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Postoperative Pain Relief for Circumcision in Children: Comparison among Morphine, Nerve Block, and Topical Analgesia

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Circumcision in children usually is followed by pain that may produce crying, restlessness, and agitation in the postoperative period. Several techniques of pain relief, including caudal block,[1–7] blockade of the dorsal nerve of penis[8–11] and narcotic administration[6,7] have been used. The use of topical analgesia has not been described in this kind of surgery. Because of the simplicity of application, we investigated the efficacy of topical analgesia in relief of postcircumcision pain in comparison with blockade of the dorsal nerve of penis, narcotic administration, and a control group in whom no analgesic treatment was given.

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METHODS

Seventy-seven healthy boys, ages ranging from 1 to 13 years admitted for circumcision as outpatients were studied. They were divided randomly into one control group and five study groups (table 1). No premedication was given. All circumcisions were done under general anesthesia. Induction of anesthesia was with thiopental 4 mg/kg iv or by inhalation of nitrous oxide and halothane, according to the child's stated preference. Anesthesia was maintained with inhalation of 70% nitrous oxide and 1–1.5% halothane through a face mask.

The first group (control) received general anesthesia alone; no supplemental drug was given neither during nor after surgery. In the second group, morphine (0.2 mg/kg) was given im after the children had been anesthetized. In the third group, after anesthesia had been induced, the dorsal nerves of the penis were blocked by single injection of 1–1.5 ml 0.5% bupivacaine at the root of the penis.[8] In the fourth, fifth, and sixth groups, after the surgery had been accomplished but before the children were awake, a thin film of lidocaine spray (10–20 mg of 10% solution), lidocaine ointment (0.5–1 ml of 5% preparation), or lidocaine jelly (0.5–1

TABLE 1. Age, Body Weight, and the Time from Termination of General Anesthesia to Being Fully Awake (Mean ± SD)

	Control	Morphine	Nerve Block	Lidocaine Spray	Lidocaine Ointment	Lidocaine Jelly
Number	12	11	14	12	11	17
Age* (yr)	4.6 ± 2.0	4.5 ± 1.6	4.1 ± 1.8	2.5 ± 1.4	3.2 ± 1.6	4.3 ± 1.7
Weight* (kg)	17.5 ± 3.8	17.9 ± 3.2	14.4 ± 2.2	11.0 ± 1.7	12.8 ± 2.2	15.8 ± 2.8
Time* (min)	20.2 ± 3.9	42.0 ± 5.6	45.7 ± 5.9	38.4 ± 5.2	31.1 ± 5.6	28.2 ± 4.2

* No statistical differences between the control and the study groups.

ml of 2% preparation) was applied to the surgical wound.

The children remained in the recovery room until they were fully awake, and then they were allowed to return home. The recovery time was recorded as the time from discontinuation of general anesthesia to the time the children were fully awake. The children were considered fully awake when they were able to give their name in response to asking their names every 5 min. Their condition in the recovery room was recorded by recovery room nurses who were unaware of which groups the children belonged to. It was recorded whether they were pain free or painful, alert or drowsy. According to the children's expression or complaint, the onset and severity of pain as well as the incidence of vomiting were recorded.

The pain-free period was defined as the immediate postoperative period that the children did not complain of pain. It was recorded as the time from the termination of general anesthesia to the time the children started to complain or cry of pain. If they were discharged before having pain, their parents were instructed to record the time of the onset of pain on the provided form.

