Original Article

Use of EMLA cream for skin anesthesia and epidural insertion in the patients with cesarean delivery: A prospective double-blind randomized clinical trial

ABSTRACT

Background: Pain relief of epidural anesthesia in cesarean delivery is difficult. EMLA, a eutectic mixture of lidocaine and prilocaine, is effective for pain reduction during venipuncture and superficial surgery. However, its effectiveness during epidural insertion is not well elucidated. The aim of this randomized, double-blind study was to evaluate the efficacy of EMLA for epidural insertion in elective cesarean delivery.

Methods: With Institutional Review Board approval and written patients' informed consent, forty-two ASA physical status 2 patients (aged 23–45) scheduled for elective cesarean section were included in this study. The patients were randomized to applied ELMA (EMLA group) or placebo cream (Placebo group) about one hour prior to anesthesia. Pain during skin infiltration with 1% mepivacaine and subsequent insertion of Tuohy needle was assessed immediately after each procedure. The presence of patient's response with physical withdrawal on both procedures was recorded. Statistical analysis was performed using Mann–Whitney U test and Fisher's exact test. A value of $P < 0.05$ was considered significant.

Results: Median VAS values on skin infiltration and on insertion of Tuohy needle did not differ between groups. The incidence of patient's response with physical withdrawal on skin infiltration was not different between groups. However, that on insertion of Tuohy needle was significantly lower in EMLA group than in Placebo group (0%, 21%).

Conclusions: EMLA cream could not reduce the pain during epidural insertion.

Key words: Cesarean delivery, EMLA cream, epidural insertion

Introduction

Epidural anesthesia is sometimes reported as being painful procedure to patients. So local anesthesia to the skin and subcutaneous tissue is routinely applied.[1] Moreover ketamine, fentanyl, and parecoxib are tried to alleviate the pain for epidural catheter placement.[1,2] However, pain relief of the insertion of epidural catheter in cesarean delivery is significantly difficult because of the possibility to be harmful to a fetus with systemic drugs.

Access this article online	
Website: www.saudija.org	Quick Response Code
DOI: 10.4103/sja.sja_728_21	

How to cite this article: Doi K, Ueda Y, Imamachi N. Use of EMLA cream for skin anesthesia and epidural insertion in the patients with cesarean delivery: A prospective double-blind randomized clinical trial. Saudi J Anaesth 2022;16:145-9.

Katsushi Doi[1,2], Yoko Ueda[2], Noritaka Imamachi[2,3]

[1]Department of Anesthesiology, Saitama Medical University Hospital, Iruma-gun, [2]Department of Anesthesiology, National Health Organization Hamada Medical Center, Hamada, [3]Department of Anesthesiology, Shimane University, Faculty of Medicine, Izumo, Japan

Address for correspondence: Dr. Katsushi Doi, Department of Anesthesiology, Saitama Medical University Hospital, Saitama - 350-0495, Japan. E-mail: kdoi@saitama-med.ac.jp

Submitted: 11-Oct-2021, **Revised:** 16-Oct-2021, **Accepted:** 17-Oct-2021, **Published:** 17-Mar-2022

EMLA (Eutectic Mixture of Local Anesthetics) cream, a eutectic mixture of lidocaine and prilocaine, is effective for pain reduction during venipuncture and superficial surgery.[3] However, its effectiveness during epidural insertion is not well elucidated.[4,5] The aim of this randomized, double-blind study was to evaluate the efficacy of EMLA for epidural insertion in elective cesarean section.

Material and Methods

We conducted a single-center, prospective, randomized, double-blind, placebo-controlled study. After obtaining Institutional Review Board approval (National Health Organization Hamada Medical Center Institutional Committee No. 2826), written informed consent was obtained from each patient enrolled in the study. We obtained ethics committee approval on March 24, 2017. This study was registered in the University Hospital Information Network in Japan, registration number is UMIN000028620.

ASA physical status II patients who presented for elective cesarean delivery using combined spinal and epidural anesthesia were included in this study. Exclusion criteria were as follows: allergy to pentazocine, morphine, fentanyl, lidocaine, prilocaine, mepivacaine, bupivacaine, or levobupivacaine; preeclampsia; diabetes mellitus; or neurologic disease.

