OUTCOME OF SINGLE STAGE OMG URETHROPLASTY BY KULKARNI TECHNIQUE IN COMPARISON WITH JOHANSON'S STAGED URETHROPLASTY FOR MANAGEMENT OF PAN-URETHRAL STRICTURE

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Abstract

Purpose: *To observe the outcome of single stage buccal mucosal graft and Johanson's staged urethroplasty for treatment of pan- urethral stricture.*

Materials and Methods: *A total of 60 patients with an average age of 42 years (21-55) underwent OMG urethroplasty and Johanson's staged urethroplasty between March 2008 to September 2015 for pan-urethral stricture of different etiology. OMG was always harvested from cheek using 2 team approaches. Graft was placed using Kulkarni technique. Clinical outcome was considered success or failure if any post operative procedure needed. Mean follow up was 45 month (6-95)*

Results: *Total 60 patients were included for final calculation, 31 patients with buccal mucosal graft (Group A) and 29 patients with Johanson's staged urethroplasty (Group B) were followed up for average 45 months. Success rate of group A was 93.5% at 3 months and 77.4% at 3 years and in group B 65.5% at 3 months and 44.8% at 3 years follow up which is statiscally significant (p <.05). Postoperative complications were significantly higher in group-B.*

Conclusion: *Repair of pan-urethral stricture in a single-stage OMG by Kulkarni technique is simple, fast, safe, effective and reproducible in the hand of any surgeon.*

Key Words: *urethra, urethral stricture, oral mucosa,urethroplasty.*

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Introduction

Urethral stricture is one of the oldest problem faced by the urologist occurs due to fibrotic narrowing of urethral lumen and fibrosis usually extend into the surrounding corpus spongiosum causing spongiofibrosis[1]. Many management options are available for urethral stricture disease, ranging from simple dilation to complex multistage procedure but none claims to be the best for all patients. Significant progress made over last 30 years allows many of the complex strictures to be reliably reconstructed in one stage [2].

Panurethral stricture disease is a process that encompasses the full length of the urethra from meatus to the proximal bulbar urethra. The incidence of panurethral strictures continues to rise, particularly in Indian and Asian countries, where the primary etiology is lichen sclerosis. Prevalence of iatrogenic strictures has also increased, asendoscopic instrumentation of the urethra may result in iatrogenic panurethral strictures[3].

The gold standard treatment of urethral stricture is urethroplasty [4]. The use of oral mucosa was first described in 1941[5] and reintroduced in 1992[6]. Buccal mucosa is tough, resilent, easy to harvest, easy to handle, reistant to skin diseases e.g. BXO and also resistant to infection. Buccal mucosa is architecturally similar to stratified squamous epithelium of penile and

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glanular urethra making it exceptionally adaptable for urethral reconstruction[7].

Surgical approach to long segment anterior and pan-urethral stricture is more controversial[8]. Currently, there is a paucity of evidence supporting specific management options for pan-urethral stricture disease. The conventional approach for the management of pan-urethral stricture is Two stage Johanson repair[9]. Here in stage -I , a hypospadious is created by incising the stricture segment of urethra by longitudinal midline ventral incision and lay open by marsupialization of urethral mucosa to adjacent penile or perineal skin according to the site of stricture. Then after a specific interval, stage-II procedure performed. Currently substitution urethroplasty (OMG) has been suggested for pan-urethral stricture with a promising result[10]. It may be in single stage or multiple stage.

The present study is designed to observe the outcome of Johanson's staged urethroplasty and single stage buccal mucosal graft for treatment of pan-urethral stricture.

Patients and Methods

A hospital based, prospective and comparative study was conducted in the department of urology, National Institute of Kidney Diseases & Urology (NIKDU) from March 2008 to September 2015 to evaluate the results of substitution urethroplasty using dorsolateral onlay buccal mucosa and Johanson's staged urethroplasty for pan-urethral stricture to determine the better option.

