



**REVIEW ARTICLES**

## Buccal Mucosa Graft Urethroplasty in Proximal Bulbar Urethral Stricture

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### ABSTRACT

**Background:** The bulbar urethra is the most common site of urethral stricture disease (USD), which is difficult to treat. Patients usually present with symptoms of chronic obstructive voiding, but they may also have recurrent urinary tract infections, detrusor failure, or renal disease. Although urethral reconstructive procedures have advanced in recent decades, the search for the perfect replacement continues.

**Methods:** We conduct a thorough literature assessment to ascertain the effectiveness and potential hazards of using buccal mucosal grafts for substitution urethroplasty.

**Results:** Grafts of buccal mucosa have shown to be an adaptable replacement for strictures resulting from a variety of sources. Ninety-six percent of patients who underwent two-stage procedures to treat complex urethral strictures required a revision after the first stage, with fewer complications than when a penile skin graft was substituted. Dorsally placing the graft appears to be more successful than ventrally placing it.

**Conclusion:** As a result, buccal mucosa is probably going to replace urethroplasty as the new gold standard, and longer-term outcomes from its use are anxiously anticipated.

**Keywords:** BMG, Urethroplasty, Urethral Stricture

### INTRODUCTION

The most typical location of anterior urethral stricture is the bulbar urethra. Approximately 40% of bulbar urethral strictures are idiopathic, especially in the developed world. Some of these idiopathic instances are believed to have congenital roots. A third of bulbar urethral strictures have been attributed to instrumentation, which includes hypospadias surgery. The remaining patients have a medical history of infection, particularly sexually transmitted infections [1].

Until now, different surgical methods have been established for bulbar urethroplasty procedures carried out for bulbar urethral strictures, either with or without the use of buccal mucosal grafts (BMG). In addition to end-to-end anastomosis, the most often utilized procedures are Asopa dorsal inlay, ventral onlay, dorsal onlay, double-face with BMG, and non-transaction anastomotic urethroplasty [2].

The use of oral mucosa, grafting versus anastomotic repair, dorsal versus ventral location of

the graft, and surgical alternatives for patients with failed hypospadias restoration are still some of the controversial topics in the contemporary practices of bulbar urethral surgery. It is not unexpected that each of these several healing methods has unique benefits of its own. This report included the highlighted processes and the rationale for selecting each procedure under a certain scenario. Furthermore, the effectiveness of various approaches in treating individuals with bulbar urethral strictures is examined [3].

Many approaches were described using OMG in proximal bulbar stricture, including Ventral Onlay OMG urethroplasty, Dorsal Onlay OMG urethroplasty, lateral exposure OMG urethroplasty, Dorsal inlay OMG urethroplasty and Two-Sided Dorsal Plus Ventral Double OMG Urethroplasty.

#### Ventral Onlay:

Morey and McAninch originally described ventral onlay for bulbar urethral strictures in 1996. After the stricture is identified, the surrounding

supporting material is preserved by making a midline sagittal incision into the ventral spongiosum. After augmenting the urethral lumen by sewing the graft directly to the urethrotomy's margins, the corpus spongiosum is closed over the graft to create a well-vascularized bed [4] Barbagli et al. reported that in a retrospective study of 214 patients with bulbar stricture who underwent ventral onlay urethroplasty using only BMG the success rate was 85.5% [A] **Figure 1**.

#### **Dorsal Onlay:**

In order to perform a urethrotomy on the dorsal aspect of the strictured segment, Barbagli's invention, the dorsal onlay urethroplasty, entails mobilizing and rotating the bulbar urethra 180 degrees. Afterward, a graft is stitched to the corpora cavernosa's underlying tunica albuginea on both its margins and face. This helps to avoid graft contracture and graft elevation brought on by an underlying hematoma. The urethra is then turned back to its original position to cover the grafted area after the dorsally fixed buccal graft is sutured to both edges of the urethrotomy [5]. A recent review described the success rate of 35 studies of the dorsal onlay bulbar urethroplasty in a total of 934 patients. The average success rate was 88.4%, [D] **Figure 2**.

