

COMPARISON OF OUTCOME BETWEEN SINGLE STAGE DORSOLATERAL ONLAY BUCCAL MUCOSAL GRAFT URETHROPLASTY AND JOHANSON'S STAGED URETHROPLASTY FOR TREATMENT OF LONG SEGMENT ANTERIOR URETHRAL STRICTURE

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Abstract

Background: Urethroplasty is the treatment of choice for long segment anterior urethral stricture. Various types of graft can be used as substitution, but now a day Buccal Mucosal Graft (BMG) is more popular with very promising results. This study was conducted to compare the outcome between dorsolateral free BMG graft and traditional staged reconstruction technique.

Materials and methods: This was a hospital based quasi experimental study done prospectively on 64 patients, dividing in two groups, dorso-lateral onlay BMG Urethroplasty (Group A) and Johanson's staged Urethroplasty (Group B) from January 2016 to June 2018 for long segment (30-80mm) anterior urethral stricture with a minimum 06 months follow-up. Two patients were failed to attend at follow up clinic were excluded from the study. Data were analyzed by student's t test, and chi-square test where appropriate.

Results: Total 62 patients were included in results (2 lost in follow-up) 32 patients with BMG (Group A) and 30 patients with Johanson's urethroplasty (Group B) in 6 months follow-up where success rate of group A was 90.7% and group B 63.3% which is statistically significant. At the end of six months 22 patients (68.8%) in Group A had

peak urinary flow rate more than 15 ml/sec, whereas only nine patients (33.3%) had had such flow rate in B group. Post operative complications were significantly higher in Group B. Eight patients (26.7%) in Group B had developed fistula and eleven patients (36.7%) had recurrence in Group B which is significantly higher than Group A.

Conclusions: Dorsolateral onlay BMG urethroplasty is comparatively an effective technique with excellent functional outcome for long segment anterior urethral stricture and feasible with good short term success.

Key words

Urethroplasty; Buccal mucosal graft; Dorsolateral onlay.

Introduction

The overall incidence of stricture disease might be as high as 0.6% of certain populations¹. Any process of infection or injury to the anterior urethral epithelium or underlying corpus spongiosum to the point that the healing results in a scar can cause an anterior urethral stricture². Anterior urethral stricture are commonly caused by inflammation or infection by gonorrhoea or Lichen Sclerosus (LS), trauma specially straddle injury, iatrogenic injury during catheterization, endoscopic and open surgery, idiopathic cause and rarely malignancy³.

The traditional treatment of urethral stricture is urethral dilatation or urethrotomy but none is curative⁴. The gold standard treatment of urethral stricture is urethroplasty⁵. Urethral substitution has long been accomplished by using genital skin flaps and grafts of genital or extragenital tissue⁶. Now a day, buccal mucosa has emerged the best among the other grafts used for urethral reconstruction with promising early results⁷. Buccal mucosa is architecturally similar to stratified squamous epithelium of penile and glanular urethra, making it exceptionally adaptable for urethral reconstruction^{8,9}. And the conventional approach for the management of long segment anterior urethral stricture is two stage Johanson's repair¹⁰.

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In Bangladesh, different modalities of treatment have been advocated over the years. Currently substitution BMG urethroplasty has been suggested for long segment anterior urethral stricture with a promising result worldwide¹¹. It may be single or multi staged. Dorsolateral onlay BMG urethroplasty by unilateral dissection is minimally invasive, preserve one sided vascular, entire muscular, nerve supply & reduce the incidence of post operative complications^{12,13}. The present study was designed to observe the comparison between the outcomes of Johanson's staged urethroplasty and single stage dorsolateral buccal mucosal graft urethroplasty for treatment of long segment stricture of anterior urethra.

