

Urethroplasty with oral mucosal graft in patients with anterior urethral stenosis. Comparative study with conventional treatment

Uretroplastía con injerto de mucosa oral en pacientes con estenosis uretral anterior. Estudio comparativo con tratamiento convencional

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Abstract

Background: Urethroplasty management of urethral stricture is a fundamental surgical option, and comparing urethroplasty with oral mucosal graft with end-to-end urethroplasty is important to know the difference between both techniques. **Objective:** To compare urethroplasty with oral mucosal graft with end-to-end urethroplasty in patients with urethral stricture type Jordan C, D and E. **Method:** Quasi-experiment performed in patients with anterior urethral stricture operated with urethroplasty with end-to-end anastomosis or with oral mucosal graft. **Results:** Twenty-nine patients with a mean age of 50.7 years, 6 diabetic, 9 hypertensive, mean stenosis length of 3.6 cm, 10 with end-to-end urethroplasty (group 1) and 19 operated with urethroplasty with buccal mucosa (group 2). The average preoperative International Prostatic Symptom Index was severe in most patients (93%). There was significant improvement postoperatively in both groups ($p = 0.0001$ and $p = 0.0011$), as well as in uroflowmetric results ($p = 0.0046$ and $p = 0.00062$). **Conclusions:** Both procedures achieved significant improvements in urinary symptomatology at 6 months compared to preoperative values.

Keywords: Clavien-Dindo classification. International Prostate Symptoms Score. Oral mucosa graft urethroplasty. End to end urethroplasty. Uroflowmetry.

Resumen

Antecedentes: El manejo con uretroplastía de la estenosis uretral es una opción quirúrgica fundamental, y comparar la uretroplastía con injerto de mucosa oral con la uretroplastía término-terminal tiene trascendencia para conocer la diferencia entre ambas técnicas. **Objetivo:** Comparar la uretroplastía con injerto de mucosa oral con la uretroplastía término-terminal en pacientes con estenosis uretral tipo Jordan C, D y E. **Método:** Cuasiexperimento realizado en pacientes con estenosis uretral anterior operados de uretroplastía con anastomosis término-terminal o con injerto de mucosa bucal. **Resultados:** Veintinueve pacientes con una media de edad de 50.7 años, 6 diabéticos, 9 hipertensos, longitud media de la estenosis de 3.6 cm, 19 operados con uretroplastía

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termino-terminal (grupo 1) y uretroplastía con mucosa bucal (grupo 2). El Índice Internacional de Síntomas Prostáticos promedio preoperatorio fue grave en la mayoría de los pacientes (93%). Hubo mejoría significativa en el posoperatorio en ambos grupos ($p = 0.0001$ y $p = 0.0011$), así como en los resultados uroflujométricos ($p = 0.0046$ y $p = 0.00062$). Conclusiones: Ambos procedimientos lograron mejorías significativas en la sintomatología urinaria a los 6 meses en comparación con los valores preoperatorios.

Palabras clave: Clasificación Clavien-Dindo. International prostate symptoms score. Uretroplastía con injerto de mucosa bucal. Uretroplastía término-terminal. Uroflujometría.

Introduction

Urethral stricture is a narrowing of urethral lumen. Anterior urethral stricture goes from the origin of the bulbar portion to the penile portion, and is a disease in which the corpus spongiosum is found beneath the urethral epithelium, which leads to a scarring process that extends through corpus spongiosum tissue and adjacent structures. It can remain asymptomatic for some time, although significant voiding symptoms may subsequently occur¹.

Most times it is traumatic, and often it goes unnoticed until the patient experiences voiding symptoms². Posterior urethral injuries are considered traumatic by definition and cause obliterative or nearly obliterative defects associated with extensive fibrosis interposed between injured urethral ends³.

In general, patients experience voiding symptoms such as straining and tenesmus, and obstructive symptoms such as post-micturition dribble, decreased urine stream, urination time lengthening, recurrent urinary tract infections (epididymitis and prostatitis) and, in some cases, urinary retention^{4,5}.

Location and depth can be established with radiographic studies, ultrasonography or urethrocystoscopy. Depth and density of the scar are determined by physical examination, and appearance of the urethra, with contrast-enhanced imaging and ultrasound evaluation⁶. Retrograde urethrography and voiding cystourethrography are the diagnostic radiological procedures of choice for urethral stricture examination⁷. According to Jordan (1987), urethral strictures are classified into six grades: A) mucosal fold; B) iris constriction; C) full-thickness involvement with minimal spongiofibrosis; (D) full-thickness spongiofibrosis; E) inflammation and fibrosis involving tissues outside the corpus spongiosum; and F) complex stricture complicated by a fistula⁸.

Symptoms are varied and may include tenesmus, polyuria, urinary incontinence, decreased urinary stream, straining and nocturia. Symptoms are evaluated with the International Prostate Symptoms Score

(IPSS), which provides information for staging them into mild, moderate and severe⁸.

