

SCIENTIFIC AND PRACTICAL BASIS OF SURGICAL
TREATMENT OF THE MALE URETHRAL STRICTURE
USING A FREE ORAL MUCOSA GRAFT

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Abstract

Strictures of the male urethra are a relatively common disease with a serious impact on the quality of life in men. The lack of a universal operative technique gives rise to different opinions and recommendations when choosing the most appropriate treatment approach.

The present study aimed to prospectively analyze the results of surgical treatment of male urethral strictures with a free oral mucosa graft in comparison with other operative techniques, and to compare the obtained results with the data from the other reference centres. For a period of 5 years – from January 2017 to March 2022, 84 patients with a urethral stricture (newly diagnosed and recurrent) were operated on and followed up at the Clinic of Urology with a specific activity in Andrology of “Tsaritsa Yoanna – ISUL” University Hospital. Patients were divided into 3 groups: patients after urethroplasty with a free oral mucosa graft; patients after urethroplasty using extragenital tissue graft and anastomotic urethroplasty; transurethral minimally invasive operative techniques. Patients from Group 1 and Group 2 had a mean recurrence-free period of 19.35 ± 8.24 months and 20.62 ± 6.5 months, respectively, which were statistically significantly longer compared to Group 3 (10.44 ± 9.84), $p = 0.000$.

Lingual mucosa proves to be a highly efficient alternative material in urethroplasty.

Key words: urethral stricture, urethroplasty, oral mucosa

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Introduction. Urethral stricture represents a progressive reduction of the calibre of the urethral lumen as a result of cicatrix formation and fibrosis of the urethral mucosa and surrounding spongy tissue (spongiofibrosis) [1]. Usually asymptomatic at first, this fibrotic process gradually leads to urethral narrowing and symptomatic obstruction, with subsequent micturition and ejaculation difficulties. Stricture of the male urethra is a relatively common disease that has a serious impact on the quality of life in these patients.

Etiological factors and methods of treatment pose a serious challenge to researchers and clinicians even today. In Bulgaria, our clinic is involved with this problem both in theory and in practice. In 2007, SLAVOV [2] launched an algorithm for choosing the appropriate approach and treatment of urethral strictures, but at the moment there is no scientific proof of its effectiveness. The 2007 trends are fully confirmed after the 2017 update of the AUA guidelines [3]. The lack of a universal surgical technique, adaptable to different localizations and etiological causes, gives rise to different opinions and recommendations in the choice of the surgical treatment of strictures of the male urethra and the use of an appropriate substitute material [4]. Oral mucosa has proven to be a reliable, versatile, easily and safely available substitute material for reconstructive urology [5]. The introduction of lingual mucosal graft urethroplasty has also not been followed in detail.

The present study aimed to prospectively analyze the results of surgical treatment of male urethral strictures with a free oral mucosa graft in comparison with other operative techniques, and to compare the obtained results with the data from the other reference centres.

Materials and methods. Patient recruitment. Inclusion and exclusion criteria. From January 2017 to March 2022, 84 patients with urethral stricture (newly diagnosed and recurrent) were operated on and followed up in the Clinic of Urology with a specific activity in Andrology “Tsaritsa Yoanna – ISUL” University Hospital. All patients signed an informed consent to participate in the study, and it was approved by a local ethics committee.

Inclusion criteria for participation in the study were: clinical manifestation of lower urinary tract obstruction, confirmed with uroflowmetry, urethrocystoscopy, retrograde urethrography and voiding cystography.

The following exclusion criteria were met: the presence of benign prostatic hyperplasia; bladder sclerosis; stenosis of neo anastomosis, a foreign body in the lower urinary tract; incontinence; accompanying severe systemic diseases.