#### **Lateral Onlay:**

The lateral graft placement described by Barbagli is an amalgam of the ventral and dorsal approaches. Kulkarni et al. subsequently proposed a one-sided dorsolateral graft urethroplasty that, eliminating the need for full circumferential mobilization of the urethra, preserving the lateral vascular and nerve supply to the urethra and establishing secure dorsal grafting, is a minimally invasive alternative to conventional dorsal onlay Urethroplasty [6]. Kulkarni et al. reported their experience in 12 bulbar urethral strictures with short follow-up (mean 22 months); their procedure had a success rate of 92% [C] **Figure 3**.

The ventral and dorsal techniques are combined in Barbagli's description of the lateral transplant implantation. Later, **Kulkarni et al.** proposed a one-sided dorsolateral graft urethroplasty, which is a less invasive option to traditional dorsal onlay urethroplasty because it does not require complete circumferential mobilization of the urethra, preserves the urethra's lateral vascular and nerve supply, and establishes secure dorsal grafting [6] **Figure (3)**.

#### **Dorsal inlay:**

Asopa et al. described in 2001 a ventral sagittal urethrotomy strategy for treating urethral

stricture without urethral mobilization, utilizing a dorsal free graft as a dorsal inlay technique. The stricture is exposed, and the urethra is cut open ventrally. The dorsal urethra is then cut through to the midline, leaving a sufficient amount of elliptical raw space between the cut dorsal sides of the urethra. To achieve an appropriate urethral lumen width, grafts are put over the raw area of the incised dorsal urethra (tunica albuginea of the corporal body) and sutured to the edge of the incised dorsal urethra [7]. Pisapati reported the results of 58 patients who underwent bulbar urethroplasty with the dorsal inlay technique, and the overall success rate was 87% [B] **Figure 4**.

#### **Two-sided dorsal plus Ventral Double Graft:**

Tight stricture segments should ideally be eliminated, although urethral shortening and vascular damage from transection treatments can affect sexual function. The length of the stricture limits the application of enhanced anastomotic urethroplasty; in one notable series, the stricture that was treated with the procedure was just 2 cm long. Patients with lengthier obliterative segments might not be candidates for an EPA or augmented anastomotic urethroplasty. Two-sided dorsal plus ventral double grafting combined is a treatment option for these patients. There are two methods for doing a two-sided dorsal plus ventral double grafting operation. Palminteri et al. present one technique that combines ventral onlay and dorsal inlay and reported that 166 patients underwent the technique with a success rate of (89.8%) [E]. Whereas Gelman et al. describe a technique that combines dorsal onlay and ventral inlay and reported a series of 18 patients who underwent techniques, with a success rate of 94%. Using two oral grafts, the exposed urethral plate is incised in the midline and augmented dorsally and ventrally, and the stricture is opened ventrally without causing the bulbar urethra to contract [8] [4] **Figure 5**.

#### **Complications of OMG Urethroplasty**

**Stricture Recurrence:** Oral mucosa grafts have the potential to cause less re-stricture than skin grafts when utilizing grafts [10]. Although the site of the graft lateral, ventral, or dorsal does not appear to have an impact on its outcome [6]. "Fibrous ring" refers to the short rings that typically form at the proximal or distal extent of the healing following graft or onlay flap urethroplasties [11]. Visual internal urethrotomy is a successful treatment for short recurrent strictures; repeated urethroplasty or perineal urethrostomy may be necessary for prolonged strictures resulting from graft or flap

failure [12]. Underestimating the actual severity of urethral stricture disease and treating only a portion of the diseased urethra is a typical cause of urethroplasty failure. Thus, a number of precautions ought to be taken in order to reduce the possibility of urethroplasty failure. To properly plan the procedure beforehand, they include urethrography and cystoscopy for a meticulous pre-operative evaluation of the urethra. Flexible urethroscopy is used intraoperatively to evaluate the urethra proximal and distal to the stricture. To reduce the possibility of missing a region of occult urethral disease, the urethra should be generously opened proximally and distally into a seemingly healthy urethra when doing urethroplasty [9].

**Urinary Leakage:** One to four percent of patients who had anastomotic urethroplasty have reported having urinary extravasation during post-operative urethrography after the urethral catheter was removed [13]. And in 0–25% of urethroplasties involving buccal grafts. Usually, these "leaks" disappear after more catheter urine drainage time [14].

