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Dorsal Onlay Buccal Mucosal Graft Urethroplasty in the Treatment of Urethral Strictures – Does the Stricture Length Affect Success?

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A – research concept and design; **B** – collection and/or assembly of data; **C** – data analysis and interpretation; **D** – writing the article; **E** – critical revision of the article; **F** – final approval of article; **G** – other

Abstract

Background. Treatment of urethral strictures can be challenging, but, with appropriate preoperative evaluation and surgical planning it is possible to achieve successful results.
Objectives. To analyze if the stricture length affects the success with dorsal onlay buccal mucosal graft urethroplasty technique.
Material and Methods. Between January 2004 and June 2010 a total of 40 patients with anterior urethral stricture were treated with dorsal onlay buccal mucosal graft urethroplasty. Age, etiology of the stricture, stricture length (≤ 7 cm, and > 7 cm), and localization of the stricture were assessed as the factors affecting success rate.
Results. The clinical outcome was defined as a failure when any operative instrumentation including dilatation was needed or the urine flow rate was less than 14 mL per second at the sixth month, postoperatively. The mean follow-up period was 43.44 months. Of 40 patients, 28 (70%) were successful and 12 (30%) were a failure. There was no statistically significant difference between the age groups, etiology of the stricture and success rate ($p = 0.26$ and $p = 0.41$). The statistical difference was significant for the localization and length of the stricture by means of success ($p = 0.002$ and $p = 0.025$).
Conclusions. Our results show that the stricture length and localization are the most important variables for desirable success. Even though surgical techniques are constantly evolving, long strictures stay as a problem for urologists. Studies with larger number of patients with long urethral strictures may support our findings, and may prove the efficiency of these surgical techniques (**Adv Clin Exp Med 2015, 24, 2, 297–300**).

Key words: buccal mucosa, urethral stricture, urethroplasty.

Treatment of urethral strictures can be challenging, but, with appropriate preoperative evaluation and surgical planning, it is possible to achieve successful results. Numerous surgical techniques have been described to repair urethral strictures. Minimally invasive treatment options include dilatation, internal urethrotomy (IU), and urethral stents. The recurrence rates for dilatation and IU are high, and stents cannot be used for long strictures. Open surgical repair should be the first choice with longer strictures or strictures which failed conservative treatment [1]. Short strictures (≤ 2 cm) are generally managed by primary end-to-end anastomosis. Patients with long strictures are not suitable for end-to-end anastomosis because of the risk of postoperative chordee formation [2]. Substitution urethroplasty should be the choice of treatment for long strictures. This could be achieved by using penile skin flaps, free grafts of full-thickness skin, bladder or buccal mucosa [3]. Barbagli described the dorsal onlay free graft urethroplasty in 1996, and gained worldwide acceptance [4]. Buccal mucosa offers the advantage of being accustomed to a wet environment, is hairless,

easy to harvest, resilient to infection, a thick epithelium, and there is a reduced likelihood of pseudo-diverticulum formation even when used ventrally. Also, it has a thin lamina propria allowing early inosculation [5].

The aim of this study was to analyze if the stricture length affects the success with dorsal onlay buccal mucosal graft urethroplasty technique.

Material and Methods

Between January 2004 and June 2010 a total of 40 patients with anterior urethral stricture were treated with dorsal onlay buccal mucosal graft urethroplasty. Preoperative evaluation included clinical history, physical examination, retrograde and voiding cystourethrographies, residual urine measurement, and urine culture. The median patient age was 55 years (27–77). The etiology of the stricture was iatrogenic in 21 (52.5%), ischemic in 6 (15%), traumatic in 9 (22.5%), and unknown in 4 patients (10%). The localization of the stricture was penile in 20 (50%), penobulbar in 12 (30%), bulbar in 4 (10%), and panurethral in 4 patients (10%). Patients were divided into 2 groups by means of stricture length; strictures with 7 or less, and more than 7 cm.

Technique

Operation was performed under general anesthesia with nasotracheal intubation, and the patient was plaeced in a lithotomy position. A midline perineal incision was made overlying the stricture site. The bulbar urethra was dissected and completely mobilized from *corpora cavernosa* and rotated 180 degrees. The length of the stricturous segment was measured. The inner surface of the cheek was prepared and disinfected. The Stensen duct was identified, and the desired graft size was measured and marked. Lidocaine HCl 1% with epinephrine (1/100000) was injected along the edges of the graft to enhance hemostasis. The outlined graft was sharply dissected and removed. Bleeding control with bipolar cautery was ensured and was not closed with sutures. Then, the strictorous segment was opened along its dorsal surface and a buccal mucosal graft was applied as a dorsal onlay. The buccal mucosal graft was fixed to the albuginea of the *corpora*, and the urethra was rotated to its original position to cover the graft. The bulbocavernous muscles were sutured over the spongiosum tissue. The Colles fascia, perineal fat, and the skin were closed with absorbable sutures. A suction drain left in place for 1 day, and the urethral catheter for 2 weeks.

Two weeks after surgery, voiding cystourethrography was done at the time of catheter removal. If extravasation was detected, the catheter stayed for one more week.

Uroflowmetry was repeated at 1st, 3rd, 6th months, and at the end of the first year after operation. When symptoms of decreased force of stream were present or urine flow was less than 14 mL per s, urethrography and urethroscopy were repeated.

Statistical Analysis

Statistical analysis was done to evaluate which factors correlate with success. Age, etiology of the stricture, stricture length (≤ 7 cm, and > 7 cm), localization of the stricture were assessed. Pearson χ^2 test and Fisher's exact test were used for statistical analysis. Statistical significance was set at $p < 0.05$. Statistical calculations were carried out with SPSS release 15.0 (SPSS Inc, Chicago, IL, USA).