Patient groups. Patients were divided into 3 groups: Group 1 – patients after urethroplasty with a free oral mucosa graft, various techniques of augmentation urethroplasty (ventral onlay [6], dorsal onlay [7] and augmented anastomotic urethroplasty [8]) with a free buccal and lingual mucosal graft were included in this group [9,10]. Group 2 – patients after urethroplasty using extragenital tissue graft and anastomotic urethroplasty. This group included augmentation urethro-

plasty with full-thickness retro auricular skin graft (FTSG) [11] and urethroplasty with excision of the stricture zone and primary end-to-end urethral anastomosis [12]. Group 3 – transurethral minimally invasive surgical techniques (direct vision internal urethrotomy with a cold knife and dilation of the urethra) [13].

Follow-up. In the first month after surgery, all patients underwent uroflowmetry – Qmax (ml/s) and the amount of residual urine (ml) was recorded.

All patients were followed up for 24 months according to the following indicators:

1. Incidence of UTI confirmed by microbiological examination of sterile urine;
2. Recurrence-free period. As patients who have not had recurrences are those in whom it is possible to perform spontaneous micturition, there are no indications for catheterization and/or surgical treatment;
3. Postoperative complications of the donor site. These complications include deformity as well as changes in donor site sensitivity and salivation;
4. Need for catheterization.

Statistical analyses. Statistical analyses were performed using SPSS 23 for Windows software. Kolmogorov–Smirnov tests were used to examine variable distributions. Continuous variables with a normal distribution were presented as the mean $\pm$ standard deviation. Parameters with skewed distribution were presented as the median and interquartile range (IQR). IQR was determined as the difference between the upper and lower quartile. Independent sample *t*-test and Mann–Whitney 2-sample-tests were used to compare normally and abnormally distributed continuous variables. Categorical variables were presented as percentages and counts χ^2 or Fisher’s exact tests were used for analyses. Kruskal–Wallis tests were used to compare skewed continuous variables. Kaplan–Meier curve was created to compare the differences in recurrence-free period between the patient groups. Differences among groups were assessed using the pairwise long-range test.

Results. Clinical and demographic characteristics of all examined patients. The average age of the patients was 56.73 ± 15.2 years. The demographic and clinical characteristics of the entire group of patients are presented in Table 1.

Thirty-six (42.9%) of all examined patients had an iatrogenic etiology of the urethral stricture. In 33 (39.3%) patients, the etiology was idiopathic. The distribution of inflammatory and post-traumatic strictures were as follows – seven (8.3%) had an inflammatory, and eight (9.5%) patients had a post-traumatic etiology, respectively. Localization of the stricture zone as a percentage is presented in Table 1.

The mean length of the stricture zone was 31.73 ± 23.8 mm in all studied patients. Eighteen of the patients (21.5%) had suprapubic drainage (Table 1).

Clinical characteristics of the different groups of patients. Out of the examined patients 54.8% (46) were of Group 1 (after urethroplasty using oral

T a b l e 1

Main demographic and clinical characteristics of all examined patients

Parameters	Participants, $n = 84$
Age	56.73 ± 15.2
Weight	85.08 ± 11.7
Etiology	
Posttraumatic	8 (9.5%)
Iatrogenic	36 (42.9%)
Inflammatory	7 (8.3%)
Idiopathic	33 (39.3%)
Localization of the stricture zone	
Meatal strictures	10 (11.9%)
Penile strictures	14 (16.7%)
Bulbar strictures	48 (57.1%)
Panurethral strictures	12 (14.3%)
The length of the stricture zone (mm)	31.73 ± 23.803
Suprapubic drainage "Cystofix"	18 (21.5%)

n = number of patients. Continuous variables are presented as mean values and standard deviations. Categorical variables are presented as number of patients and percentage in brackets.

mucosal graft). The patients of Group 2 (after urethroplasty using extragenital tissue graft and anastomotic urethroplasty) and of Group 3 (transurethral minimally invasive operative techniques: DVIU and UD) were 15.5% (13) and 29.7% (25), respectively (Table 2).

There was no statistically significant difference in age ($p = 0.614$) and body weight ($p = 0.40$) between patient groups. Group 1 patients (after urethroplasty with a free graft of oral mucosa) had a stricture length of 40.0 (23) mm, compared to Group 2 patients – 20.0 (10) mm, $p = 0.000$ and Group 3 (transurethral minimally invasive operative techniques) – 10.0 (3), $p = 0.000$ (Table 2).

