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Topical Analgesia for Relief of Post-circumcision Pain

THARA TREE-TRAKARN, M.D.,* SANGSOM PIRAYAVARAPORN, M.D.,† JARIYA LERTAKYAMANEE, M.D.

Circumcision usually is followed by pain. Several techniques of pain relief, including blockade of the dorsal nerve of penis,[1–5] caudal block,[6–11] and narcotic administration[12–13] have been reported. Our previous study[14] showed that a single application of topical lidocaine on the wound at the end of the operation was as effective as the blockade of the dorsal nerve of penis or the intramuscular administration of morphine in reducing the postoperative pain. Topical analgesia is simple and safe. It can be repeated in the later postoperative period by either the child or his parents. All the previous studies dealt with pain in children in the early postoperative course. The management of pain and tenderness during the whole postoperative period has not been reported. The purpose of this study is to investigate the natural course of the post-circumcision pain and tenderness, in children as well as adults, and to evaluate the efficacy of repeated application of lidocaine jelly in obviating their suffering from recovery room to the seventh postoperative day.

MATERIALS AND METHODS

Seventy-nine healthy, unpremedicated men (17–65 yr) and boys (3–12 yr), scheduled for elective outpatient circumcision procedure, were studied according to a protocol approved by our institutional review board. After obtaining informed consent from the patient or parent, the patients were randomly assigned to one of four treatment groups: 1) children-placebo (CP), 2) children-lidocaine (CL), 3) adult-placebo (AP), and 4) adult-lidocaine (AL). Neither the investigators, surgeons, nurses, nor patients (or parents) knew whether the patients were assigned to the placebo or lidocaine treatment groups.

For all children, general anesthesia consisting of halothane 1–1.5% and nitrous oxide 60–70% in oxygen was administered *via* a face mask using a Jackson-Rees modified T-piece system. For all adult patients, only regional anesthesia by blocking the dorsal nerve of the penis with 1% plain lidocaine was used. No premedication nor supplement drug was given to any patient. The circumcision procedure was performed using a standard surgical technique[15] by various surgical staffs or residents. At the end of the operation, surgeons were asked to apply a thin film of jelly (1–2 ml) on the wound and request that the patient wait at least 5–10 min before dressing. The same 10 ml tube of jelly was given to the patient or his parents, who were instructed to apply it over the wound four times a day. The coded tube contained either 2% lidocaine jelly or placebo in identical jelly base. The code was kept secret and would be revealed at the end of the study for data analysis. Acetaminophen syrup or tablet was given to the patients. They were instructed to take the oral analgesic drug only when needed for pain involving the external genitalia.

The duration of the operation and recovery room stay were recorded. The children were kept in the recovery room until they were fully awake and then were allowed to return home. The nurse recorded the time the child started to complain or cry of pain. The pain score in the recovery room was recorded before discharge using a modified visual analogue scale. If children were discharged before having pain, their parents were instructed to record the time of the onset of pain. The adult patients were asked to record the time that pain started. The time from the end of the operation to the start of pain was defined as the pain-free period.

A modified visual analogue scale (MVAS) was used to evaluate pain and tenderness scores (fig. 1). The patients were told to record "pain score" by evaluating the painful sensation existing when they were at rest, and to record "tenderness score" by evaluating the painful sensation occurring with stimulation of wound, *i.e.*, when walking or when the penis was rubbed by their clothes. A score of zero was defined as no pain or

* Associate Professor.
† Assistant Professor.

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Address reprint requests to Dr. Tree-trakarn: Department of Anaesthesiology, Faculty of Medicine, Siraraj Hospital, Mahidol University, Bangkok 10700, Thailand.

