




Retrospective evaluation of anesthesia and surgery methods in proximal hypospadias cases

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Abstract

Aim: The appropriate anesthetic technique to be used in cases of proximal hypospadias in children is a subject of debate. Local or regional anesthesia as well as intubation can be used. In this study, it was aimed to evaluate retrospectively the different anesthesia and surgery techniques used and their perioperative outcomes in the cases of proximal hypospadias consulting our hospital.

Materials and Methods: The hospital files of 30 cases operated on for proximal hypospadias were scanned retrospectively to evaluate the different methods of anesthesia and repair surgery implemented. The patients operated under general anesthesia were grouped on the basis of the airway equipment used for anesthesia as Laryngeal mask airway (Group 1) and endotracheal intubation (Group 2). Routine penile block implementation, effectiveness of anesthesia, side effects, hemodynamic changes and complications in all patients were recorded.

Results: A total of 56 sessions of operations on 28 patients were carried out. In 26 of the session's laryngeal mask and in 30 sessions endotracheal intubation were used. When the data of Group 1 and Group 2 were compared, the groups did not differ significantly with respect to age, anesthesia methods and duration, hypospadias repair methods, duration and sessions, intraoperative parameters, hospital stay and complications (all $p > 0.05$). The two groups differed on the ASA physical status classification values with Group 2 values being significantly higher ($p < 0.05$).

Conclusion: Effectiveness of anesthesia by using LMA or endotracheal intubation were perioperatively equivalent during repair of proximal hypospadias with different methods of surgery.

Keywords: Complication; endotracheal intubation; laryngeal mask; proximal hypospadias

INTRODUCTION

Hypospadias, with an incidence about 1% is the most frequently seen congenital penile anomaly at birth. Among many others, Hadidi et al. (1) has classified that comprises the glanular (Grade I), distal (Grade II), severe deep proximal without chordee (Grade III), severe deep perineal hypospadias with chordee (Grade IV), and later added the cripple and scarred types as Grade V. Proximal hypospadias cases are rare, with the urethral orifice opening to the peno-scrotal region, to the scrotum or the perineum and can be accompanied with severe chordee, and as such, they are often the most difficult cases for pediatric urologists who require multiple surgical procedures to correct. In these patients, staged surgical intervention may be required with advanced dissection, urethral plate excision and / or grafting (2).

After anesthesia induction in simple urological interventions with brief duration, ventilation can be provided by laryngeal mask airway (LMA) (3,4). Although there are differences of approach between clinics, controlled ventilation by endotracheal intubation is mostly preferred in babies, in children with suspected upper airway or respiratory function problems, during surgery with unforeseen duration and conditions requiring additional processes such as buccal graft. It is safe and ensures the control of end-tidal carbon dioxide levels (1,3). Before surgery, regional anesthesia techniques including local infiltration anesthesia and local anesthetic methods such as penile block and/or caudal and epidural block are also employed in addition to general anesthesia (5). Caudal block is found to be an effective technique in hypospadias repair surgery and reduces the postoperative analgesia requirement (6). Although there are many

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reports in the literature on the surgical and anesthetic techniques used in distal hypospadias cases, data on the anesthetic method to be elected in cases of severe proximal hypospadias are limited (7-9).

In this study, it has been aimed to evaluate retrospectively the anesthetic techniques used and their perioperative and postoperative effects on repair surgery for proximal hypospadias cases in our pediatric surgery clinic.

MATERIALS and METHODS

The study was carried out in compliance with the principles of the Helsinki Declaration after obtaining the institutional ethics committee approval coded 2011-KAEK-25 2019/02-07.

Hospital files of children who applied to pediatric surgery clinic for proximal hypospadias repair surgery between 01.11.2011 - 31.12.2018 were retrospectively scanned. Files that do not contain the necessary data were excluded. Data on demographic details, urogenital pathologies comorbid with proximal hypospadias, number and the duration of the operations, types of anesthetic techniques employed, duration of anesthesia, haemodynamic changes and the observed complications were noted.

