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Research Article

Does Block Anesthesia Used in Hypospadias Surgery Increase Complication Rates?

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Hipospadias Ameliyatında Kullanılan Blok Anestezisi Komplikasyon Oranlarını Arttırıyor mu?

ABSTRACT

Objective: *Caudal and penile block are two commonly used methods for providing analgesia during and after hypospadias surgery. Although caudal block is a more popular method than penile block, it is thought to contribute to venous congestion and thus to poor healing and fistula formation at the suture line. In our study, we compared postoperative complication rates in patients operated for distal hypospadias with penile or caudal block.*
Methods: *The records of 44 patients who underwent distal hypospadias surgery at pediatric surgery clinic of Okmeydani Trainig and Research Hospital between 2013 and 2018 were retrospectively reviewed. Patients were divided into two groups as caudal block and penile block groups. Patients were evaluated for meatal stenosis and urethral fistula development.*
Results: *There were 26 patients in the penile block gruop and 18 patients in caudal block grop. Mean age was 2.3 in the penile block group and 3.5 in the caudal block group. In penile block grop, fistula was observed in 2 patients (7.6%) and meatal stenosis in 4 patients (15.3%). In caudal block group fistula was observed in 1 patient (5.5%) and meatal stenosis was observed in 2 patients (11.1%). There was no statistically significant difference between the two groups.*
Conclusion: *Both penile and caudal block are commonly used in hypospadias surgery for providing analgesia. In the literature, there are studies showing that the caudal block contributes to urethral fistula formation. In our study, there was no significant difference in the complication rates between the two groups.*

Keywords: *Hypospadias, regional anesthesia, complications*

ÖZ

Amaç: *Kaudal ve penil blok hipospadias cerrahisi sırasında ve sonrasında analjezi sağlanması için sık kullanılan iki yöntemdir. Kaudal blok penil bloğa göre daha popüler bir yöntem olmasına rağmen venöz konjesyona ve bu sebeple dikiş hattında kötü iyileşme ve fistül oluşumuna katkısı olduğu düşünülmektedir. Çalışmamızda penil ve kaudal blok uygulanan distal hipospadiaslı hastalarda postoperatif komplikasyon oranlarını karşılaştırdık.*
Yöntem: *2013-2018 yılları arasında Okmeydanı Eğitim Araştırma Hastanesi Çocuk Cerrahisi kliniğinde distal hipospadias tanılı 44 hastanın dosyaları geriye dönük olarak incelendi. Hastalar kaudal blok ve penil blok uygulananlar olarak iki gruba ayrıldı. Hastalar meatal stenoz ve üretrakutanöz fistül gelişimi açısından değerlendirildi.*
Bulgular: *Penil blok uygulanan 26, kaudal blok uygulanan 18 hasta mevcuttu. Penil blok grubunda yaş ortalaması 2.3, kaudal blok grubunda 3.5 olarak saptandı. Hastaların ameliyat sonrası 7. gününde üretral kateteri çekildi. Penil blok uygulanan hastaların 2' sinde fistül (%7,6), 4'ünde meatal stenoz (%15,3) gözlendi. Kaudal blok uygulanan hastaların 1'inde fistül (%5,5), 2'sinde meatal stenoz (%11,1) gözlendi. İki grup arasında istatiksel olarak anlamlı bir fark saptanmadı.*
Sonuç: *Kaudal ve penil blok hipospadias cerrahisinde analjezi sağlanması için sık kullan iki yöntemdir. Literatürde kaudal bloğun üretrakutanöz fistül oluşumunda katkısı olduğunu gösteren çaışmalar mevcut olsada, bizim çalışmamızda kaudal ve penil blok uygulanan hastalarda komplikasyon oranları açısından anlamlı fark saptanmamıştır.*

Anahtar kelimeler: *Hipospadias, rejyonel anestezi, komplikasyonlar*

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INTRODUCTION

Caudal-epidural and penile block are the most commonly methods used for intraoperative and postoperative pain control in hypospadias surgery. Recent studies reported that penile block has similar efficacy to that of caudal-epidural block. Dorsal penile block is associated with relatively rare occurrence of serious adverse effects in penile surgery [1,2]. The landmark-based technique was first described by Bateman in 1972 [3]. Its most common adverse effect was reported as block failure and minimal redness and bleeding at the injection site [4]. Penile block not only provides faster and long-lasting pain control but is also associated with lower complication rates, as reported by larger scale studies [5].

The other reliable and efficacious anesthetic method for penile surgery, the caudal-epidural block, is comparably less frequently used due to its lower efficacy in older children. Vasodilation and venous congestion induced by sympathetic blockade secondary to caudal anesthesia in penile region poses a limitation for bleeding control during the surgery. In addition, Saavedra-Belaunde et al. [6] recently reported that caudal anesthesia was associated with a higher risk of fistula formation after distal hypospadias repair.

In this study, we aimed to compare complication rates in patients who underwent caudal-epidural block and penile block for hypospadias surgery.

