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# Percutaneous Anaesthesia with a Lidocaine-Prilocaine Cream (EMLA®) for Cutting Split-Skin Grafts

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**Summary.** Percutaneous anaesthesia induced by a lidocaine/prilocaine cream (EMLA®) applied to the donor area for 1 to 8 h enabled split-skin grafts to be harvested without supplementary analgesia in 72 out of 83 patients (87%). The pain during cutting of the graft was rated as either none or slight by 60 patients, as moderate by 16 and as severe by 6 of the patients. The results suggest that the best analgesic effect is obtained if the graft is cut within five hours of the cream being applied. No adverse influence on the viability of the graft or on the healing of the donor site was observed. Topical anaesthesia with EMLA cream is useful for harvesting split-skin grafts and is now used routinely at this clinic.

**Key words:** Percutaneous anaesthesia – Lidocaine/prilocaine cream – Split-skin graft

Analgesia in the cutting of split-skin grafts may be achieved by infiltration of local anaesthetics. A disadvantage of infiltration anaesthesia is that patients often find the injections uncomfortable or painful especially when large areas are to be anaesthetized. Percutaneous anaesthesia is of benefit in this respect and has previously been used by Pettersson [7]. A new lidocaine/prilocaine cream (EMLA®, Eutectic Mixture of Local Anaesthetics) has been used for the cutting of split-skin grafts with encouraging results [5]. Since plasma concentrations of both lidocaine and prilocaine have been found to be low after percutaneous application of EMLA cream [2, 5], its potential use in high risk patients is promising in order to avoid general anaesthesia, regional anaesthesia and the injection of large doses of local anaesthetics.

We report our experience of EMLA cream used for anaesthesia for the harvesting of split-skin grafts in a prospective study. The study was approved by the Ethical Committee of St. Erik's Hospital, Stockholm.

## Patients

Eighty-three Caucasian patients, 39 men and 44 women aged 17 to 96 years (mean 63), scheduled for the cutting of split-skin grafts or dermabrasion were included in the trial. Twenty-two patients were older than 80 years. The patients were informed about the nature of the trial and gave their written consent to participate in accordance with the recommendations of the Helsinki Declaration.

The reasons for split-skin grafting in the various patients were granulating skin defects in 54 cases and excised neoplasms in 27 cases. In addition, 2 patients with dermabrasion were included. Thirty-three of the 70 patients evaluated regarding healing of the donor area and 'take' of the graft had concomitant diseases which might influence healing (Table 1).

## Material and Methods

### *Anaesthetic and Surgical Procedure*

The site and size of the donor area was marked on the skin by the surgeon. At the time of routine premedication 1–2 h prior to surgery a thick layer of EMLA cream[1] was applied to the donor area by a nurse. The site was then covered with a plastic wrap (Glad®, Union Carbide) which was taped to the skin to form an occlusive dressing. An elastic bandage was then loosely applied to provide an even layer of cream and to protect the area. The patients remained in bed after the application to prevent dislodgement of the bandage.

Seventy-three of the patients were premedicated, either with diazepam 5–10 mg (29 patients), pethidine 25–100 mg (28)

[1] Astra, containing lidocaine 25 mg and prilocaine 25 mg per g

**Table 1.** Concomitant diseases capable of influencing healing among 70 evaluated patients

| | |
|---|---|
| Arterial insufficiency | 10 |
| Venous insufficiency | 6 |
| Rheumatoid arthritis | 7 |
| Diabetes | 7 |
| Anaemia | 1 |
| Asthma (cortisone medication) | 1 |
| Psychogenic pruritus | 1 |
| Total | 33 |

**Table 2.** Anaesthetic cream application and surgical details of the donor areas

| | Mean | Range |
|---|---|---|
| Area applied with cream ($cm^2$) | 147 | (16–420) |
| Application time (h/min) | 3.24 | (1.15–8.15) |
| Dermatome setting (mm) | 0.52 | (0.43–0.73) |
| (1/1000 inch) | 20.8 | (17–29) |
| Size of graft ($cm^2$) | 85.6 | (9–300) |

or morphine and scopolamine 5–15 + 0.2–0.6 mg (16). After a minimum application time of 60 min the cream was removed and the skin examined for any local reactions. After disinfection with 0.5% chlorhexidine-gluconate in 70% alcohol the split-skin graft was cut and the patient asked to assess the pain.