Anesthetic methods

On the basis of the anaesthetic method used during proximal hypospadias surgery, the patients included in the study were placed in Group 1 as the LMA group and Group 2 as the endotracheal intubation groups. In Group 1, anesthesia was induced after monitorization by 0.01-0.02 mg/kg i.v. midazolam (Zolamid; Vem, Turkey) followed by 1-2 mcg/kg fentanyl (Talinat; Vem, Turkey) and, 2-3 mg/kg propofol (Pofol; İlsan-İltas, Turkey). In Group 2, induction was achieved by 0.6 mg/kg rocuronium bromide (Curon; Mustafa Nevzat, Turkey) before endotracheal intubation, followed by 2-3% sevoflurane (Sevoflurane; Abbvie, Turkey) in %50 medical air + %50 O₂ mixture 1 L/d for minimum alveolar concentration. At the termination of surgery 0.03-0.05 mg/kg neostigmine (Neostigmine; Adeka, Turkey) and 0.01 mg/kg atropine (Atropin sülfat; Osel, Turkey) were used to antagonize the muscle relaxant agent before extubation and transfer to the recovery room.

Surgical Methods

All operations were carried by the same surgeon. After general anesthesia, all cases were injected as a preemptive measure next to dorsal penile block, with 0.5% bupivacaine (Buvicaine; Polifarma, Turkey) circumferentially at the penile root and sides of the urethral plate (Figure 1). In cases with chordee, firstly the ventral fibrous bands were excised and in the 30% with persistence of chordee, further correction was made with dorsal midline plication or the Nesbit operation. Excepting those who underwent a single stage urethroplasty, in the first surgical stage, urethral plate was constructed by Byar's flaps in cases with adequate prepuce turned ventrally or by free preputial grafts as the Bracka method. At the subsequent sessions the neourethra was made by the Thiersch-Duplay principle. If required, at the third session, the urethral meatus was moved to the

glans by tubularised incised urethroplasty or the Thiersch-Duplay method. For postoperative analgesia, 10 mg i.v. paracetamol was given every 8 hours. Complications such as early stage of hemorrhage, hematoma and wound infection and late stage wound split, fistula and strictures were recorded.

Statistical evaluation of the data was made on the SPSS 21 program (SPSS, Armonk, New York, IL, USA). Variables were expressed in terms of the mean, minimum and maximum; variables of descriptive statistics were indicated by the mean and the standard deviation and the categorical variables were expressed numerically. The Chi Square, Student's T test and the Mann Whitney U tests were used for analyzing the relationships between the parameters. A p value of <0.05 was accepted for statistical significance.

