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Comparison of Caudal and Ilioinguinal/iliohypogastric Nerve Blocks for Control of Post-orchiopexy Pain in Pediatric Ambulatory Surgery

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Orchiopexy is one of the procedures which is increasingly being performed in children on an ambulatory basis. Considerable postoperative pain, associated with a high incidence of nausea and vomiting, occurs with this operation. In a review of a large number of ambulatory surgical procedures, orchiopexy was identified as the only procedure requiring orally administered narcotics for the control of postoperative pain following discharge.[1]

The purpose of this study was to evaluate and compare the effectiveness of caudal analgesia and ilioinguinal/iliohypogastric nerve blocks in producing post-orchiopexy analgesia in children without delaying discharge from the hospital.

METHODS

Institutional approval was obtained for a prospective study of 44 ASA physical status I or II boys, age 18 months to 12 yr, scheduled on an ambulatory basis for the elective repair of a unilateral undescended testicle. Informed consent was obtained from the parents of each child. Preoperative medication was not used. Anesthesia was induced either by inhalation of nitrous oxide and halothane or by iv injection of thiopental, and was maintained with nitrous oxide and halothane. Intravenous access was established and hydration was achieved using 5% Dextrose in Lactated Ringer's solution. No analgesic drugs were administered intraoperatively. At the termination of the operation, but prior to emergence from general anesthesia, patients were randomly assigned to one of three groups according to instructions contained in a sealed serially numbered envelope. Group I patients received a caudal injection of 0.25% bupivacaine solution in a dose of 2.5 ml/yr of age with the child in the lateral position using a standard technique. This dose has been shown to provide T-10 level analgesia in a previous study.[2] Group II patients received combined ilioinguinal and iliohypogastric nerve blocks by infiltration of the abdominal wall muscles through the lateral edge of the skin incision in the area just medial to the anterior superior iliac spine with 4–6 ml of 0.25% bupivacaine solution.[3] Group III patients received no blocks and served as controls.

To prevent observer bias, all patients had a dressing applied over the groin, and the sacrum was painted with poviodine-iodide and covered with a "band-aid"-type strip to conceal possible block markings. In addition, the anesthetic records were sealed.

In the post-anesthesia recovery room (PARR), the degree of recovery from general anesthesia was assessed using the Aldrete score.[4] Patients were observed in PARR for 30–45 min, and later in the Short Stay Recovery Unit (SSRU) for a minimum of 75 min by the same observer who was unaware of the treatment modality. The children were evaluated at 5-min intervals for pain and/or discomfort using the scoring system shown in table 1. Older children who could state that they felt pain were awarded additional points: one, if they reported that they had pain but could not localize it; and two, if they could localize the pain either verbally or by pointing. Fentanyl (1–2 mcg/kg) was administered iv to any child who achieved a score of seven or more during two successive observation periods. Patients were discharged from the hospital when all of the following criteria were met: children were alert and oriented, had stable vital signs, could walk with minimal assistance, and could tolerate clear liquids with only minimal nausea and vomiting. The duration of anesthesia and surgery, and the time needed to meet the predetermined discharge criteria, were compared for differences among the three groups using standard analysis of variance. Pain scores among the three groups were compared by Kruskal-Wallis analysis of variance. Statistical comparison of the need for fentanyl was accomplished by chi-square analysis. $P < .05$ was considered statistically significant in all cases.

RESULTS

Sixteen patients received caudal injections, 13 had nerve blocks, and 15 served as controls. The three groups

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were comparable in terms of age, method of anesthesia induction, and duration of anesthesia, and operation (table 2). All the children had recovered to the same degree (as measured by the Aldrete score)[4] upon arrival in the PARR. There were no complications associated with any of the blocks.

No significant differences in the postoperative pain/discomfort scores (median, range) were found between patients who received caudal (1.0, 6) and those who received nerve blocks (1.0, 6). For comparison, the two treatment groups were combined. The combined treatment groups (caudal and nerve blocks together) had a lower pain score than did the patients in the control group (2.5, 7.5), but the difference was not statistically significant. Significantly more patients ($P < .03$) received fentanyl in the PARR in the control group (5 or 33%) compared to the combined treatment groups (1 or 3%). The overall incidence of postoperative vomiting was 45%, with no significant difference in the incidence between the control group (40%) and the combined treatment groups (48%). All children were adequately hydrated, and no pharmacological treatment for vomiting was administered.

The time (minutes) needed to meet discharge criteria from the SSRU was 219.4 ± 25.9, 184.0 ± 14.8, and 198.7 ± 21.0 for patients in the caudal, nerve blocks, and control groups, respectively, which are not statistically different. No difference was found in discharge time between patients (from all groups) who received iv fentanyl (206.6 ± 22.5 min) and those that did not (200.6 ± 15.0 min).

