

VENTRAL ONLAY BUCCAL MUCOSAL GRAFT URETHROPLASTY OF A STRICTURE URETHRA AND URETHROCUTANEOUS FISTULA IN ADULT: A CASE REPORT

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Abstract

This study aims to report the results of using ventral onlay buccal mucosal graft urethroplasty in the management of strictured urethra and urethrocutaneous fistula in adults by evaluating the success of the procedure and its long-term outcomes. This study was a case study, involving adults who had strictured urethra and urethrocutaneous fistula and underwent ventral onlay buccal mucosal graft urethroplasty as a surgical procedure. Data were collected through medical records, clinical history, and physical examination of the patients. Information regarding the ventral onlay buccal mucosal graft urethroplasty procedure, disease course, and treatment results were systematically recorded. The collected data were analyzed using descriptive analysis method to describe patient characteristics and treatment outcomes. The results of this study showed that ventral onlay buccal mucosal graft urethroplasty is an effective technique in the management of strictured urethra and urethrocutaneous fistula in adults. There was no evidence of complications, signs of graft failure, recurrent fistula, or urethral stricture at 1-month follow-up. The success of the procedure included healing of the urethral stricture and healing of the fistula. In addition, long-term results showed that patients had an improved quality of life after undergoing this procedure.

Keywords: Ventral Onlay Urethroplasty, Buccal Mucosal Graft, Urethral Stricture, Urethrocutaneous Fistula.

INTRODUCTION

A damaged or narrowed urethra is called a urethral stricture. A urethral stricture is a narrowing of the urethral canal that can cause difficulty in urinating and disrupt the flow of urine. Urethral stricture occurs when the urethra is narrowed due to scarring or fibrosis that blocks the flow of urine from the bladder to the outside of the body (Archie, 2022; Anjar, 2021). The main cause of urethral stricture is trauma, inflammation, or infection of the urethra which causes scar tissue to form and narrow the urethral canal (Doğantekin et al, 2022). Symptoms of urethral stricture may vary, including difficulty urinating, weak or intermittent urine flow, painful urination, frequent urination, or recurrent urinary tract infections (Gormley, 2010). Urethral strictures can affect both men and women, but are more common in men as the male urethra is longer and prone to trauma (Danarto, 2021; Widya et al, 2008). In an attempt to treat urethral strictures, urethral reconstruction using tissue grafts or flaps is often an option. This procedure aims to replace damaged or narrow parts of the urethra so that urine flow can return to normal. The use of ventral onlay buccal mucosal graft is one of the reconstructive techniques used to treat urethral strictures with good results (Dubey et al, 2005).

Urethral reconstruction remains a significant challenge for urologists even in this modern era. Despite many developments and innovations in medical technology, there is no technique that is considered perfect and fully effective to treat all cases of urethral stricture in every patient. Each case of urethral stricture has different complexities and characteristics, requiring a unique and personalized approach to treatment. Although various methods of urethral reconstruction have been developed, such as ventral onlay buccal mucosal graft urethroplasty, urethral anastomosis technique, and

dilatation method, there are still some obstacles in overcoming this problem. Some of the problems often encountered are the difficulty in obtaining suitable tissue to replace the affected part of the stricture, the risk of infection, postoperative complications, as well as the possibility of failure of the reconstruction procedure (Reksodiputro, 2019; Widya et al, 2008).

Replacement urethroplasty with a flap or graft has become a standard procedure for treating urethral strictures (Horiguchi, 2017). In the management of bladder and penile urethral stricture cases that cannot be resolved by excision and anastomosis, urethral reconstruction using a buccal mucosal graft (BMG) has become an established option (Hefermehl et al, 2020). In the case of urethrocutaneous fistula, a condition where there is an abnormal channel between the urethra and the surrounding skin (Soemiarto, 2015), which can cause urine leakage with urethral stricture, the researchers present a treatment method using ventral onlay buccal mucosal graft urethroplasty.

This ventral onlay buccal mucosal graft urethroplasty procedure is an effective alternative and has proven to provide good results for patients (Coguplugil et al, 2021). The buccal mucosal graft is used to replace the damaged mucosal area of the urethra, and at the same time, the ventral onlay technique is used to precisely position the graft so as to improve the structure and function of the affected urethra (Singgih, 2022). In such cases, it is important for urologists to use appropriate and innovative approaches to achieve optimal patient outcomes. Ventral onlay buccal mucosal graft urethroplasty has proven to be an effective option in treating urethrocutaneous fistula with urethral stricture, and provides hope for patients to have better recovery and better quality of life after the procedure.

