Does the use of magnifying loupes an effective factor in preventing urethrocutaneous fistula and meatal stenosis in hypospadias repair with tipu in children?

Çocuklarda tıpu ile hipospadias onarımında başarıyı etkileyen faktörler: büyütücü luplar üretrokütanöz fistül ve meatal stenozu önleyici bir faktör mü?

Magnifying loupes in hypospadias repair

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The study was presented at 34th Annual Congress of Pediatric Surgery between 26 - 30 October 2016, in Girne, Turkish Republic of Northern Cyprus.

Öz

Amaç: Bu çalışmanın amacı, Tubularize insize plak üretroplastiyle hipospadias onarımı yapılmış çocuklarda üretrokütanöz fistül ve meatal stenozun oluşumunu etkileyen belirleyicilerin ayrıştırılmasıdır ve büyütücü lupların üretrokütanöz fistül ve meatal stenozun oluşumuna etkisinin araştırılmasıdır. Gereç ve Yöntem: 2008'den 2016'ya kadar 130 hasta tek bir cerrah tarafından hipospadias nedeniyle Tubularize insize plak üretroplastiyle opere edildi. 130 hastanın dosyaları geriyedönük olarak incelendi. Tüm hastaların ameliyat yaşları, hipospadias tipi, ek anomaliler, kordi, komplikasyon oranı, büyütücü lup kullanımı, üretral kateter uygulama süresi ve hastanede kalış süresi değerlendirildi. Bulgular: Yaş ortalamaları (IQR) 3(4.5)yıl (5ay-15yıl) olan 130 çocuğun 103'ü distal hipospadiasa sahipti ve bunlar 7 glanüler, 60 koronal, 13 megameatus, 23 subkoronal hipospadias içermekteydi. Yirmiyedi çocuk proksimal hipospadiasa sahipti 20'si midşaft ve 7'si penoskrotal hipospadiastı. Yirmibeş hasta 1 yaşından küçüktü. Ellibeş hastada büyütücü lup (2.5X) kullanıldı. Dört üretrokütanöz fistül, 7 meatal stenoz, 2 üretrokütanöz fistül ve meatal stenoz, 1 meatal stenoz ve üretral çekilme olan 14 hastaya (10.8%) tekrar müdahale gerekmiştir. Üretrokütanöz fistül ve meatal stenoza göre; yaş (≤ 1y karşın >1y), hipospadias tipi (distal karşın midşaft ve penoskrotal), ek anomaliler ve kordinin sonucu etkilemediği tespit edildi, buna karşılık büyütücü lup kullanımının univariate and multivariate logistic regression analizlerinde önemli derecede sonucu etkilediği tespit edildi ($p < 0.05$). Fakat büyütücü lup kullanılan 55 hasta kullanılmayan 75 hasta ile karşılaştırıldığında guruplar arasında yaş dağılımı, hipospadias tipi, ek anomaliler, kordi, üretral kateter uygulama süresi ve hastanede kalış süresi yönünden anlamlı bir fark tespit edilmedi ($p>0.05$). Tartışma: Büyütücü lup kullanımı çocuklarda hipospadiasın Tubularize insize plak üretroplastiyle onarımından sonra üretrokütanöz fistül ve meatal stenozu önleyici etkin bir faktördür.

Anahtar Kelimeler

Çocuklar; Hipospadias; Büyütücü Lup; Tubularize İnsize Plak Üretroplasti; Üretrokütanöz Fistül

Abstract

Aim: To investigate factors affecting urethrocutaneous fistula and meatal stenosis in repairing hypospadias through tubularized incised plate urethroplasty in children and the effects of magnifying loupes in preventing urethrocutaneous fistula and meatal stenosis. Material and Method: Operated with tubularized incised plate urethroplasty due to hypospadias between 2008-2016; 130 patients were retrospectively evaluated for age, type of hypospadias, associated anormalies, chordee, complication rate, magnifying loupes, and urethral catheterization and hospitalization times. Results: At mean intraoperative age (IQR) of 3 (4.5) years (5months-15years), 130 patients were enrolled. Of 130 cases, 103 children had distal hypospadias, including seven as glanular, 60 as coronal, 13 as megameatus, and 23 as subcoronal, and 27 had proximal hypospadias, including 20 as midshaft and seven penoscrotal hypospadias. Twenty-five patients were younger than one year. Magnifying loupes (2.5X) were used in 55 cases. In 14 patients, four with urethrocutaneous fistula, seven with meatal stenosis, two with urethrocutaneous fistula and meatal stenosis, and one diagnosed with meatal stenosis and glans dehiscence, reintervention was required. For urethrocutaneous fistula and meatal stenosis: age (≤1y versus >1y), type of hypospadias (distal versus proximal), associated anomalies, and chordee had no effects on outcome, whereas magnifying loupes affected the outcome significantly in univariate and multivariate logistic regression analyses. We found no other statistical difference in factors likely to cause such a difference in outcome, including age, type of hypospadias, associated anormalies, and chordee, when comparing the 55 and 75 cases performed with and without loupe. Discussion: Using magnifying loupes is effective in preventing urethrocutaneous fistula and meatal stenosis after tubularized incised plate urethroplasty in children with hypospadias.

