Introduction: Reconstruction of the long urethral strictures is a difficult task in urology. The most frequently used method is augmentation with the free buccal mucosal graft.

Material and methods: Retrospective analysis of 57 patients with the long urethral stricture was performed. All patients were evaluated endoscopically and radiologically before the surgery. Buccal mucosal graft harvested from the inner side of the cheek (unilateral or bilateral) was used for the urethral reconstruction in all patients. Follow-up was one year.

Results: Complete follow up is achieved in 44/57 (77.2%) patients. The most important etiology of the strictures was previous iatrogenic trauma (instrumentation). The strictures were the most frequently located in the bulbar urethra. Preoperative exact evaluation of the stricture length was possible in only 35/57 patients (61.4%). Overall success rate of the surgery was 38/44 (86.3%). Complications occurred in 6/44 (13.7%) of patients – primary graft failure and urinary fistula. Mean preoperative IPSS was 19.2±5.2, and postoperative 10.3±3.2 (p<0.0001). IPSSQOL was 4.9±3.7 before the surgery, 2.9±1.1 after the surgery (p<0.001). Persistent urinary infection was present in 12/44(27.2%) patients.

Conclusion: Buccal mucosal free graft could be successfully used in the reconstruction of long urethral strictures. However, complications are not uncommon, and residual symptoms still exist after the surgery, and could not be neglected.

Key words: long urethral strictures, buccal mucosal graft, reconstruction

INTRODUCTION

A long urethral stricture is a demanding task in urology. The possibility of anastomotic repair exists in patients with the stricture length 1-2 cm, up to an ecdotally reported 5 centimeters, in the bulbar urethra\(^1\). If the strictures are longer augmentation of the urethra is mandatory. Augmentation is mandatory in the penile urethra whatever the stricture length is, in order to avoid postoperative curvature.

There were several approaches to the augmentation in patients with the long strictures. Flaps - augmentation with the skin island and its own vascular supply (random flap). The other is graft-free transplant based on the local in growth of the blood vessels. The buccal mucosa free graft is the commonly used augmentation method now, due to its superior features: elasticity, and natural resistance, based on wet, nonsterile harvesting area\(^1\).

The aim of the study was to investigate diagnosis, as well as the outcome of the surgery of long urethral strictures performed with the augmentation of the buccal mucosal free graft.

MATERIAL AND METHODS

A retrospective analysis of 57 patients operated between 2009 and 2013 was performed. Surgery was done in all patients by a single appropriately trained surgeon. The follow up was 12 months long. Standard diagnostic procedures in all patients included: urethrography (retrograde and voiding), ultrasound evaluation of the kidneys, bladder, residual urine, and endoscopic evaluation of the urethra.

Absence of infection was confirmed before the surgery in 43/57 (75.4%) patients. In patients with the persistent positive bacterial count, targeted antibiotic therapy was initiated three days before the surgery and continued for seven days.

HARVESTING OF THE GRAFT

Graft harvesting was performed from the inner side of the cheek (usually 6 cm long and up to 2 cm wide on the one side). In cases with longer strictures (13) graft harvesting from the both cheeks was necessary. In 4 cases additional mucosa was harvested from the inner side of the lower lip. Extensive defetization was performed, and grafts were placed on the ventral surface of the urethra. Buccal graft are carefully sutured on the urethral plate.
(water tight suture 5-0), covered and sutured with the corpus spongiosum. Minimal cystostomy was left in situ in all cases. The voiding urethrogramy was performed at least 21 day after the surgery.

Success of the surgery was defined as: no need for additional instrumentation during the follow up, absent residual urine and/or $Q_{\text{max}}=10-15\,\text{ml/s}$.

Voiding symptoms and quality of life were evaluated with the International Prostate Symptom Score–IPSS, and IPSS quality of life score (IPSSQOL) before and after the surgery.

T test was used for the statistical evaluation.

**RESULTS**

In all patients ventral buccal mucosa graft was performed. Thirteen patients were lost from the follow-up. Complete follow up was available for 44/57 (77.1%) patients.

In 11/57 (19.3%) patients preoperative minimal cystostomy was present because of high residual urine or complete urinary retention.

Etiology of the stricture and stricture length are shown in Tables 1 and 2. The most frequent were bulbar strictures after iatrogenic trauma.

Preoperative evaluation of the stricture length was exactly possible before the surgery in 35/57 (61.4%). In other cases voiding urethrogramy was not possible and consequently accurate evaluation of the stricture length (Figure 1).

Success of the surgery was confirmed in 38/44 patients (86.3%) of patients. Although postoperative patency was achieved, radiological appearance of the reconstructed area was not perfect after the surgery (Figure 2). Statistically significant improvements occurred anyway of both IPSS and IPSSQOL (Table 3). Complications were: primary failure 3/44 (6.6%), urinary fistula 3/44 (6.6%). Urethral fistulas are solved with the longer catheter stay.

Postoperative persistent infection was confirmed in 12/44 (27.2%) patients.

**DISCUSSION**

Success rate of the urethral reconstruction in our series is in line with other published results. Later deterioration of the strictures could be expected because of the relatively short follow-up. Drop out of patients (23%) is also important for the evaluation of the final outcome.

