Clinical Study

A Comparative Study of Dorsal Buccal Mucosa Graft Substitution Urethroplasty by Dorsal Urethrotomy Approach versus Ventral Sagittal Urethrotomy Approach

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Objectives. To compare the outcome of dorsal buccal mucosal graft (BMG) substitution urethroplasty by dorsal urethrotomy approach with ventral urethrotomy approach in management of stricture urethra.

Methods and Materials. A total of 40 patients who underwent dorsal BMG substitution urethroplasty were randomized into two groups. 20 patients underwent dorsal onlay BMG urethroplasty as described by Barbagli, and the other 20 patients underwent dorsal BMG urethroplasty by ventral urethrotomy as described by Asopa. Operative time, success rate, satisfaction rate, and complications were compared between the two groups. Mean follow-up was 12 months (6–24 months).

Results. Ventral urethrotomy group had considerably lesser operative time although the difference was not statistically significant. Patients in dorsal group had mean maximum flow rate of 19.6 mL/min and mean residual urine of 27 mL, whereas ventral group had a mean maximum flow rate of 18.8 and residual urine of 32 mL. Eighteen out of twenty patients voided well in each group, and postoperative imaging study in these patients showed a good lumen with no evidence of leak or extravasation.

Conclusion. Though ventral sagittal urethrotomy preserves the blood supply of urethra and intraoperative time was less than dorsal urethrotomy technique, there was no statistically significant difference in final outcome using either technique.

1. Introduction

Strictures of anterior urethra are commonly idiopathic or occur following balanitis xerotica obliterans, faulty catheterization, instrumentation of urethra, and pelvic injury. Short strictures (<3 cm) have been managed by end-to-end anastomosis of urethra with almost 100% success rate. However, reconstruction of stricture greater than 3 cm often leads to chordae and impotence as the length of the stricture increases [1]. Hence, long strictures have been treated by graft substitution urethroplasty [2]. Various genital and extragenital grafts have been used for substitution urethroplasty [3]. But they carry the disadvantage of higher chances of graft necrosis leading to recurrence and donor site morbidity [4]. Buccal mucosa graft (BMG) has emerged as a versatile substitute because of easy harvest, resilience due to thick epithelium and rich elastin content, and good take [5], though it is associated with complications of pain, numbness, and restriction of mouth opening [6–10]. Graft bed heals rapidly with minimum postoperative morbidity. In addition, BMG is resistant to infection and trauma [5]. Initially ventral substitution urethroplasty came in vogue because of simplicity of access and excellent graft bed offered by spongy tissue. Stricture was easily visualized and lumen was clearly delineated [8]. But it fell into disrepute because of ballooning, sacculation, and urethrocele leading to postvoid dribbling. Urine stasis in ballooned graft led to urinary infection and fistula formation [11–13]. Other complications are shrinkage of graft because of lack of mechanical support or insufficient graft neovascularization. Dorsal substitution urethroplasty is devoid of the above said complications. It can be performed by two approaches: dorsal urethrotomy [14–16] and ventral sagittal urethrotomy [17–20]. In this series we have attempted to assess and compare the following.

(1) Feasibility and efficacy of both of the approaches.
2. Materials and Methods

From June 2005 to May 2011, 40 patients with stricture of anterior urethra underwent one stage BMG substitution urethroplasty. Inclusion criterion included any penile, peno-bulbar, and bulbar stricture of any etiology except traumatic. Patients with pan urethral stricture greater than 12 cm and those associated with infection, high bulbar strictures, completely obliterated stricture with insufficient urethral plate, and previously failed urethroplasty were excluded. The Ethics Committee of the hospital approved this study, and the patients signed their consent on a written form of information. All patients were investigated with urine culture and sensitivity, retrograde urethrogram and micturating cystourethrogram (RGU-MCU), ultrasound kidney, ureter, and bladder (KUB), and postvoid residual urine and uroflowmetry. Patients were divided in two groups: Group A underwent dorsal BMG substitution urethroplasty by dorsal urethrotomy approach and Group B by ventral sagittal urethrotomy. Patients were randomized using computer generated randomized tables.

