

Lidocaine Iontophoresis Versus EMLA Cream for CO₂ Laser Treatment in Seborrheic Keratosis

Rosaya Phahonthep MD*,
Wannasri Sindhuphak MD*, Pin Sriprajittichai MD**

*Department of Medicine, Faculty of Medicine, Chulalongkorn University

**Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University

Background : Topical anesthesia for skin surgery has widely been used for a long time. Various preparations are used. The EMLA cream is the most popular one.

Objective : The authors compared the local analgesic effect of topical lidocaine iontophoresis and EMLA cream in a cross-over study design.

Method : After informed consent, 16 patients with seborrheic keratosis, who required CO₂ laser surgery, were enrolled. Two lesions on the opposite side of the body with a comparable size, shape and location were selected from each patient. The lidocaine iontophoresis was done on one lesion and the EMLA cream was applied on the other. The CO₂ laser surgery was performed after 10 min of lidocaine iontophoresis and 60 min after EMLA cream. The level of pain was recorded using a 100-mm visual analog scale. Ratings of patient satisfaction were also assessed.

Results : There were no significant differences in pain scores between the two groups ($p=0.968$), but significantly higher in satisfaction scores (1-5 scale) in the iontophoretic group than the EMLA group ($p=0.005$). Fifteen patients preferred lidocaine iontophoresis (93.8%), none preferred EMLA cream. All patients in the present study tolerated the tingling and burning sensations. No severe adverse events and side effects were detected.

Conclusion : Lidocaine iontophoresis provides effective pain relief for CO₂ laser surgery of seborrheic keratosis as well as the EMLA cream. The effect is as fast as 10 min after application. There is no significant side effect. Most of the patients were satisfied. Lidocaine iontophoresis is a useful, noninvasive local anesthesia for CO₂ laser surgery of superficial skin lesions.

Keywords : EMLA, Lidocaine, Iontophoresis, Seborrheic keratosis, Carbondioxide laser.

J Med Assoc Thai 2004; 87 (Suppl 2): S15-8

e-Journal: <http://www.medassocthai.org/journal>

Procedures such as CO₂ laser surgery of superficial skin lesions are a common part of dermatologic practice. Most patients receive EMLA cream as local anesthetic before surgery. It has become the treatment of choice when patients desire a needle-free method for local anesthesia⁽¹⁻³⁾. EMLA (eutectic mixture of local anesthetics) is a combination of lidocaine 2.5% and prilocaine 2.5%, which has been well documented to provide anesthesia before many dermatologic procedures. However, effective analgesia requires the application of EMLA for 60 to 90 min, limiting its usefulness in busy ambulatory health care settings^(4,5). Other topical anesthetics have been developed, ELA-Max cream and amethocaine gel, that require a shorter application time than EMLA (30 to 45 min)^(6,7). However, ELA-Max has undergone limited study for dermato-

logic procedures⁽⁸⁾, and amethocaine is not available in Thailand.

Lidocaine iontophoresis is a transepidermal drug delivery system that uses an electric current to carry ionized lidocaine through the stratum corneum⁽⁹⁾. Drug delivery is proportional to the strength and duration of the current (mA/min). Lidocaine iontophoresis can provide effective topical anesthesia of skin in 5 to 15 min⁽¹⁰⁾. In this prospective, crossover study, we compared the efficacy, patient's satisfaction, side-effect, and patient preferences for EMLA and lidocaine iontophoresis in seborrheic keratosis patients undergoing CO₂ laser surgery.

Material and Method

Sixteen patients were enrolled after informed consent was completed. All patients with multiple lesions of seborrheic keratosis, who required CO₂ laser surgery, were eligible for the study. Patients with

Correspondence to : Sindhuphak W. Division of Dermatology, Department of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

pacemakers, electrically sensitive hardware, or allergies to tape or local anesthetics, those incapable of completing the visual analog scale(VAS) and questions on the assessment forms; and those with preexisting neuropathies, sensory or motor deficits, and skin conditions such as eczema were excluded.

Two lesions on the opposite side of the body with a comparable size, shape, and location were selected from each patient. One lesion was covered with a thick paste of 1 g of EMLA cream and an occlusive dressing for a minimum of 60 min. This was wiped off before CO₂ laser surgery.

On another lesion, the reservoir of a positively charged delivery electrode was saturated with 1 ml of lidocaine hydrochloride 2% with epinephrine 1:80,000. The drug delivery electrode was placed over this site after cleansing the area with a soft cloth and water. A negatively charged grounding electrode was moistened with tap water and placed in one hand. Iontophoresis was performed by using a device provided by Iomed (Model PM-850). The current was set at 2 mA, and the device was programmed to increase the current from 0 mA to 2 mA over 60 seconds. The iontophoresis treatment was continued for 10 min.