The graft was cut with a Brown electrodermatome preset to a thickness of 17–29/1000 inch. Donor sites were the thigh (68), arm (12) and buttock (3). The donor site wound was covered with a sterile dressing (Opsite® or Tegaderm®). The operations were performed by several surgeons. Data regarding the donor areas is presented in Table 2.

### *Evaluations*

Before the operation the patient was asked about any discomfort, particularly smarting pain and itching, caused by the applied cream and bandage. Local reactions such as oedema, redness or paleness were recorded by the surgeon and rated on a four-point scale as none, slight, moderate or severe. The patient rated the pain experienced during the cutting of the graft as none, slight, moderate or severe. The use of supplementary analgesia was recorded.

Sub-group analyses of differences in pain were performed with the Mann-Whitney test with variances corrected for ties where appropriate.

The surgeon judged the practical usefulness of the topical anaesthetic technique as: excellent, satisfactory, barely satisfactory or unsatisfactory.

### *Healing*

In the 70 patients evaluated for healing of the donor site and graft, the graft was applied to excised wound areas in 20 patients and to granulating areas in 48. In two patients the dermatome was used for removal of tattoos without grafting. The graft was meshed in 38 cases.

The 'take' of the graft one week after surgery was assessed on the following rating scale: 100% of the size of the graft, less than 100% but more than 75%, 75% to 50% or less than 50%. Healing of the donor area within two, three – four or five weeks was also recorded.

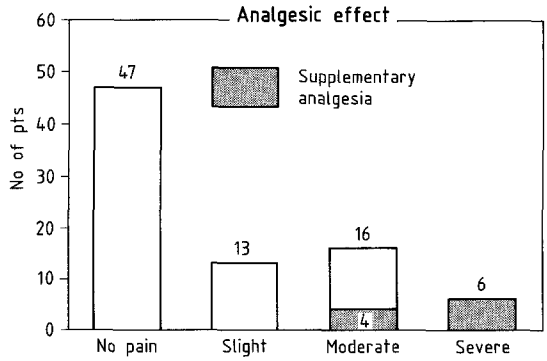


**Fig. 1.** The patients' ratings of the pain. The graft was cut without supplementary analgesia in 72 out of 83 patients. One patient was given additional analgesia before the cut and hence no pain evaluation was made

## Results

### *Analgesic Effect*

The split-skin graft was cut without the need for additional analgesia in 72 out of the 83 patients (86.7%). One patient requested supplementary anaesthesia before the cut as he had no analgesia when tested by pin prick or pinching with a forceps, and hence no evaluation of pain was made. Sixty of the 83 patients reported either no or slight pain during the procedure (Fig. 1). The surgeons' evaluation of usefulness was in accordance with the patients' rating of the pain; excellent 46, satisfactory 17, barely satisfactory 13 and unsatisfactory in 7 patients.

The results suggest that the analgesic efficacy is dependent on the application time; the frequency of no or slight pain was 64% in patients operated on less than two hours after application, 75–84% in patients operated on after 2–5 h and 50% in patients operated on after more than five hours ($p = 0.10$, 2–5 h vs 5–). There was no difference in analgesic effect when comparing patients above and below 80 years of age ($p = 0.47$). Neither was there any difference in pain assessment between patients given diazepam as premedication and those given morphine or pethidine ($p = 0.31$).

### *Local Reactions*

Five patients (6.0%) reported transient "smarting pain". No patient reported itching or other reactions. The frequencies of paleness, redness and oedema are listed in Table 3. There were no severe reactions.

