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CLINICAL RESEARCH

Comparison of Dorsal Penile Nerve Block and Laryngeal Mask Applications for the Management of Circumcision Surgery

Sünnet Cerrahisinde Dorsal Penil Sinir Bloğu ve Laringeal Maske Uygulamalarının Karşılaştırılması

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ABSTRACT

Objective: Circumcision is the excision and removal of skin part that covers glans penis which is called as prepicium, Dorsal penile nevre block (DPNB) is used alone or in combination with general anesthesia for circumcision. Application of a laryngeal mask (LMA) is preferred especially in pediatric age group because it requires less anesthetic substance, it does not trigger laryngeal reflexes. Our aim was to compare DPNB application under sedation and LMA application for management of anesthesia in circumcision surgery.
Material and Methods: One thousand and ten patients who had DPNB under sedation and LMA were compared with regards to duration of surgery, duration of anesthesia, duration of recovery, need for postoperative analgesia, complications, and season of surgery.
Results: Duration of surgery, anesthesia, and recovery were significantly shorter in DPNB application under sedation compared with LMA application ($p<0,05$). For postoperative analgesia caudal block was applied to 72, and IV analgesics were applied to 433 patients who had LMA application. DPNB provided sufficient analgesia.
Conclusion: Application of DPNB under sedation provides both adequate anesthesia and postoperative pain control by allowing less surgery, anesthesia, and recovery durations than LMA application.

Keywords: Circumcision Surgery, Dorsal penile nevre block, Laryngeal mask

ÖZ

Amaç: Sünnet, prepisyum adı verilen glans penisini kapatan deri parçasının kesilip çıkarılması işlemidir. Dorsal penil sinir bloğu (DPNB) sünnet için tek başına veya genel anestezi ile birlikte kullanılır. Laringeal maske (LMA) uygulaması özellikle pediatrik yaş grubunda anestezik madde gerektirmemesi, laringeal refleksleri tetiklememesi nedeniyle tercih edilmektedir. Amacımız sünnet cerrahisinde anestezi yönetiminde DPNB uygulaması ile sedasyon altında LMA uygulamasını karşılaştırmaktı.
Gereç ve Yöntem: Sedasyon altında DPNB ve LMA uygulanan, bin on hasta, ameliyat süresi, anestezi süresi, derlenme süresi, ameliyat sonrası analjezi ihtiyacı, komplikasyonlar ve ameliyat mevsimi açısından karşılaştırıldı.
Bulgular: LMA uygulamasına kıyasla sedasyon altında DPNB uygulamasında cerrahi, anestezi ve iyileşme süresi önemli ölçüde daha kısaydı ($p<0,05$). LMA uygulanan 72 hastaya postoperatif analjezi amaçlı kaudal blok, 433 hastaya IV analjezik uygulandı. DPNB ise yeterli analjezi sağladı.
Sonuç: DPNB uygulaması LMA uygulamasına göre daha az cerrahi, anestezi ve iyileşme sürelerine izin vererek hem yeterli anestezi hem de ameliyat sonrası ağrı kontrolü sağlamaktadır.

Anahtar Kelimeler: Sünnet cerrahisi, Dorsal penil sinir bloğu, Laringeal maske

Introduction

Male circumcision (MC), which is practiced for religious and medical reasons, is a common surgical procedure involving the removal of distal penile skin (1). MC is a daily procedure commonly performed in children aged under the American Society of Anesthesiologists (ASA) I and II health classes (2).

Anesthetic method used in MC procedure depends on patient's clinical condition and the experience of the surgeon. To date, various anesthetic and analgesic techniques have been reported in the literature. Meaningfully, the technique to be used in MC procedure needs to be reliable and effective and also should ensure rapid recovery and a minimal complication risk since the patient is discharged shortly after the procedure (3).

Local anesthesia induces a reversible loss of sensation in a limited region of the body without changing the level of consciousness. Dorsal penilenerveblock (DPNB) is a regional anesthetic technique mostly performed in children undergoing MC, which has been reported to be an effective, practical, and safe technique (4). Local anesthesia is simple technique for MC procedures and has been shown to be more effective compared to other anesthetic techniques (5,6).Supraglottic airway devices such as laryngeal mask airway (LMA) are commonly used in pediatric anesthesia and these devices maintain an open airway with no requirement for muscle relaxants, laryngoscopy, and intubation tube(7,8).