We included patients who presented for primary consultation as well as those patients with previous failed repair. Exclusion criteria included patients with malignant urethral lesions. All the male patients of anterior urethral stricture were evaluation with clinical history, physical examination, urine culture, uroflowmetry, residual urine

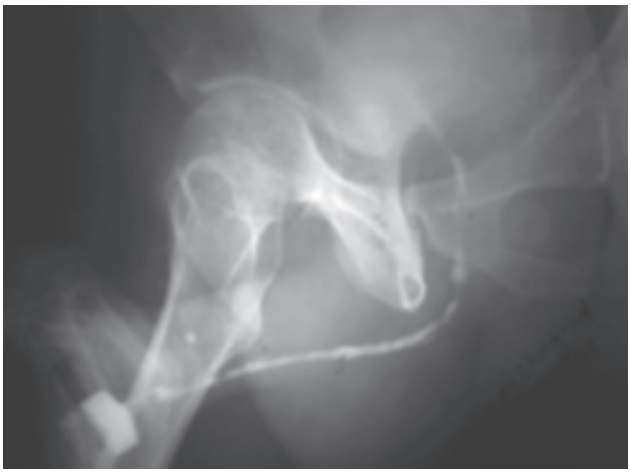

Fig.-1 *Urethrogram in a patient with pan-urethral stricture.*

measurement, retrograde and voiding urethrography and urethroscopy using a 4.5 or 6 Fr. Ureteroscope.

The primary outcome measure of this study was success of surgery, defined as freedom of postoperative instrumentation or dilatation.

Surgical technique (OMG Urethroplasty)

All patients were treated using the one-stage OMG urethroplasty through a perineal incision previously described by Kulkarni et al.[11–13].

The patient is first either orally or nasally intubated. The patient is placed in simple lithotomy position, with heels carefully placed in with care to minimize pressure on the calves to avoid peroneal nerve injury. The suprapubic, scrotal and perineal skin is shaved, disinfected using chlorhexidine, and draped. Two teams work simultaneously at the donor and recipient site, with separate sets of instruments. The oral mucosa is harvested from both cheeks as described by Barbagli et al.[14].

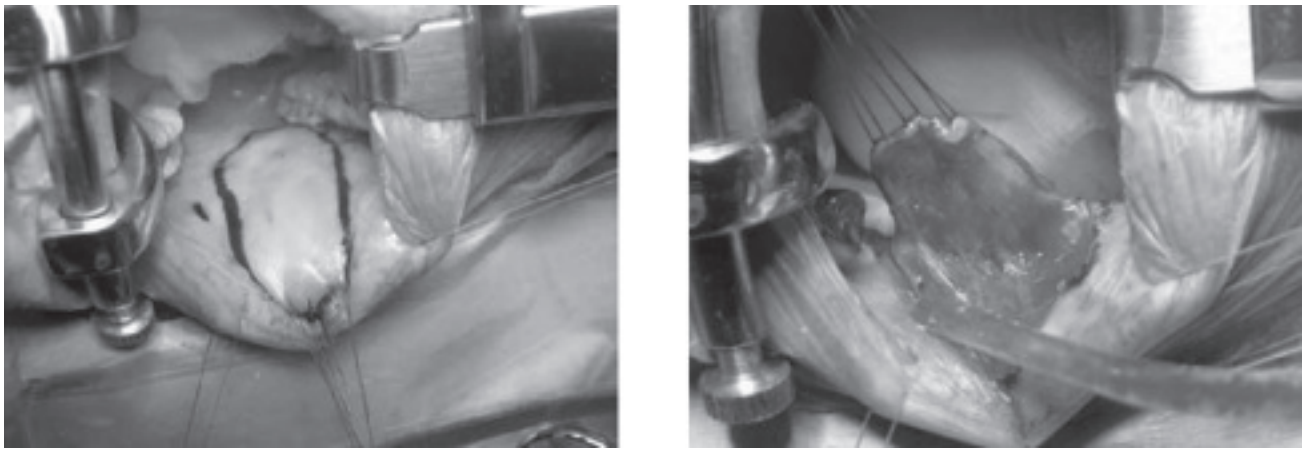

Fig.-2 : *Harvesting of OMG*

Preoperatively, urethroscopy is performed using a 4.5 or 6 Fr. Semirigid Ureteroscope. Methylene blue is injected into the urethra and a midline perineal incision is made. The bulbar urethra is dissected along the left lateral border. The bulbospongiosus muscle and central tendon of the perineum are left intact ventrally. The urethra is then mobilized across the midline to the contralateral attachment to the corpora cavernosa, which is left intact. This helps to preserve the neurovascular supply to the urethra. The penis is then invaginated into the perineum. This can be accomplished by applying steady pressure on the penis from above while sharply incising the thin fascia over the urethra. This should be continued to the glans to allow full mobilization of the urethra.

