < 0.05$)

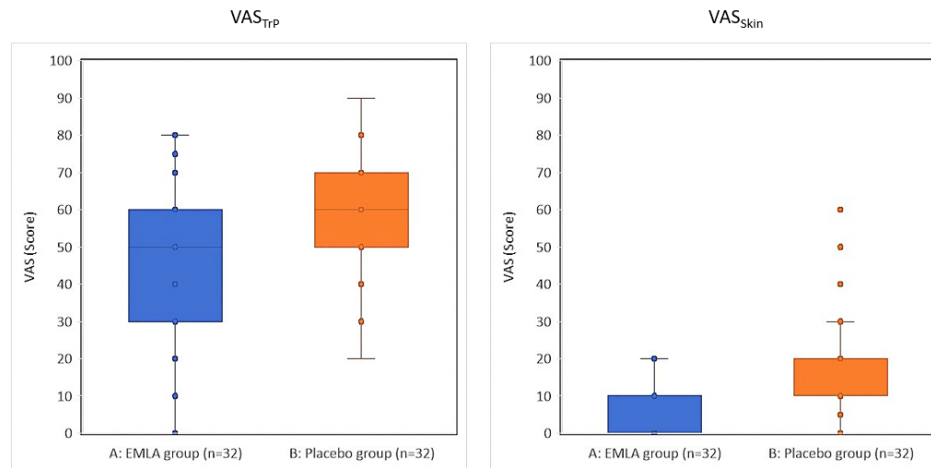


Figure 2. Box plots comparing pain intensity during DN (VAS_{Trp}) and pain while the needle penetrated the skin (VAS_{skin}) between the EMLA and placebo groups

Table 2. Pain intensity during DN (VAS_{Trp}) and pain while the needle penetrated the skin (VAS_{skin}) between the EMLA and placebo groups

	EMLA group (n=32)	Placebo group (n=32)	p-value
VAS_{Trp}			
Moderate to severe pain (45–100 mm), n (%)	17 (53.1)	25 (78.1)	0.035*
Median (IQR)	50 (30–60)	60 (50–70)	0.016*
VAS_{skin}			
No pain (0–4 mm), n (%)	21 (65.63)	5 (15.63)	< 0.001*
Median (IQR)	0 (0–10)	10 (10–20)	< 0.001*

EMLA, eutectic mixture of local anesthetics; VAS_{Trp} , Visual Analog Scale for pain during dry needling; VAS_{skin} , Visual Analog Scale for pain while the needle penetrated the skin; n, number of participants; IQR: inter-quartile range; Mann-Whitney U test for continuous outcomes and Chi-square test or Fisher's exact test for categorical data were performed; *Statistically significance ($p < 0.05$)

in the EMLA group reported 'moderate to severe pain' while the needle penetrated the skin.

Observed adverse effects from EMLA cream included pallor ($n = 3$), a tingling sensation ($n = 2$), and erythema ($n = 2$) at the site of cream application, all of which resolved spontaneously within 5 minutes. No adverse events from DN were observed.

DISCUSSION

The present study demonstrates that using EMLA cream effectively reduces pain during DN and while the needle has penetrated the skin. The current study observed a significant reduction in VAS_{Trp} and VAS_{skin} in the EMLA group compared with the placebo group. The efficacy of EMLA cream was shown by the statistically significant difference in frequency distribution in pain severity between groups. For VAS_{Trp} , the percentage of patients with 'moderate to severe pain' in the EMLA

group was markedly significantly lower than that in the placebo group. Similarly, the majority of patients in the EMLA group reported 'no pain' and none reported 'moderate-to-severe pain' for VAS_{skin} .

The pain-relieving effect of EMLA was more pronounced when the needle penetrated the skin than when it penetrated the MTrP, possibly due to the limited depth of penetration of EMLA cream (26). Despite its limited penetration depth, some studies have suggested EMLA effectively reduces intramuscular injections' underlying muscle spasms and pain (14, 18–20). Possible mechanisms of reduction of pain associated with intramuscular insertion include: 1) EMLA may reach deeper tissues than previously reported and may block nociceptors for muscle stretch; 2) blockage of cutaneous nociceptors may in some way modify afferent signals from the stretching of underlying muscle; 3) because it was difficult to distinguish

pain associated with a skin prick from that associated with muscle insertion, subjects reported a reduction in overall pain perception as their score for muscle insertion (19, 20).

Bijur PE et al. found that a change of 10 mm or more in the VAS indicates an actual change in most patients' acute pain experience (25). In the present study, the results showed both statistically significant and clinically significant differences regarding the median difference of VAS_{TrP} and VAS_{skin} between the EMLA and placebo groups.

According to Martín-Sacristán, L. et al., there is a statistically significant association between the number of LTRs and the symptoms suffered by DN (27). In the current study, although the number of LTRs was significantly lower in the placebo group, pain during DN and while the needle penetrated the skin was higher in this group than in the EMLA group. These findings support the efficacy of EMLA cream in reducing pain from the DN procedure.

