

# Describing the learning curve for bulbar urethroplasty

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**Background:** Learning curves have been described for a number of urological procedures including radical prostatectomy and laparoscopic nephrectomy but rarely for urethroplasty. We describe the learning curve for bulbar urethroplasty in a single surgeon series.

**Methods:** A retrospective case note review was performed of 91 consecutive men median age 32 years (range, 15–66 years) having bulbar urethroplasty performed by a single surgeon. Data was collected on type of urethroplasty, restructure rate (as defined by urethrogram and/or flow rate) and duration of follow up. The restructure rates were compared by quartiles and statistical analysis was by  $\chi^2$  between the first and fourth quartiles.

**Results:** The 91 men had 42 dorsal onlay buccal mucosal graft (Dorsal BMG), 20 BMG augmented bulbobulbar anastomotic (Augmented Rooftop) and 29 bulbobulbar anastomotic (BBA) urethroplasties performed. Median follow up was 39 months for the first quartile, 42 months for the second, 36 months for the third, and 35 months for the fourth. The restructure rate was 17% in the first quartile, 8.7% in the second and third quartiles and 4.5% in the fourth quartile. There were no restructures noted after 24 months. There were 4 restructures in the first quartile and 1 restructure in the fourth quartile ( $\chi^2$   $P < 0.01$ ).

**Conclusions:** There is a statistically and clinically significant difference in restructure rates between first and fourth quartiles with rates falling from 17% to 4.5%. There is a learning curve for bulbar urethroplasty with a reduced restructure rate each quartile and it may take as many as 90 cases to reach optimum restructure rates.

**Keywords:** Urethra; stricture; urethroplasty; buccal mucosal graft; learning curve

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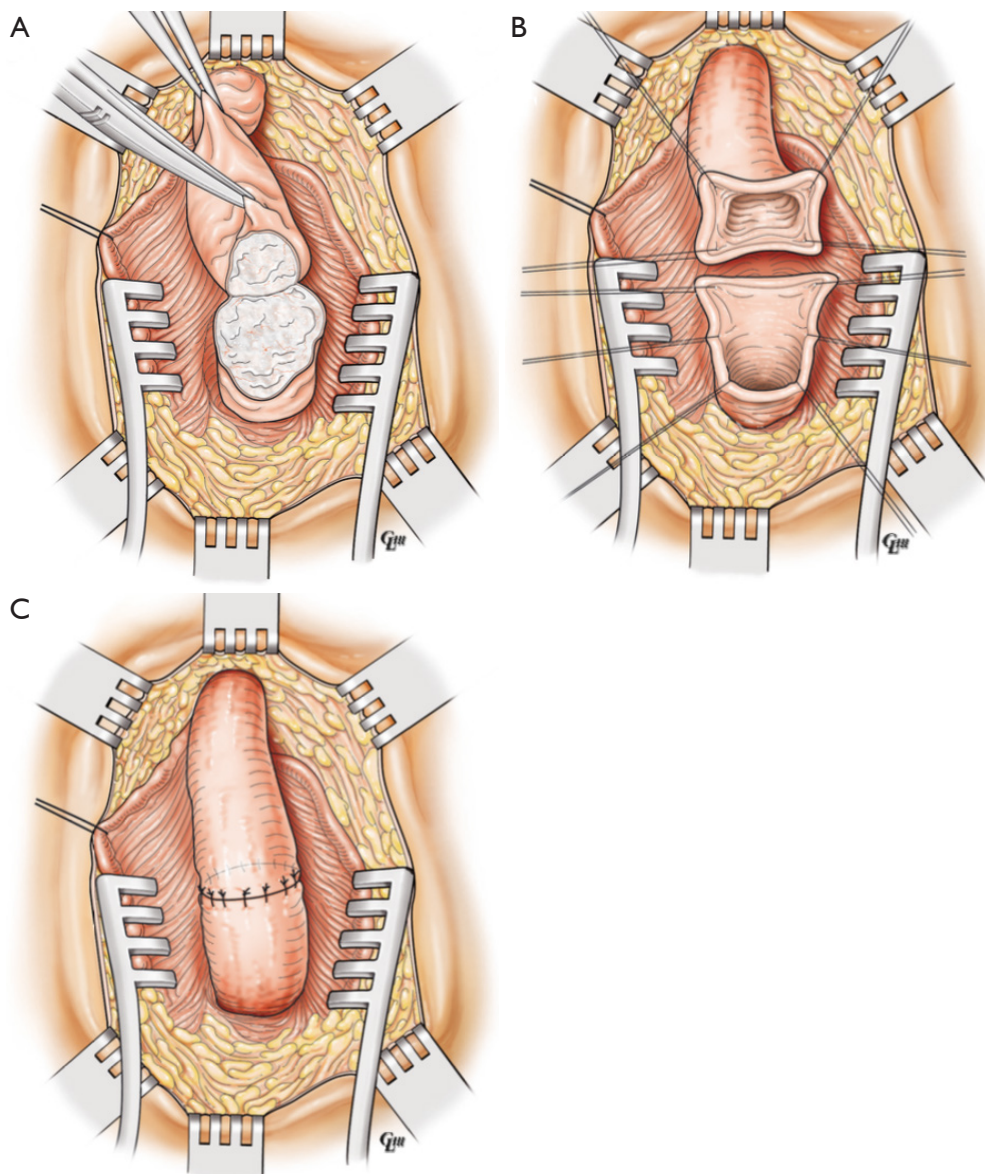
## Introduction