Follow-up and comparison of groups of patients. No statistically significant difference was found in the amount of residual urine between the groups $p = 0.38$, (Table 2).

No statistically significant difference was observed in the frequency of UTIs between the three groups $p = 0.94$, (Table 2).

Group 1 patients had a significantly higher rate of need for catheterization 26.1% (12) compared to Group 2 patients: 23.1% (3), $p = 0.008$.

The uroflowmetry parameter Qmax was significantly higher in Group 1 and Group 2 (20.63 ± 3.56 ml/s and 21.08 ± 3.70 ml/s) compared to Group 3 (17.08 ± 4.07), $p = 0.003$, (Table 2).

Patients from Group 1 and Group 2 had a mean recurrence-free period of

T a b l e 2

Prospective evaluation of examined patients according to different patient groups

Parameters	Urethroplasty Group 1	Urethroplasty Group 2	Endoscopic techniques Group 3	<i>p</i>
Participants, <i>n</i> = 84	46 (54.8%)	13 (15.5%)	25 (29.7%)	–
Age, years	55.22 ± 15.22	59.08 ± 12.47	58.28 ± 16.73	0.61
Weight (kg)	86.54 ± 13.01 kg	81.85 ± 8.74 kg	84 ± 10.69 kg	0.40
The length of the stricture zone (mm)	40.0 (23) mm ^{*^}	20.0 (10) mm [*]	10.0 (3) mm	0.000
Residual urine volume (ml)	46.43 ± 55.18 ml	40.00 ± 19.58 ml	47.60 ± 20.06 ml	0.38
Recurrence-free period (month)	19.35 ± 8.24 [*]	20.62 ± 6.50 [*]	10.44 ± 9.84	0.000
Uroflowmetry (ml/s)	20.63 ± 3.56 ml/s [*]	21.08 ± 3.70 ml/s [*]	17.08 ± 4.07 ml/s	0.003
Urinary tract infection frequency, % (<i>n</i>)	28.3% (13)	23.1% (3)	20% (5)	0.94
Donor site morbidity, % (<i>n</i>)	6.5% (3)	–	–	ns
Re-catheterisation, % (<i>n</i>)	26.1% (12) [^]	3 (23.1%)	–	0.008

Results are presented as mean values and standard deviation. For the parameters with skewed distribution, results are presented as median and interquartile ranges (IQR) in brackets.

^{*}*p* < 0.05 vs. Group 3. [^]*p* < 0.05 vs. Group 2

19.35 ± 8.24 months and 20.62 ± 6.5 months, respectively, which were statistically significantly longer compared to Group 3 (10.44 ± 9.84), *p* = 0.000, (Table 2, Fig. 1).

Discussion. Despite established trends and the availability of many different operative techniques, treatment of male urethral strictures continues to be a challenge and gives rise to different opinions and recommendations when choosing the most appropriate approach in the treatment of urethral strictures.

A minimally invasive approach is preferred in the initial surgical treatment of male urethral strictures. Direct vision internal urethrotomy (DVIU) and urethral dilation (UD) are preferred operative techniques. Given the recurrent nature of the disease [14], further treatment options include repeat transurethral technique or reconstructive urethroplasty [5]. The choice of the appropriate technique largely depends on the preferences and capabilities of the operator [4], but most reference reconstructive centres recommend that urethroplasty be performed [3]. Replacement urethroplasty is indicated for prolonged and complex structures of the urethra. Oral mucosa has proven to be the substitute material of choice in reconstructive urology [15]. Lingual and buccal mucosa have a similar histo-