Materials and methods

This was a hospital based quasi experimental study carried out from January 2016 to June 2018 over the male patients having stricture urethra involving the bulbar and penile part and stricture length > 2 cm to 8cm admitted in the Department of Urology, Chittagong Medical College Hospital (CMCH) Chattogram. A total number of 64 patients meeting the eligibility criteria were included and divided into two groups by even numbers and odd numbers. First sample was selected by lottery method. Group A included 32 patients, who were treated by buccal mucosal graft Urethroplasty and Group B included 32 patients, who were treated by Johanson's staged urethroplasty.

For Buccal Mucosal Graft (BMG) urethroplasty, a midline perineal skin incision was made; the involved bulbar urethra was dissected off the corpora cavernosa on the left side. Urethra was partially rotated and the dorsolateral surface was incised exposing the lumen. The BMG was harvested from the inner cheek and lower lip. Proximally, the graft was sutured to the open urethra by few interrupted sutures at the apex and at the medial urethral margin. One edge of the graft was sutured to the medial urethral margin, which was in place and fixed to the corpora. Few interrupted sutures were taken at distal apex. Quilting sutures were applied. A 14 Fr Foley catheter was kept. The other margin of the graft was sutured to the lateral margin of the urethra and the tunica of corpora. These three tissues were taken together while closing the lateral edge, thereby anchoring both graft and urethral margin to corporal tunica. The bulbospongiosus muscle was approximated in the midline, subcutaneous tissue were closed with interrupted absorbable sutures. Skin was closed with interrupted nonabsorbable sutures.

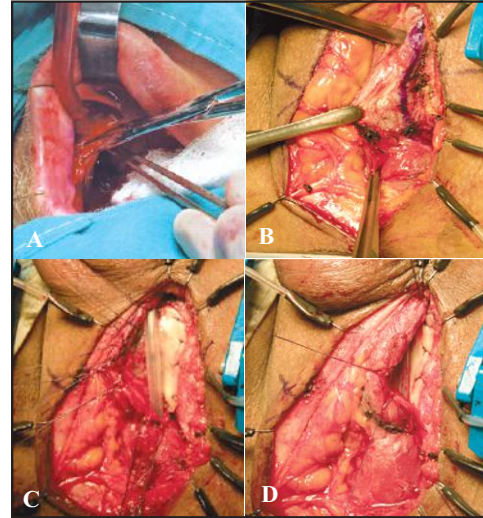


Fig 1: Dorsolateral Onlay BMG Urethroplasty : A) Harvesting of Buccal mucosa B) Unilateral dissection at recipient site C) Graft placement D) Closure of recipient site (Source : Personal Series).

In Johanson's staged urethroplasty, in the first stage a hypospadias was created in the strictured region, the narrowed urethra was laid open and its incised edges anastomosed to adjacent skin. An 18 Fr Foley catheter was left indwelling for 05 days after this procedure upto oedema subside. The interval between two stages varies with the healing power of patient and averages from twelve to twenty four weeks. The second stage technique is universal. The lateral skin edges of the penis or scrotum were freed for a distance of 2-3 cm, so that the skin edges could be approximated over the buried strip without tension^{10,14-17}.

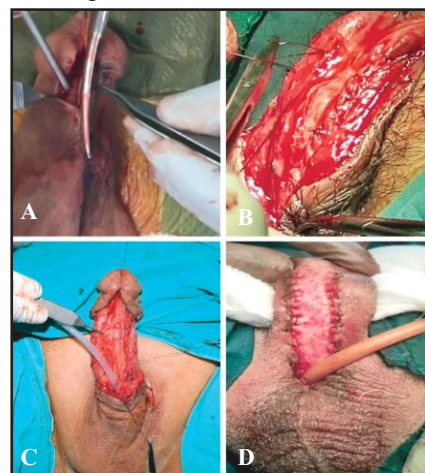


Fig 2 : Johanson's staged urethroplasty-1st stage. A) Midline opening of the stricture part B) Complete exposure of the stricture urethra C) Suturing of the urethral margin with the fascia & skin D) Stricture part laid open for healing).

