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Original Article

Does site of buccal mucosa graft for bulbar urethra stricture affect outcome? A comparative analysis of ventral, dorso-lateral and dorsal buccal mucosa graft augmentation urethroplasty

Bulber üretra darlığı için bukkal mukoza greftinin alınma yeri sonucu etkiler mi? Ventral, dorsolateral ve dorsal bukkal mukoza greftiyle gerçekleştirilen ogmentasyon üretroplastilerinin karşılaştırmalı analizi

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ABSTRACT

Objective: To compare long- term outcomes of buccal mucosa graft (BMG) augmentation urethroplasty for long segment bulbar urethral strictures done by placing the graft ventrally, dorso-laterally and dorsally.

Material and methods: We conducted a single institution retrospective study on 112 who underwent BMG augmentation urethroplasty for non-traumatic bulbar urethral strictures between January 2005 to December 2014. The cases were divided into three groups based on the site of placement of BMG graft i.e. (a) Ventral (n=44), (b) Dorso-lateral (n=48) and (c) Dorsal (n=20). Follow-up period was from one year to five years. Patients with failed outcomes underwent urethroscopy or retrograde urethrogram to note the site of recurrence of stricture.

Results: Out of 112 cases 91 (81%) were successful and 21 (19%) failed. The success rates for ventral, dorsolateral and dorsal BMG augmentation procedures were 89%, 79% and 70%, respectively (p=0.18). Among 21 failed cases, 12 cases (57%) had stricture at proximal anastomotic site, 4 cases (19%) at graft and 5 cases (24%) at distal anastomotic site (p=0.01).

Conclusion: The overall success rate for BMG augmentation urethroplasty is equal for all techniques. Ventral onlay urethroplasty provides better exposure of proximal anastomotic site thus it is associated with minimum proximal anastomotic site recurrence rates. Patients with extensive spongiofibrosis and long segment strictures had higher rates of failure.

Keywords: Augmentation urethroplasty; buccal mucosa graft; urethroplasty; urethroplasty failure.

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ÖZ

Amaç: Uzun segmentli bulber üretra darlıklarında, ventral, dorsolateral ve dorsal yerleşimli greftle uygulanan bukkal mukoa greft (BMG) ogmentasyon üretroplastisinin uzun dönemli sonuçlarını karşılaştırmak

Gereç ve yöntemler: Travmatik nedenlere bağlı olmayan bulber üretra darlıklı 112 olguda 2005-2014 arasında uyguladığımız BMG ogmentasyon üretroplastilerinin retrospektif tek merkezli çalışmasını gerçekleştirdik. BMG greftinin yerleştirilme bölgesine göre olgular üç gruba ayrılmıştır.(a) ventral (n=44), (b) dorsolateral (n=48) ve (c) dorsal (n=20). İzlem süresi bir yılla beş yıl arasında değişmekteydi. Başarısız olunan hastalara darlığın nüks ettiği yeri saptamak için üretroskopi veya retrograt üretrogram uygulandı.

Bulgular: Yüz on iki olgununn 91'inde (%81) başarılı ve 21'inde (%19) başarısız olunmuştur. Ventral, dorsolateral ve dorsal BMG ogmentasyonunda başarı oranları sırasıyla %89, %79 ve %70 idi (p=0,18). Başarısız olunan 21 olgudan 12'sinde (%57) proksimal anastomoz yerinde darlık, 4 (%19) pan greft ve 5 (%24) distal anastomoz yerinde darlık (p=0,01) vardı.

Sonuç: BMG ogmentasyon üretroplastisinde genel başarı oranı tüm teknikler için benzerdi. Ventral onlay üretroplastisi proksimal anastomoz yerinin daha iyi açılımını sağladığından proksimal anastomoz yerinde nüks oranı minimal düzeydedir. Yaygın sponjiyofibrozu ve uzun segment darlıkları olan hastalarda başarısızlık olasılığı daha yüksekti.

Anahtar Kelimeler: Ogmentasyon üretroplastisi; bukkal mukoza grefti; üretroplasti; üretroplasti başarısızlığı.