Mobilization of the urethra off the corpora cavernosa is continued from proximal to distal, ending at the coronal sulcus (Fig. 3). Once mobilization is complete, the dorsal aspect of the urethra is exposed and opened longitudinally (Fig. 4.). An additional wide dorsal meatotomy may be performed externally (Fig. 5).

Fig.-3 *One-sided dissection of the entire anterior urethra*.

Fig.-4: *Urethra opened along dorsal aspect longitudinally.*

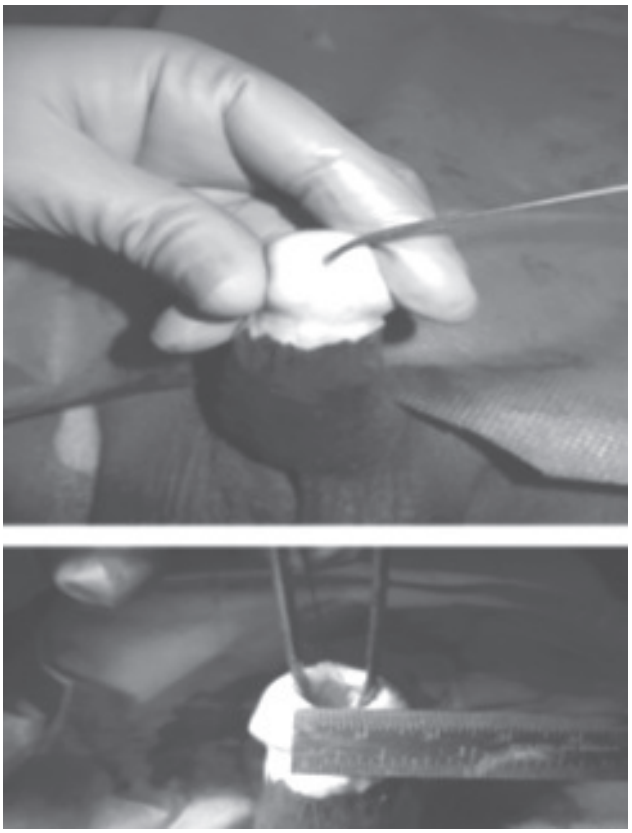

Fig.- 5 *(a) Initial Meatus. (b) After dorsal meatotomy.*

The OMG are then passed into the field. The first is sutured to the dorsal apex of the meatus, and then passed through to the penile urethra fixed to the corpora cavernosa over the midline. The second graft is applied to the corpora cavernosa opposing the bulbar urethra. The grafts are 1.5 cm in width, and are spread and fixed to the corpora with quilting sutures.

Once quilting of the graft is completed, the OMG margin is sutured to the urethral plate. A 14 Fr silicone urethral catheter is inserted. The urethra is rotated back to its original position and a continuous 5–0 polyglactin suture is used to approximate the urethral margin to the OMG and the corpora cavernosa on the left . The separated ends of the bulbocavernosus muscle are reapproximated. At the end of the procedure, the graft is completely covered by the urethra and bulbospongiosus muscle. A 3-layer closure of perineal fat, Colles' fascia, and skin is completed in a running fashion.

Johanson's staged urethroplasty: (Modified from Donald, et al , 1956; Jack Lapides, 1959)

All patients underwent surgery under spinal anesthesia. The patient placed in a mild lithotomy position, so that either perineal or suprapubic regions can easily be exposed. The operation is divided in two stages. In the first stage a hypospadias is created in the strictured region—the narrowed urethra is laid open and its incised edges anastomosed to adjacent skin. If the stricture is so severe that proximal end cannot be identified accurately, a supra pubic cystostomy and passage of a sound through the vesical neck down to stricture site may be performed. The skin edges of the penis are then sutured to the edges of the urethral mucosa with mucosa with 5/0 vicryl. If the strictured area extend into the perineal portion of the urethra, a flap of scrotal tissue must be inverted to give one enough skin for closure of the urethra in the second stage operation. In this area it is very important to excise all fistulous tracts and surrounding scar tissue completely. A 18 Fr Foley catheteris left indwelling for 3-4 days after this procedure. Johanson insists that even if hair bearing areas are inverted, the hair will soon disappear and afford no hazards.

