Tubularised Buccal Mucosal Graft Urethroplasty for Posterior Pelvic Fracture Urethral Distraction Defects in Children

Pelvik Kırık ile Posterior Üretrada Ayrılma Defekti Olan Çocuklarda Tübülerize Bukkal Mukoza Greft Üretroplastisi

Doğuş GÜNEY, H.Tuğrul TİRYAKİ

Health Sciences University, Ankara Child Health and Diseases Hematology Oncology SUAM, Pediatric Surgery Clinic, Ankara, Turkey

ABSTRACT

Objective: Posterior urethral trauma is rare type of trauma that is particularly difficult to treat in children. Here, we have presented our experience with tubularised buccal mucosal graft (BMG) repairs for posterior pelvic fracture urethral distraction defects (PFUDDs) in children.

Material and Methods: We retrospectively evaluated three cases of tubularised BMG repairs for PFUDDs in our clinic between 2009 and 2016. The BMGs were 3 cm in length, on average, and sutured between the stump of the proximal prostatic urethra and the distal bulbar urethra. All of the patients underwent urethrography, urethroscopy and uroflowmetry assessments postoperatively.

Results: The mean patient age was 9 (6–14) years and all three patients were male. Two of the three patients with posterior urethral injuries were operated on at least twice at another centre and referred to our clinic with PFUDDs. All three patients underwent tubularised BMG urethroplasties for the PFUDDs. We noted urethral integrity in the cystoscopic evaluations of two of the patients, with no strictures, and these two patients were fully continent. A proximal anastomotic contracture was noted in the third patient and a revision was required.

Conclusion: A tubularised BMG should be used to prevent penile shortening and anastomotic tension in a PFUDD.

Key Words: Trauma, Urethra, Urethral obstruction

ÖZET

Amaç: Posterior üretra travması çocuklarda tedavisi güçlük arz eden nadir bir travma tipidir. Burada pelvik kırık ile posterior üretrada ayrılma defekti olan çocuklarda tübülerize bukkal mukoza greft üretroplastisi deneyimlerimiz sunulacaktır.

Gereç ve Yöntemler: Kliniğimizde 2009-2016 yılları arasında pelvik kırık ile posterior üretrada ayrılma defekti olan tübülerize bukkal mukoza greft üretroplastisi onarımı yaptığımız üç olgumuz geriye dönük değerlendirildi. Ortalama 3 cm uzunluğundaki bukkal mukozal greftler proksimal ve distal üretra uçları arasına dikildi. Bütün hastalar postoperatif dönemde üretragrafi, üreteroskopi ve uroflovmetri ile değerlendirildi.

Bulgular: Üçü de erkek olan olgularımız ortalama 9 (6-14) yaşındaydı. İki olgumuz posterior üretra yaralanması nedeni ile başka merkezlerde en az iki kez opere edilip merkezimize refere edildi. Üç olgumuza pelvik kırık ile posterior üretrada ayrılma defekti nedeni ile tübülerize bukkal mukoza greft üretroplastisi işlemi uygulandı. İki olgumuzda tam kontinasla beraber sistoskopik değerlendirmede üretra bütünlüğünün darlık olmadan sağlandığı görüldü. Üçüncü olgumuzda ise revizyon gerektiren proksimal anastomotik darlık mevcut idi.

Sonuç: Tübülerize bukkal mukoza penil kısalığı ve anastomatik gerginliği önlemek için pelvik kırık ile posterior üretrada ayrılma defektlerinde kullanılabilinir.

Anahtar Sözcükler: Travma, Üretra, Üretral obstrüksiyon

INTRODUCTION

Non-iatrogenic urethral trauma is uncommon but a serious entity (1,2). The management of a traumatic distraction defect of the posterior urethra remains one of the most difficult tasks in paediatric urology. Because they are encountered so rarely, there are not enough cases in a single centre to develop expertise (3). In addition, due to the rudimentary prostate and puboprostatic ligaments, the injury is believed to be more proximal in children, thus making the repair more difficult.

Correspondence Address / Yazışma Adresi:
Doğuş GÜNEY
Sağlık Bilimleri Üniversitesi, Ankara Çocuk Sağlığı ve Hastalıkları Hematoloji Onkoloji SUAM, Çocuk Cerrahi Kliniği, Ankara, Turkey
E-mail: dous_caliskan@hotmail.com

Received / Geliş tarihi : 05.12.2017
Accepted / Kabul tarihi : 19.01.2018
Online published : 15.02.2018
Elektronik yayın tarihi
DOI: 10.12956/tjpd.2018.338

It has been reported that a transperineal anastomotic urethroplasty is technically much more difficult in the restricted perineum of a child (4). In addition, the urethra does not have enough elasticity in childhood, and recurrent operations may cause a shortening of the urethra. Thus, the repair of a posterior pelvic fracture urethral distraction defect (PFUDD) is difficult to perform. Moreover, a substitutional urethroplasty may be required in some patients for a tension-free urethral repair.

We repaired PFUDDs using tubularised buccal mucosal grafts (BMGs) in three paediatric patients with previous surgical failures, and this report describes our experiences.