Introduction

Urethral stricture is a sequel to any process that would injure the urethral epithelium beyond the point of healing. There has been a trend towards minimally invasive surgery for the management of most cases with urethral strictures, and increasing number of reconstructive urologists prefer to do urethroplasty rather than repeated endoscopic dilations or multiple visual internal urethrotomies.[1] This paradigm shift has been brought about by the excellent cure rates achieved by both augmentation and anastomotic urethroplasties.

Management of non-traumatic long- segment bulbar urethral stricture is now being universally achieved using augmentation urethroplasty with the most common donor site being buccal mucosa. However, there is yet no consensus on technique as in whether to place the graft ventrally, dorso-laterally or dorsally. There are three different sites where buccal mucosa graft (BMG) can be placed while doing augmentation urethroplasty. BMGs can be placed dorsally (the entire urethra is mobilised and the graft placed on caversnosal bodies), ventrally (a urethrotomy is made ventrally on the stenotic segment and graft placed zon the urethrotomy defect) and dorso-laterally (urethra is mobilised unilaterally and graft is placed on dorso-lateral urethrotomy defect).

Our objectives were to compare the long- term outcomes of BMG augmentation urethroplasty for long- segment bulbar urethral strictures based on the surgical success rates in relation to the site of graft placement i.e. ventral, dorso-lateral or dorsal, to evaluate the patterns of failure in terms of site of recurrence of stricture i.e. proximal anastomotic, distal anastomotic or pan graft, and finally to assess whether the site of recurrence is varies dependent on the site of the graft placement.

Material and methods

A single institutional retrospective study was conducted on 112 cases of BMG augmentation urethroplasty for bulbar urethral strictures performed from January 2005 to December 2014. Only patients with >2 cm nontraumatic purely bulbar urethral strictures who underwent BMG augmentation urethroplasties and who had a follow up of >1 year were included in the study. The site of BMG augmentation was noted. Patients were followed up for a minimum period of one year (range.1-5 years) Outcome of surgery was successful if maximum postoperative flow rate was >15 mL/sec as detected on normal retrograde urethrogram and/or urethroscopy and absence of voiding symptoms. Failure was defined as maximum flow rate <15 mL/sec or voiding symptoms with stricture diagnosed on retrograde urethrogram and/or stricture seen on urethroscopy which required endoscopic intervention, self-dilatation of urethra or urethroplasty.

Statistical analysis

All patients whose BMG augmentation procedures failed underwent urethrosopy to identify the site of stricture. The data so obtained were analysed with *chi*-square test to find out whether any association could be established between the site of BMG augmentation and the pattern of stricture recurrence and also whether the site of graft placement affected the outcome. As it was a retrospective analysis and purely involved analysis of data records without disclosure of patient's identity, patient consent and ethics committee approval were not required.

Results

Out of 112 cases of BMG augmentation urethroplasty, ventral (n=44), dorso-lateral (n=48), and dorsal (n=20) augmentation procedures were performed in respective number of patients. Out of 112 cases that underwent BMG augmentation, 91 cases (81%) were successful and 21 cases failed (19%).

Overall the postoperative Qmax was 25 mL/sec with a mean improvement of 17 mL/sec compared to the preoperative Qmax. Among the patients undergoing ventral, dorsolateral and dorsal onlay urethroplasty the mean (median) preoperative Qmax values were 8 mL/sec (5 mL/sec), 7 mL/sec (5 mL/sec) and 8 mL/sec (5 mL/sec) while mean (median) postoperative Qmax values were 26 mL/sec (25 mL/sec), 26 mL/sec (27 mL/sec) and 22 mL/sec (20 mL/sec) with increases of 18 mL/sec (20 mL/sec), 19 mL/sec (22 mL/sec) and 14 mL/sec (15 mL/sec) respectively compared to the preoperative values.