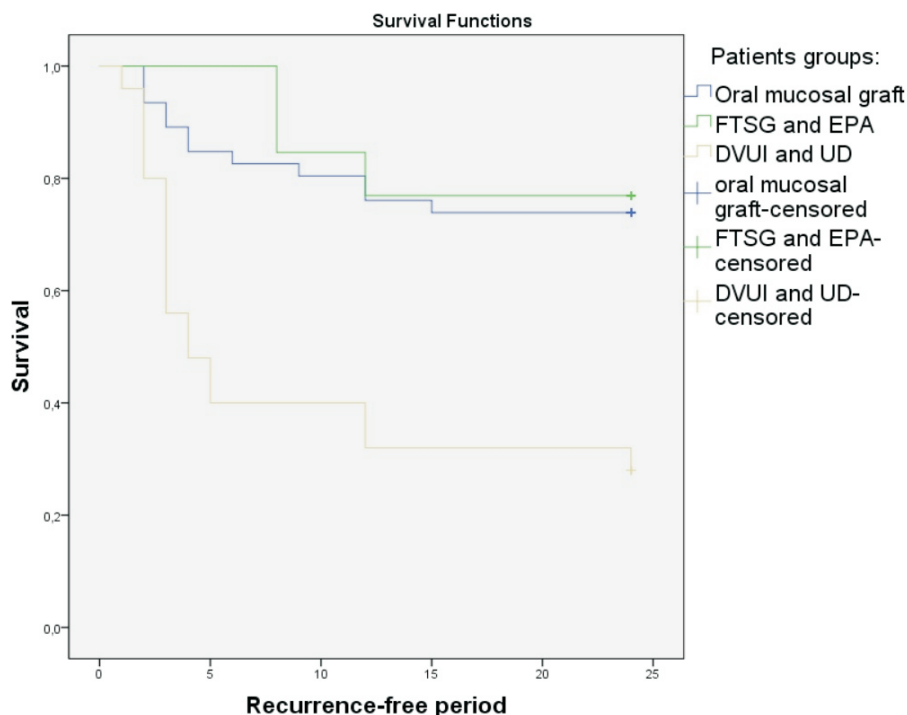


Fig. 1. Recurrence-free period between the patients groups. Kaplan-Meier curve, assessing the difference in recurrence-free period between the patient groups. Mean recurrence-free period for oral mucosal graft group was 19.35 ± 8.24 months; for FTSG and EPA group 20.62 ± 6.50 months, without statistical significance between these groups. Mean recurrence-free period for DVUI and UD group was 10.44 ± 9.84 months, which is significantly lower than in the other two groups, $p = 0.00$. FTSG – Full thickness skin graft; EPA – Excision and primary anastomosis; DVUI – Direct vision internal urethrotomy; UD – Urethral dilation

logical structure, characterized by strong immunological properties, pronounced resistance to infections, resistance to the aggressive environment and regenerative properties [16]. The lingual mucosa is characterized by easy harvesting, good immunological characteristics (resistant to infection), a thick epithelium, a thin lamina propria, and many elastic fibres, with a rich blood supply. Such characteristics facilitate the uptake of the graft (imbibition and inosculation) [17].

SLAVOV et al. [18] are among the first authors worldwide with experience in the use of free tissue grafts from the oral cavity.

The obtained results of our study demonstrate a high success rate in the three groups of patients, but there are statistically significant better results in the groups of urethroplasty (oral mucosal graft, FTSG and EPA). The most significant difference in our study was demonstrated by a significantly better success rate, defined as a recurrence-free period, in the groups of patients after urethroplasty

with free graft and after urethroplasty using extragenital tissue graft and anastomotic urethroplasty compared to the group of transurethral minimally invasive operational techniques (DVIU and UD).

In all three groups of patients there is a significant improvement in clinical symptoms, uroflowmetry parameters, and residual urine after micturition. The data correlates with the results obtained in other reference centres [19,20].

Conclusion. The length and etiology of the stricture largely determine the choice of an appropriate operative technique. In recent years, the use of buccal mucosa, being an innovative procedure, has firmly established itself as the “gold” standard in urethral reconstructive surgery. Buccal mucosa has established itself as the preferred plastic material for urethroplasty. Lingual mucosa is proving to be an alternative material with high efficiency.

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