PATIENTS and METHODS

We retrospectively evaluated three paediatric males who were treated for PFUDDs via the interposition of a tubularised BMG between 2009 and 2016.

Operative technique

All of the patients received intravenous antibiotics during the perioperative period. A combined retrograde and antegrade urethrography was performed under general anaesthesia and showed a loss of urethral continuity, with 3–5 cm distraction defects in all three cases (Figure 1). After evaluating the anterior urethra and bladder neck using urethroscopy and antegrade cystourethroscopy, we begin the urethroplasties in each of the patients with a perineal inverted U-shaped incision that provided adequate access to the urethra and good exposure. We used an advanced perineal approach in all of the cases, starting with the circumferential mobilization of the bulbar urethra (Figure 2). The proximal bulbar urethra was transected at the site of obliteration, and the pelvic fibroses were excised between the separated urethral ends, staying close to the midline to avoid neurovascular injury. The posterior urethra was incised over an antegrade bougie passed through the suprapubic cystostomy tract.

If the distraction defect did not allow the accurate restoration of urethral continuity, we proceeded with an inferior pubectomy and further mobilized the bulbar urethra combined with a separation of the corporeal bodies. Because of the longer distraction defects in these three patients, tension-free anastomoses were impossible, and when we tried to perform a direct anastomosis, we noted a decreasing penile length. Penile shortening is a troublesome condition, based on our previous experience; therefore, we decided on a substitution urethroplasty using a tubularised BMG for these patients.

First, the graft is harvested from the buccal mucosa, tailored to the calibre of a 10 F feeding tube, and implanted between the proximal and distal urethra via an abdominoperineal route. We also performed a bladder neck repair to one of these patients.

Suprapubic catheterisation was used for the bladder drainage, while a urethral stent was left indwelling for 6 weeks and removed when a pericatheter urethrogram showed no evidence of extravasation. All of the patients underwent urethrographies and uroflowmetries at three and six-month intervals, and urethroscopies one year postoperatively. The voiding status was also assessed.

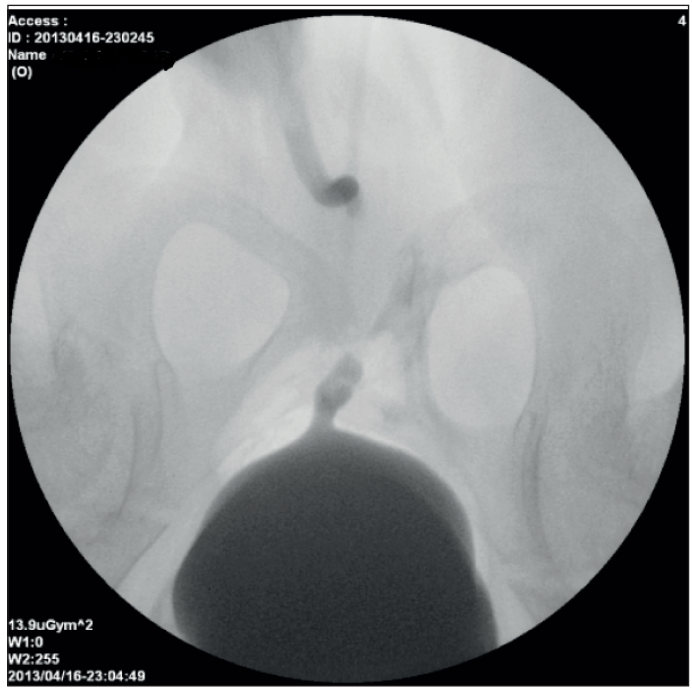

Figure 1: Image of the urethral defect on a combined retrograde and antegrade urethrography.

Figure 2: Circumferential mobilization of the bulbar urethra using a perineal approach.

RESULTS

The mean age of the patients in this study was 9±4.35 years and the PFUDDs were caused by traffic accidents in all three cases (6-14). All of the patients were treated with previous primary perineal posterior urethroplasties for the urethral injuries related to the pelvic fractures. The bladders were displaced cranially in these patients, and two of the three patients had two previous operations, while the third had one. All three patients had distraction defects with dense fibrosis and a failed subsequent surgery, and one had a bladder neck injury. A tension-free anastomosis was not possible in any of these cases because of the long distraction defects. When we forced the primary anastomosis, each penis was excessively buried and shortened. Therefore, we constructed a tubularised BMG with a mean length of 3 cm over a feeding tube and implanted it into each of the three patients.

One patient voided spontaneously without problems after the catheter removal, but another patient required dilation four times. After 6 months, the mean peak flows were 11 and 9 mL/s, respectively, and the maximum flow rate was 17–19 mL/s. The follow-ups at 2–4 years indicated that these two patients had uneventful postoperative courses with no further problems. We noted urethral integrity in the cystoscopic evaluations of these two patients, with no strictures. In addition, these two patients were fully continent. However, a proximal anastomotic contracture was noted in the third patient, and a revision of the proximal anastomosis was required.