The effect of the immediate postoperative pain relief on the subsequent postoperative pain was investigated by recording the severity of pain in the first 24–48 h postoperatively. The parents who were unaware of the children's groups were asked to fill in the pain score in the given form. The recording intervals were the times their children started to have pain to their next meal and then every 4–6 h (time between each meals) and at night. The average daily scores were used for comparison among each groups. The initial pain-free period was not included for averaging the scores of the first postoperative day. A simple pain score ranging from 1–4 was explained and given to the parents. The pain score was recorded as one when the children had slight pain and were able to play or perform their normal activity and needed no oral analgesic. The score 2 was recorded when the children had moderate pain with reduced activity. The score 3 was recorded when the children had severe pain, stopped playing, and had marked reduction of their activity, which caused pain and tenderness at the wound. The score of 4 was recorded when the children had very severe pain, with marked irritability and agitation with frequent crying. The oral analgesic (acetaminophen 10 mg/kg) was taken as needed to relieve pain. The frequency of taking oral analgesic was recorded. The children and their parents were seen on the following two mornings to ensure the correctness of their record and to inspect the condition of the surgical wound.

A variety of surgeons performed the procedures. The circumcision wounds were dressed in various fashion, according to the surgeons' preferences, ranging from leaving the wound open to covering with petroleum jelly and surgical gauze.

Analysis of variance was used to compare means of data from the control and the study groups and among the study groups. When they were shown to be statistically different, least significant difference (LSD) was used to compare means of data from two independent groups of the control and each of the study groups. Student's t test was used to compare means of data of pain scores and frequency of consumption of oral analgesic of the first and second postoperative day of the same group. A P value less than 0.05 was considered to be statistically significant.

The study has been approved by the Committee of Human Right and Research of the Faculty of Medicine Siriraj Hospital, Mahidol University.

RESULTS

There was no significant difference between the control and the study groups and among the five study groups in terms of age or weight or recovery time from general anesthesia (table 1).

Table 2 shows the condition of the children in the recovery room. Eleven of 12 children in the control group had pain (91.7%): one had severe pain with crying; six had moderate pain with crying; and four had mild pain. Three of 11 children (27.3%) in the morphine group had mild to moderate pain; eight children (72.7%) had no pain. Six of them were drowsy and two were alert in the recovery room. The number in the group of blockade of the dorsal nerves of penis was different

TABLE 2. Condition of the Children in the Recovery Room

	Control	Morphine	Nerve Block	Lidocaine Spray	Lidocaine Ointment	Lidocaine Jelly
Number	12	11	15	12	11	17
Pain	11	3	1	0	1	1
Severe pain	1	—	1	—	—	—
Moderate pain	6	2	—	—	1	—
Mild pain	4	1	—	—	—	1
No pain	1	8	14	12	10	16
No pain, drowsy	—	6	—	—	—	—
No pain, alert	1	2	14	12	10	16

from the first table, because of the addition of a case of technical failure (1/15 = 6.7%). The child had severe pain with restlessness and agitation in the recovery room. The pain was relieved by lidocaine jelly, and he was not included in the other part of the study. Only two of 40 children (5%) in the three groups of topical analgesia had mild to moderate pain. The rest of them (95%) had no pain and were alert in the recovery room.

Although vomiting was found in three of 11 children of the morphine group (27.3%), none was found in the other groups. Obvious respiratory depression was not found in this study.

Table 3 shows the duration of pain-free period, which was recorded as the time from the termination of general anesthesia to the time the children started to complain or cry of pain. Children in the control group started to have pain about 1 h (mean 1.1 ± 1.0 h) after termination of general anesthesia, but all the five study groups had no pain for 4–5 h. There was a significant difference in the pain-free period between the control and each of the five study groups ($P < 0.01$), but there was no statistical difference among the five study groups. This indicated that morphine, block of the dorsal nerves of penis, and the three techniques of topical analgesia were equally effective in relief pain of circumcision in the early postoperative period.

Table 3 also shows the pain scores recorded after the effects of the various techniques of the immediate postoperative pain relief had worn off. There was no statistical difference in the scores among the control and the study groups in the first and second postoperative days. The pain score of the second postoperative day, except in the morphine group, was significantly lower ($P < 0.01$) than the score of the first day in the same group. There was no significant difference in the frequency of taking oral analgesic between the control and the study groups, but the frequency of taking drugs on the second day, except for the control group, was lower ($P < 0.01$) than of the first day.