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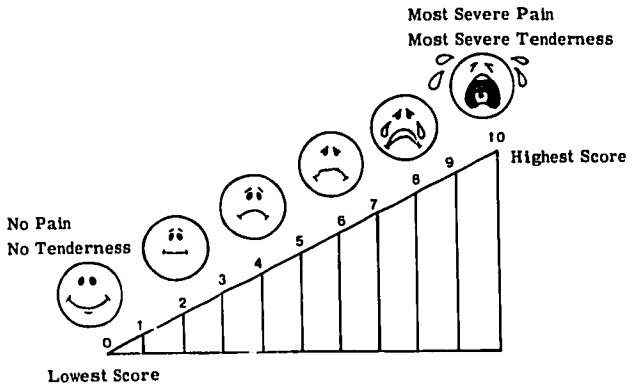

FIG. 1. Modified visual analogue scale (MVAS) of pain and tenderness scores. Score 0 = no pain or tenderness at all; score 10 = most severe pain or tenderness. The slope of 5 cm height was added to give impression of the increasing magnitude of pain. Figures of facial expressions were added to aid the children in locating their scores.

tenderness. The score increased linearly to a maximum score of 10, *i.e.*, the most severe pain or tenderness they have ever experienced or could imagine. The slope of 5 cm height was added to the conventional 10 cm linear visual analogue scale[16] to give the impression of the increasing magnitude of pain or tenderness. Figures of facial expressions were added above the scale to aid the children in identifying their score. Recovery room nurses showed and explained the scale to fully awake children. They were asked to point at a figure of the facial expression to show the magnitude of their pain or tenderness and the score beneath the figure was recorded. If they pointed at two adjacent figures, the score between the two figures was recorded.

On discharge, a recording form, including a MVAS chart, was given and explained to the child's parents. They were asked to help the child rate his scores and record four times daily. The adult patient was asked to record pain and tenderness scores in a similar manner. Apart from the numbers and days of application of jelly, the frequency of oral analgesic intake was also recorded. The patients were seen on the first, third, and seventh postoperative day to inspect the condition of the wound and to verify their data collection sheets.

Comparison between two groups was performed using Student's t test for unpaired data. Comparison between four groups was performed using analysis of variance and least significant differences. For all analyses, we tested for homogenicity of variance using an F test or Bartlett's test. If the variance was unequal, we used a nonparametric (Kruskal-Wallis) rather than the parametric analysis of variance. A P value less than 0.05 was considered to be statistically significant.

RESULTS

There was no significant difference between the corresponding control and lidocaine treatment groups in terms of age, weight, numbers and days of application of jelly, and total doses of consumption of oral analgesics (table 1).

In the recovery room (table 2), 70% of patients in the children-lidocaine group had no pain, while only 20% of the children-placebo group had no pain. Twenty percent of the lidocaine group had moderate pain (score 4–6) and 10% had severe pain (score 8–10), while 30% of the placebo group had moderate pain and 50% had severe pain. The mean pain score of the children-lidocaine (1.9 ± 0.7) was significantly lower ($P < 0.01$) than the placebo group (6.0 ± 0.8).

The pain-free period was significantly longer ($P < 0.05$) in the children-lidocaine group (5.1 ± 0.9 h) than the placebo group (1.5 ± 0.4 h). The children-placebo group started to have pain about 1–2 h after the operation, while the children-lidocaine group did not begin to experience pain until after 4–6 h. The patients in the adult-placebo group started to have pain in about 2 h (1.8 ± 0.6 h) after the operation, while the adult-lidocaine group enjoyed a twice longer ($P < 0.05$) pain-free period (3.6 ± 0.8 h). Two adults (10%) and four

TABLE 1. Age, Body Weight, Number of Times and Days of Application of Jelly, and the Total Number of Doses of Oral Analgesic (Acetaminophen) Consumed (Mean ± SEM)

	Children		Adult	
	Placebo	Lidocaine	Placebo	Lidocaine
Number (n)*	20	20	19	20
Age (yr)*	7.0 ± 0.7	6.4 ± 0.5	25.4 ± 1.8	29.6 ± 2.8
Weight (kg)*	21.1 ± 1.6	18.9 ± 1.4	57.6 ± 1.3	55.0 ± 1.3
Jelly application—Numbers*	12.7 ± 1.8	13.4 ± 1.1	8.7 ± 0.8	10.0 ± 1.1
—Days*	3.8 ± 0.5	4.3 ± 0.3	3.4 ± 0.3	3.4 ± 0.3
Doses of analgesic taken (number)*	4.2 ± 0.7	4.2 ± 0.1	2.5 ± 0.6	2.2 ± 0.4

* No statistical difference between the placebo and the lidocaine groups.