The aim of this study was to compare the efficacy of two anesthetic techniques, DPNB and LMA, in children undergoing MC.

Materials and Methods

The retrospective study included children that underwent surgical MC in Adiyaman Training and Research Hospital Pediatric Surgery between 2012 and 2014. The study was approved by Adiyaman University Medical School Ethics Board (Approval No: 2015/02-8). Patient records were retrieved from the anesthesia forms and the hospital database by double examination. Patients that underwent DPNB and LMA were selected and were divided into two groups accordingly. Patients that underwent other anesthetic techniques, patients in whom DPNB and LMA were switched to general anesthesia, and patients with incomplete clinical records were excluded from the study. As a result, a total of 1,010 patients (505 patients in each group)who had complete clinical records and had provided a written consent were included in the study.

The DPNB group was assigned as Group I. DPNB was performed under sedation anesthesia in the operating theater using standard monitoring. Sedation was achieved with intravenous (IV) 2 mg/kg propofol and 2 µg/kg fentanyl. Following sterilization, DPNB was induced with 1 mg/kg of 0.25% bupivacaine injected with a 23-gauge needle in the supine position. The block was achieved using the standard anatomical turning point technique. The penis was gently retracted caudally and the needle was placed in both sides of the middle line in the distal aspect of the inferior ramus of the pubic bone. The needle was then advanced caudally and the injection site was identified by palpation when passing through Scarpa's fascia. Local anesthesia was induced after negative aspiration.

The LMA group was assigned as Group II. A LMA of appropriate size was inserted in each patient under sedation anesthesia in the operating theater using standard monitoring. Sedation was achieved with IV 2 mg/kg propofol and 2 µg/kg fentanyl. Anesthetic maintenance was achieved with sevoflurane 2% in a 50% mixture of oxygen and nitric oxide (N_{2O}).

All the surgical procedures were performed by the same surgeons and the anesthetic procedures were performed by two experienced anesthesiologists.

The two anesthetic techniques were compared basing on operative time, duration of anesthesia, postanesthesia care unit (PACU) stay, postoperative analgesia requirement, and complications. The MC surgeries were compared in terms of the seasons in which they were performed.

Statistical analysis

Data were analyzed using SPSS 15.0 (SPSS Inc. Co, Chicago, IL, USA). Normal distribution of data was analyzed using Kolmogorov-Smirnov test. Groups were compared using a two-sample independent t-test. Descriptives were expressed as mean ± standard deviation (SD). Correlations between the differences and variables in groups were determined using Chi-square test and were expressed as frequencies (n) and percentages (%). Statistical results were given at 95% confidence interval (CI) and a *p* value of <0.05 was considered significant.

Results

No significant difference was found between the two groups with regard to mean age (*p*=0.26).In the DPNB group, mean operative time was 26.83 ± 6.42 min, mean duration of anesthesia was 33.98 ± 7.26 min, and mean PACU length of stay was 9.19 ± 2.76 min. In the LMA group, mean operative time was 32.35 ± 13.14min, mean duration of anesthesia was40.55 ± 14.05min, and mean PACU length of stay was 12.43 ± 3.02min.Accordingly, the mean operative time, mean duration of anesthesia, and mean PACU length of stay were significantly shorter in the DPNB group compared to the LMA group (*p*□0.05) (Table 1). To achieve postoperative analgesia, caudal block was administered in 72 (14.3%) and IV analgesics were administered in 433 (85.7%) patients in the LMA group, whereas IV analgesics were administered in 5 (1%) and DPNB was sufficient for postoperative analgesia in 500 (99%) patients in the DPNB group (Table 2). In the DPNB group, subcutaneous hematoma developed in 10 (2%), nausea in 22 (4.4%), and hypoxia and spasm in 8 (1.6%) patients. In the LMA group, postoperative cough was observed in 20 (4%) and hypoxia and spasm in 20 (4%) patients (Table 3). Patients were discharged on the same day when safely mobile, comfortable, tolerating oral fluids, and presenting with normal urine output. On the other hand, the MC surgeries were mostly performed in summer months (Table 4).