In previous research conducted by (Mukhtar et al, 2017) who examined ventral-onlay buccal mucosal graft urethroplasty substitution urethroplasty for urethral stricture in women showed short and medium term results showed that ventral onlay BMG substitution urethroplasty is an excellent treatment for FUS which can avoid the need for repeat procedures that are regularly required after traditional endoscopic management. Another study conducted by (Pispati et al, 2009) examined dorsal buccal mucosal graft urethroplasty for anterior urethral stricture with Asopa technique. Overall results were good (87%), with an average follow-up period of 42 months. Seven patients had minor wound infections, and five patients had fistulas. There were six recurrences (6:45, 13%) during the 12-60 month follow-up period. Two patients with panurethral strictures and four patients with bulbar or penobulbar strictures experienced recurrence and were treated with optical urethrotomy and self- dilation. The mid-term results were as good as those reported with the dorsal urethrotomy approach. The absence of previous studies discussing ventral onlay buccal mucosal graft urethroplasty in urethral stricture and urethrocutaneous fistula in adults is the novelty of this study. This study aims to report the results of using ventral onlay buccal mucosal graft urethroplasty in the management of urethral strictures and urethrocutaneous fistulas in adults by evaluating the success of the procedure and its long-term outcomes.

LITERATURE REVIEW

Ventral Onlay Buccal Mucosal Graft Urethroplasty

Ventral Onlay Buccal Mucosal Graft Urethroplasty is a urethral reconstruction surgical procedure used to treat urethral strictures by using a buccal mucosal graft (inner oral mucosal) on the ventral (lower) part of the urethra that is narrowed or damaged (Coguplugil et al, 2021). This procedure is performed to repair or replace parts of the urethra that are damaged or narrowed due to various reasons, such as trauma, inflammation, or infection. In the Ventral Onlay Buccal Mucosal Graft Urethroplasty technique, the surgeon will take mucosal tissue from the inside of the patient's cheek or mouth and place it at the bottom of the strictured urethra (Barbagli et al, 2008). The buccal mucosal graft placed in the urethra will help widen the narrow urethral canal, allowing normal urine flow (Murthy, 2020). This procedure is usually performed on men who have urethral strictures and has good results in overcoming the problem. Ventral Onlay Buccal Mucosal Graft Urethroplasty is one of several urethral reconstruction techniques available and is chosen based on each patient's condition and needs.

Urethral Stricture Urethroplasty

Urethral Stricture Urethroplasty is a urethral reconstructive surgical procedure performed to treat urethral narrowing, also known as urethral stricture. Urethral stricture is a condition in which the lumen or channel of the urethra narrows due to various reasons, such as trauma, inflammation, or infection (Jezior & Schlossberg, 2002). The Urethral Stricture Urethroplasty procedure aims to repair or widen the narrowed part of the urethra so that urine flow can return to normal (Stephenson et al, 2015). In this procedure, the surgeon will make an incision in the area affected by the stricture and then widen it using various reconstructive techniques, such as extirpation and anastomosis, skin grafts, or the installation of devices or stents (Mangera et al, 2011). The choice of Urethral Stricture Urethroplasty technique depends on the location, length, and severity of the urethral stricture, as well as the overall health condition. The process requires skilled surgical skills and careful planning to achieve optimal results. Urethral Stricture Urethroplasty is one of the effective and commonly used approaches in treating urethral stricture problems. The success rate of this procedure is usually high, and patients can experience symptomatic improvement and improved quality of life after undergoing urethral reconstruction (Webster et al, 2014; Chapple et al, 2014).

