

Dorsal penile nerve block in children undergoing circumcision in a day-care surgery

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Purpose: Circumcision is performed under general anaesthesia (GA) with dorsal penile nerve block (DPNB) as an analgesic technique for postoperative pain. The purpose of this study was to compare DPNB as the sole anaesthetic procedure vs GA and DPNB for circumcision in children as an outpatient procedure.

Methods: In a six-month prospective study, 250 boys aged 6 to 17 yr (mean age 11.5 ± 3.5 yr) were randomized into two groups. Group A ($n = 122$) received DPNB only prior to circumcision, and Group B ($n = 128$) received GA + DPNB. The groups were compared for complications of the block, effectiveness of anaesthesia, operating room time, postoperative time and ease of recovery.

Results: There were no major operative complications in the two groups. Minor block complications, including oedema and haematoma, occurred in 16 (13.1%) boys in Group A and 27 (21.10%) boys in Group B (NS). At surgery, 3 (2.6%) from Group A received additional GA and 1 (0.8%) received additional local anaesthesia. They represent a DPNB failure rate of 3.3%. Mean operating room time was 11 ± 2.5 min in Group A and 19 ± 3.5 min in Group B, and post-anaesthesia care unit (PACU) time was 51 ± 10 min in Group A and 101 ± 14.5 min in Group B ($P < 0.001$). Nausea and vomiting in the PACU were noted in one patient in Group A and in 15 in Group B ($P < 0.05$). Only patients in Group B required additional analgesia and tranquilizers in the PACU (0 versus 20; $P < 0.05$).

Key words

ANAESTHESIA: paediatric;

ANAESTHETIC TECHNIQUES: penile block.

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Conclusions: These data confirm that DPNB has advantages over GA + DPNB for paediatric circumcision in day-care surgery.

Objectif: La circoncision est réalisée sous anesthésie générale (AG) associée au bloc du nerf dorsal de la verge (BNDV) pour l'analgésie postopératoire. Cette étude visait à comparer chez des enfants opérés en chirurgie ambulatoire le BNDV seul et l'anesthésie générale avec BNDV.

Méthodes: Pendant une étude prospective de six mois, 250 garçons âgés de 6 à 17 ans (âge moyen $11,5 \pm 3,5$ ans) avaient été répartis au hasard entre deux groupes. Le groupe A ($n = 122$) recevait un BNDV seul avant la circoncision et le groupe B ($n = 128$) recevait AG + BNDV. Les groupes étaient comparés au regard des complications du bloc, de l'efficacité de l'anesthésie, de la durée de l'intervention, de la durée de la période postopératoire et du confort du patient.

Résultats: Il n'y a pas eu de complication opératoires majeures dans aucun des groupes. Des complications mineures dues au bloc, dont l'oedème et l'hématome sont survenues chez 16 (13,3%) des garçons du groupe A et chez 27 (21,10%) du groupe B (NS). Au moment de la chirurgie, dans le groupe A, on a complété avec de l'anesthésie générale chez trois enfants (2,6%) et avec un anesthésique local chez un enfant (0,8%). Ce qui établit le taux d'échec du BNDV à 3,3%. La durée moyenne de l'utilisation de la salle d'opération était de $11 \pm 2,5$ min pour le groupe A et de $19 \pm 3,5$ min pour le groupe B. La durée du séjour à l'unité de soins postanesthésiques (USPA) était 51 ± 10 min pour le groupe A et de $101 \pm 14,5$ min pour le groupe B ($P < 0,001$). À l'USPA, des nausées et vomissements sont survenus chez un patient du groupe A et chez 15 du groupe B ($P < 0,05$). À l'USPA, seuls les patients du groupe B ont eu besoin d'analgésie additionnelle et de tranquillisants (0 vs 20; $P < 0,05$).

Conclusion: Ces données confirment certains avantages de BNDV sur AG + BNDV pour la circoncision en chirurgie ambulatoire.