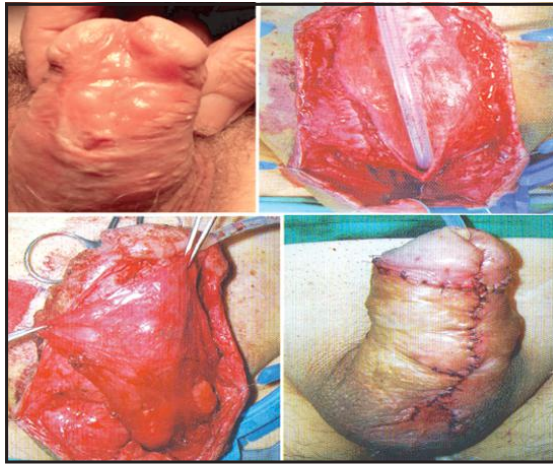


Figure 3 : Johanson's staged urethroplasty-2nd stage.

Successful reconstruction was defined as normal voiding; urine flow rate is >15 ml/sec without need for any postoperative procedure, including dilatation. Recurrent stricture and formation of post operative urethrocutaneous fistula considered as failure.

Results

Two patients of Group B were failed to attend at follow up clinic thus they were excluded from the study. Therefore, a total of 62 patients were included for final calculation, 32 patients with buccal mucosal graft (Group A) and 30 patients with Johanson's staged urethroplasty (Group B) were followed up for 6 months.

Ages of the patients between two groups were similar and comparable. Highest number of strictures was located in bulbar urethra. The measures of the stricture length were similar between two groups. There was no significant difference between the groups with respect to the mean caliber of urethral strictures. The most frequent cause of urethral stricture was inflammatory and Lichen Sclerosis (LS).

Table I: Distribution of independent variables between two groups.

	Group A (n=32)	Group B (n=30)	p value
Age (In years)	38.25 (±4.26)	40.43 (±6.14)	0.107
Site of stricture (In number)			
Bulbar	14(43.8%)	12(40%)	0.766
Proximal Penile	10(31.3%)	8(26.7)	
Bulbar and penile	8(25%)	10(33.3)	
Length of stricture (In mm)	48.72 (±6.32)	49.63 (±4.59)	0.122

Caliber of stricture (In number)

6 Fr.	18 (56.3%)	22 (73%)	0.329
8 Fr.	14(43.7%)	8 (27%)	

Aetiology of stricture (In number)

Idiopathic	6(18.7%)	5(16.7%)	0.982
Iatrogenic	6(18.7%)	6(20%)	
Inflammatory	8(25%)	6(20%)	
Traumatic	5(15.6%)	6(20%)	
LS	7(21.9%)	7(23.3%)	

During post operative follow up, one week after removal of catheter, Qmax result was significantly better in A group (p=0.008), OR: 0.207; 95% CI=0.05-0.85. Voided urine volume was significantly higher (p<0.001) in Group A.

Table II : Evaluation of outcome 01 week after removal of catheter.

Variables	Group A (n=32)	Group B (n=30)	p value
Uroflowmetry			
Good (>15ml/sec)	25(78.1%)	12(40%)	
Average (10-15 ml/sec)	4(12.5%)	8(26.7%)	0.008
Peak urinary flow rate (Qmax)			
Poor (<10 ml/sec)	3(9.4%)	10(33.3%)	
Voided urine volume (Mean ± SD in ml)	240.31±39.39	198.33±27.8	<0.001

After three months of the operation Qmax and voided urinary volume were considerably higher in Group A than those in Group B and the difference between the groups, were statistically significant (p<0.001). The frequency of UTI was less Group A in comparison to Group B, but the difference was not statistically significant (p=0.176). Where as, resticture formation in Group B was remarkably higher and was statistically significant (9.4% in Group A and 36.7% in Group B, p=0.01).

