Original Article

Short Segment Bulbar Urethral Strictures: Review of 48 Cases Managed in a Resource-Poor Setting

AO Obi

Department of Surgery, Ebonyi State University/ Urology Unit, Department of Surgery, Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria

Abstract

Objective: To share our experience on the presentation and management of short segment bulbar urethral strictures (BUSs) in a resource-poor center. **Methods**: Short segment bulbar urethral strictures (BUSs) managed from January 2009 to December 2014 were analyzed. Patients'age, stricture aetiology, mode of presentation, stricture characteristics, time to surgery, associated morbidity, operative procedure, and post-operative outcome were reviewed. All patients had bulbar anastomotic urethroplasty (BAU). **Results:** Total 42 bulbar anastomotic urethroplasties (BAUs) were done. The mean age of the patients in years was 37.46 (± 13.80). Fall astride injuries accounted for most strictures, 39(89.3%) of cases. The mean stricture lenght was 1.04 cm ± 0.49 and was longer in patients who had prior instrumentation,1.45 cm (± 0.37) versus 0.70 cm (± 0.26), P = 0.000. Associated lower urinary tract comorbidities were noted in 38 (79.2%) patients. Mean time to surgery was 10.20 (± 4.96) months. Patients operated on after 6 months of presentation had more associated comorbidities, 24/26 patients (92.3%), compared to those operated on within 6 months; 8/16 cases (50%), P = 0.003. However, this did not impact negatively on the outcome of surgery (P = 0.275). Patients with complete strictures tended to accept surgery earlier than those with incomplete strictures, 29 patients (60.4%) versus 19 patients (39.6%), P = 0.208,with no difference in outcome between the two groups, P = 0.581. The overall success rate was 92.9%. **Conclusions:** Fall astride injuries are the commonest cause of short segment BUSs. Prior urethral instrumentation is associated with recurrence and longer stricture lenght. Suprapubic catheter-related associated comorbidity increases with the duration of catheterization but does not impact negatively on the surgical outcome. BAU has low morbidity and high success rate of 92.7%. It should be the first line treatment for short segment BUS in low-resource countries.

Keywords: *Anastomotic urethroplasty, resource-poor setting, short segment bulbar urethral stricture*

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Introduction

The aetiology of bulbar urethral stricture (BUS) has changed in the last two decades. Currently BUS most commonly follows fall astride injuries and less commonly iatrogenic trauma and gonococcal urethritis.[1-3]

The choice of treatment for BUS depends on the lenght of the stricture and surgeon's preference.[4,5] Direct vision internal urethrotomy (DVIU) and urethral dilatation are regeneration procedures commonly offered as first line treatment for short (< 1 cm) incomplete bulbar strictures,[6,7] while bulbar anastomotic urethroplasty (BAU) is generally recommended for < 2 cm to 2.5

Address for correspondence: Dr. AO Obi (FWACS, FICS), Department of Surgery Ebonyi State University/Urology Unit, Department of Surgery, Federal Teaching Hospital, PMB 102 Abakaliki, Ebonyi State, Nigeria.
E-mail: draoobi@yahoo.com

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cm bulbar strictures.[8,9] In certain special circumstances such as the elderly with impotence and proximal bulbar strictures in a selected group of patients, BAU could be offered for bulbar strictures of up to 5 cm lenght.[9,10] Excluding these situations, most long bulbar strictures are best treated by substitution urethroplasty, most commonly using buccal mucosa and sometimes penile skin substitutes in single or multiple stages.[4,5] Recently, the augmented anastomotic urethroplasty[11,12] and the augmented non-transected anastomotic urethroplasty[4,13,14] have also been described.

The success rate for bulbar urethral repair is highest with BAU. Long-term success rates of 90%–98% have been reported.[9,15,16] Slightly lower success rates of 83%–93% have been reported for substitution urethroplasty.[17,18] On the other hand, DVIU and bouginage are non-curative treatment options with recurrence rates of up to 50% and approaching 100% after first and second procedures, respectively.[6,7,9] This has called to question the role of DVIU/bouginage in the management of BUSs.