Learning curves have been described for a number of urological procedures including radical prostatectomy and laparoscopic nephrectomy but rarely for urethroplasty. The criteria used to define learning curves vary from: time to optimum operative duration, time to minimum serious adverse effects or time to optimum long-term functional outcomes (1). Bulbar urethroplasty, in its various forms, is the commonest and simplest type of urethroplasty performed (2). We describe the learning curve in a single surgeon's series of bulbar urethroplasties in terms of time to optimum stricture recurrence rates.

## Methods

A retrospective case note review of a prospectively acquired database of 91 consecutive men of median age 32 years (range, 15–66 years) having bulbar urethroplasty performed between 2004 and 2011 by a single surgeon following training in a Specialist Unit was performed. Data was collected on: patient demographics, type of urethroplasty, restructure rate (as defined by routine urethrogram or urethrogram to investigate recurrent symptoms) and duration of follow up.

BBA was performed by: excision of stricture, 1 cm spatulation of the ventral aspect of the distal segment and



**Figure 1** Bulbo-bulbar anastomotic urethroplasty. (A) Transection of stricture; (B) spatulation of urethra after excision of stricture; (C) anastomosis completed.

of the dorsal aspect of the proximal segment (*Figure 1A-C: Bulbo-Bulbar Anastomotic Urethroplasty*) (3-5).

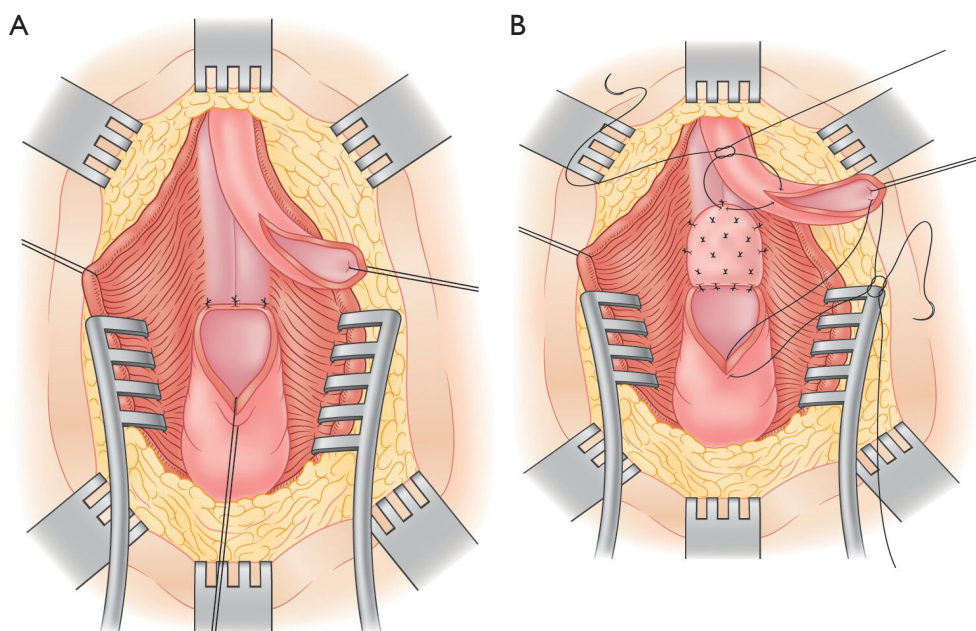
Augmented BBA was conducted by excision of the stricture, 1cm dorsal spatulation of both urethral segments and dorsal onlay of cheek BMG (*Figure as per Webster's description (Figure 2A,B; Augmented Bulbo-Bulbar Urethroplasty)*) (6).

Dorsal onlay was conducted as per Barbagli (7) with dorsal stricturotomy 1cm into healthy tissue either side of stricture and dorsal onlay of cheek BMG (*Figure 3A-C;*

*Dorsal Onlay Buccal Mucosal Graft Urethroplasty*).

All urethroplasties were performed in standard social lithotomy position, using a 16 Ch silicone catheter and patients discharged home after a 23-hour stay (the following day) unless social problems prevented this (4 patients).