After 6 months of operation Qmax and voided urinary volume were found considerably higher in Group A than those in Group B and the difference between the groups were statistically significant (p=0.005 and p<0.001 respectively). The frequency of UTI was less in Group A in comparison to Group B (12.5% vs. 20.0%) but the difference was not statistically significant (p=0.422). Recurrent stricture formation was higher in Group B which was statistically significant (9.4% in Group A and 36.7% in Group B, p=0.01).

Table III: Evaluation of outcome at 3 months and 6 months after operation.

Variables	Group A (n=32)	Group B (n=30)	p value
At 3 rd month			
Uroflowmetry Peak	Good(>15ml/sec) 22(68.8%)	7(23.3%)	<0.001
urinary flow rate (Qmax)	Average (10-15ml/sec) 7(21.9%)	11(36.7%)	
Voided urine volume	Poor(<10 ml/sec) 3(9.4%)	12(40%)	
(Mean±SD in ml)	268.44±49.36	180.33±53.47	<0.001
Urinary tract infection	5(15.6%)	9(30.0%)	0.176
Recurrent Stricture	3(9.4%)	11(36.7%)	0.01
At 6 th month			
Uroflowmetry Peak	Good (>15ml/sec) 22(68.8%)	9(30.0%)	0.005
urinary flow rate (Qmax)	Average(10-15ml/sec) 7(21.9%)	10(33.3%)	
Voided urine volume	Poor(<10ml/sec) 3(9.4%)	11(36.7%)	
(Mean±SD in ml)	265.34±50.36	185.40±46.33	<0.001
Urinary tract infection	4(12.5%)	6(20.0%)	0.422
Recurrent Stricture	3(9.4%)	11(36.7%)	0.01

At 3rd month follow up in Group A, good and average caliber urethra were found in 29 cases, revealed success rate of 90.7%. In Group B it was 19(63.4%). At 6th month follow up the success rate were 90.7% and 63.3% respectively. Both of these differences were statistically significant (p=0.016 and p=0.01).

Table IV: Success of the surgery by RGU & MCU status at follow-up.

Follow-up RGU & MCU	Group of the patient		p value	
	Group A (n=32)	Group B (n=30)		
3 rd month	*Success Good	22(68.8%)	11(36.7%)	p=0.016 [†]
	Average	7(21.9%)	8(26.7%)	
	**Failure Poor	3(9.4%)	11(36.7%)	
6 th month	*Success Good	22(68.7%)	10(33.3%)	p=0.01 [†]
	Average	7(21.9%)	9(30.0%)	
	**Failure Poor	3(9.4%)	11(36.7%)	

RGU and MCU:

*Success: Good- Normal caliber urethra
Average- Mild narrowing of urethra
**Failure : Poor-Stricture present

All of the complications occurred at a higher rate in Group B than in Group A (34.4% for Group A vs 73.3% for Group B). Except for dribbling of urine the differences of all other complications were statistically significant between two groups.

Table V: Distribution of post operative complications in between two groups.

Complications	Group of the patients		p value
	Group-A (n=32)	Group-B (n=30)	
Occurrence of any post operative complication			
Yes	11(34.4%)	22(73.3%)	p=0.002 [†]
No	21(65.6%)	8(26.7%)	
Type of post operative complication			
Fistula	2(6.3%)	8(26.7%)	p=0.029 [†]
Recurrence of stricture	3(9.4%)	11(36.7%)	p=0.01 [†]
Recurrent urethritis	3(9.4%)	10(33.3%)	p=0.021 [†]
Wound infection	3(9.4%)	11(36.7%)	p=0.01 [†]
Post micturition dribbling	1(3.1%)	4(13.2%)	p=0.14 ^{††}

Discussion

The incidence of urethral stricture is increasing due to more urethral instrumentation for diagnostic and therapeutic purposes, trauma and urethral inflammatory disease¹⁸. Continuous work has been going on to find out new, easy & effective treatment of urethral stricture with minimum complication. Currently, substitution urethroplasty with BMG has been suggested for long segment anterior urethral stricture with a promising result¹⁹.