In this paper, we share our experience on the presentation and management of short BUSs in our center, a resource-poor center. The impact of previous instrumentation on stricture lenght and outcome and the place of retrograde urethrogram in post-operative management is examined. Delay in obtaining definitive treatment is the rule in our environment because of patient poverty. The impact of this delay on patient morbidity and treatment outcome is also evaluated. In addition, we sought to know if there were any differences between patients with complete and incomplete strictures.

Patients and Methods

This was a prospective study of all patients with short segment (≤ 2 cm) BUSs managed by the author from January 2009 to December 2014. Following institutional approval, prospectively collected data were reviewed and analyzed. BUS was diagnosed from history, physical examination, combined retrograde urethrogram and micturating cystourethrogram, and in a few instances urethroscopy. Patients with less than 6 months follow-up, other forms of urethral stricture seen within the study period, and bulbar strictures > 2 cm were excluded from this study. Patients age, stricture aetiology, mode of presentation, stricture characteristics, time to surgery, associated morbidity, operative procedure, and post-operative outcome were documented. All patients were offered BAU. An informed consent was obtained in all patients. Outcome was defined as successful if a patient maintained satisfactory voiding during the follow-up period and unsuccesful if additional procedures such as DVIU or bouginage were needed for satisfactory voiding. Follow-up was primarily by means of scheduled appointments in the surgical outpatient clinic and secondarily by phone contact.

Preoperative workup and operative management

All patients were initially placed on suprapubic cystostomy (SPC) either at the time of initial trauma or at the time of presentation in the clinic. Serum electrolyte, urea and creatinine estimations, and urine cultures were done. Sterile urine was ensured before urethroplasty.

Patients were administered IV ceftriaxone 1 g and IV metronidazole 500 mg before the induction of anesthesia and this was continued till the 7th post-operative day. All BAUs were carried out by the author in standard fashion as described by McAninch.[19] Key principles being complete excision of all spongiofibrosis, spatulated tension free end-to-end anastomosis with double-layered closure of the ventral corpus spongiosum. We observe a few differences, however. Our center was a resource-poor center and only basic uro-surgical instruments were used for the surgeries. Optical loop magnification was not available. The turner warwick perineal ring retractor became available only recently and was used in about 30% of cases. We used 3/0 or 4/0 vicryl sutures for the anastomosis. In addition, we secured the lateral aspects of the anastomosis (3 and 9 clock positions) to the tunica albuginea of the corpora carvenosa to reduce tension on the anastomosis. We routinely placed a perineal tube drain which was removed 24–48 h post-operation. A pericatheter urethrogram was done by 10th post-operative day to ascertain anastomotic integrity, and if normal, the urethral stenting catheter was removed. The patients' voiding was observed and the mean flow rate measured. Patient was subsequently discharged to be seen in the surgical out patient clinic monthly for 3 months, 3 monthly for one year and yearly thereafter. During the follow-up visits, patients were questioned for erectile dysfunction, obstructive lower urinary tract symptoms, and their voiding observed. Symptomatic patients were further evaluated using the IPSS questionaire, measurement of mean flow rate (done by dividing voided volume by time in seconds), and ultrasound-determined post-void r esidual urine.

Data analysis

Data were analyzed using the statistical package for social sciences version 17.0 (SPSS Chicago,IL). The Chi square test was used to compare categorical variables and student *t*-test was used to to compare continous variables. Statistical significance was set at $P < 0.05$. All reported *P* values are two sided.

