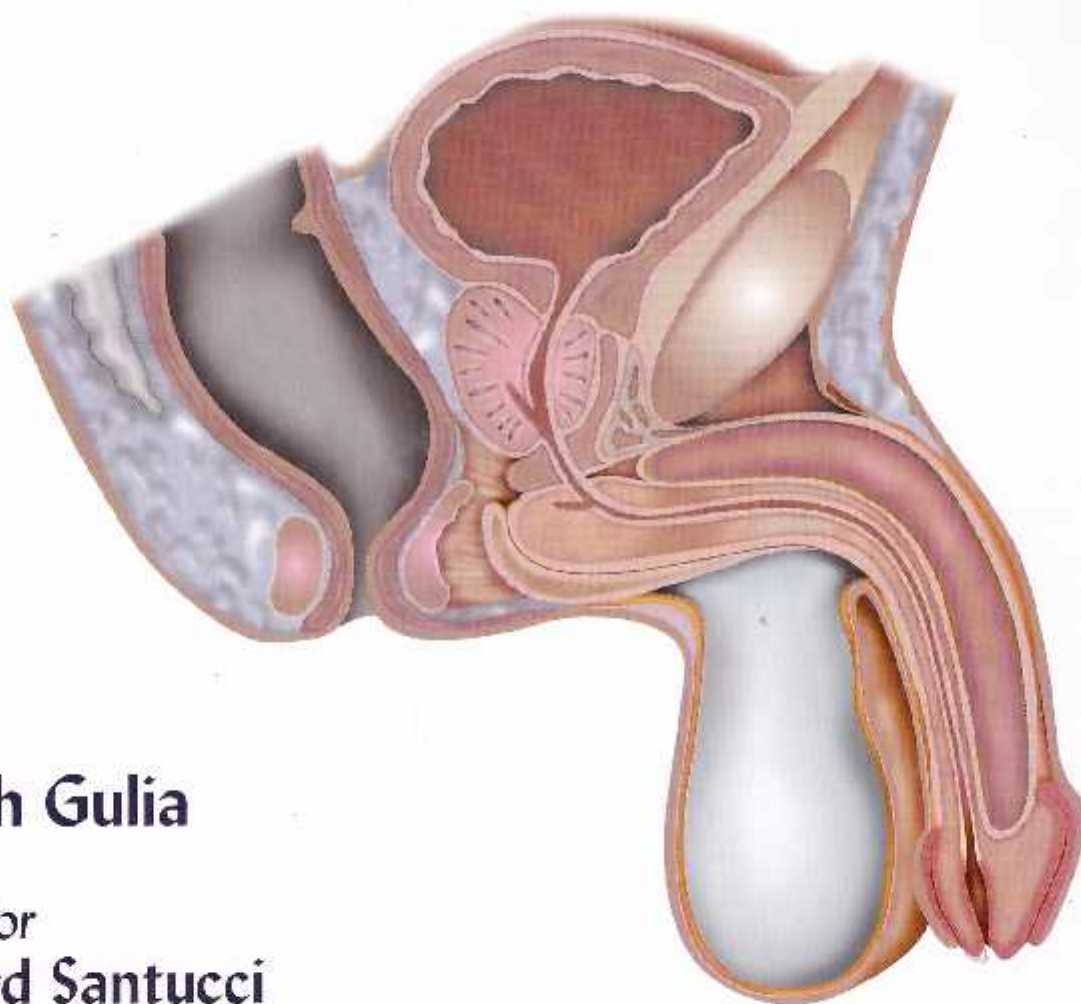


Atlas of **URETHROPLASTY**



Editor
Rajesh Gulia

Co-Editor
Richard Santucci



**Includes 2
Interactive DVD-ROMs**
Containing 10 Videos
Duration 5 hours (approx)

Foreword
Sanjay B Kulkarni



Free Graft Urethroplasty by Ventral Sagittal Urethrotomy Approach



HS Asopa

HS Asopa, Al. Vyas, GG Singhal

Chapter Outline

- Preoperative Evaluation
- Surgical Techniques
 - Dorsal Free Graft Urethroplasty by Ventral Sagittal Urethrotomy Approach in Penile Urethral Strictures
 - Dorsal Free Graft Urethroplasty in Bulbar Urethral Strictures
 - Dorsal Free Graft Urethroplasty in Panurethral Strictures
 - Combined Dorsal and Ventral Free Graft Urethroplasty by Ventral Sagittal Urethrotomy Approach
- Results of Ventral Sagittal Urethrotomy Approach
- Comments
 - Advantages
- Editorial Comments