Table 1. Demographic and clinical characteristics

	DPNB n=505	LMA n=505	*p*
Age (years)	6.81 ± 4.06	6.53 ± 3.96	0.266
Operative time(min)	26.83 ± 6.42	32.35 ± 13.14	<0.05
Anesthesia time (min)	33.98 ± 7.26	40.55 ± 14.05	<0.05
PACU time (min)	9.19 ± 2.76	12.43 ± 3.02	<0.05

Values are given as mean± standard deviation (SD). PACU: Post anesthesia care unit

Table 2. Analgesic techniques

	DPNB n=505	LMA n=505
Local Analgesia	500 (99%)	-
Caudal Analgesia	-	72 (14.3%)
IVAnalgesia	5 (1%)	433 (85.7%)

Values are given as number of patients (percentage).

Table 3. Postoperative Complications

	DPNB	LMA
Subcutaneous Hematoma	10 (1.98%)	-
Nausea	22 (4.35%)	-
Hypoxia and Spasm	8 (1.58%)	20 (3.96%)
Postoperative Cough	-	27 (5.34%)

Values are given as number of patients (percentage).

Table 4. Seasonal distribution of circumcision surgeries

	DPNB n=505	LMA n=505	Total
Winter	93 (61.6%)	58 (38.4%)	151
Spring	76 (52.4%)	69 (47.6%)	145
Summer	224 (44.3%)	282 (55.7%)	506
Autumn	112 (53.8%)	96 (46.2%)	208

Values are given as number of patients (percentage).

Discussion

Combined use of regional with general anesthesia in children has recently emerged as a safe and effective technique. Peripheral nerve blocks are alternatives to general anesthesia in children. Major advantages of peripheral nerve blocks include target nerve blockage, minimal motor blockage, lower volume of local anesthetics, and minimal incidence of urinary retention (3).DPNB was first described by Bateman in 1975 (9). DPNB is an effective technique for achieving regional penile anesthesia with low volumes of local anesthetics. The dorsal penile nerve is a branch of the pudendal nerve and innervates the penile shaft, urethra, and glans penis (10,11).Additionally, DPNB is easy to perform, safe and effective in most of the cases for alleviating postoperative pain after superficial penile surgery. Accordingly, conducting the entire surgical procedure under sedation with penile block is likely to prevent the morbidity and complications associated with general anesthesia. Moreover, combined use of DPNB and sedation provides effective postoperative pain management (11).Skin or soft tissue infection and allergic reaction to local anesthetics are the most common absolute contraindications for DPNB. Although local anesthetics are usually safe and effective, they may have toxic effects on the brain and heart. For this reason, excessive drug use, intravascular absorption, and inadvertent intravascular injection are important issues to consider in DPNB (12). Bupivacaine has been shown to have a longer duration of action and to be more advantageous compared to other local anesthetics (13).Depending on these advantages, we used bupivacaine as the local anesthetic in our study.

Supraglottic airway devices are mostly used in pediatric anesthesia and LMA has been shown to be most common anesthetic technique used in children undergoing MC (14).A recent study reviewed the anesthetic techniques employed by anesthetic specialists for MC cases in Turkey and revealed that caudal anesthesia (37.9%) was used as the most common technique, followed by DPNB (27.2%), general anesthesia (17%), and combined general and regional anesthesia (8.3%) (15). Serouret al. proposed that DPNB should be the only method for the anesthetic management of pediatric children undergoing MC (16).Some other studies indicated that caudal epidural block and DPNB provide better protection against post circumcision pain only when compared to general anesthesia (13). Another study compared caudal, parenteral, and penile block and found no significant difference among these techniques with regard to post circumcision analgesia. The authors also noted that penile block could be preferred over caudal block in children that are old enough to walk because of the possibility of temporary leg weakness following caudal block (17). Haliloglu et al. compared the efficacy of penile block, caudal block, and intravenous paracetamol in postoperative analgesia and reported that both penile block and caudal block provided similar pain scores in the early postoperative period while intravenous paracetamol was inadequate in the same period (18).It is commonly known that postoperative crying and agitation associated with pain increases the hemorrhage risk and that an effective pain management is mandatory for preventing complications. Moreover, an ideal postoperative analgesic regimen should provide minimal complications and high success rates. In the literature, penile nerve block has been shown to have a failure rate of 3-10% and to require additional peri- and post-operative analgesia in 30% of the patients (19).In the present study, no block failure was observed in any patient while additional analgesia was required in 1% of the patients. DPNB is easy to administer and thus its failure often results from technical difficulties (20). Nevertheless, a limited number of complications have been reported after DPNB such as bleeding, hematoma, and cyanosis (21).A previous retrospective study reported that the sole use of DPNB as an anesthetic technique provided effective outcomes although it was associated with hematoma in 12 (2.6%) and mild local edema in 83 (18.3%) patients (22).A previous study compared caudal block and DPNB in a cohort of 140 patients and reported that although the side effects of caudal block were observed in 5 patients, no side effects were observed in the DPNB group. The authors also noted that 3.6% of the patients in the caudal group required additional analgesia while no additional analgesia was required in the DPNB group (23).In our study, subcutaneous hematoma was observed in 10 (2%) patients in the DPNB group while no block-related complications such as bleeding, hematoma, or edema were observed in the LMA group. Moreover, the incidence of nausea was remarkably low since nausea was observed in 22 (4.4%) patients in the DPNB group and in no patient in the LMA group. Taken together, these findings indicate that as a simple and effective technique, DPNB provided effective postoperative analgesia in children undergoing MC. On the other hand, DPNB was found to provide shorter