The most important etiologic factor for the urethral stricture appearance was infection during the previous time. However, nowadays it is not the case. Infection was not frequent etiologic factor among our patients. The most important recognized etiology in our series is iatrogenic trauma. Ordinary use of urinary catheter, especially in non-urologic departments is frequently inadequate with insufficient educational support of the staff, or inappropriate catheter use (toilette use of the catheter). Repetitive instrumentation without the real probability of durable success performed in urological wards, are also usual practice, regardless of the confirmed harmful effect on the stricture length and complexity.

Our diagnostic evaluation of the stricture length was not reliable. Preoperative evaluation of the urethral stricture was possible in only 61.4% of patients. There are red
TABLE 1

<table>
<thead>
<tr>
<th>ETIOLOGY OF THE URETHRAL STRICTURES</th>
<th>N(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflammatory</td>
<td>5 (8.7%)</td>
</tr>
<tr>
<td>Trauma</td>
<td>6 (10.5%)</td>
</tr>
<tr>
<td>Iatrogenic</td>
<td>24 (42.1%)</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>22 (38.5%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57 (100%)</strong></td>
</tr>
</tbody>
</table>

TABLE 2

<table>
<thead>
<tr>
<th>LOCATION OF THE STRICTURES</th>
<th>N(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penile</td>
<td>12 (21.0%)</td>
</tr>
<tr>
<td>Bulbar</td>
<td>32 (56.1%)</td>
</tr>
<tr>
<td>Panurethral strictures</td>
<td>13 (22.8%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57 (100%)</strong></td>
</tr>
</tbody>
</table>

TABLE 3

<table>
<thead>
<tr>
<th>SYMPTOM SCORE AND QUALITY OF LIFE BEFORE AND AFTER THE SURGERY</th>
<th>Before the surgery (mean+/−SD)</th>
<th>After the surgery (mean+/−SD)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPSS</td>
<td>19.2±5.2</td>
<td>10.3±3.2</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>IPSSQOL</td>
<td>4.9±3.7</td>
<td>2.9±1.1</td>
<td>p&lt;0.0001</td>
</tr>
</tbody>
</table>

Reconstruction of the long urethral strictures with the buccal mucosal free graft

Reconstruction of the urethral strictures due to possible changes of the operative strategy.

Placement of the graft was a matter of the debate. Dorsal, lateral or ventral placement of the graft showed no specific advantages. Ventral placement of the graft was used in our series due to surgical simplicity. Residual symptoms exist after the surgery, although anatomical patency was achieved. Possible cause of residual symptoms could be anatomical imperfection of the augmented urethral part, acquired diverticula of the bladder, residual infection, and persistent symptoms due to concomitant benign prostatic hyperplasia. IPSS is not specific for the evaluation of symptoms in patients with urethral strictures, however it is well accepted.

Postoperative persistent infection was more frequent in our patients than expected, although targeted antibiotic therapy was performed. Possible explanations for this phenomenon are long standing obstruction and changes of the bladder wall (pseudodiverticula), and residual urine persistent for the long time before the surgery. There is confirmed evidence that inflammatory strictures have higher rate of postoperative infection as well as complication rate.

Primary failures of the surgery occurred mainly in the penile urethra. Corpus spongiosum, routinely used to cover the augmented urethral part, is relatively thin in the distal urethra. Because of that vascular support could be bad, and failure necrosis of the buccal graft in the augmented urethra occurs. In cases with relatively insufficient vascular support, or as consequence of technical imperfection, fistula appeared. Temporary urinary catheter was inserted again, and urethra healed in all cases with the urine leakage, two weeks later. Problems with the graft necrosis were solved with the perineal urethrostomy and acceptable quality of life in two cases. In one case staged procedure was performed.

Shortcomings of the study are: retrospective investigation and the limited follow up. More extensive investigations and longer follow up are necessary for the definitive conclusion.

CONCLUSION

Reconstruction of the urethral stricture with the buccal graft is a good option in reconstructive surgery. It is still far from perfect due to possible postoperative complications, as well as, residual symptoms. It is mandatory to explain the patient possible outcomes of the surgery in order to obtain real expectations of the patient.

REZIME


Rezultati: Kompletno praćenje postojalo je kod 44/57 (77.2%) bolesnika. Najčešći etiološki faktor je prethodna jatrogena trauma (instrumentacija), a stenoze su bile u
bulbarnoj uretri. Preoperativno adekvatna radiološka procena dužine stenoze je bila moguća samo kod 35/57 (61.4%) bolesnika. Ukupno rekonstrukcija je bila uspešna kod 38/44 (86.3%) bolesnika. Komplikacije su postojale kod 6/44 (13.7%) bolesnika, i to su bile primarna nekroza grafa i fistule uretre. Preoperativni IPSS je bio 19.2±5.2 a postoperativno 10.3±3.2 (p<0.0001). Kvalitet života (IPSSQOL) bio je preoperativno 4.9±3.7 a postoperativno 2.9±1.1 (p<0.001). Perzistentna infekcija postoperativno postojala je kod 12/44 (27.2%) bolesnika.

Zaključak: Rekonstrukcija dugih stenoza uretre graftom obrazne sluzokože daje zadovoljavajuće rezultate. Komplikacije ipak nisu retke a rezidualni simptomi koji postoje posle operacije ne mogu se ignorisati.

Ključne reči : duge stenoze uretre, graft obrazne sluzokože, rekonstrukcija

REFERENCES