TABLE 2. Pain Scores of Children in the Recovery Room (Number and Percentage, Mean ± SEM)

	Children	
	Placebo	Lidocaine
Number	20	20
No pain—Score 0	4 (20%)	14 (70%)
Pain—Score 2	0	0
—Score 4	4 (20%)	2 (10%)
—Score 6	2 (10%)	2 (10%)
—Score 8	4 (20%)	1 (5%)
—Score 10	6 (30%)	1 (5%)
Mean score	6.0 ± 0.8	1.9 ± 0.7*
Pain-free period (h)	1.5 ± 0.4	5.1 ± 0.9†

* Significant difference from the placebo group ($P < 0.01$).
† $P < 0.05$.

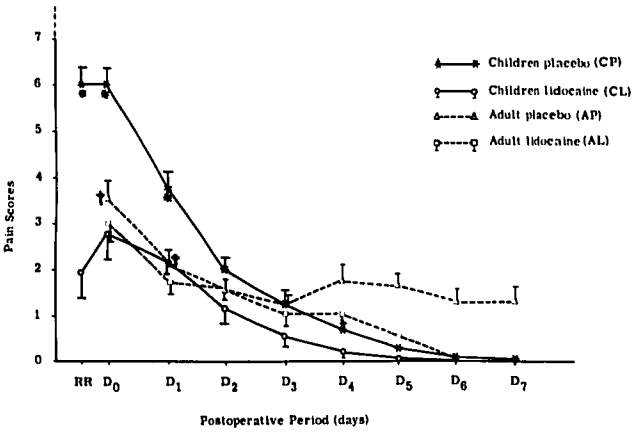

FIG. 2. Pain scores in the postoperative period (mean value ± one sided SEM). Score 0 = no pain at all; score 10 = most severe pain. RR = recovery room; D_0 = the same day of the operation; D_1–D_7 = the first–seventh postoperative day. *CP significantly different from CL values, $P < 0.05$; †AP significantly different from CP values, $P < 0.05$.

children (20%) of the lidocaine groups had no pain at all throughout the postoperative period. None of the placebo groups had that experience.

The pain score (fig. 2) in the children-placebo group was highest in the recovery room and during the operative day (score 6), and markedly decreased ($P < 0.01$) in the first and second postoperative days (score 4 and 2). The children-lidocaine group had significantly lower pain scores ($P < 0.05$) than the placebo group in the recovery room (score 2) and on the operative and the first postoperative days (score 2.8 and 2.2), but had no difference in the subsequent postoperative days.

The tenderness scores (fig. 3) in the children-placebo group was highest in the operative day (score 7), and markedly decreased ($P < 0.05$) in the first and second postoperative days. The tenderness score of the children-lidocaine group was lower ($P < 0.05$) than the children-placebo group only on the operative and the first postoperative days, but there was no difference on the subsequent postoperative days. There was no difference both in the pain and tenderness scores between the adult-placebo and the adult-lidocaine groups throughout the study period (figs. 2, 3). Comparing the adult-placebo to the children-placebo, the adult had lower ($P < 0.05$) pain and tenderness scores than the children only during the day of the operation and on the first postoperative day. On subsequent days, their scores both decreased to a mild level and there was no difference between them.