DISCUSSION

The result of the control group confirmed that circumcision was usually (91.7%) followed by pain, especially in the first few hours postoperatively. Morphine was effective in relieving pain (for 5 h) but caused drowsiness

TABLE 3. Duration of Pain Free Period* (Hours after the Operation), Pain Scores, and Frequency of Consumption of Oral Analgesic (Acetaminophen) in the First and Second Postoperative Days (Mean ± SD)

	Control	Morphine	Nerve Block	Lidocaine Spray	Lidocaine Ointment	Lidocaine Jelly
Number	12	11	14	12	11	17
Pain free period* (h)	1.07 ± 1.03†	4.82 ± 1.73‡	5.19 ± 1.68‡	4.06 ± 1.50‡	4.07 ± 1.66‡	5.29 ± 1.93‡
Pain scores						
First postoperative day§	1.48 ± 0.71	1.69 ± 0.80	1.66 ± 0.69	1.79 ± 0.45	1.59 ± 0.81	1.40 ± 0.64
Second postoperative day§	1.00 ± 0¶	1.32 ± 0.82**	1.25 ± 0.65¶	1.33 ± 0.48¶	1.20 ± 0.40¶	1.04 ± 0.36¶
Frequency of analgesic						
First postoperative day§	1.91 ± 1.02	2.00 ± 0.94	1.50 ± 1.13	1.83 ± 1.24	2.09 ± 0.97	1.65 ± 1.08
Second postoperative day§	1.45 ± 1.30**	0.70 ± 1.12¶	1.00 ± 1.19¶	0.92 ± 1.35¶	1.36 ± 1.10¶	1.71 ± 1.15¶

* Immediate postoperative period that the children neither complained nor cried of pain.

† Significant difference from each of the five study groups ($P < 0.01$).

‡ No statistical difference among the five study groups.

§ No statistical difference between the control and the study groups of the same postoperative day.

¶ Significant difference from the first postoperative day of the same group ($P < 0.01$).

** No statistical difference from the first postoperative day of the same group.

in the following 1–2 h. Incidence of vomiting was high (27.3%). Although respiratory depression may follow the administration of morphine, we did not observe such depression in this study. The blockade of the dorsal nerves of the penis eliminated pain for 5 h but could cause hematoma and toxic absorption[11] due to injection into the highly vascular area. There may be technical failures when performing this nerve block. The technical failure rate of our study was 6.67% as compared with 4% in the studies of Soliman and Tremblay[8] and Goulding.[10] Repeated block to produce prolonged analgesia may not be agreeable to the child after he has awaken.

Topical analgesia was found to be highly effective (95%) in relief of pain. The two cases of incomplete analgesia were due to early rubbing off of the lidocaine ointment or jelly by the children's clothes before the full effect of analgesia was produced. The duration of analgesia was almost the same (4–5 h) as those produced by morphine and nerve block. Among the three techniques of topical analgesia, lidocaine spray could be repeated without touching the wound; this probably was preferred most by the children. Lidocaine jelly, when dry, formed a thin film of coating over the wound, similar to the protective plastic wound coating commonly employed by surgeons. Lidocaine ointment easily was rubbed off by the children's clothes. The children whose wounds had been left open had a shorter duration of analgesia than those who had the wound covered with dressings.

Topical analgesia has the advantages of having neither central nervous system nor respiratory depression. The application was simple and required no skill of regional nerve block. It could be repeated in the later postoperative period by either the child or his parents. With repeated application, topical analgesia could be maintained for the extended period of time and a state of "painless circumcision" could be achieved. It is the most noninvasive technique when compared with the caudal block.[1-7] In considering all the above factors, topical analgesia is superior to the other methods of analgesia used for relief of postcircumcision pain and deserves wider application.

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