**Urethral Fistula:** Due to the bulbospongiosus muscle and thick perineal subcutaneous layers acting as an intermediary between the bulbar urethra and the perineal skin, fistulae are extremely rare following bulbar urethroplasty. Following penile urethral reconstructions, fistulae are far more prevalent. This is clearly caused by the tissue layers between the penile urethra and penile skin being thin or nonexistent [9]. Post-operative erections may also influence fistula formation. According to some, the use of monofilament sutures like Polydioxone sutures (PDS) reduces the incidence of fistulas [15]. Nevertheless, additional research did not support this benefit [16]. If extra tissue layers, such as dartos flaps or tunica vaginalis flaps, are employed to cover the suture line, fistula formation is less common [17]. It is believed that wound infection or dehiscence, as well as necrosis of the skin, intervening tissue, and graft, are the causes of fistula formation [18]. Compared to dorsal graft urethroplasty, fistulae are more frequent in ventral graft urethroplasty. With meticulous skin wound care and continuous catheter drainage, small fistulae may heal on their own. After six to twelve months, multilayer fistula closure is typically necessary for established fistulae. Care must be taken with restrictions that are not close to the fistula [19].

**Urethral Sacculaton:** Urethral sacculaton can occasionally develop following buccal graft urethroplasty; however, it seldom causes

uncomfortable post-micturition dribbling, and when it does, it is referred to as a diverticula or urethrocele [6]. However, sacculations are less frequent with dorsally positioned BMG. Compared to lingual graft, urethroplasty, that is. Elliott et al. documented in 2003 the significance of appropriately fitting buccal grafts positioned ventrally. Furthermore, sufficient closure of the corpora spongiosum adventitia (spongioplasty) over the graft will offer support and lessen this problem even further.

**Post-Voiding Dribbling:** Because many authors didn't think of post-micturition dribbling as a complication or even ask their patients about it, the incidence of this condition is underreported in the literature. On the other hand, some patients find the semen sequestration and post-micturition dribbling irritating. Since stress urine incontinence following urethral surgery is extremely rare, many patients who report urinary incontinence after surgery really have considerable post-micturition dribbling [9]. Semen sequestration and post-micturition dribbling during urethroplasty can have several causes, including urethral elasticity loss and corpus spongiosum continuity loss. Loss of the bulbospongiosus muscle contraction's effectiveness, as well as diverticula or sacculaton. It is crucial to remember that the emergence of dribbling could potentially signal the recurrence of a urethral stricture [9]. The frequency of annoying dribbling may vary depending on the urethroplasty procedure used: After the buccal graft, only urethroplasty, 8–21% of patient's experience after micturition dribbling [20]. Andrich et al. observed that when comparing ventral to dorsal locations, there was no discernible difference in annoying dribbling for ventral (21%) against dorsal (17%) [21].

**Urinary Tract Infection:** Any urological procedure requiring post-operative catheter fixation, such as urethroplasty, may occasionally result in UTI. In these situations, it is preferable to remove the catheters as soon as possible and to administer antibiotic prophylaxis in order to prevent UTI. Four percent of patients after bulbar urethroplasty had a UTI, particularly following ventral buccal mucosa graft urethroplasty. This condition typically goes away by leaving the SP catheter in place for drainage for an extra one to two weeks [9].

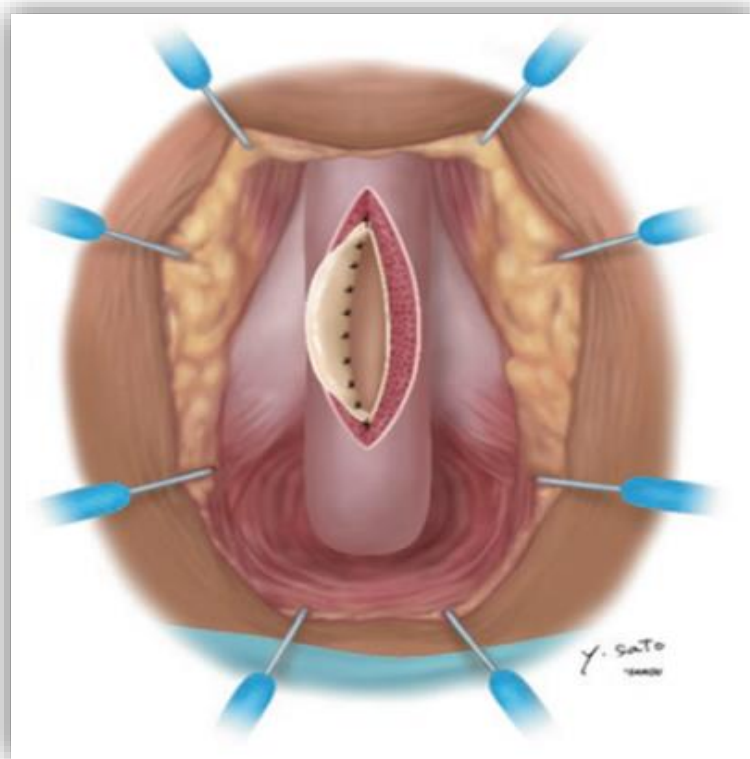
**Erectile Dysfunction (ED):** After urethroplasty, ED, as determined by the International Index of Erectile Function (IIEF), may develop temporarily. Almost all reported symptoms resolve around 6.0 months after surgery [22]. A meta-analysis has

