Outcome of dorsal buccal graft urethroplasty for recurrent bulbar urethral strictures

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Objective To audit our results of dorsal buccal mucosal graft urethroplasty for recurrent bulbar urethral stricture disease and compare them with those from specialist centres.

Patients and methods Data were collected prospectively on 52 men who had urethroplasty with ≥ 1 year of follow-up; failure was defined as the need for further intervention.

Results The mean (range) age of the patients was 39 (19–61) years and 23 (45%) had an identifiable cause for their stricture. The mean (range) stricture length was 3.5 (1.5–6) cm and was associated with moderate or severe spongiosfibrosis in 38 (73%) men. Ten (19%) men had minor complications after surgery. The mean (range) follow-up was 34 (12–80) months, with the mean maximum urinary flow rate increasing from 6 to 24 mL/s after surgery. The surgery failed, requiring dilatation or urethrotomy, in seven (14%) men at a mean (range) of 25 (15–50) months after urethroplasty, giving an overall success rate of 86%.

Conclusion This prospective audit of dorsal buccal patch augmentation urethroplasty for bulbar strictures shows an equivalent outcome to the standard set by the expert originators, suggesting that it is transferable to less specialized centres. The efficacy, low complication rate, short hospital stay and general applicability of the technique encourage its use for all men with recurrent bulbar stricture disease, but formal comparison with other options in randomized trials, including cost-effectiveness analysis, is needed.

Keywords buccal mucosal graft, urethroplasty, urethral stricture

Introduction

Urethral stricture is a relatively common condition, with an estimated prevalence of 40 per 100 000 men at risk [1] and results in ≈ 20 000 hospital admissions annually in the UK [2]. Strictures are caused by excessive scarring after mucosal injury [3] and the bulbar segment of the anterior urethra represents the commonest site, accounting for more than a third of patients undergoing reconstructive surgery [4]. Affected men generally present with a deteriorating urinary stream, confirmed by a reduced maximum urinary flow rate (Q\text{max}) and flattened flow curve on uroflowmetry. The location, length and severity of the stricture can then be determined by endoscopic, radiographic or ultrasonographic assessment. Since the introduction of cold-knife optical urethrotomy [5], initial treatment is generally by endoscopic division, but the long-term recurrence rate is more than half [6]. Repeated urethrotomies will not cure the problem, although the stricture-free interval can be extended by regular self-dilatation [7].

Urethroplasty, using an anastomotic or augmentation technique, results in a considerably longer stricture-free interval and might have a higher cure rate, but its routine use has been discouraged by the relatively high cost, lack of an ideal graft material and the need for specialized surgical care. Two recent developments have resulted in a re-examination of the urethroplasty option: the use of buccal mucosa grafts in an augmentation patch technique with no division of the urethra [8]; and managed-care pathways encouraging early mobilization and reduced hospital stay. Case series from specialist centres have shown good results but it remains uncertain whether such outcomes can be reproduced in less specialized units. We therefore prospectively audited the process and outcome of buccal graft dorsal patch bulbar urethroplasty against the expert standard, to judge the transferability of the technique and the need for appropriately designed comparative trials.

Patients and methods

We prospectively audited 52 consecutive men who had a single-stage buccal patch dorsal bulbar urethroplasty using the Barbagli technique [8], between October 1999 and February 2006. We were unable to collect outcome data from three men who could not be contacted following their surgery. These men were marked as censored at 12 months on the Kaplan-Meyer plot and were otherwise excluded from outcome analysis. Selection criteria were isolated bulbar segment disease, recurrence after at least one previous urethrotomy, > 2 cm of diseased urethra, and appropriate fitness for anaesthesia. The anonymized patient database was updated regularly to include details of presentation, operation and short- and long-term follow-up.
Routine follow-up was by patient report of symptoms and uroflowmetry, expressed as $Q_{\text{max}}$. Imaging was only used for suspected recurrence, and failure was defined as the need for further intervention for the bulbar stricture.

The men were generally admitted to hospital on the day of surgery and given one preoperative prophylactic dose of antibiotic. A $6 \times 2$ cm buccal mucosa graft was harvested from the left inner cheek, avoiding the parotid duct orifice. Initially the oral mucosa was sutured closed, whereas in later cases the wound was left open after diathermy haemostasis. The bulbar urethra was exposed through a longitudinal perineal incision, mobilized from its dorsal attachments and a dorsal urethrotomy performed centred on the strictured area, with no division of the urethra but extending proximally and distally 0.5 cm beyond visible mucosal change and spongiosis. Stricture length was then measured and degree of spongiosis assessed by inspection and palpation. The graft was prepared and sutured against the underlying corpora for stability, before being incorporated into the urethra as a dorsal patch. After wound closure a 16 F Silastic urethral catheter was left in situ for 3 weeks, at which stage a check retrograde urethrogram was taken before removing the catheter. Ambulation was encouraged after the first day after surgery and patients were generally discharged home on the second day. The follow-up was by outpatient or telephone review at 3 months and then yearly thereafter.