MATERIAL and METHODS

After approval by local ethics committee, we retrospectively reviewed medical records of 81 patients with a diagnosis of distal hypospadias followed in pediatric surgery department of Okmeydanı Training and Research Hospital between October 2013 and April 2021. Patients were divided into two groups as those who were applied penile or caudal-epidural block.

All patients were to be operated by the pediatric surgeons and pediatric urologist of the same department using the same techniques and materials. No patients had received premedication except prophylactic antibiotherapy with ampicillin at a single dose of 50 mg/kg one hour before the surgery. All cases were monitored with electrocardiogram, noninvasive blood pressure measurement, peripheral oxygen pressure, and end-tidal carbon dioxide pressure. Laryngeal mask airway was placed after anesthesia induction with propofol 3-5 mg/kg or sevoflurane 8%. Once the position of the mask was confirmed, dorsal penile block and caudal block were applied with bupivacaine 0.25% at a dose of 3-5 ml (at a maximal dose of 0.5 mg/kg) and at a dose of 0.5 ml/kg in penile and caudal block groups, respectively. Anesthesia was maintained with 66% nitrous oxide, 1 MAC isoflurane, and 33% oxygen under spontaneous respiration. The cases where mean arterial pressure was increased or a >15% increment in heart rate were considered as block failure, which prompted bolus administration of fentanyl 1 mcg/kg. Pre- and post-block heart rate, mean blood pressure, and end-tidal carbon dioxide pressure were continuously monitored and recorded. This monitoring was maintained till 30 minutes after transfer to the recovery room.

Postoperative analgesia was maintained with 10 mg/kg intravenous paracetamol administered at every eight hours. The patients were discharged on postoperative day 0 and 1. On the 7th postoperative day, the dressing was opened and the catheter was withdrawn. The patients were followed up for 6-18 months postoperatively. Those who developed meatal stenosis and fistulae were recorded.

Statistical Analysis

Statistical analysis was performed via IBM SPSS 26.0 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). Descriptive data were expressed as numbers and percentages for categorical variables and as the mean, standard deviation, minimum, and maximum values for continuous variables. The comparison of continuous variables between the two groups was made using Mann- Whitney U test as the normality test showed non-normal distribution. Categorical variables were compared with chi-square test and Fisher's exact test. Statistical significance was set as "$p<0.05$"

RESULTS

The mean age of study population was 3.4±3.5 years (range: 6 months-16 years). Forty-six patients had received caudal block (56.79%), and the remaining 35 patients (43.20%) penile block. The mean age of patients in caudal block group (3.9±3.8 years, range: 6 months- 8 years) was higher than that in penile block group (2.7±3.1 years, range: 1-16 years), (p=0.045).

The patients who developed urethral fistulae had undergone fistula repair at month 6 of follow-up. Most of the cases (n=72, 88.9%) had undergone TIPU (Tubularized Incised Plate Urethroplasty) The remaining nine cases (11.1%) underwent MAGPI (Urethral (meatal) Advancement and Glanuloplasty). No local adrenaline was administered intraoperatively. Chordee assessment was performed via artificial erection for each patient. Chordee was detected in eight patients with five cases in caudal block and three cases in penile block of the study groups , and chordee correction was performed in these patients. While urethral repair was performed through meatal advancement and glanuloplasty (MAGPI) in fourteen patients who had glanular meatus, those with coronal, subcoronal or midpenile meatus or megameatus had undergone tubularized incised plate urethroplasty (TIPU). During postoperative follow-up, ten patients (12.3%) developed meatal stenosis and two cases (2.5%) had fistula. Dorsal meatotomy was performed after six months if routine dilation proved no benefit in patients with meatal stenosis. Those developing fistula underwent fistula repair with meatotomy provided that meatal stenosis

Table 1. Postoperative clinical characteristics of the study groups.

	Anesthesia	Anesthesia		
		Caudal-epidural Block (n=46)	Penile Block (n=35)	
	Mean±SD Median (IQR)	Mean±SD Median (IQR)	Mean±SD Median (IQR)	
Age	3.4±3.5 2 (1-5)	3.9±3.8 2 (1-6)	2.7±3.1 2 (1-3)	p=0.045[a]
	n (%)[b]	**n (%)[c]**	**n (%)[c]**	
Mea position				
Coronal	39 (48.1)	24 (52.2)	15 (42.9)	
Glanular	13 (16.0)	8 (17.4)	5 (14.3)	
Megameatus	1 (1.2)	-	1 (2.9)	x^2=2.566
Midpenile	5 (6.2)	2 (4.3)	3 (8.6)	p=0.633
Subcoronal	23 (28.4)	12 (26.1)	11 (31.4)	
Chordee				
Yes	8 (9.9)	41 (89.1)	31 (91.4)	p=0.519[c]
No	73 (90.1)	5 (10.9)	3 (8.6)	
Operation technique				
MAGPI	9 (11,1)	4 (8.7)	5 (14.3)	x^2=1.534
TIPU	72 (88.9)	42 (91.3)	30 (85.7)	p=0.464
Postoperative Fistula				
Yes	2 (2.5)	-		
No	79 (97.5)	46 (100.0)	2 (5.7)	p=0.184
Postoperative meatal stenosis			33 (94.3)	
Yes	10 (12.3)	4 (8.7)	6 (17.1)	p=0.316[c]
No	71 (87.7)	42 (91.3)	29 (82.9)	