The interval between varies with the healing power of patient and averages from eight to ten weeks. The second stage technique is universal. Urinary diversion should be performed and was done by suprapubic cystostomy in all our patients. A strip of urethra and surrounding skin approximately 2 cm wide, or 75 percent of the circumference of the urethra desired is left intact. The lateral skin edges of the penis or scrotum are freed for a distance of 2-3 cm, so that the skin edges can be approximated over the buried strip without tension. A

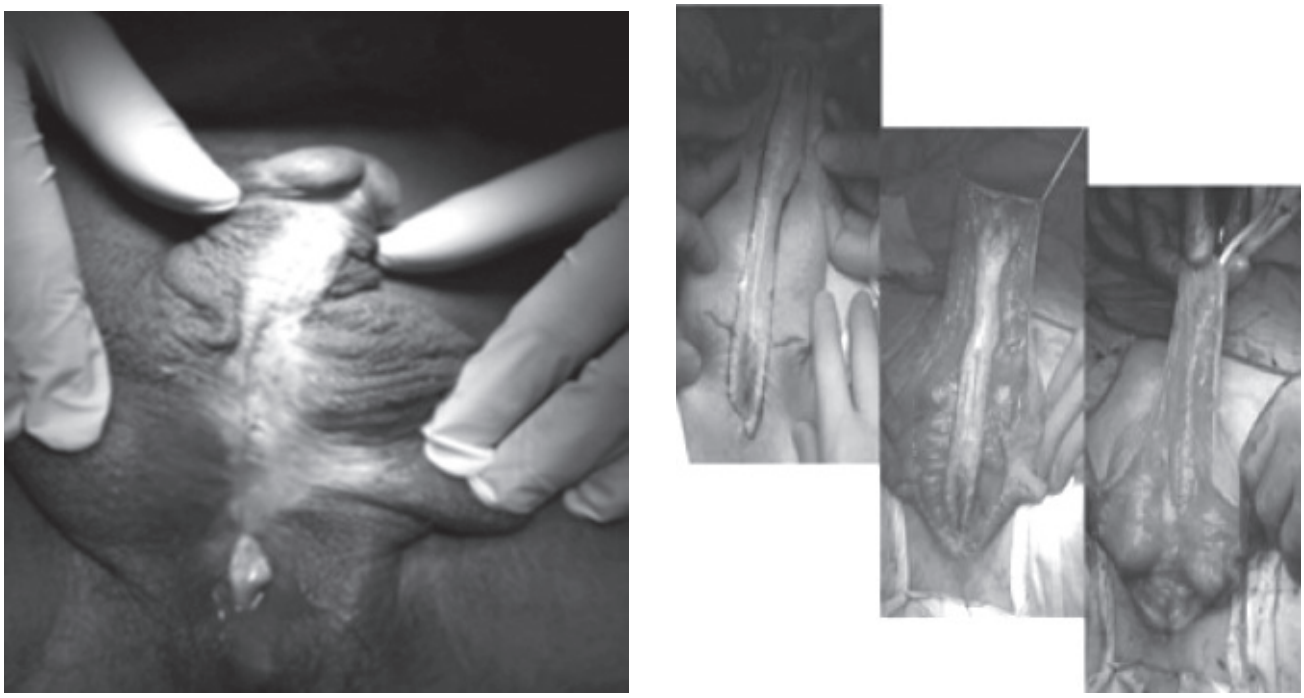

Fig.-6: *Johanson's two stage repair (1953)*

dorsal relaxation incision is made if necessary. The skin is closed with interrupted sutures of 5-0 polyglactin. The patient is allowed to void on tenth day if wound appear solid.