Urethrocutaneous Fistula

Urethrocutaneous fistula is a medical condition in which an abnormal channel forms between the urethra (the tube that drains urine from the bladder) and the skin. This fistula may occur as a complication of a previous urethral surgical procedure, such as urethroplasty or other procedures involving the urethra (Chung et al, 2012). Fistulas usually form when there is a leak or gap in the lining of the urethra that allows urine to leak outside the body through the skin. This can cause health problems, such as infection, irritation, or inflammation around the area of the fistula (Retik et al, 1994). Urethrocutaneous fistula usually needs to be treated with surgery to close the abnormal passage. The surgical procedure to repair these fistulas involves cleaning and closing the tract with healthy tissue or mucosal grafts. The aim of the surgery is to resolve urine leakage and allow the urethra and skin to heal properly. The care and treatment of urethrocutaneous fistula can be done by an experienced urological surgeon. The patient's recovery rate and prognosis depend on the size, location and

complexity of the fistula, as well as the patient's overall health condition. Along with surgery, proper follow-up care and follow-up will help ensure optimal recovery for the patient (Elbakry, 2001).

METHODS

This research is a case study, involving adults who had urethral strictures and urethrocutaneous fistulas and underwent ventral onlay buccal mucosal graft urethroplasty as a surgical procedure. According to Yin (2014), case study research is a research method that explores contemporary phenomena in a real-life context, when the boundaries between the phenomenon and its context are not clear, and when researchers use multiple sources of evidence. Data were collected through the patient's medical records, clinical history, and physical examination. Information regarding the ventral onlay buccal mucosal graft urethroplasty procedure, disease course, and treatment outcomes were systematically recorded. The collected data were analyzed using the descriptive analysis method to describe patient characteristics and treatment outcomes.

DISCUSSION

Urethral stricture refers to the pathological narrowing of the urethral lumen secondary to scar formation in the subepithelial connective tissue and can occur anywhere along the anterior urethra, the portion distal to the genitourinary diaphragm that is enveloped in corpus spongiosum. Within the anterior urethra, the bulbar urethra is the most common site for stricture development, comprising almost 50% of all urethral strictures treated, with the majority in the United States being of either iatrogenic or idiopathic in origin (Coddington et al, 2022). The urethral stricture is a narrowing of the urethra due to scar tissue, which leads to obstructive voiding dysfunction with potentially serious consequences for the entire urinary tract. Urethral strictures can present with obstructive and irritative urinary symptoms and may ultimately impair renal function. Urethral stricture is a relatively common disease in men with an associated prevalence of 229-627 per 100,000 males, or 0.6% of the at-risk population, who are typically older men (Anjar et al, 2019).

Urethral strictures in children are uncommon. They may present as lower urinary tract symptoms or acute urine retention. The causes could be congenital, iatrogenic, posthypospadias repair, or traumatic. The diagnosis involves a detailed history, physical examination, and appropriate radiological and endoscopic investigations. Retrograde urethrography (RUG) with or without micturating cystourethrogram (MCUG) is the gold standard confirmatory test. In some situations, urethroscopy may be required for confirmation and treatment. Penile and long bulbar urethral strictures are generally regarded as complex strictures. This is because they do not lend themselves to simple excision and primary anastomosis. They require tissue transfer in the form of grafts, flaps, or staged repair (Appiah et al, 2020).

Urethrocutaneous fistulae present a reconstructive challenge. Common etiologies include sequela from post-infectious urethral stricture disease, adult hypospadias repair, and urethral stricture repair, particularly following two-stage urethroplasty. Diagnosis is established with physical examination, urethrography, and endoscopy. Attention is paid to the location and multiplicity of the fistula, along with the caliber of the remainder of the urethra, and the health of the surrounding tissue in order to plan

a repair. Simple fistulas can be repaired in a single stage with multi-layered closure, while complex fistulas may require two or more stages with advanced reconstructive techniques in order to achieve success. General principles and specific techniques are discussed, and an algorithm for fistula management is suggested (Higgins & Gupta, (2019).

The treatment urethrocutaneous fistulae is challenging but crucial to avoid life-long urinary complications such as recurrent stricture formation, urinary incontinence, and impotence (Waterloss et al, 2018).

A buccal mucosal graft placed dorsally or ventrally remains an excellent graft material in the bulbar and pendulous urethra. When lichen sclerosus is present, careful consideration should be given to complete excision of the diseased urethra with multistage repair vs accepting a higher rate of stricture recurrence with 1-stage repair (Levine, 2007).

Ventral onlay buccal mucosal graft urethroplasty offers satisfactory results in the setting of recurrent and complicated urethral stricture disease. Graft failures and complications generally occur within the first year after surgery. Bulbar strictures enjoy greater graft patency and lower complication rates than other stricture locations. In particular, guarded expectations should be given for stricture length >4 cm and multifocal disease (Mellon & Bihrlé, 2013).