Keywords

Children; Hypospadias; Magnifying Loupes; Tubularized Incised Plate Urethroplasty; Urethrocutaneous Fistula

DOI: 10.4328/JCAM.5100 Received: 21.05.2017 Accepted: 06.06.2017 Printed: 01.12.2017 J Clin Anal Med 2017;8(suppl 4): 362-6
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Introduction

Hypospadias are known as the most common urogenital anomalies with the prevalence rate ranging between approximately 0.4 and 8.2 per 1000 live births, and a probable increase in the incidence of hypospadias has been suggested in recent reports [1,2]. For the treatment of these anomalies, numerous and various techniques have been developed and are still being performed [3]. One of these techniques is tubularized incised plate urethroplasty (TIPU). This technique was described and developed for the first time by Snodgrass in order to correct distal hypospadias [4], and the indication of TIPU was later extended to include midshaft and proximal penile hypospadias with no or mild curvature [5]. In the primary cases, the most common problem has been urethrocutaneous (UC) fistula; meatal stenosis is known as the second most common complication of hypospadias [6,7].

A magnifying loupe is an instrument used to increase the efficiency and quality of medical practices, and the use of magnifying loupes by clinicians in surgical settings increases visual acuity [8]. As in other surgical areas, magnifying loupes are essential and beneficial devices in thepractice of pediatric surgery and urology, as they enable surgeons to identify and define critical anatomic structures accurately in younger patients. Loupes with 2.5X–4.5X magnification are the most frequently used types, although an operating microscope may be needed in some circumstances, such as for hypospadias repair [9,10]. In the present study, we aimed at investigating the factors affecting the formation of UC fistula and meatal stenosis in the repair of hypospadias through TIPU in children, and the effects of magnifying loupes in preventing UC fistula and meatal stenosis.

Material and Method

From 2008 to 2016, 130 patients were operated due to primary hypospadias with TIPU by the single surgeon (C.K.). The hospital records of 130 patients were reviewed retrospectively, and all patients were evaluated as to intraoperative age, type of hypospadias, associated anomalies, chordee, type of suture material used, complication rate, use of magnifying loupes, and the lengths of time of urethral catheterization and hospitalization.

In 55 of the 130 cases, the operations were conducted with the use of 2.5X magnifying loupes (HEINE HR ® binocular loupes, Heine Optotechnik, Herrsching, Germany) and 75 cases were performed without their use. The reason for this was that magnifying loupes were obtained in the department only after the first 75 cases had been operated. Informed consent was obtained from the parents of all children. The procedure was performed in one stage under general anesthesia, and routine local penile block was conducted at the beginning of surgery. The penis was degloved, and an artificial erection test was performed to find out whether chordee was present. Ventral chordee was corrected with a dorsal plication, if needed. Also, a tourniquet to the root of the penis was used for hemostasis in all patients. Two parallel vertical incisions were performed at the junction of the urethral plate and glans wings, isolating the urethral plate. Then, the urethral plate was widened by a longitudinal midline dorsal incision from the meatus to its distal extent and tubularized by using 6-0 polyglyconate absorbable sutures with a 2-layer subepithelial closure. A single suture running distally was tied and then returned proximally over a 6 Fr or 8 Fr urethral catheter. Double dartos flaps, most often obtained from ventral dartos, were used to cover the neourethra. In occasional cases where a ventral dartos was lacking a dorsal dartos was formed as a button-holed flap and transposed ventrally. Glansplasty also began distally at the point where a normal meatus could be located. Glans wings were approximated in a single layer of interrupted subepithelial 6-0 polyglyconate absorbable sutures.