Treatment can be medical or surgical, depending on the degree of obstruction. Surgical treatment is reserved for grades C to F and depends on obstruction length, site, and severity. If stricture extension is short and luminal narrowing is not serious, the procedures can be less invasive, such as urethral dilation, internal urethrotomy, or temporary stent implantation⁹. Bulbar urethra strictures measuring less than 1.5 cm and not being associated with dense, deep spongiofibrosis (straddle injuries) can be treated with internal urethrotomy, with success rates of up to 74%¹⁰.

Open urethroplasty offers varying results. In strictures of segments larger than 2 cm caused by urological instrumentation, urethroplasty with mucosal grafting is preferred, and in stenoses of 2 cm or less caused by urethral trauma secondary to car accident injuries with pelvic fracture, end-to-end anastomosis is preferred^{1,3}. However, experience of the urologist in the use of each one of these techniques should be considered. Given that in the literature there is limited evidence on the superiority of one technique over the others, performing this study was decided, the purpose of which is to compare the results of urethroplasty with buccal mucosal graft with those of end-to-end urethroplasty in patients with anterior urethral stricture larger than 1.5 cm and grades C, D and E on Jordan's classification.

Method

Observational, quasi-experimental study carried out in patients with Jordan's classification grades C, D and E anterior urethral stricture who underwent urethroplasty between January 2016 and December 2018.

Men who underwent end-to-end urethroplasty (group 1) or urethroplasty with buccal mucosal graft (group 2), older than 18 years, without urinary tract infection prior to surgery, with stricture of traumatic origin and Jordan classification grades C, D and E were included. Patients with hypospadias or epispadias were

Table 1. Stricture length, IPSS and uroflowmetry baseline values by group of patients, and their differences (Levene's test)

Type of surgery		n	Mean	SD	p
Stricture length (cm)	End-to-end anastomosis	10	3.80	1.989	0.91
	Urethroplasty with buccal mucosal graft	19	3.58	1.953	
IPSS	End-to-end anastomosis	10	21.60	3.658	0.27
	Urethroplasty with buccal mucosal graft	19	23.58	2.479	
Uroflowmetry	End-to-end anastomosis	10	10.10	0.568	0.13
	Urethroplasty with buccal mucosal graft	19	10.37	0.831	

IPSS: International Prostate Symptom Score; SD: standard deviation.

excluded, and those who died or who requested to be withdrawn from the study were eliminated.

The following variables were analyzed: type of urethroplasty, urethral stricture grade, stricture length measured by urethrography, type of trauma that caused the stricture, patient concomitant diseases, post-surgical complications according to Clavien-Dindo scale, pre-surgical and post-surgical symptoms according to the IPSS, and optical internal urethrotomy (OIU) performance prior to surgery. Evaluations were carried out at baseline and 6 months after the operation. Descriptive statistics were used, with measures of central tendency and dispersion. For the comparison between variables of interest, the chi-square test, Mann Whitney's U-test and Cohen's D-test were used to determine the effect size, as well as Fisher's exact test depending on the type and distribution of variables, with SPSS program, v.25, for Windows.

The protocol was duly registered with and approved by the medical research ethics committee of the participating unit, with patients' anonymity being preserved at all time.

Results

In total, 30 patients were included, out of whom one was eliminated for presenting with hypospadias. Of the remaining 29 patients, 10 (34%) underwent urethroplasty with end-to-end anastomosis (group 1), and 19 (66%), urethroplasty with buccal mucosal graft (group 2).

Preoperative stricture length, IPSS and uroflowmetry values by group of patients, as well as the difference between groups, are shown in table 1.

Patient mean age was 51.6 ± 15.8 years (range: 25-86). Preoperative creatinine, glucose, IPSS and uroflowmetry mean values were 0.86, 102.1, 22.9

Table 2. Creatinine, blood glucose, IPSS and uroflowmetry values of patients included in the study

	n	Minimum	Maximum	Mean	SD
Preoperative creatinine	29	0.65	1.20	0.86	0.13
Postoperative creatinine	29	0.62	1.56	0.95	0.14
Preoperative blood sugar	29	75	160	102.10	20.47
Postoperative blood sugar	29	84	157	101.41	20.44
Preoperative IPSS	29	15	30	22.90	3.08
Postoperative IPSS	29	5	36	12.52	8.35
Preoperative uroflowmetry	29	9	12	10.28	0.75
Postoperative uroflowmetry	29	7	18	13.41	2.65

IPSS: International Prostate Symptom Score; SD: standard deviation.

and 10.28, respectively; postoperative values of the same parameters were 0.95, 101.4, 12.52, and 13.41, respectively (Table 2).

Stricture most common location was the bulbar urethra, with 21 cases (72.4%), followed by the penile urethra with 5 (17.2%) and both urethral portions with 3 (10.3%). Urethral stricture mean length in group 1 was 4 ± 2.16 cm (range: 2-8), while in group 2 it was 3.68 ± 2.12 cm (range: 2-8). Stricture etiology was traumatic in all cases.

Documented comorbidities included the following: in group 1, type 2 diabetes mellitus in 4 patients and hypertension in 5; in group 2, type 2 diabetes mellitus in 2 patients and hypertension in 4. Five patients in group 1 and 13 in group 2 underwent OIU.