The iontophoretic equipment, electrode, EMLA cream, and an occlusive dressing were removed and the application site cleaned with an isopropyl alcohol before CO₂ laser surgery was done. CO₂ laser surgery was done in two sessions, on the EMLA site and on the iontophoretic site. The authors randomized the sequence by randomized permuted block to define which lesion would be done first. However, the patients and the doctors could not be blinded. At each session on each site, the patients were asked to assess the pain intensity during CO₂ laser surgery on a 100-mm visual analog scale. (Fig 1). After the surgery, the patients completed a short questionnaire with the following script:

1. Did you like the treatment ? Grade on a 1-5 scale that is a satisfaction scale where 1=dislike a lot and 5=like a lot.

2. What kind of treatment would you prefer for the next session ?

The occurrence of itching, tingling and discomfort during both interventions was assessed by the patients on a 0-5 scale where 0=none, 1=very low, 2=low, 3=medium, 4=high, 5=very high as a level of the side effects.

No pain _____ The most pain imaginable

Fig.1 VAS (visual analog scale)

The primary outcome variable of the present study was the VAS pain score as assessed by the patients. A sample size of 16 was calculated on the basis of the pilot study. Data analysis was performed by using SPSS ver.11. Normally distributed continuous data were analyzed with paired t-test, data not normally distributed were analyzed with Wilcoxon sign ranked test. Data are presented as mean for normally distributed data, as median for data not normally distributed. A p-value of <0.05 was considered statistically significant.

Result

Sixteen patients were enrolled in the present study, 3 males and 13 females. No patient was excluded from the study. The demographic data are shown in Table 1. There were no significant differences between the two groups regarding any demographic variable or tumor size. There were no significant differences between the two groups in the VAS scores for pain as

Table 1. Demographics (two dependent sample)

Variable	Iontophoresis and EMLA group (n=16)		
1. Gender			
Male		3	
Female		13	
2. Age(years) : mean SD		61.38	12.71
3. Procedure location			
Face		14	
Neck		1	
Forearm		1	
Variable	Iontophoresis (n=16)	EMLA (n=16)	p-value
4. Tumor size (mm)			
Diameter (mean SD)	5.25±2.18	5.13±2.06	0.333
Thickness (mean SD)	1.69±0.48	1.69±0.48	-

Table 2. Patient VAS pain ratings and Patient satisfaction scale ratings

Variable	Iontophoresis (n=16)	EMLA (n=16)	p-value
1. 100-mm VAS (mean SD)	13.69±15.86	13.81±17.41	0.968
2. 1-5 satisfaction scale: median (interquartile range)	5 (5-5)	4 (3-4.75)	0.005*

* p-value<0.05, 100-mm VAS test by paired t test, 1-5 satisfaction scale test by Wilcoxon sign rank test

Table 3. Adverse effects during the interventions : Assessed by the patients

Adverse effects (0-5 scale)	Iontophoresis (n=16)	EMLA (n=16)
1. Itching	0	0
2. Tingling		
very low level (1 score)	2 (12.5%)	0
low level (2 score)	1 (6.2%)	0
3. Discomfort		
very low level (1 score)	1 (6.2%)	0
Total	4 (25%)	0

assessed by the patients ($p=0.968$). There were significantly higher satisfaction scores (a 0-5 scale) in the iontophoretic group than the EMLA group ($p=0.005$). (Table 2)

Fifteen patients (93.8%) preferred iontophoresis, none preferred EMLA cream, and one (6.2%) had no preference for the intervention to provide dermal analgesia. Adverse effects included tingling and discomfort in 4 of 16 patients in the iontophoretic group, but limited to low and very low level (Table 3). No severe adverse events and side effects were noted during the study period.

Discussion

The present study has demonstrated similar pain scores during CO₂ laser surgery in seborrheic keratosis patients receiving EMLA or iontophoresis for dermal analgesia. This is in keeping with previous studies in adults and children in which iontophoresis compared favorably as a safe noninvasive alternative to subcutaneous lidocaine for dermatologic procedures⁽¹¹⁾ and as a more rapid-acting and reliable alternative to EMLA in adults.⁽¹²⁾ Lidocaine iontophoresis can be effectively used in adults for dermal analgesia during many dermatologic procedures⁽¹³⁻¹⁵⁾.

The present study confirms the previous results of Galinkin et al⁽¹⁶⁾ that iontophoresis is an effective alternative to EMLA. The present study differs from other previous studies because the authors used CO₂ laser surgery of seborrheic keratosis as a dermatologic procedure and used the same patient to evaluate the pain intensity during surgery, so that each patient could serve as his or her own control. Lidocaine iontophoresis takes less time to establish dermal analgesia than EMLA, a major advantage in busy ambulatory surgery centers. It has also been reported to be associated with a deeper penetration of the skin⁽¹⁷⁾ and can ameliorate pain associated with the injection of hyperosmolar saline and propofol^(12,18).

