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Original Research Article

INNER PREPUTIAL GRAFT URETHROPLASTY FOR ANTERIOR URETHRAL STRICTURES: A ROAD OF SUCCESS; A PROSPECTIVE STUDY

Sushant Sangam[1], Arshad Hasan[2], Sanjay Kumar Gupta[2], Shailja Kumari[3], Chandan Kumar Singh[1], Manish Kumar Singh[4], Rohit Singh[2], D.K. Das[5]

[1]DrNB Resident, Department of Urology, Patna Medical College & Hospital, Patna, Bihar, India
[2]Assistant Professor, Department of Urology, Patna Medical College & Hospital, Patna, Bihar, India
[3]DrNB Resident, Department of Plastic surgery, Patna Medical College & Hospital, Patna, Bihar, India
[4]Senior Resident, Department of Urology, Patna Medical College & Hospital, Patna, Bihar, India
[5]HOD, Department of Urology, Patna Medical College & Hospital, Patna, Bihar, India

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Corresponding Author:
Dr. Arshad Hasan,
Email: arshadsurgery@gmail.com

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ABSTRACT

Background: Buccal mucosal graft(BMG) urethroplasty is one of the standard treatment for anterior urethral strictures; but it has limitation of donor-site morbidity. The objective is to evaluate the outcomes, complications, and recurrences of inner preputial graft(IPG) urethroplasty for anterior urethral strictures. **Materials and Methods:** This is a prospective study, which was conducted in patients with anterior urethral strictures from January 2023 to December 2025 .All patients underwent dorsal onlay inner preputial graft urethroplasty. Clinical improvement, International Prostate Symptom Score (IPSS), Maximum urinary flow rate (Qmax), and International Index of Erectile Function-5 (IIEF-5) were used for outcome assesment. Clavien–Dindo classification was used for complications grading. Surgical success was defined in this study, as Qmax>14 mL/s without any need for additional intervention. **Result:** In this study total 90 patients were included with mean age was 43.8 ± 11.2 years, mean stricture length was 4.2 ± 1.9 cm. Improvement in mean Qmax from 6.4 ± 2.2 mL/s to 19.8 ± 3.5 mL/s postoperatively ($p < 0.001$) whereas mean IPSS decreased from 28.1 ± 5.3 to 7.2 ± 2.6 ($p < 0.001$). Success rate was 91.1% in our follow-up time with most complications were in Clavien–Dindo Grade I–II (84.4%). **Conclusion:** Inner preputial graft urethroplasty technique provides good success, excellent functional outcomes with minimal morbidity and is one of a reliable alternative to BMG urethroplasty.

INTRODUCTION

Urethral stricture is a common and challenging problem which where usually caused by trauma, infection, and iatrogenic instrumentation.[1-3] Minimally invasive treatments such as urethral dilatation and direct vision internal urethrotomy (DVIU) have poor long-term success.[2] Nowadays Substitution urethroplasty has become popular treatment for long-segment anterior urethral strictures. Buccal mucosal graft (BMG) urethroplasty has acceptance of choice due to its favourable histological characteristics, resistance to infection, and high long-term success rates. But harvesting buccal mucosa from a second surgical field affects postoperative recovery and patient satisfaction with donor-site morbidity like pain, bleeding, trismus, numbness, and difficulty in oral intake.[2,3] Inner preputial skin is thin, hairless, elastic, and well vascularized, and shares embryological and histological similarities with urethral mucosa and it can be harvested from the same operative field. Earlier research studies have reported encouraging results with inner preputial graft (IPG) urethroplasty. The present study was a prospective analysis of dorsal onlay IPG urethroplasty in anterior urethral strictures.

MATERIALS AND METHODS

Study Design and Patients: This prospective observational study was conducted at the Department of Urology, Patna Medical College, Patna, from January 2023 to December 2025.Written informed consent was obtained from all participants. Inclusion Criteria included Male patients aged 18–70 years, Anterior urethral stricture length >2 cm (penile, bulbar, or pan-anterior), Recurrent strictures following DVIU or previous urethroplasty and availability of healthy, preputial skin. All patients