**Results**

The mean (range) age of the men was 39 (19–61) years. A clear aetiological factor for stricture disease was identifiable in 23 (45%) men (Table 1). All men had had previous urethral dilatation, optical urethrotomy or urethroplasty with the mean (range) number of procedures being 3 (1–15) and 20 (38%) were or had been self-dilating before surgery. In the six men with previous urethroplasty, either an anastomotic (three) scrotal flap (one), Blandy (one) or buccal patch (one) technique had been used. Before surgery the mean (SD) $Q_{\text{max}}$ was 6.3 (5.1) mL/s, including six men (12%) who were unable to void ($Q_{\text{max}}$ of 0) and were being managed by indwelling suprapubic catheterization, but excluding seven men with no recorded preoperative flow rate.

The mean (SD, range) theatre time was 3.6 (0.7, 1.5–5) h and the mean (SD) stricture length measured during surgery was 3.5 (1.4) cm. Moderate or severe spongiosis was seen in 73% of cases, with the stricture predominantly in the proximal and middle thirds of the bulbar urethra. There were complications after surgery in 10 patients (19%), and included: local wound infections in seven, of which one abscess required drainage; one scrotal haematoma; one idiopathic scrotal swelling; and one prolonged lower limb myalgia. The urethral catheter was removed after a check urethrogram at 3 weeks in 42 (81%) of men, whilst in 10 there were leaks which delayed catheter removal by 1–3 weeks.

All patients are currently > 1 years from surgery and the mean (SD, range) follow-up was 34 (16.6, 12–80) months. At the last visit all but three patients were happy with their urinary flow, including those requiring subsequent dilatation, whilst two have bothersome postvoid dribbling and one persistent cheek soreness. Information on erectile function was recorded for 49 men, of whom 10 (20%) complained of erectile dysfunction (ED) before urethroplasty. After surgery, a further three men reported the new onset of ED, of whom one was diagnosed with type 1 diabetes. By contrast, two men with previous ED reported resolution after urethroplasty.

The mean (SD) flow rate at last visit was 24 (12.3) mL/s, vs 6.3 (5.1) mL/s before surgery. All six men with indwelling suprapubic catheters before surgery were catheter-free afterward.

To date seven men (14%) have required further treatment for recurrent bulbar urethral stricture with a mean (range) time to re-treatment of 25 (15–50) months (Fig. 1, Table 2). Four men had optical urethrotomy and two had urethral dilatation for strictureting at the distal or proximal end of the graft, with two requiring a second procedure during the follow-up interval. There was no association between failure and the number of previous urethrotomies, but for all the degree of clinical spongiosis was graded as moderate or severe.

**Discussion**

This study shows that the standard of efficacy for buccal patch urethroplasty in bulbar stricture disease as documented by leaders in the field can be achieved by a less experienced urologist, and suggests that the technique is transferable across different centres. Although cohort studies such as the present are graded low in evidence-based medicine terms, they remain of value for less common conditions or treatments, to establish standards of outcome on which personal or institutional audits can be based. They also add impetus and useful data for the design and conduct of multicentre controlled trials, which are needed to establish the optimum treatment of primary and recurrent bulbar urethral stricture disease.

Several previous studies evaluated the outcome of bulbar augmentation urethroplasty using buccal grafts (Table 3) [9–12] with 80–97% of men being stricture-free for periods of 2–4 years. Other series suggested that most failures occur in the first year, implicating technical operative errors [11,13], whereas the present data suggest a peak at 2 years. Later failure is less common but it seems inevitable that the urethra of most men treated will remain ‘stricture-prone’, giving a substantial risk of recurrence or new stricture formation throughout their lifetime [14]. The current prospective study shows that our results are in line with the experience of leading urethral surgeons, and this should encourage others to audit their results and help to establish the technique as a routine option in the management of all men with bulbar strictures.

The cause of treatment failure remains uncertain but might result from poor healing and graft incorporation at
one or other end of the patch. This could be caused by poor graft ‘take’, deficient vascularity of the graft bed, poor surgical placement of apical sutures, or insufficient dissection proximal and distal to the stricture site to expose normal healthy underlying urethral mucosa [15]. Interestingly, all the patients who had a re-strictur e in the present study had moderate or severe spongiosfibrosis, which might imply poor vascularity of the adjacent spongiosum as a cause. Irrespective of the aetiology, current expert opinion suggests that fibrous ‘ring’ strictures at the proximal or distal end of the graft site often respond to either a simple dilatation or urethrotomy [15,16]. However, the poor long-term results of repeated intraluminal treatments suggest that recurrence is likely given a sufficiently long follow-up [17,18].