Results

The results and data analysis are summarised in Table 1 and Table 2, respectively. A total of 48 patients qualified for inclusion in this study. Of which, 42 patients had

Table 1: Baseline demographics in 48 patients with bulbar urethral stricture

Age (years).	*N* = 48
Mean	37.46 (±13.85)
Range	14–75.
Mode of presentation	
Referred	28 (58.3%)
Direct(following trauma)	20 (41.7%)
Stricture etiology.	
Fall astride	39 (81.3%)
Forceful removal of catheter	4 (8.3%)
Unknown etiology	3 (6.3%)
Toxic catheter	2 (4.2%)
Stricture length (cm)	
Mean (SD)	1.04 (±0.49)
Range	0.40–1.80
Stricture characteristic.	
Complete	29(60.4%)
Incomplete	19(39.6%)
Prior instrumentation	
Yes	19 (39.6%)
(a)Bouginage	18 (37.5%)
(b)Direct vision internal urethrotomy (DVIU)	1 (2.1%)
No	29 (60.4%)
Presence of associated morbidity.	
Yes	38 (79.2%)
No	10 (20.8%)
Types of associated morbidity observed.	No. of patients affected (total no. 38)
Recurrent UTI	30
Catheter retention.	10
Catheter dislodgement	6
Epididymorchitis	14
Vesical stone	6
Use of post-operative pericatheter Urethrogram	*N* = 42
Yes	6 (14.28%)
No	36 (85.71%)
Time to surgery (months)	*N* = 42
Mean (SD)	10.20 (±4.96)
Range	4.20–20.00
≤ 6 months	16 (38.10%)
> 6 months	26 (61.90%)
Outcome of surgery	*N* = 42
Satisfactory	39 (92.86%)
Not satisfactory	3 (7.14%)

urethroplasty, while 6 were still awaiting surgery due to financial constraints. The mean age of the patients in years was 37.46 (± 13.80, range 14–75).

Twenty eight patients (58.3%) were reffered to our service, while 20 patients (41.7%) presented directly to us immediately after urethral trauma.

Fall astride injuries accounted for 39 (89.3%) strictures. This category included two patients who fell on their buttocks. Other aetiologies are shown in Table 1.

The overall mean stricture lenght was 1.04 cm ± 0.49 (range 0.40–1.80). The mean stricture lenght was longer in patients who had prior instrumentation compared

Table 2: Results of statistical analysis and comparison between various groups in 48 patients with short segment bulbar urethral stricture

		Mean stricture length (cm) (SD)	*P*-Value
Stricture length versus previous intervention	No intervention (*n*=23)	0.70 (±0.26)	
	Previous intervention (*n*=19)	1.45 (±0.37)	0.000
		≤6 months / >6 months	
Time to surgery versus morbidity	No morbidity	8 (50%) 2 (7.7%)	
	Associated morbidity	[8] (50%) 24 (92.3%)	0.003
		Not satisfactory/satisfactory	
Time to surgery versus outcome	<6 months (*n* = 16 (38.10%)	0(0%) 16(100%)	
	>6 months (*n* = (26)(61.90%)	3(11.5%) 23(88.5%)	0.275
		<6months / >6months	
Stricture characteristic versus time to surgery	Complete stricture	11 (68.8%) 12 (46.2%)	
	Incomplete stricture	5 (31.3%) 14 (53.8%)	0.208
		Satisfactory outcome	
		No / Yes	
Stricture characteristic versus outcome	Complete	1 (4.3%) 22 (95.7%)	
	Incomplete	2 (10.5%) 17 (89.5%)	0.581

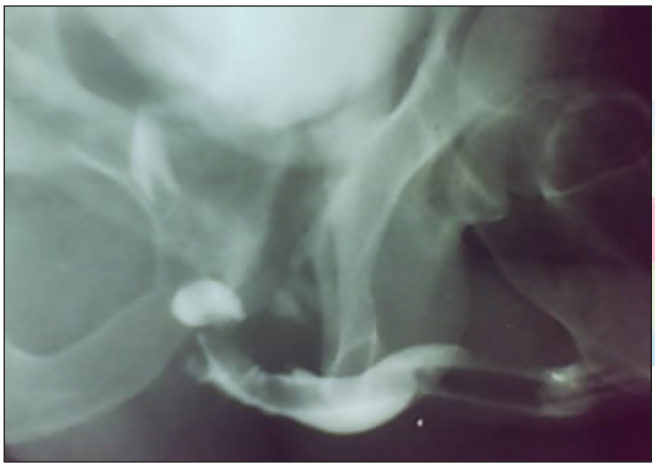

Figure 1: Post-operative peri-catheter urethrogram showing free flow of contrast into the bladder without extravasation. Note site of spatulated anastomosis in the bulbar urethra.

to those who did not.1.45 cm (± 0.37) versus 0.70 cm (± 0.26), *P* = 0.000 [Table 2].