Dorsal penile nerve block (DPNB) is an effective and safe method for pain relief during circumcision.^{1,2} Circumcision in children is performed under general

anaesthesia (GA) to reduce fear and DPNB is used for postoperative analgesia.¹⁻⁵ Penile block is used as the sole intraoperative anaesthetic in neonates and adults.⁶⁻⁸

In a previous retrospective study,⁹ we showed that DPNB was effective as the sole anaesthetic in children undergoing circumcision. The present study tests the hypothesis that DPNB is effective as the sole anaesthetic for pediatric circumcision in a prospective, randomized fashion.

Methods

A prospective study was conducted over six months among 257 children aged 6 to 17 yr (mean age 11.5 ± 3.5 yr) who underwent circumcision as an outpatient procedure. The boys were randomly allocated for circumcision with DPNB alone (Group A) or GA + DPNB (Group B). The evaluation could not be blinded since those performing the procedure were also those evaluating the patients. Informed consent was obtained from parents or guardians, in accordance with the ethical requirements of our facility. No child received premedication, additional anaesthesia or analgesia. Routine monitoring (pulse oximeter, blood pressure and ECG) was used, and the children were anaesthetized with an inhalational technique using oxygen, isoflurane and nitrous oxide. The patients were all managed without tracheal intubation.

For Group A, DPNB was performed by the anaesthetist in the preoperative room 20 min before the surgical procedure, while a second anaesthetist monitored the child being operated upon. Under these circumstances, DPNB took two to five minutes and this was not calculated in the operating room time. In Group B, DPNB was administered by another anaesthetist in the operating room following GA. For those in Group A who rejected DPNB because of fear or other psychological factors, it was administered after GA: these patients were excluded from the study.

The block was administered with patients in the supine position, using a 23 gauge needle to inject a solution of $1 \text{ mg} \cdot \text{kg}^{-1}$ lidocaine 2% mixed with $0.5 \text{ mg} \cdot \text{kg}^{-1}$ bupivacaine 0.5% without epinephrine, to a maximum dose of 10 ml. The needle was inserted in the midline at the base of the penis up to the symphysis pubis.^{10,11} One paramedian injection of local anaesthetic was performed in order to block the dorsal nerves on both sides. Additional analgesia was administered on the raphe line at the border between the scrotum and penis to alleviate pain from the perineal nerves.^{8,9} The solution was injected in a ratio of 75–25% on the dorsal and ventral aspects of the penis, respectively. In Group A children, analgesia was confirmed by gently pinching the skin of the penis with forceps about 15 min after injection. Children

were asked about the level of their discomfort by the anaesthetist before incision. In the event of insufficient analgesia, a second test was performed five minutes later. In the presence of persistent pain, fear or refusal of surgery, GA was administered.

Surgery alternated between two operating rooms with the block performed by the anaesthetist while surgery progressed in the other room, monitored by the second anaesthetist. The procedure involved transection of the foreskin, haemostasis by electrocautery and suture of the skin edges with 3–0 plain catgut. After incision, patients were asked to report any kind of sensation or pain during surgery. Based on the child's reply and behaviour, the intensity of the pain was graded by both the surgeon and the anaesthetist on the following scale: (1) totally cooperative and no pain, (2) totally cooperative with mild pain, (3) agitated but manageable, reporting moderate pain, (4) uncooperative and agitated with severe pain, and (5) total refusal to continue. In patients with severe intraoperative pain (grades 3 to 5), the surgical procedure was suspended and analgesia was supplemented with either GA or local anaesthesia by subcutaneous injection of 0.1 ml lidocaine 2% at the pain site. The need for supplemental anaesthesia was recorded as a DPNB failure. Operating room time, defined as the time of patient placement on the operating table until his removal, was recorded in all cases.

In the postoperative period, patients were observed in the post-anaesthesia care unit (PACU). We defined PACU time as the time that they entered the room until the time of discharge. Oral intake was immediately permitted in those receiving only DPNB. Analgesics (paracetamol) and tranquilizers (hydroxyzine HCl) were administered as needed. The surgeon discharged the children from the PACU following a period of observation, and after examining the patient for evidence of complications. Discharge criteria included an alert and oriented patient who voided spontaneously. Vomiting, postoperative pain, need for medications and PACU time were recorded by the PACU nurses.

