Advances in urethroplasty

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Background

- Evolved from the era of dilatations to urethroplasty
- Use of buccal grafts revolutionized the success rates of urethral reconstruction
- Etiology: lichen sclerosis, trauma, infections, iatrogenic and idiopathic, and post-hypospadias repair

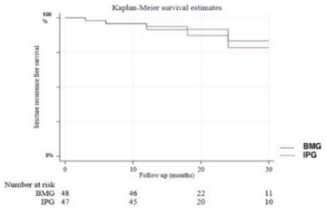
Bulbar Urethroplasty

- Bulbar urethra is the commonest site for urethral stricture
- Commonly used techniques:
  - Dorsal onlay
  - Ventral onlay
  - Dorsal inlay
  - Double-face graft
  - Non-transecting anastomotic urethroplasty
  - Transecting to end-to-end anastomosis
- *Buccal mucosa graft is still the gold standard for augmentation.*

'Pee'BuSt Trial: A single-centre prospective randomized study comparing functional and anatomic outcomes after augmentation urethroplasty with penile skin graft versus buccal mucosa graft for anterior urethral stricture disease

Shantanu Tyagi[1] · Kalpesh Mahesh Parmar[1] · Shrawan Kumar Singh[1] · Anuj Sharma[1] · Mukesh Shukla[2] · Aditya Prakash Sharma[1] · Sudheer Kumar Devana[1] · Gopal Sharma[1] · Santosh Kumar[1] · Arup Kumar Mandal[1]

Fig. 2 Kaplan-Meier diagram showing comparative success between two arms; BMG-Buccal Mucosa Graft; IPG-Inner preputial graft



Preservation of bulbospongiosus muscle

- Bulbospongiosus- cavernosus muscle:
  - Compresses the urethra on lower aspect and helps in ejaculation and evacuation of terminal drops of urine
  - Compressing emissary veins and process of erection.
- Traditionally, dorsal onlay was performed by using a circumferential mobilisation of bulbar urethra. This is by incising bulbospongiosus muscle in midline ventrally with circumferential mobilisation of the urethra. (Bargagli approach)

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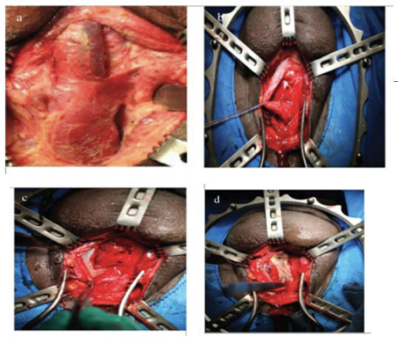

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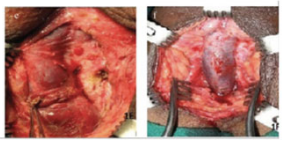
Preservation of bulbospongiosus muscle



- Kulkarni approach: One-sided dissection, sparing the bulbospongiosus muscle and limiting the muscle division only to the distal bulbocavernosus muscle, which is a muscle preserving approach
- Neurovascular supply to the urethra on one side of patient is preserved

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Preservation of bulbospongiosus muscle

- Systematic reviews by the SIU with the International Consultation on Urological Disease reported average success rates of 88.3% after dorsal onlay approach during the average follow-up period of 42 months

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Ventral approach

- Requires less urethral mobilisation and can be performed by either muscle cutting or muscle sparing techniques
- The best indications for ventral onlay urethroplasty are proximal or middle bulbar urethral strictures only and particularly proximal strictures developing after transurethral resection of prostate surgery
- It is essential that the patient should have wide spongious tissue of more than 1 cm diameter

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Ventral approach

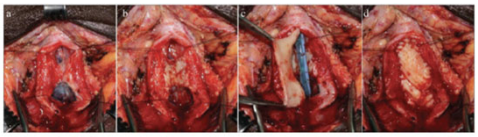

Fig. 2 – (a) Ventral incision in urethra showing near-obliterative bulbar stricture (b, c) Small graft placed as dorsal inlay and large graft as ventral onlay-double-face BMG urethroplasty. (d) Ventral onlay.

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Dorsal Vs Ventral

- Ventral graft placement requires less urethral dissection and mobilisation
  - It is technically easier
  - Similar success rates
- Similar success rates (85 - 93%) and stricture recurrence

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Double-face BMG urethroplasty

- Dorsal onlay with ventral inlay or ventral onlay with dorsal inlay technique
- Near-obliterative bulbar strictures is the main indications of double-face graft urethroplasty

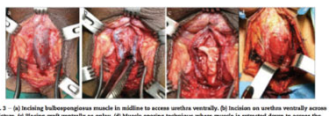

Fig. 3 – (a) Incising bulbospongiosus muscle in midline to access urethra ventrally. (b) Incision on urethra ventrally across stricture. (c) Placing graft ventrally as onlay. (d) Muscle sparing technique where muscle is retracted down to access the ventral aspect of urethra.