Of the 19 reffered patients who had previous instrumentation, 18 underwent bouginage, while 1 patient had DVIU. The frequency of instrumentation ranged from 1 to 4 with a mean of 2.1 procedures.

The presence of associated comorbidity related to the presence of suprapubic catheter and bladder outlet obstruction was noted in 38 (79.2%) of patients. These associated comorbidities are detailed in Table 1. Some patients had combinations of comorbidities.

The mean time to surgery from presentation was 10.20(± 4.96) months. A total of 16 (38.10%) patients were operated on within 6 months of presentation, while the remaining 26 (61.90%) patients were operated on after 6 months. Most of the patıents operated on after 6 months of presentation had associated comorbidity, 24/26 patients (92.3%) compared to those operated on within 6 months; 8/16 cases (50%), *P* = 0.003. However, this did not impact negatively on the outcome of surgery, *P* = 0.275 [Table 2]

29 patients (60.4%) had complete strictures as opposed to 19 patients (39.6%) with incomplete strictures. Patients with complete strictures tended to accept surgery earlier than those with incomplete strictures, *P* = 0.208, but there was no difference in the outcome of surgery between the two groups, *P* = 0.581 [Table 2].

Total 6 patients (14.28%) had post-operative pericatheter urethrogram before urethral catheter removal, while the remaining 36 (85.71%) operated cases could not afford the pericatheter urethrogram and had to be managed without it [Table 1]

Surgery was succesful in 39 (92.86%) patients and unsuccesful in 3 (7.14%) patients. The duration of follow-up is currently between 6 and 38 months (mean 14.2 months). Two of these three patients have had bouginage. Of the two, one attained the satisfactory flow rate, while the second patient is still obstructed after two episodes of dilation. He is currently being considered for re-evaluation and repeat urethroplasty.The third patient has currently declined further intervention for now.

Discussion

Urethral stricture disease and its treatment is a major challenge both for the patient and reconstructive urologist,

especially in a resource-poor setting. Unfortunately, it is the highly productive sector of any population that is affected by this disease. This is evidenced by the mean age of 37.5 years in this series and 35.5 years and 38.0 years in the series by Park *et al.*[1] and Santuchi *et al.*,[9] respectively. This is also the highly mobile age group that is more readily prone to trauma. Currently, trauma has overtaken infective causes as the leading cause of BUS.[1-3,21] This has been attributed to the advent of effective antibiotics[20] and urbanization.[21] By far the most common form of trauma is straddle injury[1,3] in which the bulbar urethra is crushed against the undersurface of the pubic symphysis. This was the finding in our series as 81.3% (39/42) of our patients had straddle injury. Included in this number, however, are two patients who simply claimed they landed on their buttocks as opposed to classical fall astride injuries. We propose that these patients may have fallen on a rough surface with a projection unto the bulbar urethra as in classical fall astride injuries. It is also possible that some mechanism not currently clear to us may be responsible for the bulbar urethral injuries observed. Four (8.3%) patients in this series were semiconscious patients who forcefully pulled out their indwelling catheters and because of this we advocate stricter nursing care and restraining of semiconscious and unconscious patients. Three patients (6.3%) could not remember sustaining any injury. Lumen *et al.*[22] have noted that many bulbar strictures are idiopathic. These idiopathic strictures may represent forgotten injury or infection. Two patients (4.2%) developed bulbar strictures shortly after open prostatectomy for benign prostatic hyperplasia. We attribute their strictures to tissue reaction to poor quality (toxic) latex urethral catheters. This scenario has been observed by some urologists in our subregion.[23] This has caused a policy change in favor of silicone catheters in most institutions despite the higher cost.