Abstract

Though this method is developed and perfected by Professor Asopa himself, he never calls this procedure by his name. Rather calls it as free graft urethroplasty by ventral sagittal urethrotomy approach. The basis is minimal dissection of the urethral plate to preserve its maximum nerve and blood supply. All this translates into better results. Also better preservation of sexual function. Practical steps and tips have been clearly described as to how Professor Asopa does it. Written by the master himself, it is a treat to go through this manuscript.

Keywords

Ventral sagittal urethrotomy, Tunica albuginea, Meshed free graft, Quilting of graft, Palminteri, Combined dorsal and ventral free graft urethroplasty, Bisected urethra, Dorsal free graft, Ventral free graft, Substitution urethroplasty, Circumflex vessels, Native urethral plate, Circumcoronal incision.

INTRODUCTION

The management of the anterior and posterior urethral strictures defers considerably. Although simple urethral dilatation and optical urethrotomy are commonly used procedures yet the long-term success remains always in doubt in the management of anterior urethral strictures. Simple stricture excision with primary spatulated anastomosis in bulbar urethral strictures is a common surgical treatment with long-term cure.¹

The penile strictures, recurrent, multiple and long anterior urethral strictures need tissue substitution for cosmetic and long-term success. Presently buccal, preputial and penile skin are commonly used to substitute the urethra as free graft, which can be used dorsally, ventrally or both.²

Recently dorsal free graft has gained popularity and well accepted world over. Barbagli et al. (1996) described

the dorsal free graft technique by mobilizing the strictured urethra and a dorsal stricturotomy.³ Asopa et al. (2001) described dorsal free graft urethroplasty by ventral sagittal urethrotomy approach.⁴ Since then this technique is well taken-up and practiced world over. This chapter describes the substitution urethroplasty for anterior urethral strictures by this technique. It can be further extended by combining a ventral free graft in refractory bulbomembranous strictures [as described by Palminteri et al. (2008)] with good results.

PREOPERATIVE EVALUATION

Every patient is evaluated by detailed history, physical examination, uroflowmetry, micrurating cystourethrogram and retrograde urethrogram. In some cases urethroscopy is resorted to. Ultrasound examination and magnetic resonance imaging of stricture may be resorted to in

difficult redo complicated cases where things are not amply clear.

SURGICAL TECHNIQUES

Dorsal Free Graft Urethroplasty by Ventral Sagittal Urethrotomy Approach in Penile Urethral Strictures

Patient is placed in supine position if the stricture is limited to the pendulous penile portion. Appropriate regional or general anesthesia is administered. Urethra is exposed by midline ventral penile incision. Methylene blue is injected (in the lumen of urethra) and 5 F feeding tube is placed in lumen of strictured urethra. Alternatively a guide wire is placed through the narrow lumen of strictured urethra with the help of urethroscopy. A 16 F Nelaton's catheter is introduced through the external urethral meatus to identify the distal site of stricture.

Step 1

Ventral urethrotomy is created to lay open the strictured portion on the urethra and extended for 1 cm, both