In the present study information about sexual function before and after surgery was obtained by simple enquiry, with no formal completion of a sexual function questionnaire. As noted in previous series, changes in sexual function are uncommon and inconsistent, showing both deterioration and improvement. There is no anatomical reason why bulbar urethroplasty should alter sexual function, although associated haematoma, discomfort and psychological distress might cause temporary problems. In keeping with this view, a previous questionnaire study found that the risk of ED after anterior urethroplasty was similar to that after circumcision [19]. A more recent study showed no overall deterioration in erectile function or sex drive after surgery, although older men appeared more likely to experience ED [20]. Perhaps the most surprising finding in the present men was the relatively high rate of pre-existing ED in this relatively young population (20%).

We feel that despite the methodological constraints, the present case series is a useful addition to publications on augmentation urethroplasty using buccal grafts. It prospectively recorded the outcome of the procedure performed by one surgeon, in a well-defined patient group, and used a standard consistent operative technique. We did not image the urethra during the follow-up but relied on patient-reported symptoms and the subsequent need for further procedures to define failure. This has the advantage of being patient-centred and therefore of most value in cost-effectiveness terms, but might have missed subclinical structuring of the repaired augmented segment of the urethra. We did not use formal questionnaires to gain a semi-objective quantification of outcome, as none has been validated for this purpose. Buccal mucosa has been shown to be an effective and versatile graft material for the urethra, and in our experience rarely results in adverse effects from the donor site, except for one patient with persistent mouth soreness. The time in theatre was relatively long, but included patient preparation and consecutive rather than synchronous graft harvesting. To maintain consistency we placed the graft dorsally in all cases, as originally described by Barbagli et al. [9], although there is no evidence that this is superior to a lateral or ventral location. The dorsal approach has the advantage of maintaining continuity of the corpus spongiosum, although access for suturing of the urethral edge to the graft can be restricted.

In conclusion, in many general centres the treatment of men with bulbar urethral stricture disease continues to be by repeated urethrotomy and teaching self-dilatation, which is minimally invasive but has poor long-term success [17,18]. The evidence from several case series, including the present study, is that augmentation urethroplasty represents a useful alternative. Some researchers suggest that for short bulbar urethral strictures a primary anastomotic urethroplasty is more cost-effective than internal urethrotomy [21,22], and others suggest that an initial single urethrothotomy or dilatation followed by urethroplasty in those with recurrent disease might be a cost-efficient strategy [23]. We now need to establish with certainty which method of management is cost-effective and preferred by patients, and this can only be done, given the relative rarity of the disease, by conducting a well-controlled, prospective multicentre trial.

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Abbreviations: ED, erectile dysfunction; Q_max, maximum urinary flow rate.

Fig. 1. A Kaplan-Meier survival plot showing the mean (full line with diamonds) patency rates during the follow-up, with 95% CI (broken lines with squares). Table 2 shows number of men available for inclusion in the analysis at each time point.

<table>
<thead>
<tr>
<th>Cause</th>
<th>% of men</th>
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<td>Idiopathic</td>
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<tr>
<td>Previous catheterization</td>
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<tr>
<td>Trauma</td>
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<tr>
<td>Urethral infection</td>
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<tr>
<td>After TURP</td>
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<td>Previous hypospadias repair</td>
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<tr>
<td>Lichen sclerosus</td>
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Table 2 The number of men available for inclusion in the Kaplan-Meier analysis in Fig. 1. *Men lost to follow up following surgery.

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<th>Category</th>
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<th>36</th>
<th>48</th>
<th>60</th>
<th>72</th>
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<td>49</td>
<td>26</td>
<td>16</td>
<td>8</td>
<td>4</td>
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<tr>
<td>Censored</td>
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<td>8</td>
<td>8</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Failed</td>
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<td>4</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Graft placement</td>
<td>No. of patients</td>
<td>Mean age, years</td>
<td>Follow-up, months</td>
<td>Success rate (%)</td>
</tr>
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<td>--------</td>
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<td>-----------------</td>
<td>-----------------</td>
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<td>[9]</td>
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<td>84</td>
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<tr>
<td>[10]</td>
<td>2001</td>
<td>Dorsal/ventral</td>
<td>77</td>
<td>31</td>
<td>&gt; 24</td>
<td>89</td>
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<tr>
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<td>52</td>
<td>13</td>
<td>80</td>
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<tr>
<td>Present</td>
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<td>Dorsal</td>
<td>52</td>
<td>39</td>
<td>34</td>
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*Not given