While no suprapubic diversion was performed in any of the 130 patients, circumcision was performed as a routine part of the surgical procedure. The operation was finished with the application of gauze dressing to the penis, and the gauze dressing was opened on the second postoperative day. Urethral catheters were placed in the patients with distal hypospadias for approximately seven postoperative days and in those with midshaft and penoscrotal hypospadias for 14 postoperative days. All patients were prescribed trimethoprim/sulfamethoxazole (6 mg/kg/day of trimethoprim) twice per day and analgesics, including paracetamol of 15 mg/kg/dose three times per day. Patients over the age of 2 years also received oxybutynin as 0.2 mg/kg per dose (highest dose, 5 mg) twice per day during catheterization, when needed. Patients with distal hypospadias were hospitalized for seven days, while those with midshaft and penoscrotal hypospadias were hospitalized for 14 days. However, the cases under the age of 3 years were discharged with an open drainage system into doubled diapers on the second postoperative day. The patients underwent follow-up examinations at the 10th day and at the first and sixth month after the discharge, with more frequent examinations if required. The complications were classified as UC fistula, meatal stenosis, glans dehiscence, urinary tract infections, urinary retention, and postoperative bleeding. Meatal stenosis was suspected for patients having difficulty in voiding and/or a narrow meatal orifice or inability to pass an 8 Fr catheter at the postoperative sixth month. No patients were given any preoperative testosterone. The mean follow-up period was 29 months, ranging between 4 months and three years.

Statistical analyses were performed using SPSS for Windows 15.0 (SPSS, Chicago, IL). The appropriateness of variables to normal distribution rates was evaluated with visual histogram and probability graphics using analytic methods, such as the Kolmogorov-Smirnov and Shapir-Wilk tests. Descriptive analyses were shown using median and interquartile range (IQR) for abnormal variables and frequency tables for ordinal variables. The univariate analyses to identify variables associated with patient outcomes were investigated using the chi-square, Fisher's exact, and student's t-tests where they were appropriate. In multivariate analyses, the possible factors identified with univariate analyses were further entered into the logistic regression analyses to determine independent predictors of patient outcomes. $p< 0.05$ was considered statistically significant. The study was approved by the local researchethics committee.

Results

The mean intraoperative age (IQR) of 130 patients was 3 (4.5) years (ranging between 5 months-15 years). Of 130 children, 103 had distal hypospadias, including seven as glanular, 60

as coronal, 23 as subcoronal, and 13 as megameatus intact prepuce; the other 27 patients had proximal hypospadias, including 20 as midshaft and seven as penoscrotal hypospadias. Twenty-five of the patients were younger than one year. Magnifying loupes (2.5X) were able to be used in only 55 of 130 cases. As well as hypospadias, associated anomalies, such as two undescended testes, two inguinal hernias, two hydroceles, one urethral duplication, one penile torsion, one urolithiasis, and two vesicoureteral refluxes were present in 11 cases. There was also minimal ventral chordee (< 30°) in another 11 cases.

In 14 patients (10.8%), UC fistula (in four), meatal stenosis (in seven), urethrocutaneous fistula and meatal stenosis (in two), and meatal stenosis and glans dehiscence (in one) were diagnosed and reintervention was required (Table 1). In addition, postoperative bleeding (in five), urinary tract infection (in one), and urinary retention (in one) were also observed. During the repair period in children treated with TIPU due to distal hypospadias, while the rate of UC fistula was 5.8%, the rate of meatal stenosis was found as 3.8%.

Operated patients with hypospadias were divided into two groups as those with and without magnifying loupes. While the mean age (IQR) of the cases with magnifiying loupes was 3.5 (4.1) years (range 5 months-15 years), the mean age (IQR) was found as 3 (4.8) years (range 6 months-11 years) in the cases without the loupes. Mean urethral catheter and hospital stay times were found as 6.29±2.75 and 4.85±2.75 for the cases with loupes and 5.57±2.08 and 4.75±2.05 for those without loupes, respectively (Table 2).