durations of surgery, anesthesia, and PACU stay by eliminating the risks of general anesthesia, which implicates that DPNB is an appropriate procedure for outpatient treatment of MC.

It is commonly known that children feel the same pain as adults, suffer a stress response to surgery, and need to address the pain without affecting their respiratory center. Accordingly, regional anesthetics that are added to anesthesia to achieve postoperative analgesia are commonly used in clinical practice since they offer a postoperative period without pain and problems (3). For these reasons, in the present study, IV analgesics were administered in 433 (85.7%) patients in the LMA group and caudal analgesics were administered in 72 (14.3%) patients in the LMA group. Caudal analgesia is relatively specific to pediatric patients and is commonly performed and probably effective in such patients. Single-shot injection is a relatively simple technique that often provides less prolonged postoperative pain and shorter operative time. For these reasons, the single-shot injection technique is highly appropriate for outpatient surgery (24).In patients undergoing caudal nerve block, complications that are specific to the central block may be seen. DPNB is easier to perform compared to caudal block and does not lead to complications such as delayed mobilization and postoperative urinary retention that can delay the discharge from hospital (25). Gauntlett reported that caudal anesthesia with bupivacaine led to delayed micturition although it was administered at a lower dose than that of DPNB. The author also suggested that DPNB could be preferred to caudal block due to its lower complication rates (26).Another study compared the efficacy of general anesthesia and penile block in MC and revealed that penile block is highly effective when used with light sedation for distal penile surgeries with a duration of less than 2 hours as compared to standard general anesthesia (27). Since the MC surgeries are mostly performed in school-age children, the demand for MC is relatively higher during the summer holiday in Turkey. In a confirmatory manner, our findings also indicated that the MC procedures were mostly performed during summer months.

Ultrasound (USG) has recently become a popular technique for the performance of regional anesthesia. Nevertheless, O'Sullivan et al. found no significant difference between administering DPNB with and without USG (28).In our study, USG was not employed for the DPNB procedure.

Our study was limited due to its retrospective nature. Despite this limitation, the strength of our study was that it included a large number of patients from a single center rather than including the same patient groups.

Conclusion

Children are ideal patients for outpatient anesthesia and surgery. Determination of the ideal anesthetic technique for MC surgery plays a key role in pediatric surgery. DPNB provides highly effective outcomes in distal penile surgeries when used in combination with light sedation. Moreover, postoperative analgesia induced by DPNB allows early recovery of the children after the surgery. The administration of DPNB under sedation provides shorter surgical and anesthetic durations compared to LMA and also provides adequate anesthesia as well as postoperative pain management.

References

1.American Academy of Pediatrics Task Force on Circumcision. Circumcision policy statement. Pediatrics 2012; 130: 585-586.

2.August DA Everett LL. Pediatric ambulatory anesthesia. Anesthesiol Clin 2014; 32: 411-429.

3.Bellieni CV, Alagna MG, Buonocore G. Analgesia for infants' circumcision. Ital J Pediatr. BioMed Central; 2013; 39: 38.

4.Beyaz SG. Comparison of postoperative analgesic efficacy of caudal block versus dorsal penile nerve block with levobupivacaine for circumcision in children. Korean J Pain 2011; 24: 31-35.

5.Polaner DM, Taenzer AH, Walker BJ, et al. Pediatric Regional Anesthesia Network (PRAN): a multi-institutional study of the use and incidence of complications of pediatric regional anesthesia. AnesthAnalg 2012; 115: 1353-1364.