Post-surgical complications were divided into three types according to the Clavien-Dindo classification: major complications in 5 patients (17.2%), minor complications in 7 (24.1%) and no complications in 17 patients (58.6%). The association between post-surgical

Table 3. Association between post-surgical complications and the performed procedure

	No complications	Minor complications	Major complications	Total	Fisher's E	p
End-to-end urethroplasty	5	2	3	10	1.74	NS
Urethroplasty with buccal mucosal graft	12	5	2	19		
Total	17	7	5	29		

NS: Non-significant.

Table 4. Postoperative IPSS result of patients included in the study

	Postoperative IPSS			Total
	Mild	Moderate	Severe	
Operated with end-to-end urethroplasty	3	5	2	10
Operated with urethroplasty with buccal mucosal graft	10	7	2	19
Total	13	12	4	29

IPSS: International Prostate Symptoms Score.

Table 5. Difference between preoperative and postoperative IPSS and uroflowmetry means

	Type of surgery					
	End-to-end anastomosis			Buccal mucosa graft		
	Baseline	Final	p	Baseline	Final	p
IPSS	21.4 ± 3.6	14.8 ± 7.96	≤ 0.05	23.5 ± 2.4	11.73 ± 5.6	≤ 0.05
Uroflowmetry	10.08 ± 0.83	13.83 ± 3.06	≤ 0.05	13.21 ± 2.67	10.36 ± 8.3	≤ 0.05

IPSS: International Prostate Symptoms Score.

complications and the performed procedure is shown in table 3.

Postoperative symptoms according to IPSS results were mild in 13 patients (44.8%), moderate in 12 (41.4%) and severe in 4 (13.8%). Table 4 details the recorded symptoms by group of patients.

Table 5 presents the comparison between baseline and final values on IPSS, as well as on uroflowmetry, in both groups of patients, with a difference being observed between baseline and post-surgery interventions.

Cohen's D-test for evaluating the effect showed a difference between groups of 0.37 for IPSS and 0.64 for uroflowmetry.

Discussion

Anterior urethral structure causes lower urinary tract symptoms. Its complications can be serious and range

from infections to obstructive processes. Urethroplasty, in its different modalities, can resolve these complications.

In this series, in which urethroplasty with buccal mucosal graft is evaluated comparing it with end-to-end urethroplasty as standard treatment, urethroplasty with buccal mucosal graft was found to offer comparable results, with an overall success rate of 82.8% and a failure rate of 17.2%, with a failure rate that is lower than that of end-to-end urethroplasty (10.5% vs. 30%).

Patients who underwent OIU prior to urethroplasty were 62.1% in group 1 and 68.42% in group 2, which is similar to figures reported in the literature^{10,11}, given that OIU was regarded as a treatment for urethral stenosis. Currently, expert recommendations for the management of this pathology advise not to perform OIU in strictures larger than 1 cm and grades C, D

and E on Jordan's classification, although, in this series, it was carried out¹¹⁻¹³.

Stricture most common anatomical site was the bulbar urethra (72.4%), followed by the penile urethra (17.2%) and, finally both portions of the urethra (10.3%), similar to findings reported in the literature^{9,14,15}.

Urethral stricture mean length was 4.2 cm. Strictures longer than 8 cm were managed with buccal mucosa graft in 2 patients and with end-to-end anastomosis in one patient who required partial pubectomy, with good results for both techniques. It should be noted that stricture extended length impacts the surgical results of both techniques. Some authors¹⁶ report strictures of up to 16 cm, which we did not find in this patient series. When the stricture is too long, two or more surgical times may be necessary, which also contributes to unfavorable results¹⁷.

The difference in preoperative and postoperative IPSS score of patients operated with urethroplasty plus end-to-end anastomosis had a p-value of 0.0011, while for anastomosis with buccal mucosal graft, p-value was 0.00001 (Table 4), which indicates that both techniques improve the symptoms of patients with anterior urethral stricture¹⁰.

Prior to surgery, most patients (93.1%) had severe urinary symptoms, and the remaining 6.9%, had moderate urinary symptoms. In the postoperative period, both groups had a significant improvement, as determined by uroflowmetry results at 6 months of the procedure. In those patients who underwent end-to-end anastomosis, the difference between preoperative and postoperative uroflowmetry values had a p-value of 0.0046, and for those who underwent anastomosis with buccal mucosal graft, p-value was 0.00062 (Table 4), which indicates that uroflowmetry results improve postoperatively at 6 months with both techniques¹⁷⁻¹⁹.

As for complications, there was no significant difference between both techniques, with a p-value > 0.05 (Fisher's exact test).

One of the study limitations is that patient selection for the type of surgery was not random; however, the comparison of preoperative urethral stricture length values, as well as of IPSS and uroflowmetry values, showed no statistically significant differences. Another limitation of the study is the sample size, which is why

we consider that these results can serve as a basis for subsequent studies with a larger number of patients to be carried out.

Based on the presented data, it is concluded that both procedures offer good results and have similar complications, and that urinary tract symptoms significantly improve with both techniques, but the test of the effect between groups shows no significant difference.

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