Using a computer-generated sequence of random numbers, the parturient were randomized to applied EMLA cream or placebo cream; petrolatum ointment. About one hour prior to arrival at operating room, the study cream was applied by the anesthesiologist who did not participate in the care and evaluation of the patients on the preoperative visit and covered with an occlusive dressing. The application site was median of their back between Th11 and L2 level.

After arrival in the operating room, all patients received combined spinal and epidural anesthesia. At first, with the patient of lateral position, epidural catheterization was performed using median approach. Our technique for injecting local anesthetic was follows. Three ml mepivacaine 1% was injected using 25-gauge injection needle (NXENENP25X100RB, NIPRO, Tokyo, Japan) in the region in which epidural catheterization was to take place. The needle was directly inserted to into the intra-spinous ligament. We infiltrate mepivacaine deep tissue first and then anesthetize subcutaneous tissue and skin on withdrawal.

An18-gauge epidural needle (NY007/068/007, Smith Medical, Tokyo, Japan) was inserted at the Th11–12 or Th12–L1 level by the loss of resistance technique using normal saline. After confirmation of epidural space, 3 ml normal saline was injected. Then an 18-gauge nylon catheter (NY007/377/418) was inserted with 5 cm length into the epidural space.

One anesthesiologist who did not know patient group evaluated patient pain and physical withdrawal response (verbalization, arching back or leg or arm movement). Each patient rated her pain score during skin infiltration with 1% mepivacaine and subsequent insertion of an 18 gauge Tuohy needle immediately after each procedure using 100 mm visual analogue scale (VAS) score. The presence of patient's response with physical withdrawal on both procedures was also recorded. The overall duration time of epidural insertion was compared.

The primary outcome of this study was mean VAS score at the insertion of 18 G Tuohy needle. Secondary outcome was mean VAS score at the skin infiltration with 1% mepivacaine, the incidence of patient's response with physical withdrawal during skin infiltration and insertion of 18-G Tuohy needle.

Statistical analysis

Statistical analysis was performed using Mann–Whitney *U* test and Fisher's exact test. A P value < 0.05 was considered significant.

In the pilot study, the mean VAS score in the control group was 60 with SD 30. Reduction of VAS by 50% was considered to be clinically significant. The sample size was estimated with the requirement of Type I and II errors of <0.05 and <0.2, respectively. Therefore, each group had to include at least 17 patients.

Results

Forty-two patients were recruited in this study. Three patients were excluded from the study as two patients were not administered the study drug, and one patient was performed emergency cesarean delivery [Figure 1]. Therefore, in the final analysis, data were collected from 20 patients in EMLA group and 19 patients in placebo group.

There were no differences between the two groups in patient characteristics [Table 1].

Mean VAS values during insertion of a Tuohy needle were 36 ± 31 in EMLA group, 38 ± 23 in Placebo group. Mean VAS values during insertion of a Tuohy needle and during skin infiltration did not differ between groups [Table 2]. The