indicated that the probability of developing new onset erectile dysfunction after anterior urethroplasty is less than 1% [23]. It is unknown if the type of urethroplasty, specifically anastomotic urethroplasty, causes or contributes to sexual dysfunction. After urethroplasty for pelvic fracture urethral injury (PFUI), there doesn't seem to be a substantial change in erectile function. Rather than the urethral repair that followed, ED in this cohort may have been caused by the original pelvic damage [24]. Up to 21% of men who have had bulbar urethroplasty report experiencing ejaculatory dysfunction, which manifests as decreased ejaculatory force, decreased semen volume, and pooling of semen. Although the precise cause of ejaculatory dysfunction is yet unknown, urethroplasty surgery may contribute to its onset [25]. On the other hand, some patients will have an improvement in their ejaculatory function after bulbar urethroplasty, as determined by the Men's Sexual Health Questionnaire (MSHQ). This is especially true for those individuals whose pre-operative ejaculatory dysfunction was linked to obstruction brought on by the stricture [25].

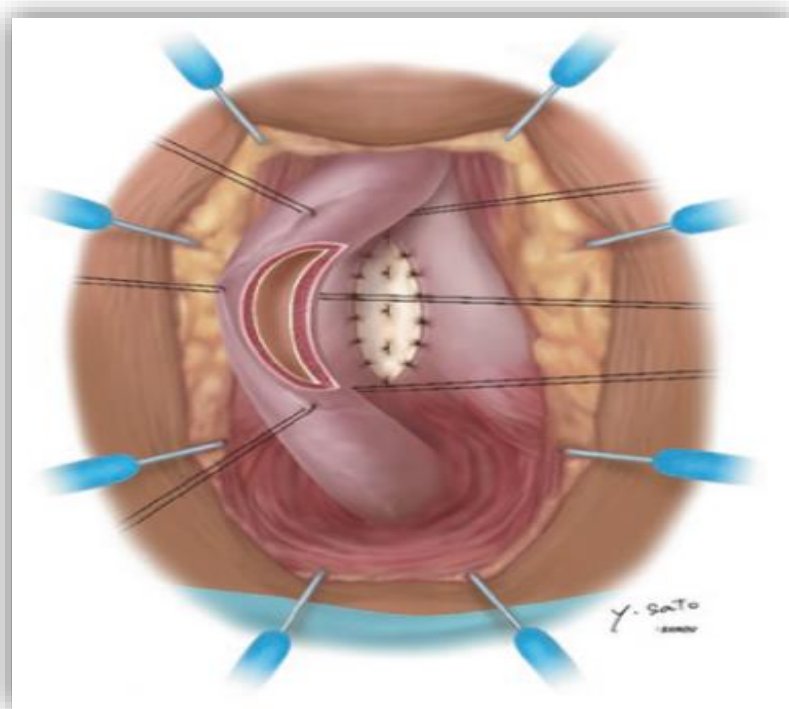
**Complications of Patient's Positioning:** Nerve Injury: In a survey of 177 patients who underwent surgery in the exaggerated lithotomy position, 15.8% of the patients had temporary neuropraxia of the common peroneal nerve (Angermeier and Jordan, 1994). In a different research, 10% of 185 open urethroplasties were evaluated for position-related complications of the lower extremities (compartmental syndrome, rhabdomyolysis, neurapraxia) who underwent urethroplasty in the high lithotomy position experienced lower limb problems, four of which were of a serious kind [26]. The length of the operation is the only important factor that influences the probability of neuropathic complications [27]. Despite a longer surgical duration in the lithotomy position, older patients undergoing urethroplasties did not exhibit an

increased risk of neurovascular problems in the lower limbs [28].