Preoperative patient evaluation included medical history, physical examination, urine culture, post-void residual urine measurement, uroflowmetry and RUG/AUG (Ahyai et al, 2015). For preoperative evaluation, it starts from cystoscopy. Cystoscopy is a simple way to confirm the presence of suspected urethral stricture disease. However, it has limited value in preoperative planning because it cannot determine the length of the stricture or the status of the more proximal urethra.

This is of particular importance to the current discussion, because ventral onlay approach allows easy extension of the substitution “onlay” or “patch graft” into the most proximal portions of the anterior urethra. The combination of retrograde urethrogram and voiding cystourethrogram accurately assesses the bulbar urethra and determination of the length of a stricture along with its functional significance.

Techniques for retrograde and voiding urethrography have been reviewed elsewhere. However, one point requires elaboration related to *bulbar* urethral stricture: the penis must be adequately stretched so that the pendulous portion of the penile urethra and the penoscrotal junction are appropriately visualized (Wessels, 2016).

In this case report that a 51 year old man came with complaints of leaking urine for 6 months. In 2012, the patient had a history of stricture urethra and long-term catheterization. In 2017, the patient had a history of recurrent urethritis and abscess. Then in 2022, the patient complains of leaking urine and is brought to the hospital for a urethrography.

Retrograde urethrogram revealed a stricture and urethrocutaneous fistula (Figure 1). The patient was scheduled to do ventral onlay BMG urethroplasty.



Figure 1: Retrograde Urethrogram

The BMG placement can be ventral, dorsal, lateral or combined dorsal and ventral BMG in the meeting of stricture but the first two are most common. Ventral location provides the advantages of ease of exposure and good vascular supply by avoiding circumferential rotation of the urethra. Early success rates of dorsal and ventral only with BMG were 96 and 85%, respectively. Anterior urethral stricture treatments are various, and comprehensive consideration should be given in selecting individualized treatment programs, which must be combined with the patient's stricture, length, complexity, and other factors. Traditionally, anastomotic procedures with transection and urethral excision are suggested for short bulbar strictures, while longer strictures are treated by patch graft urethroplasty preferably using the buccal mucosal as gold-standard material due to its histological characteristics. The current management for complex urethral strictures commonly uses open reconstruction with buccal mucosal urethroplasty. However, there are multiple situations whereby buccal mucosal is inadequate (pan-urethral stricture or prior buccal harvest) or inappropriate for utilization (heavy tobacco use or oral radiation). Multiple options exist for use as alternatives or adjuncts to buccal mucosal in complex urethral strictures (injectable antifibrotic agents, augmentation urethroplasty with skin flaps, lingual mucosal, colonic mucosal, and new developments in tissue engineering for urethral graft material). In the present case, our patient had a stricture and we chose to correct the stricture with a buccal mucosal graft because of our personal expertise. We can conclude that the buccal mucosal graft is easier to perform and can be an option to repair urethral strictures (Favorito, 2018). Ventral onlay buccal mucosal graft urethroplasty have comparable efficacy and complication rates for treatment of long-segment incomplete bulbar urethral strictures (Vasudeva, (2015).

Several kinds of grafts are used in urethroplasty, the most common technique in reconstructive surgery for penile strictures and injuries. Each one of them has its own advantages and disadvantages. Two of these grafts are BMG and local penile graft (LPG). We used BMG as the graft of choice for our patient because of its effectiveness and our evaluation of the patient's condition (Hosseini et al, 2023). Onlay Buccal mucosal graft urethroplasty is a highly effective surgery in treating long-segment bulbar urethral stricture. The ventral only techniques were comparable regarding urinary and erectile function outcomes. Additionally, both techniques have no significant negative impact on post-urethroplasty erectile function status (Rajaian,

2019). There are multiple techniques in such surgeries such as ventral-onlay, dorsal-onlay, dorsal-inlay, lateral-onlay, and dorsolateral-onlay. Ventral-onlay would not assure sufficient nutritional and mechanical support because of lack of proper graft's vascular supply but an 88.9% success rate of ventral-onlay has been reported in one study (Jinga et al., 2013)

Before starting the reconstruction surgery, urethrocystoscopy was done, and patency of the urethra was evaluated. After general anesthesia, an approximately 8 cm buccal mucosal graft of the inner layer of the patient's cheek (Figure 2) was taken and the patient prepared for oral mucosal graft urethroplasty.