All patients had a pericatheter urethrogram performed in the urology department at 3 weeks post surgery with removal of catheter at this time if healed (N=73 or 80%). For those patients with leakage documented on urethrogram at 3 weeks post surgery, further weekly urethrograms were



**Figure 2** Augmented bulbo-bulbar urethroplasty. (A) Excision of stricture with dorsal spatulation of distal and ventral spatulation of proximal urethra; (B) buccal mucosal patch sutured dorsally.

performed until healing was documented and catheter removed (all <6 weeks).

All patients had FR, PVR and ascending and descending urethrogram preoperatively and at 3, 12, 24 and 36 months post surgery. Patients were thereafter instructed to contact us on an as required basis if they had any concerns or symptoms.

The stricture rates were compared by quartiles (first 25%, second 25%, third 25% and fourth 25% of bulbar urethroplasties performed) and statistical analysis was by  $\chi^2$  between the first and fourth quartiles.

## Results

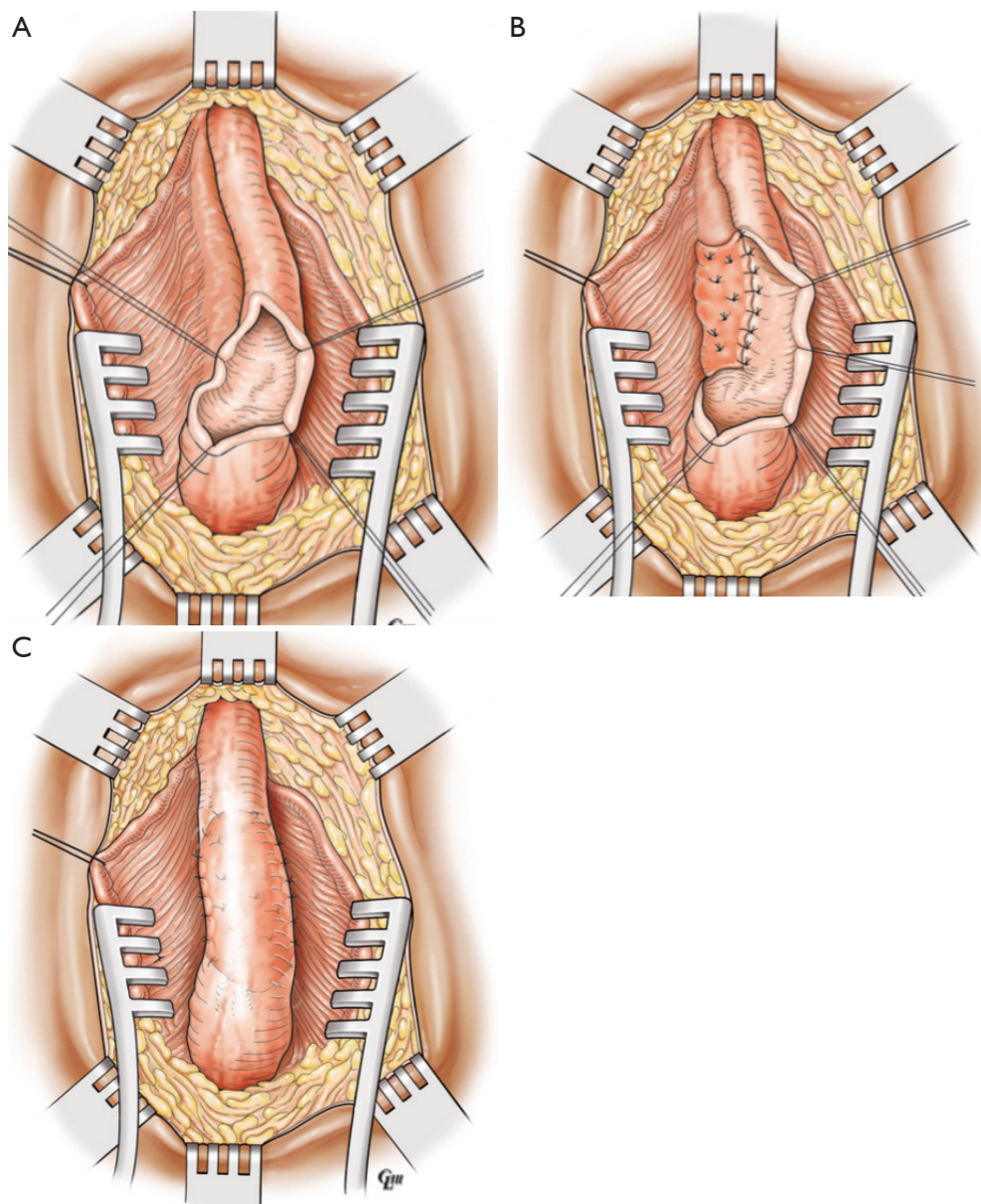
The 91 men had 42 dorsal onlay buccal mucosal graft (Dorsal BMG), 20 BMG augmented bulbobulbar anastomotic (Augmented Rooftop) and 29 bulbobulbar anastomotic (BBA) urethroplasties performed. Median follow up was 39 months for the first quartile, 42 months for the second, 36 months for the third, and 35 months for the fourth. The number of strictures per quartile is demonstrated in *Figure 4*.