The primary barrier to the routine use of EMLA cream for reducing pain in invasive procedures is its delayed onset of action of approximately 60 minutes (12, 14-16, 18, 28). This disadvantage was also observed in our study, in which approximately 60.00% of the excluded subjects declined to participate due to the time-consuming process. To reduce this obstacle, the researcher suggests two less time-consuming alternatives: first, the development of a protocol for cream application upon arrival at OPD by nurses for patients with chronic MPS who have an appointment for DN, and second, providing patients with validated instructions on how to apply the cream prior to visiting the OPD.

In the present study, only mild adverse effects from EMLA cream were recorded in 22% of subjects, including pallor, tingling sensation, and erythema, at the site of cream application which resolved spontaneously within 5 minutes.

Several limitations of our study should be mentioned. First, pain is a subjective phenomenon highly dependent on the individual's perception of its severity. Although VAS was a valid outcome assessment tool with high intra- and inter-rater reliability to assess pain severity in a clinical population (7, 25, 29), other objective outcomes should be assessed as well, e.g., blood pressure and heart rate rising after DN. Second, DN

was applied to only one MTrP of the selected upper trapezius muscle; therefore, the results from this study cannot be applied to DN used on several MTrPs and/or different muscles. Third, DN techniques were applied with specific characteristics regarding the number of needle insertions and needle diameter, so the application form limited the generalizability of the results. Fourth, pain during DN was significantly correlated with PNS, which is also an important adverse effect of DN, causing limitation of activities of daily living and reducing therapeutic adherence (11). Further studies should investigate the efficacy of EMLA cream in reducing PNS. Lastly, DN is operator-dependent which may influence pain perception during the procedure. However, all seven physiatrists performing the DN were trained at the same institution. Additionally, the upper trapezius is a relatively accessible muscle for DN, and the number of needle manipulations was standardized.

CONCLUSIONS

EMLA cream effectively reduces pain during DN and while the needle is penetrating the skin. In addition, no significant side effects were observed except for local reactions, which resolved spontaneously within a few minutes. EMLA cream is a painless, effective, and noninvasive option for reducing pain from DN procedures.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

P.F.: contributed to concept and design the study, acquisition and analysis of the data, draft the manuscript; T.P.: contributed to concept and design the study, analysis and interpretation of the data and critically revise the manuscript; C.P.: contributed to concept and design the study, analysis and interpretation of the data and critically revise the manuscript.

All authors approved the final manuscript as submitted.

DATA AVAILABILITY STATEMENT

The data supporting this study's findings are available from the corresponding author upon reasonable request.

INSTITUTIONAL REVIEW BOARD STATEMENT

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board, Royal Thai Army Medical Department (Research code: R062h/66, approved on 7 June 2023).

INFORMED CONSENT STATEMENT

Written informed consent was obtained from all participants involved in the study.