Statistical analysis was performed using Fisher Exact, Chi-square (χ^2), and Student's *t* tests, with all findings being reported with standard deviation.

Results

The study included 257 boys undergoing circumcision. Seven randomized to Group A refused DPNB, and they were excluded from the study. The remaining 250 comprised the study population, and were divided into Group A (122) and Group B (128). The study group age ranged between 6 to 17 (mean 11.5 ± 3.5) yr; mean age in Group A was 11.5 ± 3 and in Group B was 11.5 ± 3.5 .

TABLE I Minor complications among the study population.

	n	Oedema		Haematoma		Vomiting		Postop agitation		Medication	
		n	%	n	%	n	%	n	%	n	%
Group A	122	13	10.6	3	2.3	1	0.8	1	0.8		
Group B	128	18	14	9	7.4	15	11.7	9	7.0	19	14.8
Total	250	31	12.4	12	4.8	16	6.4	10	4	19	7.6

TABLE II Average operating and PACU times in Groups A and B

	Patients - n	OR time - min	PACU time - min
Group A	122	11 ± 2.5 (6-22)	51 ± 10 (30-110)
Group B	128	19 ± 3.5 (8-26)	101 ± 14.5 (90-120)
P		<0.001	<0.001

TABLE III Age and operative parameter comparisons between patients receiving supplemental medication

	DPNB success n = 118	DPNB failure n = 4	P
Age yr	11.5 ± 3	7 ± 1.4	<0.001
OR time - min	11 ± 2.5 (6-18)	20 ± 1.5 (18-22)	<0.001
PACU time - min	51 ± 10 (30-110)	75 ± 22 (40-120)	<0.001

Mean ± SD (range)

No major complications were noted with the use of DPNB. Minor complications included oedema between the skin and Buck's fascia and haematoma (Table I). No serious bleeding was noted during surgery.

All patients in Group A were considered to have had good analgesia before the surgical procedure. In four boys, supplemental anaesthesia was necessary during the procedure; three received GA and one local anaesthesia. The operating room and PACU times were shorter ($P < 0.001$) for Group A patients (Table II). The four children from Group A, who required supplemental anaesthesia were younger than the group as a whole, and required longer operating room and PACU times ($P < 0.001$) (Table III).

In the recovery period, there was no urinary retention. Nausea and vomiting were noted in 16 (6.4%) children overall; one from Group A and 15 from Group B ($P < 0.05$) (Table I). They were treated with metoclopramide as needed. Analgesics and tranquilizers were given to 19 (7.6%) children, all from Group B ($P < 0.05$).

Discussion

Penile block is frequently used for circumcision, in neonates as the sole agent^{6,7,12} or in association with GA in children.^{1,5,10} It is a safe, simple and effective procedure

for decreasing postoperative pain.^{1,4,5,12,13} It also reduces behavioural distress and diminishes adrenocortical stress response.¹⁴ Successful block avoids the need for supplemental postoperative analgesia for 6 to 24 hr.^{1,5,13,15,16} Early discharge is possible¹⁵ with a more rapid recovery^{5,14,17} and earlier micturition.⁴ We have demonstrated that in older children, DPNB may be used as the sole source of anaesthesia with a high rate of success. This technique eliminates the risk and postoperative morbidity of GA, permits shorter operating room and PACU times, and an easier recovery period without nausea, vomiting or drowsiness.⁹ All these are advantages for a day-care surgery procedure.

We encountered no technical difficulties in performing DPNB, nor were there any severe block-related complications due to local oedema or haematoma. The frequency of minor complications, such as bleeding, haematoma and minor bruising was similar to previous results.¹⁴ Rare major complications, such as toxic absorption of the anaesthetic² or gangrene of the glans¹⁹ were not seen.

Operative room and PACU times were shorter with DPNB alone, due to the lack of induction and recovery from GA times (Figure 1 and Table II). The procedure with block alone did require more attention from the anaesthetist, but saved operating room time. A reduction in the incidence of nausea and vomiting, postoperative agitation, pain and need for medications was also noted in Group A patients (Figure 2).