**Table 3.** Frequency and severity of local reactions after treatment with EMLA cream for 1 to 8 h

| Reaction | Severity | |
|---|---|---|
| | Slight | Moderate |
| Paleness | 15/80 | 2/80 |
| Redness | 26/80 | 13/80 |
| Oedema | 5/80 | |

**Table 4.** "Take" of the graft one week after surgery in percent of graft size

| [%] | No. of patients |
|---|---|
| 100 | 38 |
| 99–76 | 16 |
| 75–50 | 4 |
| <50 | 10 |
| Dermabrasion | 2 |
| Total | 70 |

**Table 5.** The number of weeks required for healing of the donor site

| Weeks | No. of patients |
|---|---|
| 2 | 6 |
| 3–4 | 31 |
| 5 | 25 |
| >5 | 6 |
| No data | 2 |
| Total | 70 |

*Healing*

In 38 patients the 'take' of the graft was complete one week after surgery. Most donor wounds healed within five weeks (Tables 4, 5).

## Discussion

Our results show that percutaneous anaesthesia with EMLA cream is a useful alternative method of anaesthesia for harvesting split-skin grafts. A considerable advantage of this method is the painless administration of the local anaesthetic. If the analgesia in some patients is inadequate, supplementary local anaesthetic infiltration is likely to be less painful than normal since the area has already been, at least partly, anaesthetized.

Ohlsén et al. (1985) reported a higher degree of analgesic efficacy in their study. Among 146 patients pretreated with EMLA only three required additional analgesia [5]. An explanation for the difference in results may be that they used thinner grafts, between 0.30 mm (12/1000 inch) and 0.53 mm (21/1000 inch).

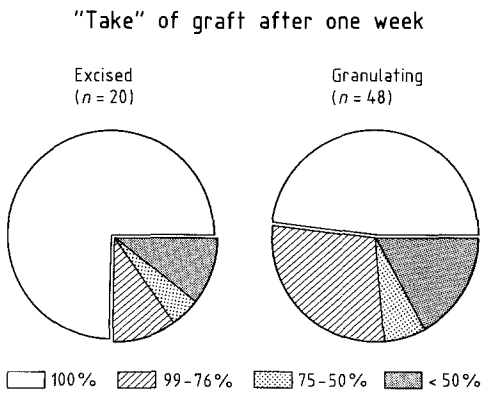


**Fig. 2.** "Take" of graft after one week in excised and granulating wounds

The dose of EMLA used in the two studies was 'a thick layer of cream', but the actual amount was not subject to investigation. In a subsequent trial a dose of 15 g EMLA per 100 $cm^2$ was found to be sufficient for the cutting of split-skin grafts [4].

The previous investigators found that moderate or severe pain occurred more frequently among patients where the cream had been applied for three hours or more, compared to shorter application times [5]. A comparison of analgesic efficacy between patients with different application times in the present trial showed that the analgesic effect tended to decrease with application times exceeding five hours. This is in accordance with new data from experimental studies where the time-response of EMLA was tested with needle-insertion in volunteers; the duration of dermal analgesia was found to be decreasing at the longest application time, 360 min. The analgesia improved with application time from 30 min to 120 min [1]. Pooled data from the present and two previous clinical studies, comprising altogether 253 patients, also suggests that 2–5 h treatment with EMLA results in the most effective analgesia [4]. It should be observed that when removing the cream earlier than 120 min from the application, a further improvement of analgesia with time occurs up to about two hours [1]. This fact may be due to the reservoir effect of the stratum corneum [8].

Ohlsén et al. (1985) suggested that cutting grafts from the upper arm may cause more pain than cutting from the thigh, where the pain receptors are more sparse [5]. However, ten out of eleven

grafts cut from the upper arm in this trial did not cause any pain. The percutaneous absorption of the local anaesthetics on the inside of the upper arm may be faster than on the thigh.

The local reactions were of no clinical significance. No adverse influence on the 'take' of the grafts or on healing of the donor area was observed compared to our previous experience with other methods of anaesthesia at this clinic. The "take" of the graft was better in the excised wounds than in the granulating wounds (Fig. 2). This is not surprising as the granulating area is more likely to be infected.

EMLA cream has also been used for anaesthesia for other superficial procedures such as epidermal surgery, dermabrasion and skin biopsy [3]. The cream also alleviates the pain arising from the insertion of an i.v. cannula or venipuncture in children [6, 9].

In conclusion, percutaneous anaesthesia with EMLA cream is useful for the harvesting of split-skin grafts. The results suggest that the best analgesic efficacy will be obtained if the graft is cut within five hours of the cream being applied. The technique is now used routinely at this clinic.

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