DISCUSSION

Pain is a private and personal feeling with large individual variation. The assessment of pain is difficult. There are several proposed methods for evaluating pain.[17] In this study, we introduced MVAS for evaluating pain and tenderness. We found that MVAS was readily understandable for both adults and children. MVAS is an important assessment tool for children to evaluate the magnitude of their pain and tenderness.

The natural course of pain and tenderness after circumcision is represented by the scores in the placebo groups. Children have severe pain and tenderness during the day of the operation, and moderate pain on the next two postoperative days. It is obvious that an effective pain relief technique is needed. Our study showed that the children in the lidocaine group had significantly lower pain and tenderness scores. This would imply that lidocaine jelly effectively reduces pain and tenderness during the early postoperative period. During the third to seventh postoperative days, pain and tenderness decreased to the level of mild discomfort. Oral analgesics may be sufficient for the late postopera-

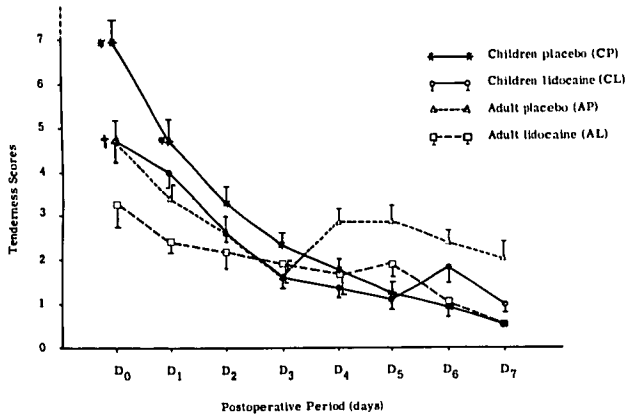

FIG. 3. Tenderness scores in the postoperative period (mean value ± one sided SEM). Score 0 = no tenderness at all; Score 10 = most tenderness; D_0 = the same day of the operation; D_1–D_7 = the first–seventh postoperative day. *CP significantly different from CL value, $P < 0.05$; †AP significantly different from CP value, $P < 0.05$.

tive pain and tenderness. There was significant difference between scores of adult-placebo and children-placebo only in the early postoperative period. This might be due to the residual analgesic effect of the blockade of dorsal nerve of penis and the difference in pain threshold between the two age groups.

Although lidocaine jelly was highly effective in reducing pain and tenderness in children during the early postoperative period, surprisingly, pain and tenderness scores in adult-placebo were not found to be different from the adult-lidocaine. The scores of the two groups of the children during the late postoperative period were also not different from each other. This finding may imply that, when there is only mild to moderate pain or tenderness, the beneficial effect of lidocaine jelly is not as obvious as when there is severe pain or tenderness.

In the postoperative period, both pain and tenderness exist. It is often difficult to separate the two sensations. In our pilot study, we tried to evaluate the two sensations together by including tenderness and pain on the MVAS in sequential manner as no pain or tenderness, no pain with mild tenderness, mild pain with moderate tenderness, moderate pain with severe tenderness, and severe pain with severe tenderness. This approach proved to be incorrect. The patients were frequently confused, and experienced difficulty in locating their scores on the MVAS. However, when we changed the protocol and asked the patients to evaluate pain and tenderness separately, both adults and children were able to give the pain and tenderness scores easily. The site of the operation and the early ambulatory activity may help the patients to distinguish the two sensations. All of our patients were allowed to return home immediately after the operation or when they were fully awake, and were allowed to resume their normal activity as soon as possible. They suffered from tenderness, occurring when the penis moved during walking and was rubbed by their clothes, more than pain that occurred when they were at rest.