Postoperative care and follow-up criteria

Patients are ambulated on postoperative day 1 and kept in hospital until postoperative day 2. They receive a single dose of broad spectrum IV antibiotics, and are then transitioned to oral antibiotics from day 2 until catheter discharge. We do not routinely performed pericatheter urethrogram prior to removal of foley catheter. We do employ this investigation for cases of redo urethroplasty; pericatheter RUG is performed at 4 weeks postoperatively, and catheter is removed if there is no evidence of contrast extravasation. Patients are followed at 3, 6, and 9 months postoperatively, and the nannually thereafter. We recommend use of uroflometry at these time intervals, and any time there is clinical indication. A clinical history of subjective decrease flow should be investigated by uroflometry; a flow rate less than 12 ml/s should promptly secondary investigations including a repeat retrograde urethrography and urethrocystoscopy.

Results

A total of 60 patients were included for analysis. Age distribution of Group-A was 21-55 years and Group-B was from 22-54 years. The mean ± SD age of group-A and Group-B were 42.13±7.65 and 41.10±8.85 years respectively. The overall median follow-up was 45 months. Etiology of the stricture were as follows: LS 39 patients (65%), non-LS (including catheter related, idiopathic, iatrogenic, failed hypospadias, and trauma) in 21 patients (35%). The mean stricture length was 11.5 cm, with a range of 8–15 cm. Of 60 patients, 52 (86.7%) had no previous urethral surgery, and 8 (13.3%) had a previous failed urethroplasty or DVIU.

Preoperatively on Uroflowmetry maximum flow rate (Qmax) varied from 6-10ml/sec. On 2 nd day after removal of catheter, in group A Qmax was good (>15 ml/sec) in 93.5%. But in group B this rate was 65.5%. Significant difference was observed between the groups in terms of peak urinary flow rate (Qmax) and voided volume on 2nd day after removal of catheter (p = 0.003 and p = 0.002).

Evaluation of outcome 3 months after operation shows Peak urinary flow rate(Qmax) and voided urinary volume were considerably higher in buccal mucosal graft than those in the Johanson's urethroplasty (29 vs 19 pt) (93.5% vs 65.5%) and the difference between the groups was significant (p = 0.000 and p = 0.001respectively). The frequency of UTI and recurrence of stricture were significantly less in the buccal mucosal graft than those in the Johanson's urethroplasty (p = 0.039 and p = 0.014 respectively).

Evaluation of outcome 1year after operation shows shows success rate in terms of Peak urinary flow rate(Qmax) and voided urinary volume were considerably higher in buccal mucosal graft than those in the Johanson's urethroplasty (27 vs 16) (87%vs55.1%) and the difference between the groups was significant (p = 0.000 and p = 0.001respectively). The frequency of recurrence of stricture and UTI were significantly less in the buccal mucosal graft than those in the Johanson's urethroplasty(4 vs 13) (p = 0.007 and p = 0.014 respectively).

Evaluation of outcome 3 year after operation shows success rate in terms of Peak urinary flow rate(Qmax) and voided urinary volume were considerably higher in buccal mucosal graft than those in the Johanson's urethroplasty(24 vs 13)(77.4% vs 44.8%) and the difference between the groups was highly significant (p<.001) The frequency of recurrence of stricture was significantly less in the buccal mucosal graft than those in the Johanson's urethroplasty(6 vs 16) (p <0.05).

Discussion

Panurethral strictures by definition involve the whole anterior urethra and form a complex subset of urethral stricture disease. Lichen sclerosus remains a primary etiology for panurethral stricture disease, particularly in the Asian subcontinent. Recently, however, there has been a trend in etiology, favoring more iatrogenic panurethral strictures. Prolonged catheterization or traumatic catheterization results in panurethral stricture secondary to inflammation and ischemia of the urethra. Another proposed mechanism includes local allergic reaction to the catheter or lubricant used at time of placement. Endoscopic instrumentation of the urethra, particularly with transurethral resection of the prostate, can also lead to urethral trauma and ischemia, resulting in stricture formation. Aside from technical considerations (obvious catheter trauma or complicated procedures), it remains difficult to identify those at higher risk for pan-urethral stricture.

In order to differentiate between the 2 most common etiologies, it is helpful to inspect the meatus. Panurethral strictures secondary to lichen sclerosus almost always involve the meatus. In iatrogenic and catheter induced strictures, the meatus is often spared.