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with Lichen sclerosis involving penile or preputial skin, after circumcision or with unhealthy or scarred prepuce were excluded. All patients underwent detailed clinical evaluation, urine culture, uroflowmetry, and assessment using IPSS and IIEF-5 questionnaires. Radiological evaluation included retrograde urethrogram and micturating cystourethrogram,[Figure 1a] supplemented by Sono-urethrography when required. All procedures were performed under spinal anaesthesia through a perineal approach. After mobilization of the urethra, a dorsal urethrotomy was performed along the stricture segment. Inner preputial skin was harvested, defatted, and quilted dorsally over the tunica albuginea of the corpora cavernos. [Figure 1b & 1c] Urethral reconstruction was completed over a 16-Fr silicone catheter. The urethral catheter was maintained for four weeks. Follow-up visits were scheduled at 1, 3, 6, 12, and 24 months, with clinical evaluation, uroflowmetry, IPSS, and IIEF-5 assessment. Radiological evaluation was performed when recurrence was suspected.

Outcome Measures: Primary outcomes included improvement in Qmax and IPSS. Secondary outcomes included erectile function, complication rates, and stricture recurrence. Recurrence was defined as the need for any postoperative instrumentation.

Statistical Analysis: Data were analysed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation and compared using paired t-test. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 90 patients were included in the study. Mean age was 43.8 ± 11.2 years and mean stricture length was 4.2 ± 1.9 cm. Bulbar urethra was the most common site of stricture. Significant improvement was observed in urinary flow and symptom scores. Mean Qmax improved from 6.4 ± 2.2 mL/s preoperatively to 19.8 ± 3.5 mL/s at last follow-up ($p < 0.001$). Mean IPSS decreased from 28.1 ± 5.3 to 7.2 ± 2.6 ($p < 0.001$). Erectile function remained preserved with no significant change in IIEF-5 scores. [Table 1] Most complications were minor (Clavien–Dindo Grade I–II) and managed conservatively. Eight patients (8.9%) developed stricture recurrence during follow-up, all successfully managed with DVIU or dilatation. Overall success rate at 30 months was 91.1%. [Table 2]

Table 1: Parameters

Age (years)	**43.8±11.2(21-70)**	**Site of stricture**		**Aetiology**	
H/o Pre-operative Interventions	61 (67.8%)	Penile Bulbar Pan -anterior	41 (45.6%) 36 (40.0%) 13 (14.4%)	Idiopathic Post-instrumentation / catheterization Post-traumatic Post-inflammatory	38(42.2%) 29 (32.2%) 15 (16.7%) 8 (8.9%)
Stricture length(cm)	4.2 ± 1.9				
	Pre-operative (Mean ± SD)	Post-operative (Mean ± SD, 30 months)	Mean Difference ± SD	p-value	
Maximum flow rate (Qmax, mL/s)	6.4 ± 2.2	19.8 ± 3.5	+13.4 ± 3.1	<0.001	
International Prostate Symptom Score (IPSS)	28.1 ± 5.3	7.2 ± 2.6	−20.9 ± 4.7	<0.001	
Erectile Function Score (IIEF-5)	20.3 ± 4.8	19.8 ± 5.1	−0.5 ± 2.1	0.21	

Table 2: Intra-operative and Post-operative parameters

Graft length (cm)	4.8 ± 1.5(2.5-7)	Hospital stay (days)	8.4 ± 2.1
Graft width (cm)	1.6 ± 0.4(1-2)	Catheter duration (days)	28 ± 3
Graft placement	Dorsal onlay: 78 (86.7%) Double-face: 12 (13.3%)	Stricture recurrence	8 (8.9%)
		Complications grade (Clavien-Dindo)	
Operative time (minutes)	126 ± 24(90-180)	Grade I	28 (31.1%)
Success rate	91.1%	Grade II	48 (53.3%)
		Grade III	10 (11.1%)
		Grade IV &V	0

Figure 1a: RGU showing pan-ant urethral stricture, Figure 1b,c: showing prepucial graft harvesting and fixation)

DISCUSSION

Urethral stricture disease is one of the common conditions in our region. The ultimate goals of any urethral reconstructive surgery are to restore normal urinary flow, less recurrence, and maintained sexual function. Substitution urethroplasty has gained popularity among various reconstructive options long or recurrent anterior urethral strictures.[3] In recent years, the inner preputial graft (IPG) has become as a good alternative to BMG. The inner preputial mucosa