In this study age distribution of Group-A was 27-46 years and in Group-B from 31-55 years. Result of different international study showed mean age of Prabha, Islam, Kulkarni, Barbagli, Asopa were 40, 38, 46, 46, 41 and 43 years, respectively^{12,20-23}.

In our study, the lengths of stricture urethra in group A were 3-5.7 cm and in group B 3.1-5.0 cm. Result of different studies show mean length of stricture of Habib AKMK, Islam MF, Barbagli et al & Asopa were 3.5 cm, 4.0 cm, 6 cm (2-10 cm) and 4.2 cm (3-10 cm) respectively^{24,20-23}.

Majority of the patients had bulbar urethral stricture in both groups. There was no significant difference of location of strictures between the groups. Habib AKMK showed the results which were almost similar with our study and no significance of difference of location of stricture in dorso-lateral onlay BMG urethroplasty²⁴. Iselin and Webster reported development of erectile chordee as a complication of BMG in penile urethral strictures²⁵.

Comparison of causes of stricture between the study groups shows that none of the causes had significant difference between the groups ($p > 0.05$). In the series of Barbagli et al highest incidence of stricture was iatrogenic 60% followed by inflammatory 25%²². In the international studies Probha, Islam et al shows LS 60%, 48%, iatrogenic 25%, 14% & idiopathic 15%, 25% respectively^{12,20}.

Postoperatively, 01 week after removal of urethral catheter, in Group A Q-max was better than Group B (78.1% Vs 40%). During follow up in 3 months, these rates were 68.8% Vs 23.3% and at 6 months follow up, these were 68.8% Vs 30% with mean Q-max 21.47 ml/sec. In the series of Islam et al post operative peak urinary flow of successful patients was 17.3 ml/s versus the pre-operative average peak urinary flow of 6.9 ml/s²⁰. Barbagli et al reported peak flow rate ranged between 18 to 29 ml/sec (Mean 21)²⁶. Jain and Talwar showed mean maximal urine flow rate (Q-max > 15 ml/sec) improved from 8.3 ml/sec to 18.7 ml/sec after surgery, success rate of BMG was 92.7%. Das et al^{27,28}.

During follow up at 3rd month RGU and MCU revealed stricture in 3 (9.4%) patient of Group A and 11 (36.7%) patients of Group B. Success rate of Group A was 90.7% and Group B was 63.3%. During follow up at 6th month, RGU and MCU revealed stricture in 3 (9.4%) patients of Group A and 11 (36.7%) patients of Group B. Success rate of Group A was 90.7% and Group B was 63.3%. This is comparable with Habib AKMK, Asopa et al, Raber et al where we can see 93.3%, 91.6% and 85% success by RGU after BMG urethroplasty^{24,23,29}.

In evaluation of post operative complications out of 32 patients in Group A, 9.4% developed wound infection. After regular dressing infection subsided but fistulas were observed in 6.3% after removal of catheter, one was healed spontaneously with 2 weeks further catheterization. 9.4% patients develop recurrence, out of them 6.3% were managed by internal Optical Urethrotomy (OIU). In Group B of 36.7% patients develop wound infection which was managed as previous group, but of them 26.7% patients develop fistula, out of them 13.3% patients were also managed by 2 weeks further catheterization. 36.7% patients develop recurrence of which 16.7% patients were also managed by OIU. Andrich and mundy, Islam MF, Prakasa RB were reported 11%, 8%, 4% of recurrent

stricture in BMG urethroplasty^{5,20,13}. Studies of Johanson's urethroplasty showed complications rate- urethrocutaneous fistula 7.8% by Culp and associates, stricture 25% & fistula 11% by Johanson himself and 9% UTI (Ali & Hajaj)^{15,14,10}. All above complications were observed higher in Group B compared to those in Group A, the differences between two groups reach the level of significance ($p > 0.05$)