[a]Mann-Whitney u test; [b]Column percentage; [c]Fisher's exact test
IQR, Inter Qartile Range; SD, standard deviation; MAGPI, meatal advancement and glanuloplasty; TIPU, tubularized incised plate urethroplasty.

was accompanied at month six postoperatively. Different types of anesthesia techniques did not differ in meatal position, presence of chordee, and surgical technique, or Dartos flap (p=0.633, p=0.519, p=0.464, and p=1.145, respectively). Complication rates were not also statistically significantly different between the study groups (Table 1).

Complication rates between the surgical techniques were not different for fistula or meatal stenosis (p=0.184 and p=0.316, respectively) (Table 2).

No complications occurred in patients undergoing MAGPI whereas two patients (2.5%) developed urethral fistula and ten patients (12.3%) had meatal stenosis among those undergoing TIPU.

Table 2. Comparison of surgical techniques in terms of postoperative fistula and meatal stenosis.

	Postoperative Fistula n (%)	Postoperative meatal stenosis n (%)
MAGPI (n=9)	-	1 (12.5)
TIPU (n=72)	2 (2.8)	9 (12.5)
	χ^2=1.534 p=0.464	χ^2=0.256 p=0.880

MAGPI, meatal advancement and glanuloplasty; TIPU, tubularized incised plate urethroplasty.

DISCUSSION

Penile block and caudal-epidural block are the two most commonly used peripheral block methods in distal hypospadias surgery. Recent studies suggested superiority of the penile block in perioperative and postoperative analgesia [7]. Major contributor of the innervation of the penis is dorsal penile nerve. The proximal part is innervated by the posterior branch of the penile nerve. The branches of genitofemoral and ilioinguinal nerves also contribute to the innervation. Therefore, penile nerve cannot be blocked with a single lateral injection. The caudal-epidural block is another popular block method that can be used as an alternative to penile block. The sympathetic block induced in this method could lead to vasodilation and penile congestion in penile venous sinuses [8], an unwanted adverse effect during and after surgery. On the other hand, formation of hematoma and necrosis could be listed among the threatening complications of the penile block, though a study reported that these could be reduced when the method was performed under the guidance of ultrasonography [9].

The failure at hypospadias surgery is a consequence of many factors including surgeon's skill, defect severity, competence of the technique used, patient-related factors, and presence of adequate urinary drainage [10,11]. The most common complication of the hypospadias surgery is urethra-cutaneous fistula. In fact, the recent advances in surgical techniques have dramatically reduced the rates of such complications [12,13]. Zaidi et al. [14] in their retrospective study involving patients who underwent primary hypospadias repair, reported association of fistula formation to the more proximal positioning of urethral meatus and use of subcutaneous epinephrine consistent with the literature and unlike the findings of the study by Kundra et al . any association to the caudal anesthesia could not be found [7]. This finding seems consistent with that of our study. In the study by Kundra et al. surgical techniques and surgical services in terms of complication rates of caudal-epidural and penile block methods were not mentioned [7]. In our study, we compared complication rates of these block methods where the surgery was performed by the same surgical services.

Whereas, Zaidi et al. reported its negative impact on wound healing as shown through the rabbit model by Kajbafzadeh et al. In fact, the authors reported markedly higher rates of cellular damage and higher number of apoptotic myocytes after bleeding control with epinephrine in the hemostatic technique with application of tourniquet compared to the non-hemostatic technique [14,15]. Tourniquet was not applied to our study patients who received local block with epinephrine administration

In our case series of distal primary hypospadias repair, we compared complication rates in patients who underwent caudal-epidural block or penile block for hypospadias surgery. We found that there was no significant difference in the complication rates between the two groups.

CONCLUSION

Our study eliminated such factors that limits the assessment of the association between peripheral block and the complications of hypospadias surgery; including use of multiple techniques, local application of epinephrine and tourniquet for hemostasis, presence of patients with proximal hypospadias, or performing hypospadias surgery by different departments. Nevertheless, the surgery is a very sophisticated procedure, requiring a high level of skill and experience. In fact, the number of procedures performed by surgeons was reported to be associated with complication rates [16]. Those with lower number of procedures were reported to have higher incidence of complications such as meatal stenosis, urethral fistula, or stricture [17]. Accordingly, the smaller number of the procedures performed by the surgeon appears to be a limiting factor in our study.

Ethics Committee Approval: Okmeydanı Training and Research Hospital Ethics Committee approval was obtained (17.04.2018/889).

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Informed Consent: Informed consent was obtained from all individual participants included in the study.

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