Other studies have noted that some patients would not tolerate the tingling and burning sensations^(16,19). However, in the present study all the patients tolerated these side effects, which may be due to lower electric currents and shorter duration of iontophoresis.

The inability to anesthetize more than one site at the same time with iontophoresis can be a limiting factor⁽²⁰⁾. In contrast, EMLA can be applied to more than one site simultaneously, allowing for dermatologic procedures of multiple skin lesions. There are data to suggest that amethocaine gel and ELA-Max can establish dermal analgesia faster than EMLA^(6,7). Unfortunately, these preparations are not available in Thailand.

In conclusion, the present study has demonstrated that lidocaine iontophoresis provides the effective pain relief for CO₂ laser surgery of seborrheic keratosis as well as the EMLA cream. The effect is as fast as 10 min after application. There is no significant side effect. Most of the patients were satisfied. Lidocaine iontophoresis should be a choice of noninvasive local anesthesia for CO₂ laser surgery of superficial skin lesions, especially when there is limited time available to establish dermal analgesia.

References

- Gajraj NM, Pennant JH, Watcha MF. Eutectic mixture of local anesthetics (EMLA) cream. *Anesth Analg* 1994; 78: 574-83.
- Ashinoff R, Geronemus RG. Effect of the topical anesthetic EMLA on the efficacy of pulsed dye laser treatment of port-wine stains. *J Dermatol Surg Oncol* 1990; 16: 1008-11.
- Tan OT, Stafford TJ. EMLA for laser treatment of portwine stains in children. *Lasers Surg Med* 1992; 12: 543-8.
- Koren G. Use of eutectic mixture of local anesthetics in young children for procedure related pain. *J Pediatr* 1993; 122: S30-5.
- Lender J, Hodgins M, Nazarali S, et al. Determinants of success and failure of EMLA. *Pain* 1996; 64: 89-97.
- Eichenfield LF, Funk A, Fallon-Friedlander S, Cunningham BB. A clinical study to evaluate the efficacy of ELA-Max (4% liposomal lidocaine) as compared with eutectic mixture of local anesthetics cream for pain reduction of venipuncture in children. *Pediatrics* 2002; 109: 1093-9.
- Lawson RA, Smart NG, Gudgeon AC, Morton NS. Evaluation of an amethocaine gel preparation for percutaneous analgesia before venous cannulation in children. *Br J Anaesth* 1995.
- Koppel RA, Coleman KM, Coleman WP. The efficacy of EMLA versus ELA-Max for pain relief in medium-depth chemical peeling: a clinical and histopathologic evaluation. *Dermatol Surg* 2000; 26: 61-4.
- Zempsky WT, Ashburn MA. Iontophoresis: noninvasive drug delivery. *Am J Anesthesiol* 1998; 25: 158-62.
- Li LC, Scudds RA. Iontophoresis: an overview of the mechanisms and clinical application. *Arthritis Care Res* 1995; 8: 51-61.

11. Russo JJ, Lipman AG, Comstock TJ, et al. Lidocaine anesthesia : comparison of iontophoresis, injection, and swabbing. Am J Hosp Pharm 1980; 37: 843-7.
12. Irsfeld S, Klement W, Lipfert P. Dermal anaesthesia: comparison of EMLA cream with iontophoretic local anaesthesia. Br J Anaesth 1993; 71: 375-8.
13. William T. Zempsky, Thomas M. Parkinson. Lidocaine iontophoresis for local anesthesia before shave biopsy. Dermatol Surg 2003; 29: 627-30.
14. Maloney JM. Local anaesthesia obtained via iontophoresis as an aid to shave biopsy. Arch Dermatol 1992; 128: 331-2.
15. Maloney JM, Bezzant JL, Stephen RL, Petelenz TJ. Iontophoretic administration of lidocaine anesthesia in office practice. An appraisal. J Dermatol Surg Oncol 1992; 18: 937-40.
16. Galinkin JL, Rose JB, Harris K, Watcha MF. Lidocaine iontophoresis versus eutectic mixture of local anesthetics (EMLA) for IV placement in children. Anesth Analg 2002; 94: 1484-8.
17. Greenbaum SS, Bernstein EF. Comparison of iontophoresis of lidocaine with a eutectic mixture of lidocaine and prilocaine (EMLA) for topically administered local anesthesia. J Dermatol Surg Oncol 1994; 20: 579-83.
18. Sadler PJ, Thompson HM, Maslowski P, Liddle A, Rowbotham DJ. Iontophoretically applied lidocaine reduces pain on propofol injection. Br J Anaesth 1999; 82: 432-4.
19. Zeltzer L, Regalado M, Nichter LS, Barton D, Jennings S, Pitt L. Iontophoresis versus subcutaneous injection: a comparison of two methods of local anesthesia delivery in children. Pain 1991; 44: 73-8.
20. Kim MK, Kini NM, Troshynskin TJ, Hennes HM. A randomized clinical trial of dermal anesthesia by iontophoresis for peripheral intravenous catheter placement in children. Ann Emerg Med 1999; 33: 395-9.