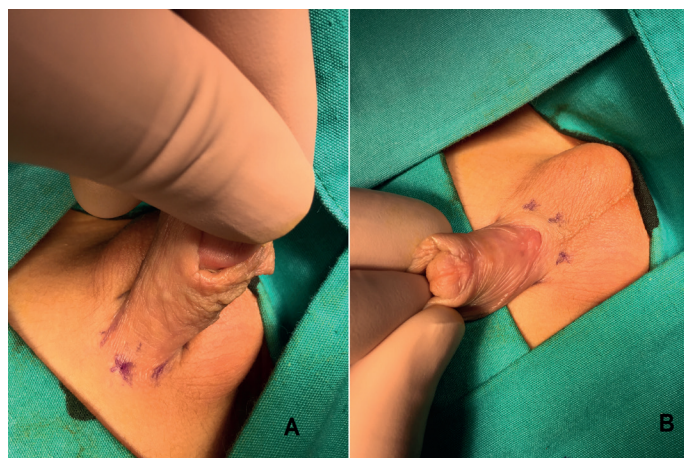


Figure 1. Local anesthesia in these cases around the sites of surgical incision

RESULTS

In this study the data in the hospital files of 28 out of the 30 cases who underwent proximal hypospadias repair were reached and analyzed statistically (Table 1). In the first session of staged repair, 53.6% of the cases were under the age of 1 year. The preoperative laboratory test results of all the cases were within normal limits. Staged repair was performed on 16 cases. Anesthesia was used in a total of 56 surgical sessions, comprising 26 in Group 1 using LMA and 30 in Group 2 using endotracheal intubation. In Group 2, five cases had systemic diseases with American Society of Anesthesiologists (ASA) physical status classification scores significantly higher than those in Group 1 ($p=0.01$) (Table 1); but problems were not encountered in this group during intubation. In Group 1, caudal block was used in 2 cases after anesthesia induction. The two groups did not differ significantly with respect to the durations of anesthesia and surgery ($p>0.05$). At 3, 5, 15, 30, 60, 90 minutes before and after anaesthesia induction and at waking up, significant differences were not determined between the heart rate and peripheral oxygen saturation of the two groups ($p>0.05$) (Table 1). A complication was not encountered in any of the cases in relation to the preoperative penile block and infiltration anesthesia

performed by the surgeon. Comparison of the hospital stay time for each surgical session were comparable in Group 1 and Group 2 (respectively, 2.53 ± 1.33 and 2.76 ± 1.36 days, $p > 0.05$) (Table 1).

The complications observed in postoperative follow up included wound split in 1 case operated for cripple hypospadias, urethrocutaneous fistula in 5 cases, stricture requiring dilatation in 2 cases and megalourethra or diverticulum in 3 cases. It was determined that in cases undergoing staged repair, different surgical techniques were performed at each session of surgery.

Table 1. Demographic features of the patients, surgical methods, findings during anesthesia and after surgery

	Group 1	Group 2
Anesthesia sessions (number)	26	30
Age (Mean \pm SD) year	3.1 \pm 2.6	4.2 \pm 4.4
ASA (n), I/II/III	14/0/0	9/3/2*
Surgery time (min, mean \pm SD)	85 \pm 28	94 \pm 33
Anesthesia time (min, mean \pm SD)	97 \pm 27	105 \pm 35
Hospital stay (day)	2.53 \pm 1.33	2.76 \pm 1.36
Operation method		
Byarflap	3	2
Bracka	3	4
Methieu	1	2
Tubulerize Duckett Onlayflap	-	1
TIPU/DuplayTirsch	19	21
Hipospadias		
One session	7	5
Two sessions	2	2
Three sessions	5	7
HR (min\pmSD)		
Before induction	118 \pm 22	116 \pm 20
3th min	117 \pm 22	116 \pm 20
5th min	115 \pm 22	114 \pm 19
15th min	115 \pm 21	112 \pm 17
30th min	112 \pm 22	110 \pm 15
60th min	115 \pm 21	112 \pm 18
Recovery	113 \pm 23	112 \pm 21
SpO ₂ (% , mean \pm SD)	99 \pm 0.6	99 \pm 0.6

Group 1: Laringal mask airway, Group 2: endotracheal intubation, SD: Standart deviation, ASA: The American Society of Anesthesiologist physical status classification system, HR: Heart rate, SpO₂: Peripheral oxygen saturation, * $p < 0.05$

DISCUSSION

The factors affecting the success of hypospadias surgery include the enough experience of the surgeon, adequacy of the techniques used, the lower severity grade of the defect and the capacity for improvement and ability to

pass urine by the patient (7). Apart from these factors, the implemented anesthesia was also argued to affect surgical success (8,9).

Hypospadias surgery is generally performed under general anesthesia combined with regional anesthesia. However, there is limited information in the literature on the requirement of intubation in hypospadias surgery. Having investigated the anesthetic methods used in inguinal, hydrocele and hypospadias surgeries of brief duration in 30 children, Mahdavi et al. (10) recommended LMA on grounds of lower peak inspiratory pressure and better pulmonary and hemodynamic compliance as compared to anesthesia by endotracheal intubation.