Based on the univariate analysis, although the use of magnifying loupes was found to be significant and to affect the outcome, such factors as age (≤1 year versus >1year), type of hypospadias (distal versus midshaft and penoscrotal), associated anomalies, and chordee were found not to affect the outcome. The findings are presented in Table 3. On the other hand, the multivariate analysis based on the logistic regression method showed that only the use of magnifying loupes influenced the occurences of UC fistula and/or meatal stenosis due to hypospadias repair, independent of age, type of hypospadias, associated anomalies, and chordee [Odds Ratio: 0.198 (95% CI: 0.04-0.9)] (p<0.05).

We found no difference in the distribution of parameters likely to cause such difference, including age (≤ 1 year vs >1 year, p=0.246), mean intraoperative age (group with loupe vs group without loupe, p=0.412), type of hypospadias (distal vs midshaft and penoscrotal, p=0.259), associated anomalies (yes vs no, p=0.135) and chordee (yes vs no, p=0.391). In addition, no statistical difference was found in the mean urethral catheterization and hospitalization times between the two groups (p>0.05). However, in terms of UC fistula and/or meatal stenosis development, a statistically significant difference was found between the groups (p<0.05).

Discussion

Among other techniques, TIPU has been the most frequently used method in the repair of hypospadias. In the primary cases, fistulas and meatal stenosis are the most frequently encountered complications ranging between 0-9% and 0-21% respectively [4,6,11-13]. In our study, while fistulas were found

Table 1. Outcome of TIPU regarding type of hypospadias

Type of hypospadias			UC fistula	MS	UCF and MS	MS and GD	%
Distal 103 (%79,2)	Glanular n (%)	7 (5.4%)	1	1			9.7
	Coronal n (%)	60 (46.1%)	1	3			
	Subcoron n (%)	23 (17.7%)	1		2		
	Megamea intact prepuce n (%)	13 (10%)	1				
Proximal 27 (20.8%)	Midshaft n (%)	20 (15.4%)		3			14.8
	Penoscrotal n (%)	7 (5.4%)				1	
Total (n)		130	4	7	2	1	10.8

TIPU, tubularized incised plate urethroplasty; UCF, urethrocutaneous fistula; MS, Meatal stenosis; GD, glans dehiscence

Table 2. Demographic data and distribution of patients' characteristics

		Loupe	No loupe	p
Patients n		55	75	
Mean age (year) (IQR)		3.5 (4.1)	3 (4.8)	.412[b]
	≤1year n	8	17	.246[a]
	>1year n	47	58	
Type of hypospadias	Distal n	41	62	.259[a]
	Midshaft and penoscrotal n	14	17	
Ventral chordee	Yes n	6	5	.391[a]
	No n	49	70	
Associated anomaly	Yes n	7	4	.135[a]
	No n	48	71	
Hospitalization Mean ±SD		4.85±2.75	4.75±2.05	.798[b]
Catheterization Mean±SD		6.29±2.75	5,57±2,08	.092[b]
UCF and/or MS		2	12	.025[a]

IQR, interquartile range; UCF, urethrocutaneous fistula; MS, Meatal stenosis; a, chi-square test; b, Manne-Whitney U test.

Table 3. Comparition of success rate of TIPU regarding postoperative UC fistula and /or meatal stenosisfactors (chi-square test)

		Success n	UCF and/or MS n	p
Age	≤1year	23	2	.619
	>1year	93	12	
Type of hypospadias	Distal	93	10	.446
	Midshaft and penoscrotal	23	4	
Chordee	Yes	9	2	
	No	107	12	.407
Associated anomaly	Yes	10	1	.851
	No	106	13	
Loupe	Yes	53	2	.025
	No	63	12	

TIPU, tubularized incised plate urethroplasty; UCF, urethrocutaneous fistula; MS, Meatal stenosis

as 5.8% with TIPU in distal hypospadias, the rate of meatal stenosis was determined as 3.8%. We evaluated the factors affecting the development of UC fistula and/or meatal stenosis in our study.

