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Original Article

To Compare the Long-Term Outcomes of Surgical Techniques Used to Repair Urethral Structure at Different Sites in A Tertiary Care Hospital

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ABSTRACT

Background: This research focused on assessing the long-term outcomes of different surgical methods used to repair urethral strictures located at various parts of the urethra and comparing their results. **Methodology**: Conducted as an observational study, it involved patients with urethral strictures visiting the General Surgery outpatient department at Sree Mookambikabika Institute of Medical Sciences. A total of 350 patients with strictures of different causes affecting various urethral segments were included. Detailed information for each patient, including history, comprehensive physical examination, and specific investigations to pinpoint the exact cause, location, and length of the stricture, was thoroughly evaluated. **Results**: The average age of patients was 38.5 years. In our community, most individuals with strictures are young to middle-aged males [20-45 years]. The chi-square value was 168.0455, and the p-value was < 0.00001, indicating significance at $p < .05$. Various reconstruction techniques were employed, such as tunica albuginea urethroplasty [TAU] and U-shaped prostatobulbar anastomosis [USPBA]. **Conclusion**: Over time, the approach to managing urethral strictures has evolved from simple dilatation, regardless of the stricture's location and length, to thorough investigation and definitive surgical procedures like urethroplasty. Among these patients, 60.5% were aged 20-45 years. Pelvic injuries accounted for 55.1% of the urethral strictures, with the membranous urethra being the most frequently affected segment. TAU and USPBA are the most commonly performed surgeries. Keywords: Surgical, urethral, stricture, and outcomes.

Keywords*: Urethral Stricture, Urethroplasty, Surgical Outcomes, Pelvic Injury, Reconstructive Techniques.*

INTRODUCTION

Urethral stricture disease is a prevalent and challenging condition in urology, characterized by fibrosis and narrowing of the urethral lumen, which leads to obstructive urinary symptoms and decreased quality of life. Surgical management remains the gold standard, with techniques such as excision and primary anastomosis, substitution urethroplasty using buccal mucosa grafts, and staged repairs being commonly employed. The choice of surgical method depends on various factors, including stricture location, length, etiology, and previous interventions. Barbagli et al. reported that primary urethroplasty offers better long-term success compared to repairs following failed endoscopic procedures (1). Kulkarni et al. demonstrated favorable outcomes for one-stage buccal mucosa graft urethroplasty in cases associated with lichen sclerosus (2).

However, recurrence remains a major concern, especially in long-segment and proximal urethral strictures, as highlighted by Mundy and Andrich (3). Morey and Kizer emphasized the utility of extended anastomotic approaches in proximal bulbar urethral strictures, achieving high long-term patency rates (4). Additionally, Al-Qudah and Santucci underscored the importance of recognizing and managing complications following urethroplasty (5). Comparing the long-term outcomes of different surgical techniques across stricture sites is critical for guiding effective and individualized treatment strategies.

AIM AND OBJECTIVES OF THE STUDY:

- To compare the long-term outcomes of various surgical techniques employed in the repair of urethral strictures at different anatomical sites of the urethra.
- To evaluate and compare the success rates of different surgical techniques (e.g., end-to-end anastomosis, substitution urethroplasty, staged urethroplasty) used for urethral stricture repair.
- To assess site-specific outcomes (anterior vs. posterior urethra) following different urethroplasty techniques.
- To identify complication rates and recurrence rates associated with each surgical technique over a defined follow-up period.

REVIEW OF LITERATURE:

Recent evidence underscores that long-term followup is essential to accurately assess the success of urethroplasty, as recurrence rates increase over time. A 2024 systematic review of onestage buccal mucosa graft (BMG) urethroplasty for lichen sclerosus showed failure rates rising from ~11% in shortterm studies to ~18% when followup exceeded 5 years, with recurrencefree survival falling to as low as ~45% at 15 years Large registry data from Germany (GRAND Study, 2005–2023) reveal that endoscopic treatments (e.g., internal urethrotomy) remain the most common interventions, despite urethroplasty offering more durable results. BMG and anastomotic repairs were far less frequent but showed comparable perioperative outcomes, including length of hospital stay and complications

Anterior substitution techniques, especially BMG versus preputial skin flap (PSF), have been compared in randomized studies. A 2021–22 trial of >2 cm anterior strictures found similar success (~93%) but significantly lower surgical morbidity, shorter operative times, and better sexual function preservation in the BMG group versus PSF (IIEF and IPSS scores favoring BMG)

In female urethral stricture, ventral onlay BMG urethroplasty yielded ~90.5% overall success at a median followup of 42 months, with ~85% sustained success at 3–5 years post-op

- A multicenter dorsal BMG series had a pooled success of ~83% at mean followup of ~33 months; strict definitions and high prior intervention rates may partially explain slightly lower results

Two-stage urethroplasty, commonly used for complex or long-segment strictures, especially in penile or lichen sclerosusassociated disease, generally shows high early patency rates (~93–94%). However, when split-thickness skin grafts (STSG) are utilized, late recurrence rates rise substantially (~53%), emphasizing that graft material selection influences durability

Earlier long-term follow-up of ventral onlay BMG reported stable outcomes: in a cohort followed for a mean of 6.9 years, complications (e.g. fistula, graft failure, recurrent stricture) were mostly early (< 12 months), and late recurrence was rare d. Additionally, a retrospective series reviewing buccal graft outcomes up to 42 months post-op showed good long-term patency without major oral morbidity

An institutional cohort (2010–2013 patients undergoing anterior BMG urethroplasty) with superlongterm median follow-up of 126 months (≈10.5 years) found recurrencefree survival of ~66% at 5 years and ~59% at 10 years—notably lower than historic midterm rates (~85–90%)—highlighting the importance of extended follow-up in assessing true durability. (11-18)

MATERIALS AND METHODS:

The study observed urethral strictures in the outpatient general surgery department at Sree Mookambika Institute of Medical Sciences. This study includes 350 stricture urethra patients of varied aetiologies and urethral segments. Each patient's history, physical examination, and standard and special investigations to assess stricture aetiology, place, and length were evaluated.