6.Mancuso T, Burns J. Ethical concerns in the management of pain in the neonate. PediatrAnesth 2009; 19: 953–957.

7.Sabuncu U, Kusderci HS, Oterkus M, Abdullayev R, Demir A, Uludag O, Ozdas S, Goksu M. AuraGain and i-Gel laryngeal masks in general anesthesia for laparoscopic cholecystectomy. Performance characteristics and effects on hemodynamics. Saudi Med J 2018; 39(11): 1082-1089.

8.Pennant J, White P. The laryngeal mask airway: Its usesing anesthesiology. Anaesthesiology 1993; 79: 144.

9.Bateman DV. Correspondence. Anaesthesia 1975;30: 101

10.Soh CR, Ng SBA, Lim SL. Dorsal penile nerve block. PaediatrAnaesth 2003; 13: 329-333.

11.Soliman MG, Tremblay NA. Nerve block of the penis for postoperative pain relief in children. Anesth Analg 1978; 57: 495–498

12.Berde CB. Toxicity of local anesthetics in infants and children. J Pediatr 1993; 122: 14-20.

13.Choi WY, Irwin MG, Lim, Chan KL. EMLA! Cream versus dorsal penile nerve block for postcircumcision analgesia in children. AnesthAnalg 2003; 96: 396-399.

14.Jagannathan N, Ramsey MA, White MC, Sohn L. An update on newer pediatric supraglottic airways with recommendations for clinical use. PaediatrAnaesth 2015; 25: 334-345.

15.Altaş C, Küçükosman G, Yurtlu B, et al. Anesthesia methods used by anesthetic specialists for circumcision cases National survey study for Turkey. Saudi Med J 2017; 38: 75-81.

16.Serour F, Cohen A, Mandelberg A, Mori J, Ezra S. Dorsal penile nerve block in children undergoing circumcision in a day-care surgery. Can J Anaesth 1996; 43: 954-958.

17.Cyna AM, Middleton P. Caudal epidural block versus other methods of postoperative pain relief for circumcision in boys. Cochrane Database Syst Rev 2008; 8: CD003005.

18.Haliloglu AH, Gokce MI, Tangal S, Boga MS, Tapar H, Aladag E. Comparison of postoperative analgesic efficacy of penile block, caudal block and intravenous paracetamol for circumcision: a prospective randomized study. Int Braz J Urol 2013; 39: 551-557.

19.Faraoni D, Gilbeau A, Lingier P, Barvais L, Engelman E, Hennart D. Does ultrasound guidance improve the efficacy of dorsal penile nerve block in children? PaediatrAnaesth 2010; 10: 931-936.

20.Masciello AL. Anesthesia for neonatal circumcision: Local anesthesia is better than dorsal penile nerve block. Obst Gynec 1990; 75: 834-838.

21.Stang HJ, Gunnar MR, Snellman L, Condon LM, Kstenbaum R. Local anaesthetic for neonatal circumcision. Effects on distress and cortisol response. JAMA 1988; 259: 1507–1511.

22.Serour F, Reuben S, Ezra S. Circumcision in children with penile block alone. J Urol 1995; 153: 474-476.

23.Ozen V, Yigit D. A comparison of the postoperative analgesic effectiveness of low dose caudal epidural block and US-guided dorsal penile nerve block with in-plane technique in circumcision. J Pediatr Urol 2019; S1477-5131(19)30340-7.

24.Allan CY, Jacqueline PA, Shubhda JH. Caudal epidural block versus other methods of postoperative pain relief for circumcision in boys. Cochrane Database Syst Rev 2003; 2: 2-8.

25.Brasher C, Gafsous B, Dugue S, et al. Postoperative Pain Management in Children and Infants: An Update. Pediatr Drugs 201416: 129–140.

26.Gauntlett I. A comparison between local anaesthetic dorsal nerve block and caudal bupivacaine with ketamine for paediatric circumcision. PaediatrAnaesth 200313: 38-42.

27.Panda A, Bajwa SJS, Sen S, Parmar SS. Penile block for paediatric urological surgery: A comparative evaluation with general anaesthesia. Indian J Urol 2011; 27: 457-464.

28.O'Sullivan MJ, Mislovic B, Alexander E. Dorsal penile nerve block for male pediatric circumcision--randomized comparison of ultrasound-guided vs anatomical landmark technique. PaediatrAnaesth 2011; 21: 1214-1218.