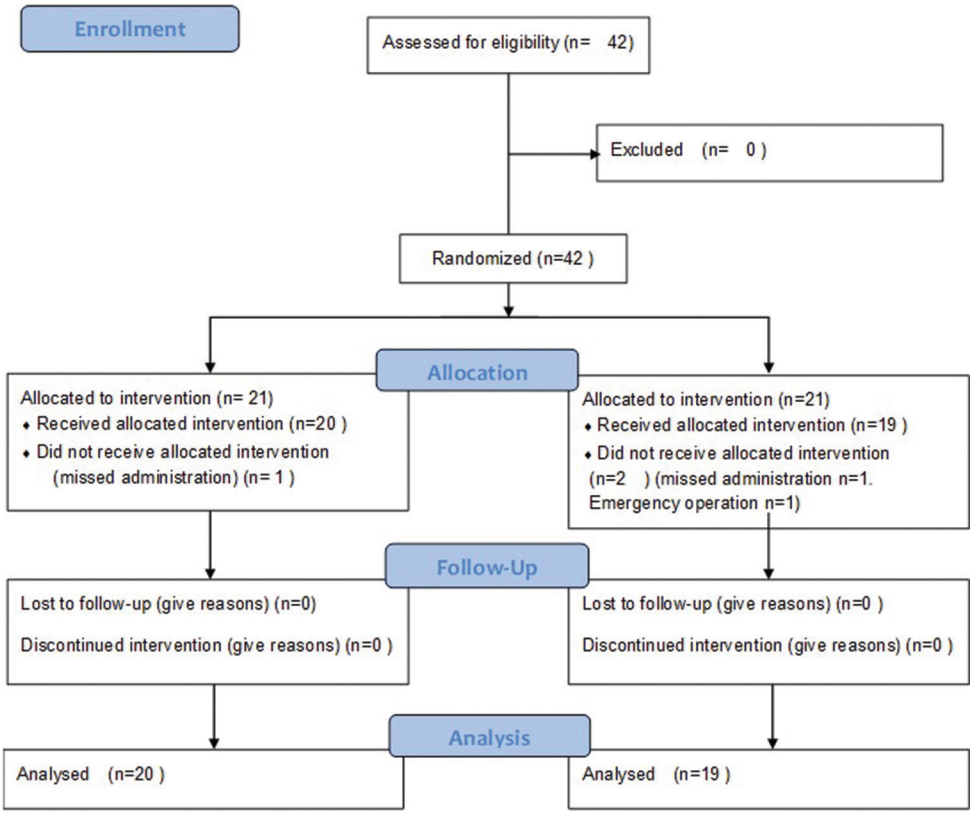

Figure 1: CONSORT diagram of the study

incidence of patient's response to physical withdrawal on skin infiltration was not different between groups. However, that on insertion of Tuohy needle was significantly lower in EMLA group than Placebo group [Table 3].

The overall duration time of epidural catheterization was similar between groups (EMLA group 297 ± 197 s, Placebo group 226 ± 100 s).

Discussion

In this study, the application of EMLA cream could not reduce the pain score during skin infiltration and epidural insertion. However, EMLA plus 1% mepivacaine infiltration may optimize patients' comfort for Tuohy needle insertion.

EMLA cream was introduced 1990' and proved to be effective for venipuncture and superficial procedure.[6] In the field of regional anesthesia, the implication of EMLA cream was reported for spinal puncture.[7] Sharma SK *et al*. indicated that EMLA cream reduces the pain during spinal needle puncture than lidocaine 1% infiltration.[7]

The analgesic effect of EMLA cream for epidural insertion was not well elucidate. Because continuous epidural anesthesia routinely needs 16 or 18 gauge Tuohy needle.

Table 1: Patients' characteristics

	EMLA (*n*=20)	Placebo (*n*=19)	*P*
Age (yrs.) (mean±SD)	32±5	33±5	0.86
Height (cm) (mean±SD)	156±6	157±5	0.56
Weight (Kg) (mean±SD)	63±9	60±6	0.46
BMI (mean±SD)	25±3	24±2	0.24

Table 2: Mean VAS score 95%CI 95% confidence interval

	EMLA (*n*=20)	Placebo (*n*=19)	*P*
Skin infiltration (mean±SD, (95%CI))	46±26 (34.3-58.6)	48±17 (39.7-56.3)	0.88
Touhy needle insertion (mean±SD, (95%CI))	36±31 (21.3-50.0)	38±23 (27.2-49.7)	0.64

Table 3: The presence of pt.'s response with physical withdrawal during skin infiltration and insertion of 18 G Touhy needle Expressed as number (%)

	Patient's response	EMLA (*n*=20)	Placebo (*n*=19	*P*
Skin infiltration	+	7 (35%)	11 (57%)	0.205
	–	13 (65%)	8 (43%)	
Insertion 18 G Touhy needle	+	0 (0%)	4 (21%)	0.047
	–	20 (100%)	15 (79%)	

These needles are thicker than most spinal needles. Ralston *et al*.[4] first reported the effect of ELMA cream for epidural insertion. Patients' pain score at 16 G epidural needle insertion after EMLA cream application was not significantly different between local anesthetic injection. However, mean pain score was most in ELMA cream. They emphasized that ELMA cream did not cause any soft tissue analgesia. Elson *et al*.[5] also reported the analgesic effect of EMLA compared to placebo at elective epidurals. They evaluated the pain scores on skin infiltration and on subsequent insertion of 16 gauge Tuohy needle. They indicated that EMLA cream reduced the pain score on skin infiltration. EMLA cream plus local infiltration was most effective, and optimized patient comfort for epidural insertion of 16 gauge Tuohy needle.