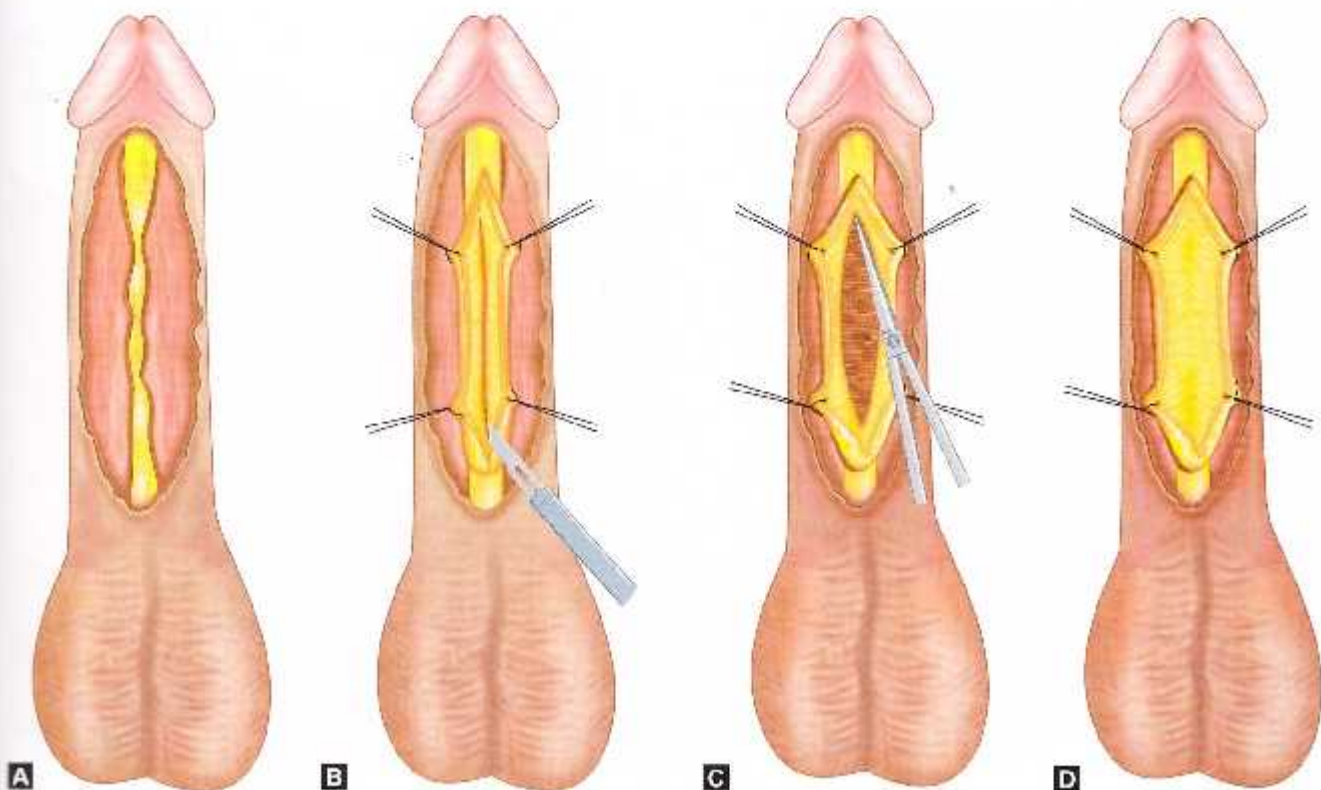
proximally and distally into the healthy urethra (Figs 8.1A and B) after infiltrating 2% lignocaine with adrenaline diluted four times.

Step 2

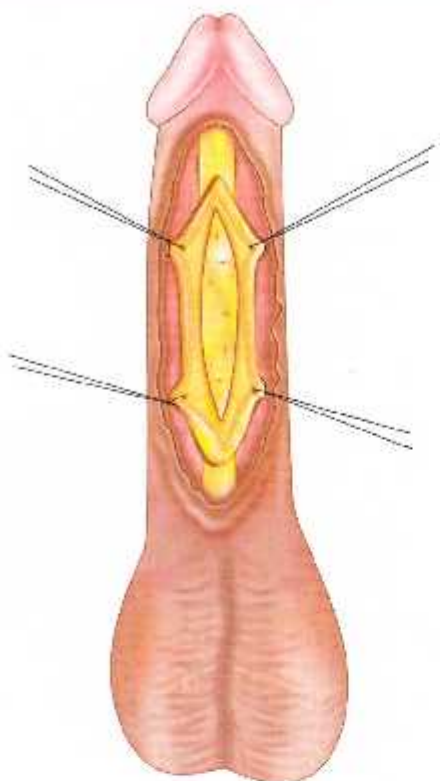
Dorsal wall of the laid open strictured urethra is incised in the midline down to the tunica albuginea of the underlying corporal bodies (after infiltrating diluted lignocaine with adrenaline). The margins of incised dorsal urethra are dissected/excised from the tunica by sharp dissection without lifting the two halves of bisected urethra, to create an adequate elliptical raw area over tunica albuginea (Fig. 8.1C). Medial margins of bisected urethra are anchored to underneath tunica using 5-0 polyglactin (vicryl) interrupted sutures (Fig. 8.1D).

