Tetracaine gel vs EMLA cream for percutaneous anaesthesia in children

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We have evaluated the anaesthetic effect of tetracaine gel 1 g, applied for 45 min, compared with EMLA cream 2 g, applied for 60 min, in a randomized, double-blind study in 60 children aged 3–15 yr. Venous cannulation was performed 15 min after removal of the EMLA cream (n=20) and tetracaine gel (n=20). Cannulation was performed up to 215 min after removal of the tetracaine gel in another 20 patients. Significantly lower pain scores were recorded by the children treated with tetracaine gel compared with EMLA cream (P<0.02). Forty to 45% of children in the tetracaine groups reported no pain compared with only 10% in the EMLA group. Only minor adverse effects were observed. We conclude that tetracaine gel provided effective, rapid, long-lasting and safe local anaesthesia, and was significantly better than EMLA cream in reducing pain during venous cannulation in children using the recommended application periods for both formulations.

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EMLA cream requires a minimum application time of 60 min under occlusive bandage and has an average duration of action of 30–60 min.1,2 It also has a vasoconstrictor effect which can make it difficult to identify the minor veins of the dorsum of the hand. Tetracaine gel is applied under occlusive bandage for only 45 min before venous cannulation and anaesthesia remains for 4–6 h after a single application. Tetracaine has vasodilatory effects which can make the small veins on the dorsum of the hand more prominent.

Two previous studies have compared the efficacy of tetracaine gel and EMLA cream in alleviating the pain of venous cannulation in children but the studies did not use the recommended application times for the formulations.3,4

The aim of our study was to compare the anaesthetic effect of tetracaine gel 1 g (applied for 45 min) with EMLA cream 2 g (applied for 60 min), 15 min after removal of the formulations. We also evaluated the anaesthetic effect of tetracaine gel 1 g applied for 45 min, more than 15 min after removal of the gel.

Methods and results

We studied 60 children, aged 3–15 yr, undergoing surgery under general anaesthesia. Approval was given by the Regional Ethics Committee and written informed parental consent and verbal child assent were obtained. Patients were excluded if they had a known hypersensitivity to local anaesthetics. A randomized, double-blind design was used. Patients received either no premedication or were premedicated 30–60 min before surgery with midazolam 0.3 mg kg−1 rectally for children less than 30 kg, or diazepam 0.2 mg kg−1 orally for children more than 30 kg. Patients were allocated randomly to one of three groups: group T had tetracaine gel 1 g applied for 45 min followed by venous cannulation 15 min after removal of the gel; group E had EMLA cream 2 g applied for 60 min and venous cannulation 15 min after removal of the cream; and group T>15 had tetracaine gel 1 g applied for 45 min and venous cannulation more than 15 min after removal of the gel. The local anaesthetic was applied on the dorsum of the hand under an occlusive dressing (OpSite Flexigrid, 6.5 cm×5 cm). The nursing staff applied and removed the preparations so that the investigators were blinded to the treatment groups. After removal of the preparations, the area of skin used was assessed for erythema, oedema, itching or any other adverse reaction.

All children had a parent present during cannulation. The same anaesthetist performed cannulation of a dorsal hand vein underlyng the treated area using a 22-gauge cannula.
Assessment of pain during cannulation was made by the children using the Poker Chip Tool (PCT), a validated instrument designed to measure children’s (3–15 yr) self-report of pain intensity. The PCT uses four red chips to quantify pain. During the preoperative visit all children were instructed on how to use the PCT and the same investigator supervised all assessments of pain. The anaesthetist evaluated how easy it was to perform the cannulation according to a four-point scale: easier than usual, as usual, more difficult than usual or impossible.

The Mann–Whitney rank sum test was used to evaluate the difference in pain scores between groups. Statistical significance was defined as P<0.05.

There were no significant differences in patient characteristics between groups. Group T had tetracaine gel applied for a mean time of 46.5 (SD 5.6) min, group E had EMLA cream applied for 60.4 (1.7) min, and group T>15 had tetracaine gel applied for 48.9 (7.9) min. Mean time between removal of the preparation and cannulation was 19.1 (5.7) min for group T, 22.2 (6.9) min for group E and 98.4 (70.7) min for group T>15.

Median pain score in the tetracaine groups was 1 (inter-quartile range 0–1) and in the EMLA group 1 (1–1.75). Pain scores in the tetracaine groups were significantly lower than those in the EMLA group (P<0.02).

Forty-five percent of children in group T, 10% in group E and 40% in group T>15 experienced no pain (PCT pain score=0) on venous cannulation (Fig. 1). Eighty-five to 90% of children in the tetracaine groups experienced acceptable analgesia (PCT pain score=0–1) compared with 75% in the EMLA group. There were no significant differences in pain scores within each group between those children who were premedicated before venous cannulation and those who were not.

Evaluation of the ease of cannulation showed no differences between groups. No oedema or itching was observed in any patient and erythema was noted in only four patients in group T and in one patient in group T>15.

Comment

The results of our study indicate that tetracaine gel was significantly better than EMLA cream in reducing pain during cannulation in children using the recommended application periods for both formulations. Tetracaine gel also appeared to have a prolonged duration of action as it was significantly better than EMLA cream in group T>15 (mean time to cannulation 98 min). Clinically acceptable anaesthesia was, however, achieved in a high proportion of children in all three groups.

We found that premedication did not influence pain perception during cannulation and this was reported in another study in children (aged 4–17 yr). However, Hopkins, Buckley and Bush showed that younger children (aged 1–5 yr) who were premedicated had significantly lower pain scores compared with others. We did not find that the technical ease of cannulation was affected by either tetracaine gel or EMLA cream. Ease of cannulation was related to intersubject variability, such as repeated blood sampling from the same vein or obesity, rather than the action of tetracaine or EMLA cream on vessels. There were no significant adverse effects of each treatment.

We conclude that tetracaine gel provided effective, rapid, long lasting and safe percutaneous local anaesthesia. The shorter onset and prolonged action times of tetracaine gel represent considerable advantages.

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References