COMPARISON OF THE EFFECT OF EMLA CREAM, SUBCUTANEOUS RING ANAESTHESIA AND A DOUBLE CUFF TECHNIQUE IN THE PREVENTION OF TOURNIQUET PAIN

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SUMMARY

We have examined the effect of EMLA on tourniquet pain and compared it with those of subcutaneous ring anaesthesia (SRA), a double cuff technique and a single cuff (control) during i.v. regional anaesthesia. The durations of analgesia (mean 57.3 (SD 16.6) min) and tolerance (72.3 (13.9) min) to tourniquet inflation in the EMLA group were comparable to those in the SRA group (54.1(16.2) min and 68.3(19.0) min), but significantly (P < 0.05) greater than those in the control group (30.0 (10.7) min and 45.6 (14.0) min). The double cuff technique was the most effective method, with 91.5 (14.9) min duration of analgesia. We conclude that EMLA provided a significant analgesic effect on tourniquet pain compared with the control group, but a relatively limited analgesic effect compared with a double cuff technique. (Br. J. Anaesth. 1993; 70: 394–396)

KEY WORDS


I.v. regional anaesthesia (IVRA) is a useful and safe block for analgesia of the extremities. Nevertheless, analgesia at the site of the tourniquet is not achieved as easily as that at the operative site and various methods have been described to relieve tourniquet pain [1–5]. EMLA (Astra), a 5% eutectic mixture of two local anaesthetics, lignocaine and prilocaine, has been shown to be effective in producing local anaesthesia of intact skin in infants, children and adults [6–11]. The purpose of this study was to evaluate the effect of EMLA in the prevention of tourniquet pain, and compare it with subcutaneous ring anaesthesia (SRA), a double cuff technique and a standard technique (control).

PATIENTS AND METHODS

This study was performed in a randomized, single-blind, controlled manner and was approved by the local Ethics Committee. Informed consent was obtained from each patient. Forty adult patients (ASA physical status I or II) undergoing elective forearm or hand surgery were allocated randomly to four groups of 10. No premedication was given. With the patient supine, an i.v. cannula was placed in a vein on the dorsum of the hand or distal forearm of the limb to be blocked. The tourniquet, 6.5 cm in width, was applied midway between axilla and elbow over a cushioning layer of orthopaedic padding. Before IVRA, patients in group 1 received topically applied 5% EMLA cream 30–35 g circumferentially over the site of the tourniquet, then an occlusive plastic dressing was positioned for 1 h. Patients in group 2 received SRA with 1% lignocaine 20 ml, using a 22-gauge, 70-mm long needle at the site of tourniquet just before the single pneumatic tourniquet cuff was applied; the total dose of lignocaine combined with that used in IVRA was 400 mg. Double tourniquet cuffs (6 cm wide) were used in group 3 patients, without EMLA or SRA. The proximal cuff was inflated to 250 mm Hg after the arm was exsanguinated with an Esmarch bandage. The distal cuff was inflated and the proximal cuff released 30 min after i.v. injection of lignocaine. Patients in group 4 (control group) received placebo cream (a cream base containing no local anaesthetic) over the site of tourniquet, using the same procedure as in group 1. For each patient, the arm was exsanguinated by applying an Esmarch bandage from the finger tips to the tourniquet site. The cuff was inflated to 250 mm Hg. When satisfactory ischaemic conditions were obtained, the solution of 0.5% lignocaine 40 ml was injected.

The duration of tourniquet analgesia was defined as the time between application of tourniquet pressure and complaint of tolerable pain or soreness over the tourniquet site. The duration of tourniquet tolerance was defined as the time between application of tourniquet pressure and complaint of intolerable pain or discomfort that required additional analgesia.

Data were analysed by Kruskal–Wallis test with Dunn procedure. P less than 0.05 was considered statistically significant.

RESULTS

Patient characteristics are shown in table 1. The duration of analgesia to tourniquet inflation was regarded as the same as the duration of operation (which lasted longer than 90 min) if the patient still...
had no complaint about the tourniquet site. The mean duration of analgesia to tourniquet inflation in the double cuff group was 91.5 (SD 14.9) min, which was significantly longer than that in the SRA, EMLA or control groups (P < 0.05) (Table II). The mean duration of analgesia to tourniquet inflation in the EMLA group was 57.3 (16.6) min, comparable to that in the SRA group (54.1 (16.2) min) (P < 0.05 compared with the control group (30.0 (10.7) min). The duration of tolerance to tourniquet inflation in the double cuff group could not be evaluated for lack of data in eight of 10 patients because surgery ended before occurrence of intolerable symptoms. The mean duration of tolerance to tourniquet inflation in the EMLA group was 57.3 (13.9) min, was not significantly different from that in the SRA group (68.3 (19.0) min), but was significantly longer (P < 0.05) compared with the control group (45.6 (14.0) min).

DISCUSSION

To avoid subjectively reminding patients about their tourniquet pain, we did not evaluate pain scores at fixed intervals, but for practical purposes, we selected two points to evaluate pain, the duration of tourniquet analgesia and duration of tourniquet tolerance. These two points were equivalent to each end of a visual analogue scale (perceptible and intolerable). Our study indicated that the duration of tourniquet analgesia and duration of tourniquet tolerance in the EMLA group were significantly longer compared with the control group. Lowrie, Jones and Eastley [12], studying 10 healthy male volunteers, found a significantly longer duration and tolerance in the EMLA group compared with the SRA group. The duration of analgesia to tourniquet inflation in the double cuff group was 91.5 min, which was significantly longer than that in the SRA, EMLA or control groups (P < 0.05; Table II). The mean duration of analgesia to tourniquet inflation in the EMLA group was 57.3 min, comparable to that in the SRA group (54.1 min) (P < 0.05 compared with the control group (30.0 min)). The duration of tolerance to tourniquet inflation in the double cuff group was 57.3 min, which was significantly longer than that in the SRA, EMLA or control groups (P < 0.05). The mean duration of tolerance to tourniquet inflation in the EMLA group was 57.3 (16.6) min, comparable to that in the SRA group (54.1 (16.2) min) (P < 0.05 compared with the control group (30.0 (10.7) min). The duration of tolerance to tourniquet inflation in the EMLA group was 57.3 (16.6) min, comparable to that in the SRA group (54.1 (16.2) min) (P < 0.05 compared with the control group (30.0 (10.7) min). The mean duration of tolerance to tourniquet inflation in the EMLA group was 57.3 (16.6) min, comparable to that in the SRA group (54.1 (16.2) min) (P < 0.05 compared with the control group (30.0 (10.7) min).
The double cuff technique prevents tourniquet pain by the same mechanism as that of IVRA. The site of action of IVRA is controversial, but is explained best by multiple and complementary mechanisms [22-24]. With 0.5% lignocaine 40 ml in IVRA, the double cuff tourniquet can provide more reliable anaesthesia at the tourniquet site.

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REFERENCES