Among the patients who underwent onlay urethroplasty the success rates and site of failed BMG procedures are shown in Table 1. *Chi*-square test when applied showed that the result was not statistically significant (p=0.18) and no procedure could be said to be superior to other, though ventral augmentation provided better results.

Among the patients in whom BMG procedures failed (n=21) and needed recurrent interventions those who underwent urethroscopy showed that, the most common site of stricture recurrence was at proximal anastomotic site in 57% (n=12), and distal anastomotic site in 24% (n=5) of the cases while there was pan graft area stricture in 4 (19%) cases. Based on *chi*-square test, re-strictures on proximal anastomotic site rate were statistically significant accounting for maximum rates of failure (p=0.017).

Hence though the overall success/cure rate was higher with ventral augmentation urethroplasty the results were not statistically significant. However, we saw in our study that the most common cause of failure in all techniques was stricture at proximal anastomotic site which was more commonly seen with dorsal augmentation, less with dorso-lateral augmentation and least with ventral augmentation urethroplasties. The recurrence rates involving other two sites namely distal anastomotic site and pan graft area were equally distributed in all three groups (Table 1).

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Table 1. Site of onlay repair and outcomes

Site of BMG	Outcomes		Site of recurrence of stricture among failed procedures		
Onlay (n)	Success rates	Failure rates	Proximal	Distal	Pan-graft
Ventral (n=44)	39	5	2	2	1
	89%	11%			
Dorsolateral (n=48)	38	10	6	2	2
	79%	21%			
Dorsal (n=20)	14	6	4	1	1
	70%	30%			
Total (n=112)	91	21	12	5	4
	81%	19%	57%	24%	19%

Table 2. Results of the literature review comparing the three techniques

Study	Dorsal onlay Success rates, % (n)	Dorso-lateral onlay Success rates, % (n)	Ventral onlay Success rates, % (n)
Barbagli et al.[9]	85% (n=27)	83% (n=6)	83% (n=17)
Hosseini et al.[10]	80% (n=15)	-----	79% (n=19)
Wang et al.[11]	86.9% (n=513)		82.5% (n=750)
Vasudeva et al.[12]	92.5% (n=40)	------	90% (n=40)

Discussion

Male urethral stricture disease has an incidence of 0.6% in some susceptible populations.[2] Majority of the studies which investigated the etiology and distribution of strictures are single institutional studies. Thus few data have been derived from multi-institutional studies and even considerably lessser data have been gathered from developing countries. Anterior urethral stricture accounts for 92% of all urethral strictures, and 47% of these cases are solely bulbar urethra strictures.[3]

Urethral stricture is a great source of morbidity among men who can present with obstructive voiding pattern to frank urinary retention. The cause of urethral stricture can be infectious, post intervention and trauma, though in many cases the cause cannot be ascertained. Non-traumatic bulbar urethral stricture can be iatrogenic, secondary to lichen sclerosis or post-infection. Ischemia has been proposed to be responsible for spongiofibrosis with the end result being urethral stricture. A multi- geographic study to understand the demography of urethral stricture concluded that Lichen sclerosis and trauma were responsible for strictures in developing countries compared to the developed countries where iatrogenic injury in particular failed hypospadias repair is more frequently seen.[4]

The treatment modality mainly comprises of three strategies, 1) Visual internal urethrotomy (VIU). 2) Endoscopic dilation. 3) Urethroplasty (anastomotic or augmentation).

The success rate of VIU and urethral dilation is relatively low with only half of the patients remain stricture free at 48 months and the results are even much worse with second or third repetition of the procedure.[5] The results are worst for long- segment (>2 cm) strictures.[6]

So the option is urethroplasty! But it remains to be underutilized with few institutes offering the present standard of care.[1] Urethroplasty across many centres regularly performing the procedure offers a cure rate of 80% to 90% which is far superior to their competitors.[7,8] For long- segment non traumatic bulbar urethral stricture, BMG augmentation urethroplasty is the standard of care.