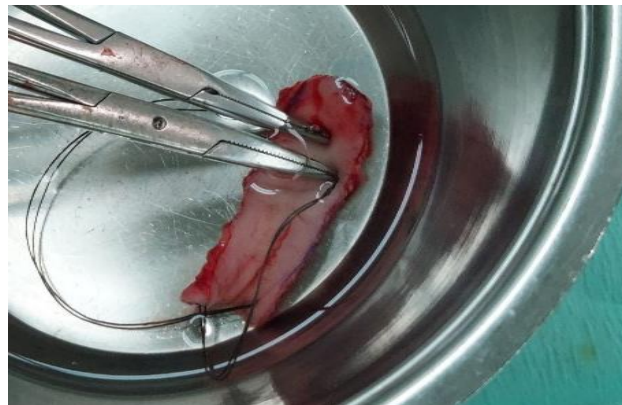


Figure 2: Buccal Mucosal

After revealing urethra with incision of perineum and bulbospongiosus muscle, harvesting and trimming the buccal graft, it was used as ventral onlay and sutured with multi 4-0 vicryl on catheter 18F (Figure 3).

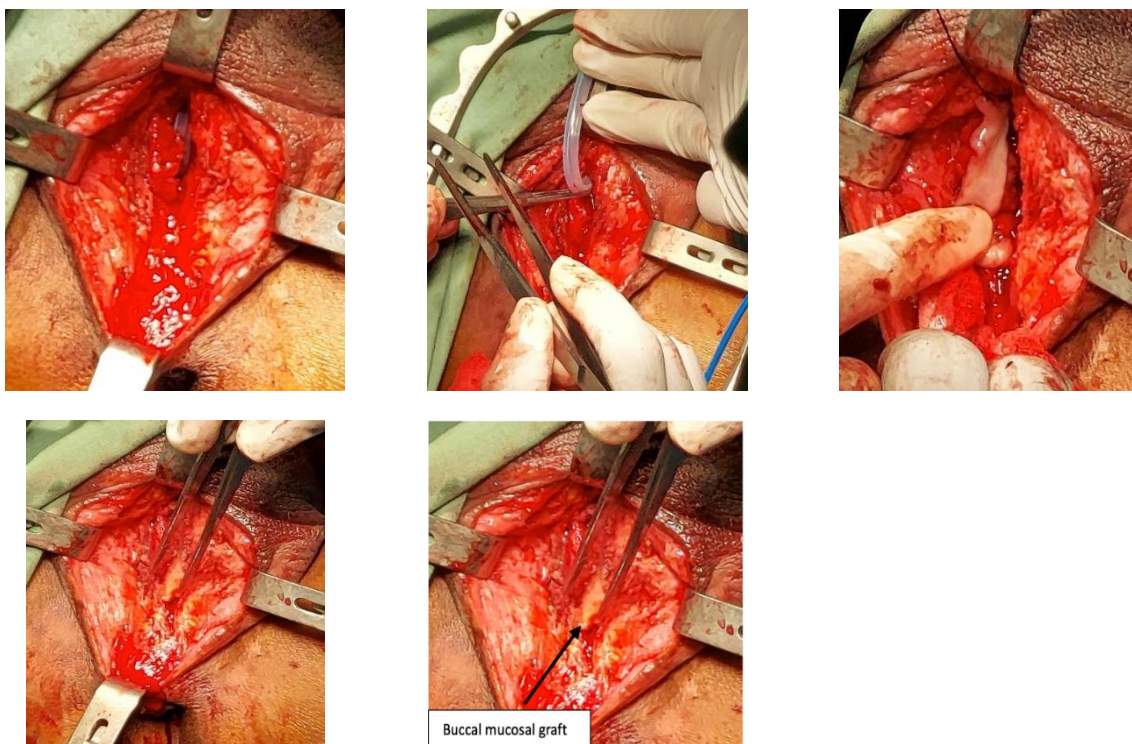


Figure 3: Ventral Onlay Buccal Mucosal Graft Urethroplasty

After grafting the buccal mucosal, we utilized surrounding tissue to provide support for the graft and stitched the layers onto the graft. This action resulted in nearly complete closure of the fistula with robust supportive tissue. We maintained the catheter in place for a month, after which we planned to proceed with a Retrograde Urethrography (RUG) as a subsequent procedure. We achieved near-complete closure of the fistula by utilizing a grafted buccal mucosal and reinforcing it with tissue from the surrounding area. We sutured the layers onto the graft to enhance the healing process. We proceeded by keeping the catheter in place for a month to ensure a successful recovery, and the next step in our plan is to perform a Retrograde Urethrography (RUG). The purpose of this procedure is to assess further developments and ensure the integrity of the urethra following the grafting procedure.