Our previous study[14] showed that single application of any one of the three preparations of topical lidocaine, *i.e.*, lidocaine spray, ointment, or jelly, was equally effective in reducing pain. Lidocaine spray can be repeated without touching the wound, and probably may be preferred by the children. But the multiple-dose, hospital-size spray bottle is expensive, and may not be suitable for home use. Lidocaine in the ointment preparation is not easily spread over the wound. Touching of the wound during the application is usually unavoidable. The jelly preparation was chosen for this study because of the convenience of application. When 0.5–1 ml of jelly was dropped on the wound at the dorsum of the penis, it spread out evenly. The application of drug without touching the wound is preferable for children. When dried, the jelly formed a thin film of coating over the wound similar to the protective plastic wound coating commonly employed by surgeons. The excess amount of jelly should be wiped out to avoid coating of the glans penis and the opening of the urethra and possibly interfering with urination.

We conclude from our current study that repeated application of lidocaine jelly on the circumcision wound is a highly effective, safe, and convenient method to obviate post-circumcision pain and tenderness in children during the early postoperative period. Unlike blocking the dorsal nerve of the penis and caudal block, topical analgesia can be performed easily by the patient or the parents. In both of our studies, topical analgesia was not associated with any complication and is readily accepted by surgeons, patients, and parents. It is a simple and safe solution to a relatively common problem: post-circumcision pain. It deserves wider application to all children subjected to circumcision.

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Post-circumcision Analgesia—A Prospective Evaluation of Subcutaneous Ring Block of the Penis

LYNN M. BROADMAN, M.D.,* RAAFAT S. HANNALLAH, M.D.,† A. BARRY BELMAN, M.D.,‡
PAUL T. ELDER, M.D.,§ URS RUTTIMANN, PH.D.,¶ BURTON S. EPSTEIN, M.D.‡

Pain is the most common and, often, a very disturbing immediate sequela of circumcision in children and in adults. Kay[1] described the use of caudal anesthesia, and Soliman and Tremblay[2] the dorsal nerve block of the penis to control this postoperative pain. These blocks have not gained widespread popularity, possibly due to the misconception that they are difficult to perform, time-consuming, and may expose patients to additional risks and complications. The purpose of this study was to determine if a simple subcutaneous ring block at the base of the penis could provide effective postoperative analgesia in children following circumcision without additional risks or delay in recovery and hospital discharge.

METHODS

Fifty ASA Class I or II children who were undergoing circumcision, and who were at least 18 months of age, were subjects for this prospective, randomized, double-blind study. The protocol was approved by our Institutional Review Board, and informed consent was obtained from all parents. The children were randomized to either the experimental or the control group by the sealed envelope method. None of the children received any form of premedication. Anesthesia was induced either by inhalation of nitrous oxide and halothane, or by the iv injection of thiopental if selected by an older child, or if younger children refused to accept an inhalation induction. Anesthesia was maintained with nitrous oxide and halothane. Dextrose 5% in saline 0.3% was infused iv. No analgesic drugs were administered intraoperatively.

Circumcision was carried out under the supervision of the same surgeon using the same technique in all patients.[3] Electrocautery was used to excise the foreskin and to coagulate blood vessels. All skin edges were approximated with 5-0 Vicryl® suture. At the termination of surgery, but prior to emergence from general anesthesia, the ring block was performed by the surgeon under sterile conditions with a solution which was obtained from a numbered vial. The exact contents of the vial was known only to the research pharmacist. Bupivacaine 0.25% without epinephrine (group I) or normal saline (group II), was injected around the shaft of the penis near the base with a 25 ga × 1.0-inch needle (fig. 1). No attempt was made to identify Buck's fascia or the dorsal nerves of the penis; however, a greater volume of solution was injected dorsally in the midline than in other areas of the ring. Since no member of the operating room team was aware of the nature of the material injected at the base of the penis, a maximum "safe" volume was calculated for each child. This "safe" volume limited the potential dosage of bupivacaine to no more than 2.0 mg/kg. The actual volume injected during the performance of each block was determined by

* Assistant Professor.
† Associate Professor.
‡ Professor.
§ Fellow.
¶ Associate Research Professor.

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Address reprint requests to Dr. Broadman: Department of Anesthesiology, Children's Hospital National Medical Center, 111 Michigan Avenue, NW, Washington, DC 20010.

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