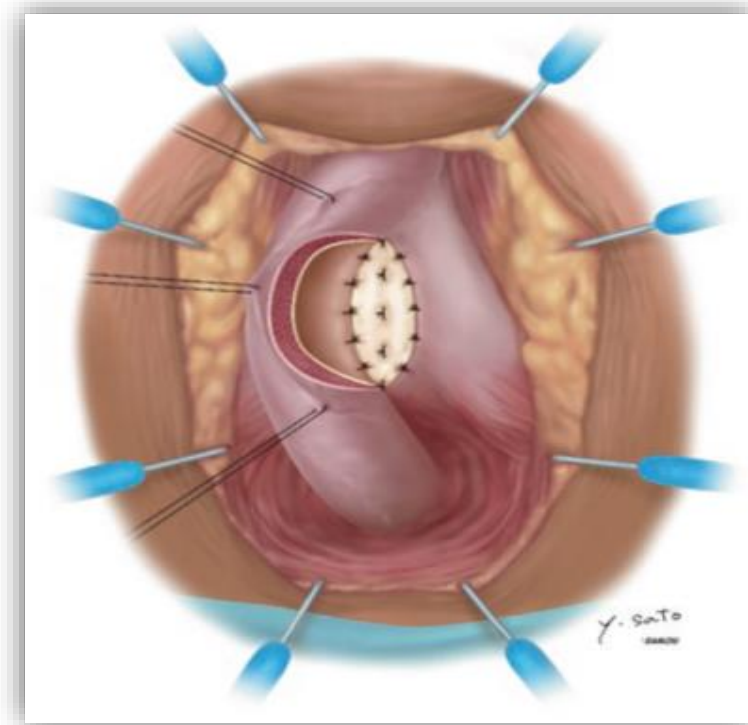
**Graft site (Oral) Complications:** The inner cheek is where buccal mucosal transplants are most frequently taken from. Compared to lip harvesting, cheek harvesting is said to have fewer early and late problems. Early effects include self-limited oral numbness (30–65%), mouth tightness (50–75%), and pain and discomfort (90–99%), which normally goes away or lessens to a modest degree in 5-7 days [29]. Prolonged oral numbness (26-26%) or prolonged oral tightness (9-32%), occurring 6–20 ms after surgery, are examples of late consequences. Salivation changed in 1–11% of cases. A number of authors noted no donor site problems. Others merely mentioned minor, transient side effects, including discomfort, paresthesia, and dry mouth that went away eventually. Intraoral hemorrhage, hematoma, infection, cheek granuloma, and injury to the Stensen's duct are uncommon consequences [29]. Devastating complications such as lip contracture are described in 3–5% of patients following lip graft harvest [30]. Naturally, the best way to prevent it is to refrain from harvesting graft material from the lip. In skilled hands, it can be uncommon; Barbagli documented only 2 occurrences (0.3%) out of 650 BMU procedures performed at his facility. Barbagli states that lip grafts are only used in severe cases, such as when a patient is unable to open their mouth wide enough to get a cheek graft or has had bilateral cheek grafts in the past. We avoid employing lip grafts [31]. There have been reports of less pain and tightness following surgery when the cheek wound is left open and allowed to heal subsequent to the original injury. We often use a 3/0 chromic gut suture to seal our buccal wounds since some patients have reported significant bleeding after the buccal graft site was closed, but others have not found pain or tightness to be an issue [29].