Patients were advised to stop smoking and chewing tobacco six weeks prior to surgery and were put on regular mouth washes with chlorhexidine 2 days prior to surgery and continued for another five days postoperatively. Patients were administered broad spectrum antibiotics (ceftriaxone and amikacin) before starting surgery which were continued for another three days followed by oral antibiotics for another week. Transnasal intubation was carried out to facilitate harvesting of BMG. Urethroplasty was performed by two teams: one harvesting and preparing the graft and the other exposing the stricture and finally doing the anastomosis. The length of the defect was measured and the graft accordingly harvested from inner cheek. The donor site was left unsutured, and local anesthetic was administered along with adrenaline gauze compression to control the bleeding.

All patients underwent urethroscopy before commencing surgery. Penile urethra was exposed by circumcoronal incision and degloving of skin. Bulbar urethra was exposed by midline perineal incision or inverted Y-shaped perineal incision for the strictures of bulbar urethra. In Group A, urethra was exposed, mobilized, and rotated to 180 degree. After dorsal urethrotomy of strictured urethra, BMG was sutured to the bed of corpora cavernosa site with 4/0 vicryl over 16 Fr silicone catheter (Figure 1). Quilting was done to prevent shrinkage and displacement of graft. Later, free margins of preplaced buccal graft were sutured to the respective edges of dorsal urethrotomy.

In Group B, after exposing the urethra, ventral urethrotomy was done at stricture site. Stay sutures were taken, and dorsal urethrotomy was done. Cut edges of dorsal wall were separated from tunica albuginea by blunt dissection along the entire length of stricture with handle of scalpel to make elliptical raw area. Buccal mucosal graft was sutured to the free edges with 4/0 vicryl (Figure 2). Intervening sutures were placed between graft and corporal bodies in quilted manner to reduce dead space. Ventral urethrotomy was closed with 4/0 vicryl over 16 Fr silicone catheter, which worked as a splint for the graft. Suprapubic cystostomy (SPC) was placed in all patients irrespective of the approach.

Patients were advised to bed-rest for a week after surgery and were allowed to do light work thereafter. Urethral catheter was removed on 10–14 postoperative day. SPC was removed in next few days after confirming satisfactory voiding. All patients were followed at 3, 6, 9, and 12 months postoperatively. All patients who complained of poor flow and with suboptimal uroflowmetry ($Q_{\text{max}} < 15 \text{mL/msec}$) underwent RGU-MCU. Urethroplasty was considered a
Table 1: Preoperative evaluation.

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Length of stricture (cm)</th>
<th>RGU/MCU-site of stricture</th>
<th>Uroflowmetry $Q_{\text{max}}$ (mL/sec)</th>
<th>USG KUB/PVR (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R: 17–69</td>
<td>R: 3–12</td>
<td>Bulbar: 12</td>
<td>R: 1.5–10</td>
<td>R: 100–300</td>
</tr>
<tr>
<td>M: 38.5</td>
<td>M: 6.5</td>
<td>Penobulbar: 4</td>
<td>M: 4.5</td>
<td>M: 180</td>
</tr>
<tr>
<td>Group B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R: 22–80</td>
<td>R: 3.4–11</td>
<td>Bulbar: 10</td>
<td>R: 3–13</td>
<td>R: 120–360</td>
</tr>
<tr>
<td>M: 41.2</td>
<td>M: 7.2</td>
<td>Penobulbar: 6</td>
<td>M: 5.8</td>
<td>M: 230</td>
</tr>
</tbody>
</table>

R: range, M: mean.

Table 2: Postoperative evaluation.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Postoperative</th>
<th>At 1 year</th>
<th>Subjective assessment of symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q_{\text{max}}$</td>
<td></td>
<td>26.2</td>
<td>19.6</td>
<td>Normal 18/20</td>
</tr>
<tr>
<td>RGU/MCU</td>
<td></td>
<td></td>
<td></td>
<td>Excellent 18/20</td>
</tr>
<tr>
<td>Normal</td>
<td>18/20</td>
<td></td>
<td></td>
<td>Average 2/20</td>
</tr>
<tr>
<td>Stricture</td>
<td>2/20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual urine</td>
<td>13.5 mL</td>
<td></td>
<td>27 mL</td>
<td></td>
</tr>
</tbody>
</table>

failure if any operative intervention was performed in the postoperative period.