Stricture occurred in 9 (9.9%) of patients: 4/23 in the first quartile (17%); 2/23 in the second quartile (8.7%); 2/23 in the third quartile (8.7%); and 1/22 in the fourth quartile (4.5%).

There were no strictures noted after 24 months. There was a significantly different ( $\chi^2$   $P < 0.01$ ) and clinically important reduction in stricture rate from first quartile (17%) to fourth quartile (4.5%).

## Discussion

To our knowledge this is the first report of a learning curve for bulbar urethroplasty alone. Bulbar urethroplasty is perhaps the simplest type of urethroplasty and as such minimum numbers to achieve stable and optimum stricture rates are highly relevant as they will also be applicable as minimum number guides for the more complex procedures of penile and posterior urethroplasty. The suggestion that it may take as many as 90 bulbar urethroplasties to obtain optimal stricture recurrence rates is supported by the data from Faris *et al.* (8). Their recently published study analyzed success at 18 months in 613 consecutive cases of bulbar and penile urethroplasty performed by 6 specialist surgeons. They found an 88.2% success for bulbar and a 78.3% success for penile urethroplasty at 18 months post surgery. There was a statistically significant trend to improvement in outcomes and reduction in complications especially with bulbar urethroplasty. They concluded that a minimum of 70 bulbar



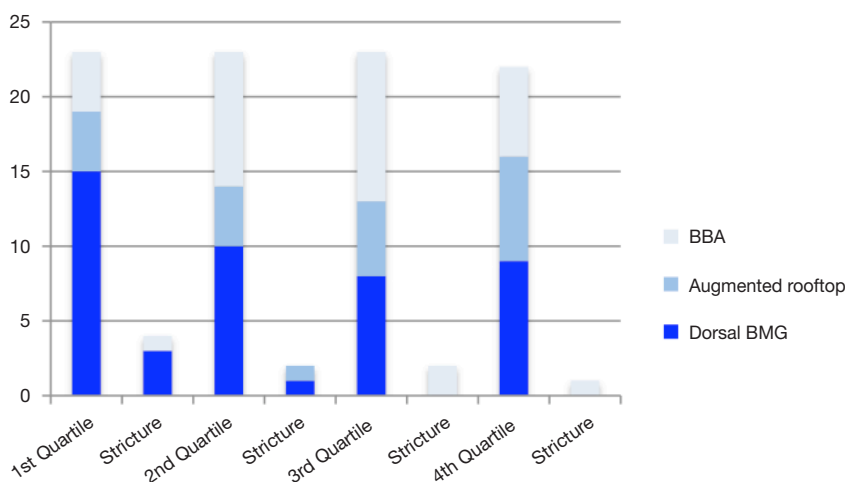
**Figure 3** Dorsal onlay buccal mucosal graft urethroplasty. (A) Dorsal stricturotomy; (B) Buccal mucosal patch sutured dorsally; (C) urethroplasty complete.

urethroplasties were required before optimal proficiency occurred (defined as success >90%). Rompré *et al.* (9) found a similar learning curve for TIP urethroplasty in pediatric urology with a reduction in complications to plateau observed after 50–75 cases.

This is at variance with Fossati *et al.* in 2016 (10) who looked again at learning curves for both bulbar and penile urethroplasty. This time the learning curve was defined

upon long-term outcomes for 564 urethroplasties with a median follow-up 69 months. The overall 5-year success rate was 77% and they concluded that long-term outcomes failed to plateau even after 500 cases. The inclusion of penile urethroplasty outcomes in this data may well be responsible for this extended learning curve.

Learning curves have been looked at for many urological procedures in particular laparoscopic and robotic



**Figure 4** Number and Type of Bulbar Urethroplasties and Strictures per Quartile.

procedures. Various surrogate and true quality outcomes have been assessed including: operative time, early complication rates, late complication rates and histological outcomes (10-16). Medium or long-term functional outcomes have rarely been addressed.

## Conclusions

There appears to be a learning curve for bulbar urethroplasty. A significantly reduced re-stricture rate was noted with each quartile increase in number of bulbar urethroplasty performed. It may take as many as 90 cases to reach re-stricture plateau and optimize urethroplasty outcomes.

## Acknowledgements

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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