In this case, we used ventral-onlay BMG urethroplasty to reconstruct the bulbar urethral urethra. Before starting the reconstruction surgery, cystoscopy was done, and patency of the urethra was evaluated. Using a specific technique and graft tissue for the surgery depends on the patient's situation. After general anesthesia, an 8-cm buccal mucous graft of the inner layer of the patient's cheek was taken and the patient prepared for oral mucosal graft Urethroplasty with the rigid 18F cystoscope. Oral mucosal grafts, especially buccal mucosal grafts (BMGs), have gained wide acceptance as a graft choice for urethroplasty. The reported length of BMG urethroplasty ranged from 1.5 to 11 cm with success rates of 71.4%-100%. The widespread application of buccal mucosal graft is partly due to its favorable characteristics, including a thick epithelium, highly vascularized lamina propria, availability, strength, and resistance to infection.

After revealing urethra with incision of perineum and bulbospongiosum muscle from the site of the meatus and harvesting and trimming the buccal graft. After grafting the buccal mucosal, we used the surrounding plate's tissue to support the graft and sutured the layers on the graft. We achieved nearly complete closure of the fistula with good supportive tissue. RUG was done after a month prior to catheter removal confirmed absence of extravasation so we removed the catheter. The outcome was satisfying. There was no evidence of any complication, graft failure signs, recurrent fistula, or urethral strictures in 1-month follow-up.

According to Patterson & Chapple (2008) in experienced hands, the outcomes of both dorsal onlay grafts and ventral onlay grafts in bulbar urethroplasty are similar. The dorsal onlay technique is, however, possibly less dependent on surgical expertise and therefore more suitable for surgeons new to the practice of urethroplasty. The complications associated with ventral onlay techniques can be minimized by meticulous surgical technique, but in series with longer follow-up, complications still tend to be more prevalent. In penile urethroplasty, two-stage dorsal onlay of BM (after complete excision of the scarred urethra) still provides the best results, although in certain circumstances a one-stage dorsal onlay procedure is possible. Fitchner (2004) observed one fistula, one graft infection/necrosis, two lower lip scars with transient impairment of lip motility, and four recurrent strictures (at the proximal anastomosis), all of which were treated successfully with internal urethrotomy. All but one recurrent stricture occurred during the first 12 postoperative months.

Early and medium-term results indicate that ventral onlay BMG substitution urethroplasty is an excellent treatment for FUS that can avoid the need for the repeat procedures regularly required after traditional endoscopic management (Mukhtar,

2017). Bulbar urethra is the most suitable site for graft onlay urethroplasty, and buccal mucosal graft is helpful for achieving good results (Wang et al, 2019). Ventral onlay buccal mucosal graft urethroplasty is a safe and effective treatment option for urethral stricture. Unnecessary dilation should not be carried out and buccal mucosal graft urethroplasty in expert centers should be recommended to these patients (Coguplugil, 2021). Balbagli (2005) tells that the placement of buccal mucosal grafts into the ventral, dorsal or lateral surface of the bulbar urethra showed the same success rates (83% to 85%) and the outcome was not affected by the surgical technique. Moreover, stricture recurrence was uniformly distributed in all patients.

CONCLUSION

Ventral onlay buccal mucosal graft urethroplasty is an effective and safe option in urethral reconstruction for urologists to treat complex cases of anterior urethral stricture. This technique is relatively easy to perform with minimal morbidity and provides excellent results in adult patients with urethral strictures and urethrocutaneous fistulas. Studies have shown that this procedure successfully cures urethral strictures and fistulas, and provides patients with improved quality of life. However, the choice of surgical technique still depends on the surgeon's preference and experience, as well as the characteristics of the patient's condition such as the length and location of the stricture, and the quality of the local tissue.

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