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Non-transecting approach for bulbar urethroplasty

- The principle of surgery is to preserve the blood supply to the urethra
- Anastomotic urethroplasty causes increased risk of erectile dysfunction and cold glans
- Non transecting approach includes steps such as incision mucosa vertically and suturing horizontally, mucosa to mucosa anastomosis, and double face
- Dorsal onlay BMG is standard in the process

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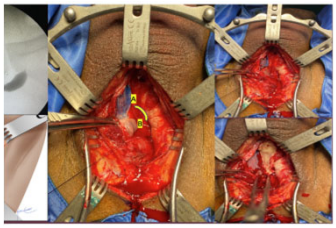
Preservation of bulbospongiosus muscle (Joshi Step)

- Mucosal sparing augmented non-transected anastomotic urethroplasty (Joshi step)
- The proximal urethra is usually dilated
- Urethral plate is pulled of the dilated proximal part to the distal part. This widens the urethral plate at the most narrow point



showing near obliterative bulbar stricture. (b) Concept of new technique. (c) Incise urethr ithout transection. (d) Muscosa after suturing. (e) Dorsal onlay BMG augmentation.

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- Anastomotic urethroplasty should be performed only for traumatic bulbar strictures
- Urethra should not be transected for non-traumatic etiology
- The recurrence after an anastomotic urethroplasty is mainly ischaemic and obliterative. It is treated by augmented anastomotic urethroplasty.

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Panurethralurethroplasty-What's out

- Deemed difficult and complex and put on dilatation pathway
- Few who are put for surgery undergo perineal urethrostomy or a two stage approach
- They never come up for the second stage
- Majority of these patients have lichen sclerosis. Second-stage surgery means high chance of the affected skin being rolled in as a part of urethra
- Two-stage surgery for panurethral stricture is not recommended

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Panurethralurethroplasty-What's in

- Preferred approach - perineal approach
- Penis is invaginated into the perineum and dissection of the urethra to one side is performed
- Oral grafts harvested from both the cheek are applied as dorsal onlay
- If the graft is insufficient, a third graft is harvested from under surface of the tongue
- *Lip grafts are discouraged, high incidence of cosmetic disability compared to the cheek grafts*

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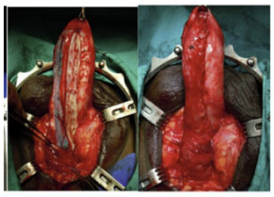
Panurethralurethroplasty-What's in



- Recurrence in pan-urethroplasty is never full length; instead, it occurs at proximal end of graft, the junction of two grafts, or the meatus
- Spiral preputial graft technique for panurethral strictures
- The prepuce is removed a spiral incision of 1.5 cm width made to make a continuous long 1.5 cm wide graft
- Single long graft is applied as dorsal onlay, eliminates the junctional strictures of BMG technique
- The results of preputial grafts are comparable to that of BMG

18 Date -- Presentation Title

Penile urethroplasty

- Penile urethral strictures can be repaired using either one stage or two-stage procedures
- Patients prefer a penile urethroplasty performed with no penile incision
- Perineal approach with penile invagination is ideal for penile strictures

Penile urethroplasty

- If a two-stage penile urethroplasty is performed for post-hypospadias complications, putting buccal graft in stage 1 can lead to graft contracture
- For complex penile strictures or for multiple fistulae, we prefer performing Johansson Stage I and then after 6 months, inserted buccal graft as inlay and tabularise immediately
- Decreases the risk of graft contracture and needs for redo surgery

Pelvic fracture urethral injury

- Associated with superior displacement of bladder and prostatic urethra
- Primary realignment to delayed anastomotic urethroplasty
  - Simple perineal approach
  - Elaborated perineal approach
  - Combined (abdomino-perineal approach) transpubic approach

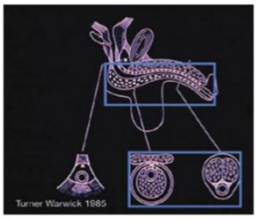


Figure 2. Diagrammatic representation of corporal thickness in the bulbar and penile urethra. From Reference 1, with permission. (Color version available online.)

Pelvic fracture urethral injury

- Primary endoscopic realignment is done to better align the proximal urethra and the distal stump to minimise stricture or defect.
- The disadvantage of this approach is the association with erectile dysfunction and incontinence
- Other complications have been reported as false passages, bladder neck injury, infection, cavities and anterior urethral damage
- *Initial cystostomy with delayed repair is safer, minimises blood loss, and lowers the resulting rates of impotence and incontinence.*

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Pelvic fracture urethral injury

- Primary end-to-end anastomosis is now the gold standard for PFUI
- Performed 3 months after the urethral injury. It is challenging to have access to posterior urethra
- In about 10% of cases, patients develop bulbar urethral ischaemia. This is treated by doing a pedicled preputial tube urethroplasty after excising the ischaemic bulbar urethra

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Pelvic fracture urethral injury

- The following steps aid in achieving a tension-free anastomosis:
  1) Transaction and end-to-end anastomosis
  2) Crural separation
  3) Inferior pubectomy
  4) Supracrural rerouting
  5) Transpubic approach and posterior pubectomy
  6) Transpubic with omental wrapping