The overall success rate of dorsolateral onlay buccal mucosal graft urethroplasty (Group-A) was 90.7% and Johanson's staged urethroplasty was 63.3%. So our study of urethroplasty was similar to other studies, kulkarni et al, Islam et al, Habib et al, Prabha et al, Prakasa et al where success rate of dorsolateral onlay BMG urethroplasty were 92%, 92%, 93.3%, 85% and 96% respectively^{21,20,24,12,13}. Overall success of Johanson's staged urethroplasty was similar to other studies Johanson, Ali-Hajaj, Farnandes and draper reported success rate were 67.5%, 60% & 72% respectively^{14,10,17}.

Thus dorsolateral onlay BMG urethroplasty a single stage procedure, causes less complications and morbidity, produces better results than conventional Johanson's staged urethroplasty. In this context, dorsolateral onlay buccal mucosal graft urethroplasty can consider a better option for long segment stricture of anterior urethra.

Limitations

Limitations of the study include smaller sample size, shorter follow up, surgery done by different surgical teams and single center based study.

Conclusion

From this study we can conclude that the outcome of dorsolateral onlay buccal mucosal graft urethroplasty is better than Johanson's staged urethroplasty. Therefore, dorsolateral onlay BMG urethroplasty can be preferred for long segment anterior urethral stricture.

Recommendation

Preliminary results with dorsolateral onlay BMG urethroplasty for long segment anterior urethral stricture are encouraging. A long-term follow-up is necessary to observe the possible advantages of this newer technique.

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Contribution of authors

SPN - Conception design, acquisition of data, manuscript writing & final approval.

UB - Acquisition of data, manuscript writing & final approval.

MA - Data analysis, interpretation of data & final approval.

MRI - Interpretation of data, critical revision & final approval.

MMUH - Conception, critical revision & final approval.

Disclosure

All authors declared no competing interest.

References

1. Chapple C. Anterior Urethral Surgery : Current Concepts and Future Directions. *Eur Urol.* 2010;73:105-108.
2. Jordan GH and Schlossberg SM. Surgery of the penis and male urethra. In: Wein A.J. Kavoussi L.R. Novick A.C. Partin A.W. and Peter C.A. (ed). *Campbell's Urology*, 11th edition, Philadelphia: Saunders. 2016;3886-3954.
3. Hampson LA, McAninch JW, Breyer BN. Male urethral structures and their management. *PMC.* 2014;11(1):43-50.
4. Andrich DE and Mundy AR. Urethral stricture and their surgical management. *BJU Int.* 2000;86:571-580.
5. Smith III TG. Current management of urethral structure disease. *Indian J Urol.* 2016; 32(1):27-33.
6. Morey AF and McAninch JW. Techniques of harvesting buccal mucosa for urethral reconstruction. *J Urol.* 1996;155:1696-1697.
7. Pahwa M, Gupta S, Pahwa M, Jain BDK and Gupta M. A comparative study of dorsal buccal mucosal graft substitution urethroplasty by dorsal urethrotomy approach versus ventral sagittal urethrotomy approach. Article ID-124836. 2013;1-5.
8. Caldamone AA, Edstrom LE, Koyle MAS, Patterson JM, Inman RD, MacNeil S. Buccal mucosal graft for urethral reconstruction. *Urology.* 1998;51:15-19.
9. Bhargava S and Chapple CR. Buccal mucosal graft urethroplasty: Is it the new gold standard? *BJU Int.* 2004;93:1191-1193.
10. Al-Ali M and Al-Hajaj R. Johanson's staged urethroplasty revisited in the salvage treatment of 68 complex urethral stricture. *Eur Urol.* 2007; 47:173-177.
11. Andrich DE, Leach CJ and Mundy AR. The Barbagli procedure gives the best results for patch urethroplasty of the bulbar urethra. *BJU.* 2001;88:385-389.
12. Prabha V, Shishir D, Vernekar R, Hiremath M. Single stage dorsolateral onlay buccal mucosal urethroplasty for long anterior urethral strictures using perineal route. *BRAZ J Urol.* 2016;42:564-570.
13. Prakasa RB, Prabhakar RM, Sridhar P. Dorsolateral onlay BMG urethroplasty in the management of inflammatory stricture urethra: A prospective clinical study. *GJRA.* 2016;5:30-32.
14. Johanson B. Reconstruction of the male urethra in strictures. *Acta Chir Scand.* 1953;176:1-103.
15. Culp DA, Flocks RH and Marberger H. Experiences with the Johanson-Denis Browne technique of urethroplasty. *BJU Int.* 1957;77:446-449.
16. Colapinto V. Two stage urethroplasty for stricture, results and technical considerations. *BJU Int.* 1969;41:491-493.
17. Fernandes M and Draper JW. Two stage urethroplasty. *Urology.* 1975;6, 568-573.
18. Peterson CA and Webster GD. Management of urethral stricture disease: Development options for surgical intervention. *BJU Int.* 2004;94, 971-976.
19. Andrich DE and Mundy AR. Substitution urethroplasty with buccal mucosal free grafts. *J Urol.* 2001;165:1131-1134.
20. Islam MF, Haque ME, Islam MW, Hooda MN, Alam MS, Awal MA, Rasul A, Salam MA. Dorsolateral onlay OMG urethroplasty through unilateral urethral mobilization in anterior urethral stricture. *BJU.* 2011;14:22-25.
21. Kulkarni SB, Barbagli G and Salvatore S. One sided anterior urethroplasty: A new dorsal onlay graft technique. *BJU International.* 2009;104:1150-1155.