Step 3

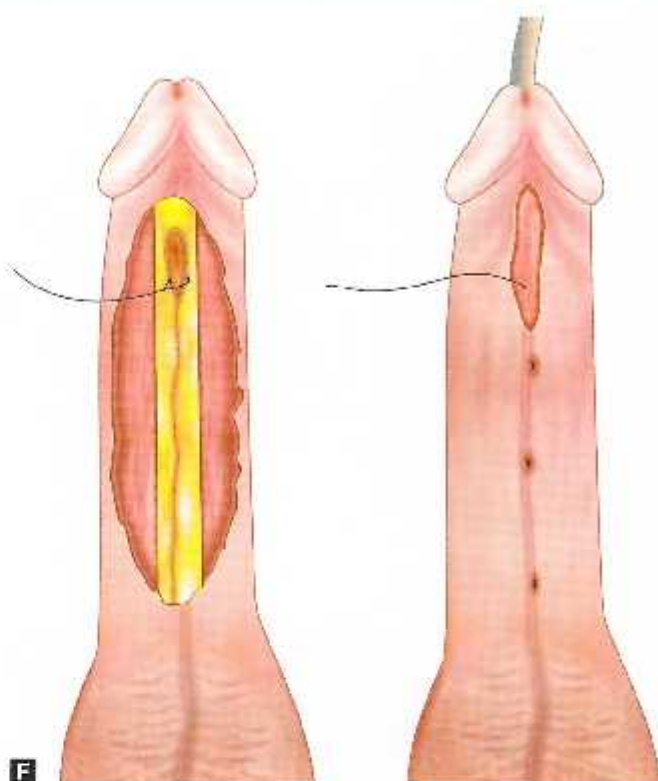
A meshed free graft (defatted inner preputial or buccal mucosa or penile skin) is placed over raw area as dorsal inlay (the defatted surface facing the tunica) and anchored to the medial margins of bisected urethra, incorporating underlying tunica by using 5-0 polyglactin interrupted



Figs 8.1A to D



E



F

Figs 8.1E and F

Figs 8.1A to F: (A and B) Ventral urethrotomy is created to lay open the stricture; (C and D) Dorsal wall of the laid open structured urethra is incised in the midline. Medial margins of bisected urethra are anchored to underlying tunica; (E) A meshed free graft is placed over the raw area and fixed to the margins as well as quilted to the underlying tunica; (F) Retubularization of the urethra with 4-0 vicryl and skin closure.

sutures. The graft is further quilted to underlying tunica at several places (**Fig. 8.1E**).

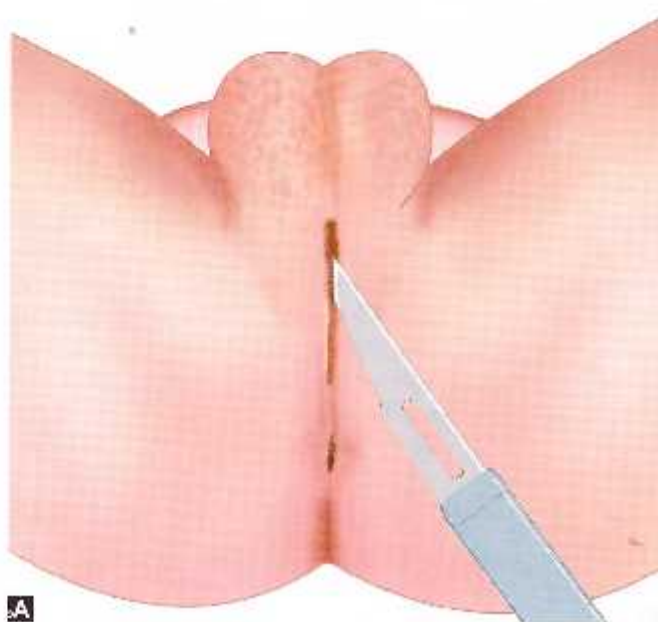
Step 4

Urethra is retubularized by continuous sutures of 4-0 polyglactin on an appropriate sized catheter (**Fig. 8.1F**). Pressure dressing is done following layered wound closure.