3. Results

The age of the patients ranged from 17 to 80 years with mean age of 40 years. The preoperative characteristics of the study population have been defined in Table 1. Most common presentation was poor urinary flow with concomitant straining at micturition. 10 patients presented with acute urinary retention for which SPC was done. The most common site of stricture was bulbar urethra (22 cases) followed by penobulbar (10 cases) and penile urethral stricture (8 cases). Length of stricture varied from 3 to 12 cm with mean of 6.8 cm. The etiology of the stricture was infection (including lichen sclerosus) in 42.5%, iatrogenic in 27.5%, idiopathic in 20%, and trauma in 12.5%. Although not statistically significant, the intraoperative time was found to be lesser in Group B as compared to Group A (142 versus 125 min, $P = 0.67$). The patients were followed for 6–24 months with mean follow-up of 12 months.

Table 2 shows the postoperative results of both of the groups. In Group A, 18 patients were satisfied with surgery and had $Q_{\text{max}}$ greater than 25 mL/sec. One patient had persistent narrowing at the stricture site and voided with a poor stream. Patient was managed with optical internal urethrotomy (OIU). Second patient had accidental removal of urethral catheter on second postoperative day and mild perineal wound gapping. SPC was removed in this case after two weeks. Patient was voiding satisfactorily in further follow-up. In Group B, all patients did well in the postoperative period after catheter removal except one who had developed postoperative wound infection which was managed with injectable antibiotics. On subsequent follow-up, 2 patients showed evidence of stricture at 1 year in Group B. Both of these patients were managed with OIU. There was no significant difference in the subjective symptom score, residual urine, $Q_{\text{max}}$, and restricture rate between the two groups.

The complications observed in both of the groups were as shown in Table 3. Most of the complications observed were clavien grade I/II in both of the groups. Only two recurrent strictures required operative intervention in the form of OIU in Group A, and one fistula repair and two OIU were done in Group B making them grade III complications. In total, 12 complications were observed in 7 patients in group A and in 8 patients in group B.

4. Discussion

Long strict urethra (>3 cm) requires graft interposition to prevent chordee and impotence [1]. Buccal mucosal graft has emerged best amongst other possible grafts available from various sites because of good take, resilience, and easy harvest [5]. Grafts can be placed dorsally [14–16] or ventrally [17–20] at strictured site of urethra. Multiple studies have shown that both ventral and dorsal onlay BMG have good blood supply and mechanical support. Barbagli showed that the success rate is equal with dorsal and ventral BMG [18]. The technical advantages of ventral onlay are considerable. Strictures are easily visualized. The lumen is clearly delineated with urethrotomy, allowing the surgeon to identify mucosal edges, measure the size of the plate, carry out a
Table 3: Complications as observed groupwise.

<table>
<thead>
<tr>
<th>Complications</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTI</td>
<td>1 (5%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Postvoid dribbling</td>
<td>4 (20%)</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>Urethro cutaneous fistula</td>
<td>0</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Erectile dysfunction</td>
<td>3 (15%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Donor site complications</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Recurrence</td>
<td>2 (10%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Wound infection</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
</tr>
</tbody>
</table>

Wound infection 1(5%) 1(5%)
Recurrence 2(10%) 1(5%)
Donor site complications 1(5%) 1(5%)
Erectile dysfunction 3(15%) 2(10%)

The authors declare that they have no conflict of interests and no source of funding.

5. Conclusion

Dorsal onlay buccal mucosal graft substitution urethroplasty for all morbid urethral strictures is feasible by both approaches. However, for purely penile urethral strictures ventral urethrotomy approach may be preferred due to easy accessibility to urethra and less time consuming, although larger randomized studies with longer follow-up are necessary before making a definite recommendation.

Conflict of Interests

The authors declare that they have no conflict of interests and no source of funding.
References