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Endoscopic management

- Although urethroplasty is now considered to be the clear gold standard for management of urethral strictures, some selected patients may qualify for endoscopic management via DVIU or dilatation
  - Efficacy of treatment diminishes as the number of attempts increase
  - Lower success rate than formal urethroplasty
- Success rate after the first dilatation is around 50 - 60% at 2 years and decreases to 30 - 40% for a second dilatation, to reach only less than 9% success rate for subsequent dilatation
- Patient selection is important to obtain good outcomes. More than 2 cm have poorer success rate and should be triaged to upfront urethroplasty
- *Stricture location is an important consideration, and endoscopic management should be avoided for penile strictures.*

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Optilume

- For short segment bulbar urethral strictures
- Paclitaxel (Mitotic inhibitor) coated balloon is inflated across the strictured urethra
- Promising option for patients who are too comorbid to undergo urethroplasty
- Could replace traditional urethrotomy or dilatation as first-line endoscopic management of urethral strictures

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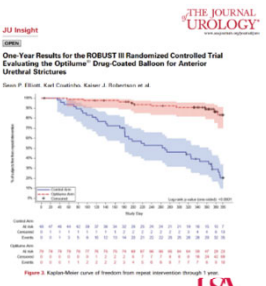
- The ROBUST III trial showed an overall success rate of 75% after Optilume treatment in 127 men and showed that 83% of patients who underwent Optilume treatment were free from further intervention compared with 22% of those who had undergone dilatation or urethrotomy


JU Insight

THE JOURNAL of UROLOGY

One-Year Results for the ROBUST III Randomized Controlled Trial Evaluating the Optilume® Drug-Coated Balloon for Anterior Urethral Strictures

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Liquid buccal mucosal graft

- This novel technique has only been described in animal models so far, but it yielded promising results
- The concept is to mechanically widen the stricture segment via DVIU and then inject a pre-prepared autologous liquid buccal mucosal grafts suspended in fibrin glue into the urethra to allow the buccal mucosa cells to patch the urethrotomy defect, hence promoting proper healing without fibrotic recurrence
- Optimal patient and stricture characteristics to ensure maximal success rate are lacking at the moment as studies are ongoing

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Novel Concept and Method of Endoscopic Urethral Stricture Treatment Using Liquid Buccal Mucosal Graft

Dmitriy Nikolavsky,* Jared Manwaring, Gennady Bratslavsky, Tiffany Caza, Steve Landas, Anita Hryniewicz-Jankowska and Leszek Kotula

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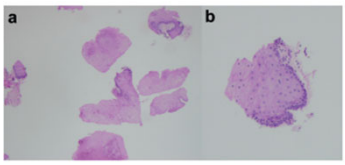

Figure 1. Minced sub mm buccal mucosa micrografts. *a*, H&E, reduced from ×50. *b*, higher magnification shows fragment with smaller basal cells thought to be progenitor cells and larger differentiated cells. H&E, reduced from ×100.

Tissue engineering in urethroplasty: MukoCell®

- Substitution urethroplasty using buccal mucosal graft or preputial skin may lead to substantial donor site morbidity
- Multiple failed urethroplasties might have insufficient good quality tissue left to harvest for subsequent substitution urethroplasty
- Ram-Liebig et al. studied the outcomes for 99 patients with surgically unsuccessful pretreated urethral stricture who underwent urethroplasty using MukoCell ®, a tissue-engineered oral mucosa graft marketed in Germany

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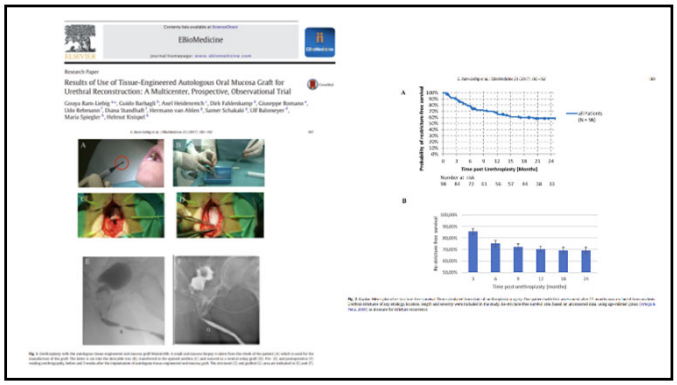
Tissue engineering in urethroplasty: MukoCells

- MukoCell ® is obtained by growing oral mucosal cells of the patient over a 2 weeks incubation period
- Cultured oral epithelial cells are bound to a biodegradable protein containing scaffold
- This tissue-engineered oral mucosa graft is then used to augment the urethra as per usual preferred surgical technique
- The outcomes obtained in that study were a success rate of 67.3% at 12 months and 58.2% at 24 months



Take home

- Urethroplasty still remains the gold standard
- Non-transecting urethroplasty should be the rule
- Single stage reconstruction is preferred
- Endoscopic management for only select patient population

Thank you