It was reported that LMA use was increased, especially in the recent years, without any complication related to the anesthetic methods used and consequent switch to intubation (10). Differences were not determined with respect to the mean values of age, surgery and anesthesia durations between Group 1 and Group 2 cases undergoing comparable surgical repair interventions. Also, the two groups did not differ significantly on the basis of results on vital signs. Hence, both anesthetic methods were implemented without problems. The most noteworthy result of the study was finding that intubation was elected in patients with elevated ASA scores. The ASA risk classification system is based of the conditions that threaten life or limit function and thereby facilitate the prediction of the preoperative risks. It is believed that ventilation by endotracheal intubation as against LMA was preferred in order to control the airways in view of possible risks during surgery on patients with systemic disease and elevated ASA scores.

One of the most discussed subjects in the literature is the peri- and postoperative use of regional anesthesia and/or local analgesia including penile, pudental and caudal block in addition to general anesthesia during hypospadias repair surgery. Penile block is being used effectively in inguinal and penile surgeries. Peripheral nerve blocks are considered to be more effective than central blocks, and using penile block in babies and children during general anesthesia results in reduced incidences of hemorrhage, local hematoma formations and without reports of serious complications in long term follow up (9,11). Penil block was shown to have a longer effect and a lower side effect profile (12) and lower incidence of urinary retention (13) as compared to caudal block. In the series presented, in addition to the penile block, circumferential infiltration anesthesia was applied to the surgical field. None of the patients required intubation despite wide dissections. The penis is essentially innervated by the dorsal penile nerve. The proximal penile and perineal parts although innervated by the posterior branches of the penile nerve remaining under the pubis, receive more innervation from the branches of the genitofemoral and ilioinguinal nerve. Therefore, local anesthesia was also used in these cases around the sites of surgical incision

(Figure 1). Complications did not develop after any of these applications.

In studies with successful use of the pudendal block in hypospadias surgery, consumption of anesthetic agents and postoperative need for analgesia were reported to be reduced (14,15). None of the cases included in this study had been given pudendal block. There is need for more data on its application in pediatric surgery for hypospadias repair.

Caudal epidural block for regional anesthesia is one of the frequently preferred methods in pediatric lower abdomen, lower extremity, perineal and inguinal surgeries. Earlier studies have demonstrated the beneficial effects of caudal block in reducing the duration of surgery, the risk of hemorrhage, postoperative pain and analgesia requirement (6,16). On the other hand, the possibility of a relationship between caudal block and complications such as fistulae, meatal strictures and dehiscence of the glans has been proposed (17). Also, there are data indicating that penile enlargement during caudal block results from sympathetic block and vasodilatation in the penile sinuses resulting in tissue oedema (8). Subsequent studies proposed caudal block to be an independent variable for the postoperative complications of hypospadias surgery and demonstrated a 3.70 fold increased risk for fistula development (18). Braga et al. (19), on the other hand, have demonstrated that it is the severity of hypospadias grade rather than regional anesthesia type that causes postoperative complications. In 2 of the cases included in Group 1 caudal block had been implemented without any reported complications.

Complications including fistulae, strictures and urethral dilatation developed in the cases included in this study although only one of these had undergone a staged repair. Since differing anesthetic methods were used in each stage of the staged repairs; and because the surgical procedures in each stage were independent of each other, a correlation model between the type of anesthesia and the postoperative complications could not be constructed. We also believe that the postoperative complications are associated with the severity of the hypospadias defect.

The primary limitation of this study is being based on retrospective investigations. Other limitations include not having data evaluating the duration of stay at the recovery room and the postoperative supplementary analgesic usage and, also, on blood pressure measurements.

CONCLUSION

In this study, a direct effect of the anesthesia induction and maintenance by using the LMA and endotracheal intubation techniques could not be demonstrated on the surgical outcomes. However, irrespective of the surgical techniques used in the severe hypospadias cases, it can be seen that both methods can be used in hypospadias repair. There is need for randomized prospective studies with wider patient populations for definitive conclusion on the effects of anesthesia on hypospadias repair surgery.

Conflict of interest: The authors declare that they have no competing interest.

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