REFERENCES

- Urits I, Charipova K, Gress K, Schaaf AL, Gupta S, Kiernan HC, et al. Treatment and management of myofascial pain syndrome. *Best Pract Res Clin Anaesthesiol.* 2020;34:427-48.
- Simons DG, Travell JG, Simons LS. Myofascial pain and dysfunction : the trigger point manual. 2nd ed. Baltimore: Williams & Wilkins; 1999.
- Tantanatip A, Chang K. Myofascial Pain Syndrome. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2024 August 31]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK499882/>
- Potchana K. The effect of stretching exercises and ergonomics on pain and quality of life in nurses with myofascial pain syndrome (MPS). *Udonthani Hospital Medical Journal.* 2022;30:45-57.
- Kattika Phumiphithakkaun CS, Prapaporn Sirisab-ya. Treatment of myofascial pain syndrome by dry needling in general police hospital. *J Thai Rehabil.* 2002;12:8-14.
- Dach F, Ferreira KS. Treating myofascial pain with dry needling: a systematic review for the best evidence-based practices in low back pain. *Arq Neuropsiquiatr.* 2023;81:1169-78.
- Shanmugam S, Mathias L, Thakur A. Effect of Dry-Needling Induced Muscle Soreness (DIMS) on the Severity of Pain Post Deep Trigger Point Needling. *Journal of Clinical and Diagnostic Research.* 2018;12:4.
- Hong CZ. Lidocaine injection versus dry needling to myofascial trigger point. The importance of the local twitch response. *Am J Phys Med Rehabil.* 1994;73:256-63.
- Martín-Pintado-Zugasti A, Mayoral Del Moral O, Gerwin RD, Fernández-Carnero J. Post-needling soreness after myofascial trigger point dry needling: Current status and future research. *J Bodyw Mov Ther.* 2018;22:941-6.
- Martín-Pintado-Zugasti A, Rodríguez-Fernández Á L, Fernandez-Carnero J. Postneedling soreness after deep dry needling of a latent myofascial trigger point in the upper trapezius muscle: Characteristics, sex differences and associated factors. *J Back Musculoskelet Rehabil.* 2016;29:301-8.
- Diciolla NS, Pérez-Clemente C, Cámara-Caballero M, Matienzo-Barreto A, Real-Rodríguez A, Torres-Lacombe M. Efficacy of Exercise on Postneedling Soreness: A Randomized Controlled Trial. *J Clin Med.* 2021;10:5527. PubMed PMID: 34884230.
- Gursoy A, Ertugrul DT, Sahin M, Tutuncu NB, Demirer AN, Demirag NG. The analgesic efficacy of lidocaine/prilocaine (EMLA) cream during fine-needle aspiration biopsy of thyroid nodules. *Clin Endocrinol (Oxf).* 2007;66:691-4.
- Buckley MM, Benfield P. Eutectic lidocaine/prilocaine cream. A review of the topical anaesthetic/analgesic efficacy of a eutectic mixture of local anaesthetics (EMLA). *Drugs.* 1993;46:126-51.
- Abuelkheir M, Alsourani D, Al-Eyadhy A, Temsah MH, Meo SA, Alzamil F. EMLA(R) cream: a pain-relieving strategy for childhood vaccination. *J Int Med Res.* 2014;42:329-36.
- Yin L, Jiang S. Evaluation of EMLA cream for relieving pain during needle insertion on totally implantable venous access device. *J Vasc Access.* 2018;19:634-8.
- Olsson Duse B, Sporrang Y, Bartocci M, Skoglund K. Efficacy of topical lidocaine-prilocaine (EMLA®) for management of infant pain during pneumococcal vaccination: A randomized controlled trial. *Paediatr Neonatal Pain.* 2022;4:53-60.
- Sharma SK, Gajraj NM, Sidawi JE, Lowe K. EMLA cream effectively reduces the pain of spinal needle insertion. *Reg Anesth.* 1996;21:561-4.
- Schechter NL, Zempsky WT, Cohen LL, McGrath PJ, McMurtry CM, Bright NS. Pain reduction during pediatric immunizations: evidence-based review and recommendations. *Pediatrics.* 2007;119:e1184-98.
- Taddio A, Nulman I, Reid E, Shaw J, Koren G. Effect of Lidocaine-Prilocaine Cream (EMLA®) on Pain of Intramuscular Fluzone® Injection. *Can J Hosp Pharm.* 1992;45:227-30.
- Himelstein BP, Cnaan A, Blackall CS, Zhao H, Cavalieri G, Cohen DE. Topical application of lidocaine-prilocaine (EMLA) cream reduces the pain of intramuscular infiltration of saline solution. *J Pediatr.* 1996;129:718-21.
- Lamarche Y, Lebel M, Martin R. EMLA partially relieves the pain of EMG needling. *Can J Anaesth.* 1992;39:805-8.
- Gerwin RD, Shannon S, Hong CZ, Hubbard D, Gevirtz R. Interrater reliability in myofascial trigger point examination. *Pain.* 1997;69:65-73.
- Gerber LH, Sikdar S, Aredo JV, Armstrong K, Rosenberger WF, Shao H, et al. Beneficial effects of dry

- needling for treatment of chronic myofascial pain persist for 6 weeks after treatment completion. *Pm R.* 2017;9:105-12.
24. Product Monograph: EMLA® Cream, EMLA® Patch, Lidocaine 2.5% and Prilocaine 2.5% Cream and Patch; Topical Anesthetic for Dermal Analgesia [Internet]. Toronto (ON): Aspen Pharmacare Canada Inc.; 2017. Available from: https://pdf.hres.ca/dpd_pm/00040608.PDF
 25. Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. *Acad Emerg Med.* 2001;8:1153-7.
 26. Wahlgren CF, Quiding H. Depth of cutaneous analgesia after application of a eutectic mixture of the local anesthetics lidocaine and prilocaine (EMLA cream). *J Am Acad Dermatol.* 2000;42:584-8.
 27. Martín-Sacristán L, Calvo-Lobo C, Pecos-Martín D, Fernández-Carnero J, Alonso-Pérez JL. Dry needling in active or latent trigger point in patients with neck pain: a randomized clinical trial. *Sci Rep.* 2022;12:3188. PubMed PMID: 35210467
 28. Babamohamadi H, Ameri Z, Asadi I, Asgari MR. Comparison of the Effect of EMLA™ Cream and the Valsalva Maneuver on Pain Severity during Vascular Needle Insertion in Hemodialysis Patients: A Controlled, Randomized, Clinical Trial. *Evid Based Complement Alternat Med.* 2022;2022:8383021. PubMed PMID: 36091600
 29. Breivik EK, Björnsson GA, Skovlund E. A comparison of pain rating scales by sampling from clinical trial data. *Clin J Pain.* 2000;16:22-8.