การเปรียบเทียบผลของลิโดเคนไอออนโตไฟเรซิสกับเอมลา ต่ออัตราชนิดความเจ็บปวดในการผ่าตัดเซบอเรอิกเคอราโตซิสด้วยคาร์บอนไดออกไซด์เลเซอร์

รศญา พหลเทพ, วัฒนศรี สินธุภัก, ปิ่น ศรีประจิดติชัย

ความสำคัญและที่มาของการวิจัย: การใช้ยาเฉพาะที่ชนิดทาสำหรับการผ่าตัดเนื้องอกผิวหนังชนิดตื้นมีการใช้กันแพร่หลายมานานแล้ว มียาหลายชนิดให้เลือกใช้ โดยปัจจุบันเอมลาเป็นยาที่นิยมใช้กันมากที่สุด

วัตถุประสงค์ในการวิจัย: เพื่อเปรียบเทียบประสิทธิภาพในการลดความเจ็บปวดระหว่างลิโดเคนไอออนโตไฟเรซิสกับเอมลา โดยทำการทดลองในคนคนเดียว

วิธีการทำวิจัย: ทำการศึกษาทดลองในผู้ป่วยทั้งหมด 16 คน ซึ่งได้รับการวินิจฉัยว่าเป็นเซบอเรอิกเคอราโตซิส และต้องการผ่าตัดรักษาโดยวิธีคาร์บอนไดออกไซด์เลเซอร์ โดยจะเลือกก่อนเนื้องอกสองก้อนที่มีขนาดเส้นผ่าศูนย์กลาง และความหนาใกล้เคียงกัน และอยู่คนละด้านซ้ายขวาของร่างกายบนอวัยวะเดียวกันมาทำการทดลองเปรียบเทียบกันโดยก่อนหนึ่งใช้วิธีลิโดเคนไอออนโตไฟเรซิสนาน 10 นาที ส่วนอีกก้อนหนึ่งใช้วิธีเอมลานาน 60 นาที หลังจากนั้นจะทำการผ่าตัดด้วยวิธีคาร์บอนไดออกไซด์เลเซอร์ หลังการผ่าตัดแต่ละครั้งจะให้ผู้ป่วยประเมินความเจ็บปวดจากการผ่าตัดโดยใช้ 100-mm VASเป็นเครื่องมือวัดความเจ็บปวด และนอกจากนี้จะประเมินความพึงพอใจของผู้ป่วยในแต่ละวิธีด้วย

ผลการวิจัย: พบว่าประสิทธิภาพในการลดความเจ็บปวดที่วัดจากอัตราชนิดความเจ็บปวดระหว่างสองวิธีไม่มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ ($p\text{-value}=0.968$) แต่พบว่าผู้ป่วยมีความพึงพอใจในวิธีลิโดเคนไอออนโตไฟเรซิสมากกว่าวิธีเอมลาอย่างมีนัยสำคัญทางสถิติ ($p\text{-value}=0.005$) โดยมีผู้ป่วย 15 คนคิดเป็น 93.8% เลือกที่จะใช้วิธีลิโดเคนไอออนโตไฟเรซิสในการผ่าตัดครั้งต่อไป และไม่พบว่ามีผลข้างเคียงที่ร้ายแรงใด ๆ เกิดขึ้นระหว่างทำการทดลองทั้งสองวิธี

สรุปผลการวิจัย: ลิโดเคนไอออนโตไฟเรซิสมีประสิทธิภาพในการลดความเจ็บปวดไม่ต่างจากเอมลา ในการผ่าตัดเซบอเรอิกเคอราโตซิสด้วยวิธีคาร์บอนไดออกไซด์เลเซอร์ โดยวิธีลิโดเคนไอออนโตไฟเรซิสใช้เวลาเพียง 10 นาทีเท่านั้น และไม่พบว่ามีผลข้างเคียงที่ร้ายแรง ผู้ป่วยส่วนใหญ่มีความพึงพอใจในวิธีนี้ ลิโดเคนไอออนโตไฟเรซิสจึงเป็นอีกทางเลือกหนึ่งที่น่ามาใช้ลดความเจ็บปวดในการผ่าตัดเนื้องอกผิวหนังชนิดตื้นด้วยคาร์บอนไดออกไซด์เลเซอร์