Catheter is removed after 3 weeks. All patients are followed-up regularly, following surgery by uroflowmetry, and urethrogram is done when the Qmax (maximum flow rate) is less than 15 ml/min on uroflowmetry. Urethroscopy is done in selected cases.

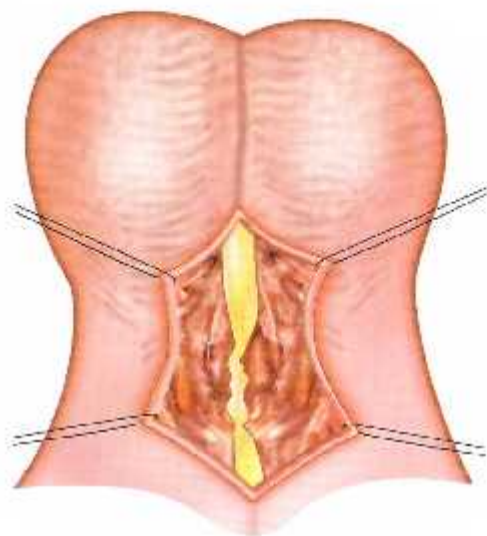
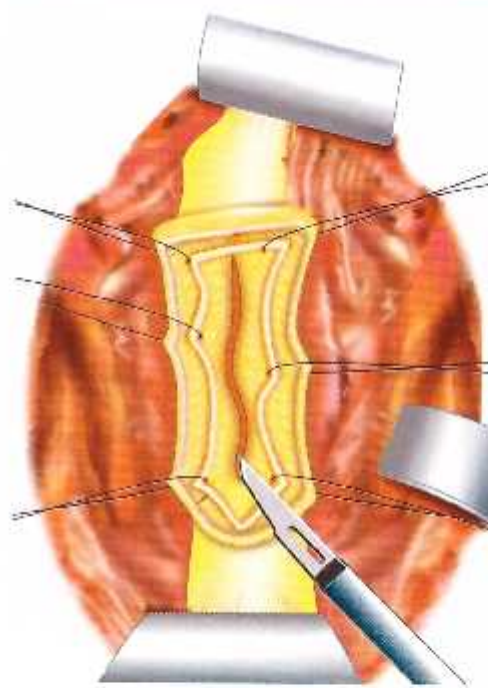
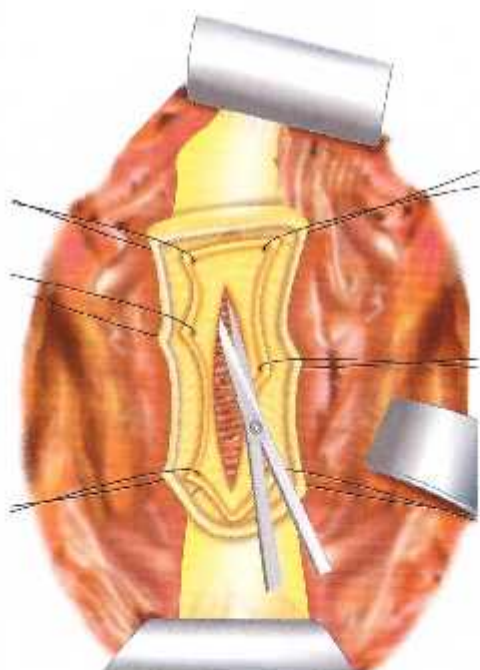
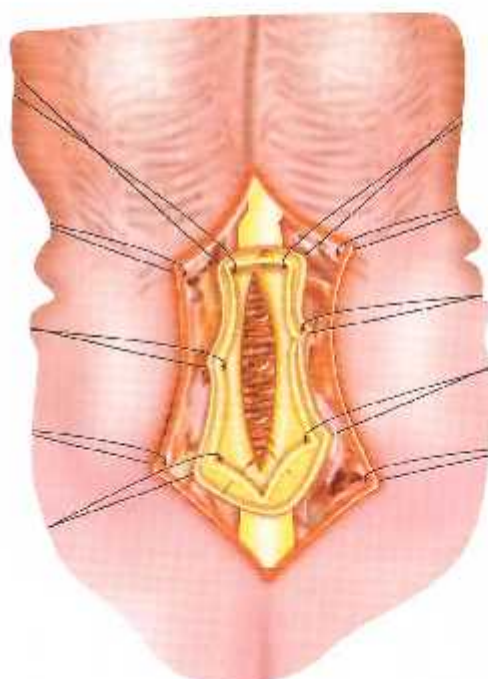
Dorsal Free Graft Urethroplasty in Bulbar Urethral Strictures⁵

The patient is placed in lithotomy position. A midline perineal incision is made. Rest of the steps are same as described step-wise above and as illustrated in the **Figures 8.2A to G**.