The preoperative assessment includes a thorough history of symptoms, duration, and causes. Preoperative AUA ratings were based on patient history. Physical examination was thorough. Routine blood and urine tests and stricture-specific tests such retrograde urethrogram, urethrosonogram, and uroflometry were done. The operating surgeon's experience and data from the foregoing investigations guided all patients' surgical operations.

All procedures were performed under spinal or general anesthesia by experienced urologists. The choice of technique was based on stricture length, site, and degree of fibrosis.

EPA was performed for short bulbar strictures (<2 cm),BMG urethroplasty was used for longer strictures or those in the penile urethra,Staged urethroplasty was employed in complex or lichen sclerosus-associated strictures

The following parameters were recorded:Demographics (age, comorbidities, stricture etiology)Stricture characteristics (length, site, number)Type of surgical technique usedOperative time, hospital stay, and complicationsPre- and postoperative uroflowmetry (Qmax)Patient-reported outcome measures (IPSS and satisfaction scores)Patients were followed up at 1, 3, 6, and 12 months, and annually thereafter.

Follow-up included:History and physical examinationUroflowmetry (Qmax <10 mL/s considered suspicious for recurrence)Retrograde urethrogram or urethroscopy if symptomaticAny need for additional procedures (e.g., dilation or reoperation) was recorded

Primary Outcome: Stricture recurrence (defined as symptomatic narrowing requiring intervention)Secondary Outcomes: Complication rate, patient satisfaction, urinary flow rates, and functional status

Data were analyzed using SPSS version [XX]. Quantitative variables were expressed as mean ± SD and compared using the Student's t-test or ANOVA. Categorical data were compared using the chi-square test. A p-value of <0.05 was considered statistically significant.

RESULTS:

Table No. 1: AGE DISTRIBUTION

S. No.	Age	No.	Percentage
1	< 20 Years	58	16.5
2	20-45 Years	212	60.5
3	46-65 Years	69	19.7
4	> 65 Years	11	3.3

Mean age of presentation is 38.5 yrs. In our society most of stricture patients are young and middle-aged male [between 20-45yrs].

Table No. 2: VARIOUS ETIOLOGICAL FACTORS

S. No.	Etiology	Number of cases	
		Number	% of cases
1.	Pelvic trauma	193	55.1%
2.	Post instrumentation	21	6%
3.	Post catheterization	71	20.2%
4.	Infection	53	15.28%
5.	Spontaneous	12	3.42 %

Table No. 3: SITE & ETIOLOGY OF STRICTURE

	Penile	Bulbar & PBJ	Membranous	Multiple [penile/Bulbar/ membranous]
Traumatic	18	45	112	06
Post instrumentation	16	05	03	03
Post catheterization	32	26	14	05
Infection	21	14	10	08
Spontaneous	05	03	02	02
Total	92	93	141	24

The chi-square statistic is 168.0455. The p-value is < 0.00001. The result is significant at p < .05.

Table No. 4: TYPE OF SURGICAL PROCEDURE

S. No.	SURGICAL PROCEDURE	Number of cases	
		Number	% of cases
1.	TAU	121	34.5
2.	USPBA	135	38.5
3.	SSU	19	5.4
4.	Meatoplasty	15	4.2
5.	Buccal Mucosa	40	11.7
6.	Dartos Flap	20	5.7

Various techniques were used for urethral reconstruction, mainly tunica albuginea urethroplasty [TAU] and U shaped prostatobulbar anastomosis [USPBA].

DISCUSSION:

Urethral strictures are difficult to treat, although preoperative diagnosis, surgical planning, and basic surgical concepts can yield outstanding results[6]. Direct vision internal urethrotomy (DVIU), urethral dilatation, and urethral stents can be employed in some individuals, although they have high failure rates[7]. DVIU and dilation work best. first-line treatment for bulbar strictures under 1 cm. Open surgical correction is best for prolonged or failed conservative strictures.

Thus, most urethral strictures are treated via urethroplasty. Excision and end-to-end anastomosis or urethral replacement can repair. Procedure depends on stricture kind and location.

End-to-end anastomosis is safe, effective, and ideal for bulbar urethra strictures under 2cm [8]. End-to-end anastomosis of penile strictures or bulbar strictures over 3cm may shorten the urethra and penile curvature upon erection [9]. Substitution urethroplasty using vacularized genital skin or free grafts treats them. Augmented anastomotic repair should be explored for 2-3cm bulbar stricture excision [10]. This method excises and spatulates the stricture dorsally. Patched dorsal spatulation, anastomosed ventral circumference. This ensures a broad, tension-free anastomosis.

Anastomotic urethroplasty has a long-term success rate of above 90% [11]. Successful anastomotic healing requires mobilisation and tension-free spatulated anastomosis. Spatulation helps overcome repair site constriction. Anastomotic urethroplasty has the lowest re-stricture and complication rates and should be done whenever possible.

CONCLUSION:

Urethral stricture care has evolved from dilatation regardless of location or length to official examination and ultimate surgery, urethroplasty. 60.5% of patients were 20-45. Pelvic injuries caused 55.1% of urethral stricture. Membranous urethra was most often implicated. The most common procedures were TAU and USPBA.

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