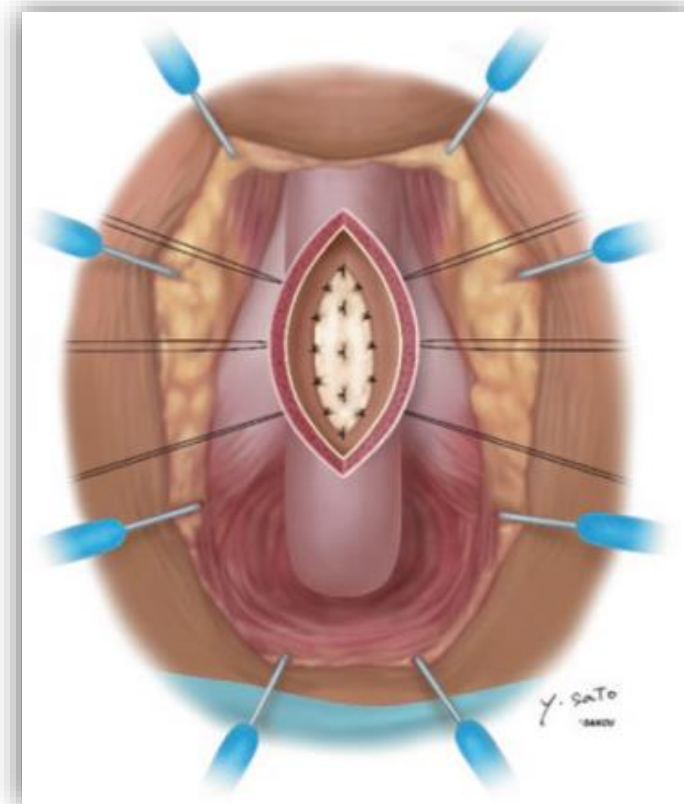
**Figure 1:** Ventral onlay.



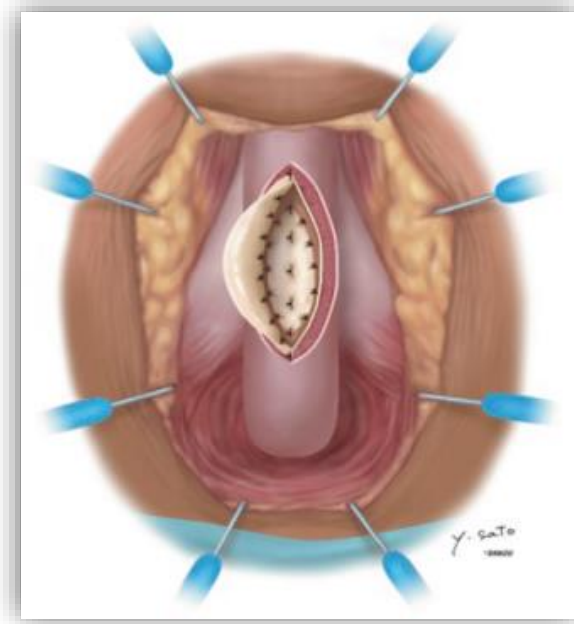
**Figure 2:** Dorsal onlay



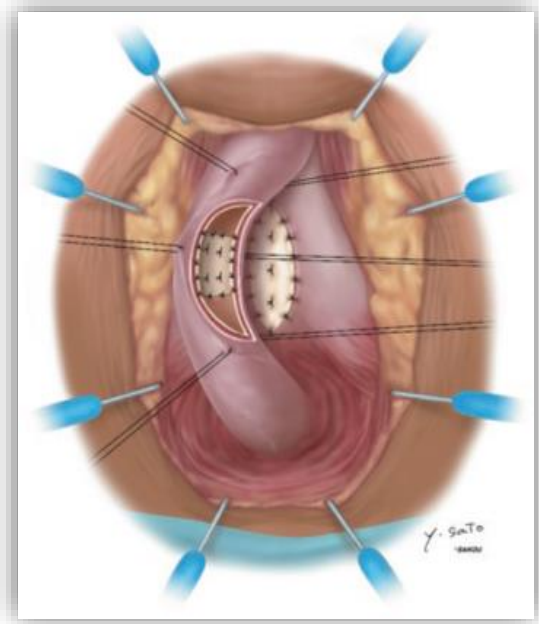
**Figure 3:** Lateral onlay.



**Figure 4:** Dorsal inlay.



**Figure (5A):** Combination of dorsal inlay and ventral onlay.



**Figure (5B):** Combination of dorsal onlay and ventral inlay.

**CONCLUSION**

There are different ways and techniques to perform bulbar urethroplasty, and each type of surgery has specific indications. Substitution urethroplasty is the procedure of choice for a long stricture in the proximal bulbar urethra or a stricture of any length located anywhere from the distal bulbar urethra and for strictures in patients who worry about sexual dysfunction. BMG has become the best urethral substitute among various tissues. The key to success is to select an appropriate procedure according to the status and location of the stricture.

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### Citation

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