TABLE 1. Pain/discomfort Scale

Observation	Criteria	Points
Blood Pressure	±10% preop	0
	>20% preop	1
	>30% Preop	2
Crying	Not crying	0
	Crying but responds to tender loving care (TLC)	1
	Crying and does not respond to TLC	2
Movement	None	0
	Restless	1
	Thrashing	2
Agitation	Patient asleep or calm	0
	Mild	1
	Hysterical	2
Posture	No special posture	0
	Flexing legs and thighs	1
	Holding scrotum or groin	2
Complains of pain (where appropriate by age)	Asleep, or states no pain	0
	Cannot localize	1
	Can localize	2

DISCUSSION

Orchiopexy is a procedure that is usually performed through an inguinal incision similar to that used for inguinal hernia repair. Other authors have shown that both ilioinguinal/iliohypogastric nerve blocks[3] and caudal block[5] are highly effective in controlling postoperative pain following inguinal herniorraphy in children. Orchiopexy, however, is associated with a higher incidence of postoperative nausea, vomiting, and pain than is a simple inguinal hernia repair. This may be due to the fact that orchiopexy is a longer surgical procedure than herniorraphy, and involves more testicular traction and manipulation. Since testicular innervation can be traced up to the 10th thoracic segment, a T10 level block may be required to prevent pain from testicular traction and/or manipulation. This logic dictates that caudal blocks would produce more effective postoperative analgesia following orchiopexy than would combined ilioinguinal/iliohypogastric nerve blocks. The volume used in the administration of our caudal blocks (2.5 ml/yr of age) should have produced T10 level analgesia 95% of the time.[2] Our study, however, did not show caudal injections to be more effective than the ilioinguinal/iliohypogastric nerve blocks.

There are many possible explanations for our findings. One is that the contribution of testicular manipulation to the overall degree of postoperative discomfort following orchiopexy is minimal, or that the level of analgesia required to block postorchiopexy pain and discomfort may be higher than the level of blockade obtained with the caudal blocks. The ilioinguinal/iliohypogastric nerve blocks were performed through the surgical incision, and the spermatic cord may have been bathed with bupivacaine which effectively reduced testicular pain. Postoperative recovery times were comparable, even for the patients who required iv fentanyl therapy of up to 2 mcg/kg in PARR. The times required for all patients to meet discharge criteria were lengthy, largely because many of the children, irrespective of treatment group, were unable to tolerate oral fluids without nausea and/or vomiting.

TABLE 2. Clinical Characteristics of the Study Groups

	Caudal (n = 16)	Nerve Block (n = 13)	Control (n = 15)
Age in months ± SEM	59.7 (8.9)	63.3 (11.3)	51.8 (11.3)
Duration of anesthesia, min ± SEM	68.69 (5.19)	66.67 (6.54)	65.73 (5.11)
Duration of surgery, min ± SEM	42.50 (5.55)	43.92 (5.79)	43.33 (4.52)
PARR admission score, median, range	5, 1	5, 2	4, 6

Values do not differ statistically for any sub-group.

For the purpose of uniformity among subjects of the three study groups, the blocks were performed at the completion of surgery. In clinical practice, however, it may be more appropriate to place the blocks before the start of surgery, but following anesthesia induction, in order to reduce the general anesthetic requirements, obviate the need for endotracheal intubation, and possibly shorten recovery and discharge time.

In conclusion, we found that both ilioinguinal/iliohypogastric nerve blocks and caudal blocks administered following inhaled anesthesia for orchiopexy are safe, and effective in controlling the postoperative pain of children. The administration of a small (1–2 mcg/kg) iv dose of fentanyl is an acceptable alternative for relief of the pain which usually accompanies orchiopexy.

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Oxygen Saturation during Preinduction Placement of Monitoring Catheters in the Cardiac Surgical Patient

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Preoperative arterial hypoxemia in patients undergoing surgery for myocardial revascularization could increase the risk of myocardial ischemia and infarction. The contribution of premedication, such as morphine and scopolamine, to arterial hypoxemia preoperatively is unclear.[1,2] However, excessive sedation from premedication in such patients may depress ventilation with resultant hypoxemia. In addition, the effect of the head-down position used during insertion of monitoring catheters may adversely affect an already compromised cardiovascular system with the potential for resultant hypoxemia. Therefore, supplemental oxygen *via* nasal cannulae is often given during the placement of invasive monitoring catheters.

We examined the requirement for supplemental oxygen during monitoring catheter insertion in premedicated, unanesthetized patients. Our results strongly support the need for supplemental oxygen and/or continuous monitoring of arterial hemoglobin oxygen saturation (SaO_2) during insertion of monitoring catheters in these patients.

METHODS

With Clinical Investigation Committee approval, we studied 38 patients, (ages 42–74 yr) presenting for elective myocardial revascularization operations. Patients having combined valve and coronary bypass operations, as well as those receiving supplemental oxygen prior to surgery, were excluded.

Each patient's baseline SaO_2 was determined on the day prior to surgery in the supine position while breathing room air. Morphine sulphate, 0.1 mg/kg, and scopolamine, 0.4 mg, were administered to each patient IM 60–90 min before transport to the operating room. Immediately after arrival in the operating room and continuously throughout placement of intravenous, radial arterial, and internal jugular pulmonary artery catheters, beat-to-beat measurement of SaO_2 was obtained by pulse

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