In a study performed by Leung et al., the complications of UC fistula and/or meatal stenosis are reported to be minimized by selecting the appropriate procedure, careful handling of tissues, optical magnification, use of stents, and use of fine, absorbable material [14]. The use of optical magnifying loupes in the repair of hypospadiac abnormalities in children is wellknown. To be successful in hypospadias surgery, the best approach is the selection of the proper dissection method and meticulous approximation of tissues. So the magnification process becomes an important tool in hypospadias surgery in small children. Among various magnification tools, high-powered simple glasses, loupes, and operating microscope are commonly used devices. The decision on which tool is used depends upon their availability and the familiarity of the surgeon with the use of the magnification tool [15]. To the best of our knowledge, however, there have been no studies investigating the use of loupes in TIPU in the literature. In a study where 14 patients with hypospadias were operated on with the help of a video telescopic operating microscope, Frykman et al. reported that no complications were determined [16]. Also, in another study performed with a new head-mounted miniaturized microscope (Varioscope®M5, Life Optics Co., Chicago, Ill., USA) in the surgical correction of hypospadias by Chiummariello et al., the complication rate of the surgical procedure was reported to have decreased from 8.9% to 2.3% [17]. Likewise, while we determined a 3.6% complication rate of UC fistula and/or meatal stenosis in our cases operated on by using loupes, the rate was 16% in those without the use of loupes. The statistical difference between the groups demonstrated that the complication rate significantly decreased; however, we found no other statistical difference likely to cause such a difference in the complication rate, including age, type of hypospadias, associated anormalies, or chordee, when comparing the 55 cases with the 75 cases without the use of a loupe.

The widely acknowledged optimal age for repair of hypospadias is between approximately 6 and 12 months after birth, according to the recommendations of the American Academy of Pediatrics [2,18]. For this reason, the hypospadias operations we performed were grouped as ≤ 1 year and >1 year of age. In the study performed by Huang et al., patient age during the repair of hypospadias was reported as a significant risk factor for the development of UC fistulas after primary hypospadias repair [19]. Despite the widespread concern that older age at time of repair increases complications, in a study where a multivariate analysis of 669 consecutive prepubertal boys undergoing hypospadias repair via TIPU was performed by Bush et al., it was found that increasing age showed no risk for urethral complications. It was also suggested that surgery could be performed in full-term, healthy boys at any time after 3 months of age with no urethral complications [20]. Similarly, while an 8% rate of UC fistula and/or meatal stenosis was observed in the cases (≤ 1 year) with hypospadias operated through TIPU in our study, the rate was detected as 11.4% in those over 1 year of age, with no other significant differences between the groups.

In another study where the types of hypospadias were evaluated by Chung et al., it was emphasized that the formation of UC fistulas after hypospadias repair was significantly associated with the location of the hypospadia [21]. A univariate analysis conducted by Nicol et al. also demonstrated that fistulas, glans dehiscence, diverticulum, stricture and/or meatal stenosis were more common in patients with midshaft and proximal hypospadias (27% in midshaft/proximal repairs vs 9% in primary and reoperative distal TIPU) ($p<0.0001$) [22]. In contrast to the studies by Chung et al. and Nicol et al.,in our study when the cases with distal hypopadias were compared with those with midshaft and penoscrotol hypospadias, we observed no significant difference. We consider that the absence of this difference may arise from the fact that the cases with midshaft and penoscrotol hypospadias had no severe chordee or that many had midshaft hypospadias.

In a study investigating chordee as another risk factor, Ozturk et al. reported that such possible risk factors as severe chordee, middle and posterior localized hypospadias, and use of a pedicle island flap could lead to an increase in the rate of postoperative complications [23]. Counter to the findings of Ozturk et al., no significant difference was found in our study; the absence of such a difference may be associated with the existence of minimal chordee in our cases with hypospadias.

In the study performed by Khuri et al,. among other congenital anomalies associated with severe hypospadias were ureteropelvic junction obstruction, vesico-ureteric reflux, renal agenesis, persistent Mullerian structures, intersex disorders, undescended testis, and inguinal hernia with or without hydrocele [24]. Similarly, we detected associated anomalies in 11 of our cases.

Limitations: Although glans width <14 mm is reported as a risk factor for complications of hypospadias repair, the fact that we did not measure glans size is the only limitation of our study.

Conclusion

We were able to prove that success of hypospadias repair is directly related to the use of a magnifying loupe. Use of a magnifying loupe is an effective factor in preventing UC fistula and meatal stenosis after TIPU in children with hypospadias. The human eye's ability to discriminate potentially fine anatomical structures is limited, possibly leading to complications in hypospadias repair.

This study was performed without funding or grants.

Conflict of interest

The authors have declared there are no conflicts of interest.

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How to cite this article:
Kocaoglu C. Does The Use of Magnifying Loupes an Effective Factor in Preventing Urethrocutaneous Fistula and Meatal Stenosis in Hypospadias Repair with Tipu in Children? J Clin Anal Med 2017;8(suppl 4): 362-6.