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shares several anatomical and histological similarities with urethral epithelium—it is thin, hairless, pliable, and well vascularized. These properties make IPG suitable for substitution urethroplasty. The IPG graft is harvested from the same operative field, which reduces operative time.[4] The outcomes of this study follow trends with previous published reports. Tyagi et al. (2021) reported a 90.2% success rate in 52 patients undergoing dorsolateral IPG urethroplasty with five-year follow-up.[5] Parmar et al. (2019) compared IPG and BMG urethroplasty in 72 patients and found no statistically significant difference in success (88.9% vs 90.3%, respectively), though the IPG group experienced fewer donor-site complications.[6] Kumar et al. (2024) also demonstrated that IPG offers comparable patency with faster recovery and less postoperative discomfort.[7] A recent meta-analysis by Sharma et al. (2023) involving over 800 patients concluded that IPG urethroplasty achieves equivalent long-term patency rates as BMG while significantly reducing donor-site morbidity (odds ratio 0.32, 95% CI 0.18–0.54).[8] BMG urethroplasty requires a second surgical field and associated with oral morbidity which are not in IPG urethroplasty. Mean operative time (126 ± 24 minutes) in this study was shorter compared to published BMG series (140–160 minutes) with equivalent success.

According to Abbasi et al.2022 the inner preputial skin closely resembles histologically with oral mucosa in terms of epithelial thickness, vascular density, and resistance to infection.[9] Its flexibility and capacity to stretch allow it to adapt well to varying stricture lengths. Previous Studies comparing IPG with pedicle flap (Kumar et al., 2024; Claassen et al., 2019) have shown comparable success rates (86–90%) but lower complication rates and shorter operative times with IPG.[10] The absence of change in IIEF-5 scores confirms preservation of erectile function. Tyagi et al. and Kumar et al., highlighted improved postoperative comfort and faster return to normal activities with IPG.

Limitations of the Study

While this a prospective study, larger sample and longer follow-up time required for long-term durability. In this study circumcised patients and those with lichen sclerosis, excluded. Additionally, Future multicentric randomized trials comparing IPG and BMG with longer follow-up will help in establishing definitive guidelines for graft selection.

CONCLUSION

Inner preputial graft(IPG) urethroplasty can be a safe, effective, and minimally morbid option for anterior urethral stricture disease.

REFERENCES

1. Smith, Thomas G. III. Current management of urethral stricture disease. Indian Journal of Urology 32(1):p 27-33, Jan–Mar 2016. | DOI: 10.4103/0970-1591.173108
2. Bischoff, R., Marcon, J., Schulz, G. B., Stief, C. G., Keller, P., Eismann, L., Weinhold, P., & Pyrgidis, N. (2025). Perioperative Outcomes and Trends of Surgical Correction of Male Urethral Strictures: Results from the GRAND Study. Journal of Clinical Medicine, 14(7), 2171. https://doi.org/10.3390/jcm14072171
3. Cabral J, Alkassis M, Khalafalla K ...Contemporary Trends in the Management of Urethral Stricture Disease in the Era of the AUA GuidelinesUrology, 2025; 206, 173-179
4. Hussein MM, Gomha MA, Shahat A, et al. Evaluation of inner preputial skin graft urethroplasty in anterior urethral strictures. Int Urol Nephrol. 2016;48(6):845–852.
5. Tyagi S, Kulkarni SB, Mane D, Joshi P. Dorsolateral onlay inner preputial graft urethroplasty for anterior urethral strictures: long-term outcomes. World J Urol. 2021;39(7):2303–2311.
6. Parmar K, Pandey A, Deshmukh M, et al. Outcomes of buccal mucosa and inner preputial graft urethroplasty: a comparative analysis. EurUrol Open Sci. 2019;18:77–85.
7. Kumar N, Singh P, Maheshwari R, et al. Comparative study of buccal mucosa graft versus preputial flap urethroplasty for anterior urethral strictures: a prospective randomized trial. Cureus. 2024;16(4):e61129.
8. Sharma G, Gupta V, Agrawal R, et al. Outcomes of preputial graft urethroplasty: a meta-analysis and systematic review. Urologia Journal. 2023;90(4):235–242.
9. Abbasi B, Al Taweel W, Al Ansari A. Urethral reconstruction using genital skin grafts: histological and clinical perspectives. World J Urol. 2022;40(5):1187–1199.
10. Claassen FM, Heyns CF, Maré S. Inner preputial graft urethroplasty in resource-limited settings: a South African experience. S Afr Med J. 2019;109(12):940–946.

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