DISCUSSION

Male children have an abnormally located bladder and prostate and a less capacious pelvis than adult males, particularly in traumatic cases when the bladder is displaced cranially, causing the prostate to lie above the level of the inferior pubic ramus and inferior pubic arch (4). In children, the bulbar urethra does not have enough elasticity, so the repair of a urethral distraction defect is performed with difficulty in some patients. Thus, urethral defects in children may require more complex repairs. Although a primary anastomosis remains the procedure of choice for most primary posterior urethral injuries, various surgical techniques have been reported in the literature for managing a traumatic posterior urethral injury. There is a group of substitution techniques using skin flaps, ventral or inlay buccal mucosa free grafts, or more rarely, appendix, ileum, or colon mucosa to achieve a tension-free anastomosis (5-8).

The reconstructive technique used depends on the location of the urethral defect, the length, and the preference and previous experience of the surgeon. A tension-free direct anastomosis could not be achieved in any of these patients, and penile shortening was noted when primary anastomoses were forced. Therefore, we chose to perform substitutional urethroplasties in these three patients; however, the scrotal skin was not appropriate for the flap urethroplasties. For those patients in which multiple penile surgeries have resulted in local scar tissue, the buccal mucosa has become our first choice for the treatment of a penile or bulbar urethral stricture. We prefer to use tubularised BMG urethroplasties. Voelzke et al. (6) previously described BMG use in selected patients to prevent penile shortening, but they used an inlay, not a tubularised, route. Tubularised tissue grafts may be needed for complex or long urethral defects, but have a high rate of failure (sometimes over 50%) (9). The BMG urethroplasty has increased in popularity over the last few years because of its feasibility, good functional outcome, and low morbidity at the reconstruction site (10). In our series, three cases had long urethral distraction defects that were not amenable to tension-free urethral anastomoses. In these cases, the long urethral stricture repair was accomplished with a one-stage circumferential tube graft urethroplasty using the buccal mucosa. A staged BMG reconstruction is not available for a posterior urethral stricture; therefore, a circumferential tube graft with a single stage procedure was required, although free grafts are not suitable in some cases since they require a vascular bed for uptake. In children, the narrow pelvic area and prostatic and adjacent support tissue seems to be enough for the free graft diffusion. Therefore, a urethral substitution via a tubularised BMG is a novel solution to these complex problems.

We successfully constructed tubularised BMG urethras over feeding tubes and implanted them into three patients with posterior urethral defects. Continence was achieved in two patients, while one with a proximal urethral stricture required additional operations. The initial clinical outcome of two of the patients in this study was satisfactory. While a urethral stricture developed in one patient, the other two patients had good calibre functioning urethras. The uroflowmetry examination showed a maximum flow rate of 17–19 mL/s; however, there is a risk of postoperative strictures, and possible reoperations should be expected. With repeated surgical interventions, the functional outcome improves over the long-term follow-up.

CONCLUSION

Various surgical solutions are required for PFUDDs in children, and some patients require substitutional urethroplasties. To prevent penile shortening, we performed tubularised BMGs for the PFUDDs in three patients. Full continence and urinating without urethral strictures were achieved in two of these three patients.

REFERENCES

1. Bariol SV, Stewart GD, Smith RD, Mc Keown DW, Tolley DA. An analysis of urinary tract trauma in Scotland: Impact on management and resource needs. Surgeon 2005;3:27-30.
2. Kashefi C, Messer K, Barden R, Sexton C, Parsons JK. Incidence and prevention of iatrogenic urethral injuries. J Urol 2008;179:2254-7.
3. Trachta J, Moravek J, Kriz J, Padr R, Skaba R. Pediatric bulbar and posterior urethral injuries: Operative outcomes and long-term follow-up. Eur J Pediatr Surg 2016;26:86-90.
4. Singla M, Jha K, Muruganandam S, Srivastava A, Ansari MS, Mandhani A, et al. Posttraumatic posterior urethral strictures in children-management and intermediate-term follow-up in tertiary care centre. Urology 2008;72:540-4.
5. Koraitim MM. Posttraumatic posterior urethral strictures in children: A 20-year experience. J Urol 1997;157:641-5.
6. Voelzke BB, Breyer BN, McAninch JW. Blunt paediatric anterior and posterior urethral trauma: 32-year experience and outcomes. J Pediatr Urol 2012;8:258-63.
7. Aggarwal SK, Sinha SK, Kumar A, Pant N, Borkar NK, Dhua A. Traumatic strictures of the posterior urethra in boys with special reference to recurrent strictures. J Pediatr Urol 2011;7:356-62.
8. Xu YM, Qiao Y, Sa YL, Wu DL, Zhang XR, Zhang J, et al. Substitution urethroplasty of complex and long-segment urethral strictures: A rationale for procedure selection. Eur Urol 2007;51:1093-8.
9. Pansadoro V, Emiliozzi P. Which urethroplasty for which results? Curr Opin Urol 2002;12:223-7.
10. Pansadoro V, Emiliozzi P, Gaffi M, Scarpone P, DePaula F, Pizzo M. Buccal mucosa urethroplasty in the treatment of bulbar urethral stricture. Urology 2003;61:1008-10.