The mean stricture lenght in this study was 1.04 cm ± 0.49 (range 0.40–1.80). This is lower than the mean stricture lenght of 1.7 cm reported by Santucchi *et al.*[9] This is probably because they had a larger number of patients (168 patients), more than half of whom had undergone DVIU, dilation, urethroplasty, or multiple procedures before refferal. On the other hand, only 45%(19/42) of our patients had instrumentation before refferal. BAU is currently recommended for strictures < 2.0 cm to 2.5 cm; [8,9] though in certain special circumstances such as the elderly impotent,[9] patients with unusually long perineum or penis,[9] and strictures in the proximal bulb,[24] it could be used for strictures as long as 5 cm. We have not encountered such special circumstances and we currently do not exceed the 2 cm limit. For longer strictures, we currently deploy buccal mucosal graft as a ventral onlay or use penile fasciocutaneous flaps if the former is not feasible or fails.

The mean stricture lenght was longer and statistically significant in patients who had prior instrumentation compared to those who did not, 1.45 cm (± 0.37) versus 0.70 cm (± 0.26), $P = 0.000$. In this series, 19 of 48 patients had previous instrumentation in the form of bouginage or DVIU. These were patients reffered to our service. The rate of instrumentation ranged from 1 to 4 procedures per patient with a mean of 2.1 procedures. It has been noted that repeated instrumentation of urethral strictures is associated with recurrence and increased stricture complexity.[7] The optimal management of short bulbar strictures is currently debated.

It is currently widely recommended that short incomplete bulbar strictures less than 1 cm should be offered one DVIU or bouginage and subsequently, urethroplasty if there is a recurrence.[6,7,9] This recommendation has come under scrutiny recently by some authours.[25] It is well recognised that the best time to cure a stricture is the first time.Advocates of the current treatment algorithm point out that DVIU/Bouginage is a simple outpatient procedure with few complications, but others like Santuchi *et al.*[9] point out that BAU is also a simple procedure with very low morbidity. In terms of efficacy, some large series have shown that DVIU/Bouginage does not provide lasting relief[6,7] and is associated with up to 68% recurrence rate after initial procedure and 100% recurence after subsequent procedures.[7] Serious complications have also been documented.[9,26] On the other hand, BAU has success rates as high as 95%[9,16] and using a cost-minimization approach Rouke and Jordan concluded that primary urethroplasty produced the lowest cost.[27] Based on this, some have advocated a reversal of the current treatment algorithm for short bulbar strictures.[25] Our philosophy has been to offer our patients with short bulbar strictures BAU, because its a simple procedure with a very high success rate. Moreover, our patients are young, the strictures are mainly traumatic with dense spongiofibrosis, follow-up is difficult, comprehensive health insurance is lacking, and funds for repeat procedures are scarce. Our center only recently acquired a urethrotome, and the authors' current philosophy is to use DVIU or dilation once or twice in failed BAU before considering reoperation.

Delay in undergoing surgery due to poor finance was a common observation in this series. The mean time to surgery from presentation was 10.20 (± 4.96)months, range, 3 months to 22 months. This is not surprising considering that in our setting there is near absence of health insurance, low per capita income of 2,866 USD

(2013 estimate), and minimum wage of 112 USD/month vis-a-vis the average cost of urethroplasty in public hospitals of 625 USD. This does not include cost of investigations. All our patients had suprapubic urinary diversion on presentation. We observed an increased incidence of comorbidities such as recurrent urinary tract infections, catheter retention, catheter dislodgement, epididymorchitis, and vesical stone formation in our patients. SPC urinary diversion is well known to be associated with risks of infection, stone formation, and other complications.[26] These comorbidities tended to increase with the delay in obtaining definitive treatment. Patients operated on after 6 months of presentation had significantly more associated comorbidity, 24/26 patients (92.3%) compared to those operated on within 6 months, 8/16 cases (50%), $P = 0.003$. We evaluated the impact of these catheter-related comorbidities on the outcome of treatment. To the best of our knowledge, this is an area that has not been previously explored. However, the observed comorbidities did not impact negatively on the outcome of surgery as there was no difference in outcome between the two groups, $P = 0.275$.