In contradiction to Elson's results, our study indicated that EMLA cream did not reduce pain score than placebo during local skin infiltration. After 60 and 120 minutes of EMLA application, the mean insertion depths with acceptable pain were 2.9 and 4.5 mm, respectively.[8] This may be the reason why EMLA cream application did not reduce the pain score during skin infiltration. Because we used 25 gauge 1 inch (25.4 mm length) needle for skin injection with 1% mepivacaine, and we routinely insert this needle directly until to intra-spinous ligament from the begging, without skin wheel formation. The needle tip usually reached to unanesthetized tissue directly and caused pain from the soft tissue including ligaments.

After local infiltration of mepivacaine, the pain score on insertion of a Tuohy needle did not differ between groups. This result is similar to Elsons' study.

We first reported the evaluation of the patients' response with physical withdrawal on skin infiltration and on insertion of Tuohy needle. van den Berg *et al*.[9] evaluated the venipuncture pain using pain score and physical response. They indicated that 25 gauge needle local injection is less painful procedures than 20 G or 21 G needle venipuncture using both pain assessment methods. Therefore, the evaluation of pain using the incidence of physical response should be useful tool as with VAS score. Our results showed that the incidence of patient's response with physical withdrawal on insertion of Tuohy needle was significant lower in EMLA group than Placebo group. This indicated that EMLA plus 1% mepivacaine infiltration may optimize patients' comfort for Tuohy needle insertion more than placebo plus local infiltration. The effective larger skin area with EMLA cream than local injection may contribute this result. Baek I *et al*.[10] evaluated the effect of local anesthetic injection depth on pain at epidural injection. They noted that deep tissue local anesthesia did not reduce epidural procedural pain. The larger local anesthetic area may be important for pain reduction during epidural puncture than deeper local anesthesia.

There are some limitations in this study. The two procedures, the local injection of mepivacaine and epidural puncture, were performed consecutively. The amplitude of pain experienced with first procedures may influenced the pain during second procedures. So, it is strictly impossible to evaluate the pain during two procedures respectively.

In conclusion, EMLA cream could not reduce the pain during epidural insertion. However, EMLA plus 1% mepivacaine infiltration may optimize patients' comfort for Touhy needle insertion.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Oda A, Iida H, Dohi S. Patient anxiety scores after low-dose ketamine or fentanyl for epidural catheter placement. Can J Anesth 2000;47:910-3.
2. Vadalouca A, Moka E, Chatzidimitriou A, Siafaka I, Sikioti P, Argyra E. A randomized, double-blind, placebo-controlled study of preemptively administered intravenous parecoxib: Effect on anxiety levels and procedural pain during epidural catheter placement for surgical operations or for chronic pain therapy. Pain Pract 2009;9:181-94.
3. Shahid S, Florez ID, Mbuagbaw L. Efficacy and safety of EMLA cream for pain control due to venipuncture in infants: A meta-analysis. Pediatrics 2019;143:e20181173.
4. Ralston S, Head-Rapson A. Use of EMLA cream for skin anaesthesia prior to epidural insertion for labour. Anaesthesia. 1993;48:65-7.
5. Elson JA, Paech MJ. EMLA cream prior to insertion of elective epidurals. Anaesthesia and Intensive Care 1995;23:339-41.
6. Matsumoto T, Chaki T, Hirata N, Yamakage M. The eutectic mixture local anesthetics (EMLA) cream is more effective on venipuncture pain compared with lidocaine tape in the same patients. JA Clin Rep 2018;4:73.

7. Sharma S, Gajrai N, Sidawi J, Lowe K. EMLA cream effectively reduces the pain of spinal needle insertion. Reg Anesth 1996;21:561-4.
8. 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.
9. van den Berg A, Rama Prabhu N. Rationalizing venepuncture pain: Comparison of lignocaine injection, butterfly (21 gauge and 23 gauge) and Venflon (20 gauge). Anaeth Intens Care 1995;23:165-7.
10. Baek IC, Choi SY, Suh J, Kim SH. The influence of local anesthesia depth on procedural pain during fluoroscopically guided lumbar transforaminal epidural injections: A randomized clinical trial. Am J Phys Med Rehabil 2019;98:253-7.