- 22.** Barbagli G, Palminteri E, Guazzoni G, Montorsi F, Turini D, Lazzeri M. Bulbar urethroplasty using buccal mucosa grafts placed on the ventral, dorsal or lateral surface of the urethra: Are results affected by the surgical technique? *J Urol.* 2005;174:955-958.
- 23.** Asopa HS, Garg M, Singhal GG, Singh L, Asopa J, Nischal A. Dorsal free graft urethroplasty for urethral stricture by ventral sagittal urethrotomy approach. *Urology.* 2001;58: 657-659.
- 24.** Habib AKMK, Alam AKMK, Amanullah ATM, Rahaman H, Hossain AKMS, Salam MA, Kibria SAMG. Dorsolateral onlay urethroplasty for long segment anterior urethral stricture: Outcome of a new technique, *BMRC.* 2011;37:78-82.
- 25.** Iselin CE, Webster GD. Dorsal onlay graft urethroplasty for repair of bulbar urethral stricture, *J Urol.* 1999;161:815-818.
- 26.** Barbagli G, Palminteri E, Guazzoni G, Cavalcanti A. Bulbar urethroplasty using the dorsal approach: Current techniques, *Int Braz J Urol.* 2003;29:155-161.
- 27.** Jain DK and Talwar R. Outcome of dorsal onlay buccal mucosal graft substitution urethroplasty in long strictures of anterior urethra. *MJAFI.* 2007;63:12-14.
- 28.** Das SK, Kumar A, Sharma GK, Pandey AK, Bansal H, Trivedi S, Dwivedi US, Bhattacharya V, Singh PB. Lingual mucosal graft urethroplasty for anterior urethral strictures, *J Urol.* 2009;73(1):105-108.
- 29.** Raber M1, Naspro R, Scapaticci E, Salonia A, Scattoni V, Mazzocoli B, Guazzoni G, Rigatti P, Montorsi F. Dorsal onlay graft urethroplasty using penile skin or buccal mucosa for repair of bulbar urethral stricture: results of a prospective single center study, *Eur Urol.* 2005;48(6):1013-1017.