We also noted that patients with complete strictures tended to accept surgery earlier than those with incomplete strictures 68.8% versus 31.3% [Table 2]. We observe that patients with incomplete strictures continued to attempt to void through their urethra, even while they were on SPC, perhaps with the hope of somehow opening up the partially obstructed urethra. Some workers have noted that supraphysiologic voiding pressures proximal to a stricture can play a role in extending the disease through both inflammatory and mechanical forces by way of a "water hammer" effect,[26,28] and also that proximal urethral hydrodilation is associated with the development of unfavorable histologic changes and proximal extension of pathologic findings within the extracellular matrix.[29] Because of this, we evaluated treatment outcome between patients with complete and incomplete strictures. The mean stricture length was longer in patients with incomplete strictures,1.26 cm versus 0.83 cm, but we found no difference in the outcome of treatment between the two groups, $P = 0.581$.

Voiding cystourethrography is commonly done at the time of catheter removal after urethroplasty to determine if there is extravasation. In our center, we use a pericatheter retrograde urethrogram [Figure 1] to determine the presence of extravasation. In our subset of patients, patient poverty created a natural cohort of 36(85.71%) patients who could not afford urethrography at the time of catheter removal and had to be managed without it. In the group that had who urethrography, there was no extravasation and none of those in the group that could not afford urethrography had any features that could suggest extravasation. Santucci *et al.*[9] have noted the low yield of urethrography. In his series, of 168 patients who had BAU, after approximately 2 weeks of catheterization only 3% of patients had abnormal voiding cystourethrography findings and only 1% showed extravasation. Other workers have also suggested that pre- and post-operative patient evaluation could be kept to a minimum in resource-poor countries without compromising patient outcome.[30] We assert that while urethrography may be very useful after prostatomembraneous repairs because of the tenuous nature of the anastomosis in this area and the higher complication and failure rates expected, it may not be mandatory after BAU especially in a resource-poor setting such as ours.

Our success rate of 92.7% compares favorably with the 95% success rate reported by Santucci *et al.*[9] though our period of follow-up is considerably shorter, Mean 14.2 months(range 6–38 months) versus, 70 months (range 6–291 months). Barbagli *et al.*[15] and Eltahawy *et al.*[16] report success rates of 90.8% and 98%, respectively. It is difficult to make direct comparisons of success rates between studies because patient characteristics, follow-up periods, and methods of follow-up often differ considerably. Though our patients had relatively short strictures, our sample population was small such that every unsuccessful case adversely affected the overal success rate. Of the three unsuccessful cases, one had multiple prior instrumentation before urethroplasty and two were elderly patients above 75 years. We did not observe any complication. These high success rates have made some authors[9] to suggest that the cure of urethral stricture by anastomotic urethroplasty can be preferable to management by other postoperative DVIU and/or dilation, for which the reported failure rate can approach 100%.[7]

The drawback in this series is the small number of patients and as pointed out this can impact negatively on the success rate and positively on complication rates. Our duration of follow-up is also not as long as has been reported in some studies. It has been noted that restricturing may occur up to 80 months after surgery.[9] However, we have observed that most failures occur within the first 3 to 6 months. Follow-up of patients is a major challenge in our environment. In our experience patients tend to consult from one urologist to another when they are not satisfied and so they are sometimes not available for the follow-up. We try to overcome this by maintaining phone contact with the patients and inviting them for follow-up visits.

Conclusions

Fall astride injuries are the commonest cause of short segment BUSs. Prior urethral instrumentation is

associated with recurrence and longer stricture lenght. SPC-related associated comorbidity increases with the duration of catheterization but does not impact negatively on surgical outcome. BAU is technically simple and can be accomplished with basic surgical instruments with high success rate of 92.7% and no morbidity.

The high success rate and low morbidity of anastomotic urethroplasty compared to DVIU/bouginage should call for a rethink of the reconstructive ladder for short BUSs. BAU could be offered first to all patients with short BUS instead of DVIU/bouginage. This is especially so in low resource countries.

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Conflicts of interest

There are no conflicts of interest.

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