Results

The clinical outcome was defined as failure when any operative instrumentation including dilatation was needed or the urine flow rate was less than 14 mL per second at the 6th month postoperatively. The mean follow-up period was 43.4 months with a standard deviation of 21.2 months. Of the 40 patients, 28 (70%) were successful and 12 (30%) were a failure. On the basis of the patient's age, the success rate was 66.6% in 3 men younger than 30 years; 80% in 5 men ranging from 30 to 44 years; 81.2% in 16 men ranging from 45 to 59; and 75% in 16 men over 60 years. There was no statistically significant difference between age groups and the success rate ($p = 0.26$). When patients are grouped according to etiology of the stricture as iatrogenic (21 patients, 71.4% success); ischemic (6 patients, 50% success); traumatic (9 patients, 66.7% success); and unknown etiology (4 patients, 75% success), no statistically significant correlation was found between success rate and etiology ($p = 0.41$). Based on stricture localization, the success rate was 90% in 20 penile strictures; 50% in 12 penobulbar strictures; 100% in 4 bulbar strictures; and all were unsuccessful for panurethral strictures in 4 men. Bulbar strictures had the best prognosis, and panurethral strictures had the worst. This difference for stricture localization and success rate was statistically significant ($p = 0.002$). On the basis of stricture length, the success rate was 88% in 25 men with strictures ≤ 7 cm; and 40% in 15 men with strictures > 7 cm. This difference is statistically significant ($p = 0.025$). Patients with longer stricture length as it is in panurethral strictures have a higher risk of failure. The success rates according to localization and stricture length was summarized in Table 1.

Table 1. The success rates according to localization and stricture length

Localization	Number of patients	Success rate of urethral strictures ≤ 7 cm	Success rate of urethral strictures > 7 cm	Overall success rate (%)
Penile	20	14/15 (93.3%)	4/5 (80%)	18/20 (90%)
Penobulbar	12	4/6 (66.7%)	2/6 (33.3%)	6/12 (50%)
Bulbar	4	4/4 (100%)	0	4/4 (100%)
Panurethral	4	0	0/4	0/4
Overall	40	22/25 (88%)	6/15 (40%)	28/40 (70%)
P-value		p = 0.025*		p = 0.002

* P-value of statistical difference between urethral strictures ≤ 7 cm and > 7 cm.

We applied urethral dilatation and internal urethrotomy if needed in unsuccessful cases. The success rate of dilatation after urethroplasty is 58.3% in our series.

Discussion

Humby was the first to use buccal mucosa for urethral reconstruction in 1941 for hypospadias repair [6]. Because buccal mucosal grafts have advantages over other grafts, they have been popular since 1990s. The placement of the graft as dorsal, ventral or lateral still stays controversial. Some argue that dorsal onlay is superior to ventral [7, 8], whereas others have reported excellent results with ventral onlay buccal mucosal grafts for urethroplasty [9]. Dorsally placed graft can have better results because of better mechanical support for the graft and richer vascular bed from the underlying corporal bodies [10, 11]. We used the dorsal onlay free graft urethroplasty technique as described by Barbagli, and utilized the buccal mucosa for potential advantages.

In our study, we investigate the effect of age, etiology, stricture localization, and focused on the length of the stricture for success. The urethral stricture location and length are the most important factors affecting the choice of the repair [1, 12]. While strictures shorter than 2 cm, end-to-end anastomosis should be the choice of operation technique, for strictures more than 2 cm, substitution urethroplasty, preferably buccal mucosa should be the choice [13].

The mean follow-up of our study was 43.44 months, and it is a relatively long period for detecting recurrences, because most repairs fail in the first 6 months [14]. While our results demonstrated that the success rate is not dependent on age (p = 0.26) and etiology of the stricture (p = 0.41), the success rate is lower in long strictures (> 7 cm) with statistical significance (p = 0.025). Correspondingly, when our results were compared for localization of the stricture and success rate, the worst was panurethral strictures (100% unsuccessful) followed by penobulbar strictures (success rate 50%). This also caused a statistically significant difference for success rate and localization (p = 0.002).

In our study, the success rate for strictures ≤ 7 cm was 88%, which is compatible with the findings found in the literature. When we look at strictures longer than 7 cm, the success rate falls to 40%. There are many studies focusing on urethral strictures and surgical procedures but detailed studies on the results of long strictures are very few. There are different results in the literature for the relation between success rate and stricture length. Barbagli gets different results in his series; in one he does not observe any differences [15] and in another [13] he finds lower success rates for strictures between 3 to 4 cm. Marchal et al. did not find any difference for stricture length [4]. Also, El-Kassaby stated that stricture length is the most important factor to design the operation technique and to predict the result [12]. In a study, Chen et al., when strictures were classified as > 4 cm, and ≥ 6 cm, reported the success rates of 82%, and 76% with buccal mucosal graft urethroplasty [16]. In our study we had 15 men with strictures longer than 7 cm with a success rate of 40%. Four of them were panurethral, and in all, the stricture recurred after the operation.

Based on these results, dorsal onlay buccal mucosal graft urethroplasty is an effective surgery for urethral strictures longer than 2 cm. However, its success decreases in strictures longer than 7 cm, probably due to the impairment in the blood supply and inosculation. When we searched the literature, the authors analyzing urethral stricture could not always show the statistical significance for success rate and stricture length, but always stated that the stricture length is one of the most important predictor of surgical success [1, 12, 17].

As a conclusion, our results show stricture length and localization are the most important

variables for desirable success. Even though surgical techniques are constantly evolving, long strictures remain a problem for urologists. Studies with a larger number of patients with long urethral strictures may support our findings, and may prove the efficiency of these surgical techniques.

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