Reported failure rate of DPNB with or without GA varies from 2.9 to 6.7%,^{4-7,15} and has been related to technical difficulties¹⁸ or failure of analgesia of the perineal nerves.^{9,10} Thus, we performed DPNB with an additional injection on the raphe line and DPNB failure was 3.3% in Group A. These patients were younger than those who had a successful block. This may be related to increased anxiety and fear during local anaesthesia and surgery. We did not consider patients who initially refused DPNB as treatment failures, but rather excluded them from the study. If these boys were also considered as DPNB failures, then the failure rate would be 8.5%.

Our study suffers from a number of limitations. First, since the same anaesthetists performed both the procedure and the evaluation, the study was not blinded. This

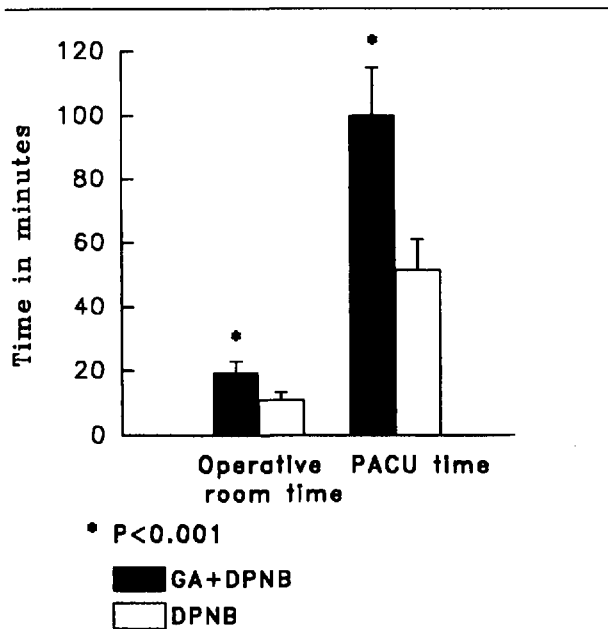


FIGURE 1 Mean operating room and PACU times.

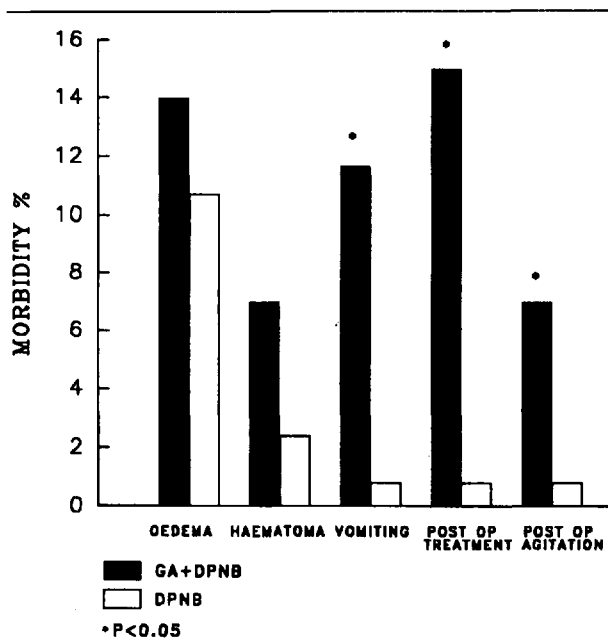


FIGURE 2 Postoperative morbidity

was particularly troublesome, since the assessment of pain was subjectively performed by the surgeon and the anaesthetist judging the patient's response. Second, while we proved that less operating room time is required for patients receiving DPNB alone, the time in the induction room was not included in our calculations.

This time was not great in our setting, since we have sufficient personnel and lack operative rooms. We acknowledge that in a setting where personnel are the limiting factor, the benefit of this approach will be greatly reduced.

In conclusion, DPNB alone is a good method of anaesthesia for children undergoing circumcision. The technique eliminates the risks of GA and results in reduced operating room and PACU times, as well as reduced postoperative morbidity. Thus, DPNB is an appropriate procedure for outpatient surgery. For older children scheduled for circumcision, DPNB should be performed without GA whenever possible.

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