The site of placement of graft remains to be a controversial issue. Barbagli et al.[9] found that all three sites were associated with similar outcomes. On review of literature it was found that both dorsal and ventral BMG augmentation urethroplasties were associated with similar outcomes (Table 2).[9-12] Proponents of dorsal placement of graft argue that there is decreased chance of diverticula formation and better chance of neovascularisation with the graft lying on cavernosal bodies which would not be seen if the graft is placed ventrally. The proponents of ventral placement in bulbar urethra argue that it offers better access to proximal site of stricture, less mobilization of urethra preserving its vascularity in addition to the fact that the bulbocavernous muscle prevents diverticula formation. However, a technique which involves unilateral mobilization of urethra with dorso-lateral placement of the graft which has evolved is a compromise between these two approaches with fairly good results.[9] This

method is nearly similar to the lateral placement of graft with the difference that it involves mobilization of urethra from ventral midline to the beyond of dorsal midline.[13]

We would like to state that though not studied in our case, logically ventral augmentation will provide the least erectile dysfunction as it involves least dissection. We found that it was technically easier to place and suture the graft at the proximal anastomotic site when approached ventrally than dorsally. We think that this is the most likely reason for the reduced rate of proximal anastomotic site stricture when graft is placed ventrally rather than dorsally and even dorso-laterally. This was especially true when the stricture was localized more proximally in bulbar urethra and the spatulation displaced the anastomotic site more proximally. As the ease of access decreases with dorsal onlay and with dorso-lateral onlay compared to ventral onlay, we noticed hesitancy of the operating surgeon in performing a generous spatulation at proximal anastomotic site. This hesitancy on the part of operating surgeon might account for the increased failure rates at proximal anastomotic site seen with dorsal onlay grafts. Hence, though the outcomes with ventral BMG graft placement were better but without statistical significance, we propose that we should consider doing ventral onlay graft placement for bulbar strictures especially when the stricture involves proximal bulbar urethra. We would also like to state that it is essential to understand that in the majority of non-traumatic urethra strictures, by doing urethroplasty we are not curing the disease. The disease process is a continuous one which is evident by the spongiofibrosis visible even in the non-stenosed part of the urethra just proximal and distal to the stenosed urethra. Hence we recommend wide spatulation of both the proximal and distal anastomotic site to cover this spongiofibrosis. Spongiofibrosis represents ischemia and extensive spongiofibrosis characterized with a narrow lumen are prone to recurrences with pan graft restenosis owing to the scanty blood supply to the graft resulting in graft shrinkage.

However, we would like to state few limitations of our study.

1) The study was carried over a period of 9 years, hence though all surgeries were performed at a single institute it was not performed by a single surgeon. However, all were performed under the supervision of the same professor and hence to a large extent the expertise were more or less the same.
2) All the three methods of augmentataion urethroplasty were done over the same time period and the choice between the three methods was arbitrarily decided by the operating surgeon based on his comfort with a particular procedure and hence no randomisation was done.
3) Bulbar urethra is a very heterogeneous group and though classification of the disease as per the stricture length, stricture diameter and location i.e. proximal-bulbar, mid-bulbar and distal-bulbar and its effect on outcome, since it was a retrospective study the same details were not available for analysis.

In conclusion, BMG urethroplasty gives excellent results for long- segment bulbar urethral strictures. More than half of the failure rates were caused due to stricture at proximal anastomotic site, hence we should be more careful while performing this anastomosis. Ventral onlay repair provides the best access to proximal anastomotic site among all the techniques and hence should be the favoured technique especially for strictures involving proximal bulbar urethra as evident by the statistically significant reduction in stricture recurrence at proximal anastomotic site with ventral onlay compared to other two techniques. Wide spatulation of both anastomotic sites is recommended to cover the spongiofibrosis localized proximal and distal to the stricture site. However, we would like to state that all three techniques gave similar results in terms of success and failure rates but the pattern of recurrence helps us to understand the need to individualise the timing, and choice of the technique to be used.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Topiwala National Medical College.

Informed Consent: Since it was a retrospective study the information was obtained from the medical records. Also it was an observational study and no name has been disclosed in the study.

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