Historically, two-stage urethroplasty was favored for the management of panurethral strictures. The Johanson's two-stage technique, first described in 1953, involves buried epithelium (originally local skin, which later evolved to autologous graft) based on the Denis-Browne principle [15]. It allows setting of the tissue and resolution of inflammatory response if any, which is adventitious. But it requires much more hospitalization time , repetitive anesthesia administration, more working hour loss, more waiting period between stages (8 weeks to 8 month or more) [16]. Upon review of the literature, several institutions have experimented with other tissue transfer techniques, including fasciocutaneous skin flap with or without simultaneous use of buccal mucosa graft [17,18], or tunica albuginea [19]. There has been long standing view of using two-stage urethroplasty for Panurethral strictures. Our primary concern with the two-stage Johanson's technique is that it relies on genital skin for the neourethra. As was shown in our series, more than 50% of panurethral strictures are secondary to lichen sclerosus. Any two-stage procedure with genital skin will have a high risk of recurrence secondary to incorporation of diseased skin in urethra[20].

Large number of patients (34.5%) had poor urinary flow (<10 ml/sec) after Johanson's II urethroplasty (group B) due to development of re- stricture, pseudo-diverticulum and urethrocutaneous fistulas. In the study of Johanson's himself 25% patient developed restenosis, 50% developed diverticulum and 11% developed fistula. Overall initial success rate was 67%. Whereas in this study success rate at 3 month is 65.5% in group B and 93.5% in group A but at 1 year it was 55.1% and 87% and at 3 year follow up it was 44.8% and 77.4%.%. This is comparable with Asopa et al. (2001), Raber et al. (2005) also showed 91.6% and 85% success after 1 year by RGU after BMG and Farnandes and draper(1997), Ali and Hajaj (2007) showed 68% and 60% success after 1 year by RGU after Johanson's urethroplasty in long segment and pan-urethral stricture.

Post operative complications in this series was evaluated. At 3 month, Out of 31 patients in group A 4 patients develop wound infection. After regular dressing infection subsided but fistula was observed in 1 patient after removal of catheter, which was resolved spontaneously with 2 weeks further catheterization. Two patient develop recurrence which was managed by internal urethrotomy. In group B of 9 patients develop wound infection which was managed as previous group but of them 5 patients develop fistula which was also managed by 2 weeks further catheterization. 10 patients develop recurrence which was also managed by internal urethrotomy. Andrich and mundy (2001) reported 11% of recurret stricture of buccal mucosa graft urethroplasty. International studies of Johanson's urethroplasty shows complications rate- urethrocutaneous fistula 7.8% by Culp and associates (1957), restenosis 25% by Johanson (1953) himself, diverticulum 12% by Bogas and Lasky (1999) All above complications were observed to be higher in the group B compared to those in the group A, the differences between the groups reach the level of significance ($p > 0.05$). With progression of time, this study shows that re-stricture rate increases in both group but more in group-B. the rate is extremely higher (66.6%) in those patient with BXO undergone johanson's staged urethroplasty.

A very recent multi-center study from high volume urethroplasty units concluded that single stage buccal graft urethroplasty was more successful than 2 stage procedures. Flaps have higher complication rates as compared to one stage urethroplasty [21].

Dubey et al. reported on their experience comparing the one-stage Kulkarni technique and two-stage repairs for panurethral strictures secondary to lichen-sclerosus [22]. They concluded that one-stage procedures had better success, and while staged procedures could be successful, they were fraught with technical difficulties and multiple revisions. [23] The Johanson staged repair has long fallen out of favor as first-line therapy. It can still be employed to salvage the most complex urethral strictures [24].

Conclusion

Panurethral stricture disease is a complex process. One stage OMG Urethroplasty by Kulkarni Technique for panurethral stricture is a minimally invasive, with excellent postoperative outcomes, improved cosmesis, and excellent functional outcomes. Johanson's staged urethroplasty should be obsolete for long segment and pan-urethral stricture due to lichen sclerosus due to extremely high re-strictue rate. But where Penis is not normal as in hypospadias or history failed urethroplasty, too narrow urethra, history multiple re-operations and if there is fistulas and inflammation— Johansson's staged Urethroplasty can be performed.

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