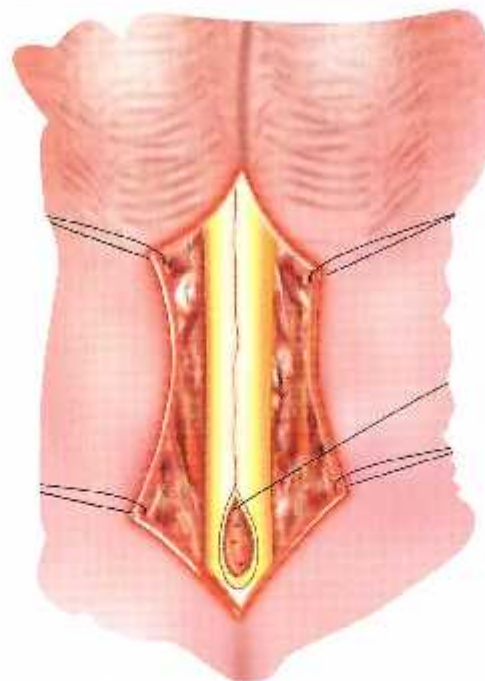
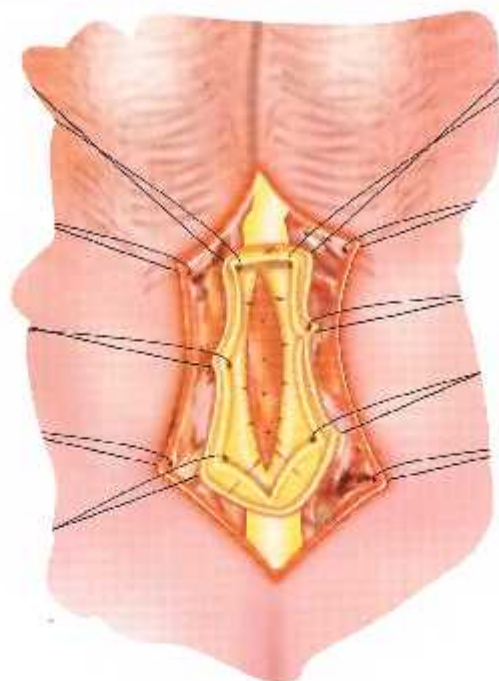


A

Fig. 8.2A

**B****C****D****E**

Figs 8.2B and F.



Figs 8.2F and G

Figs 8.2A to G: (A) Midline perineal incision; (B) The stricturous portion of the bulbar urethra is exposed; (C) After ventral urethrotomy and laying open of the stricture, a midline dorsal incision is given; (D) The midline dorsal incision is extended into healthy urethra on both sides; (E) Adequate raw area created as the graft bed. Note the medial margins of bisected urethra are fixed to the underlying tunica; (F) The free graft is placed on the raw area and fixed at margins as well as quilted to underlying tunica; (G) Retubularization of the urethra

Step 1

Midline perineal incision is given, the various fascial layers are cut in midline till bulbospongiosus is reached, which is incised in the midline (if required) to expose the stricturous portion of the bulbar urethra. A ventral urethrotomy is given and the stricturous part of the bulbar urethra is laid open. It is important to extend the incision into healthy urethra both proximally and distally (**Figs 8.2A to C**).

Step 2

A midline dorsal incision is given in the stricturous part of the bulbar urethra and care is taken to extend it into healthy urethra both proximally and distally. Adequate raw area is created as the graft bed. If required, fibrous tissue may be excised bit by bit (**Figs 8.2D and E**).

Step 3

The prepared buccal mucosa is placed on the raw surface and fixed on the margins as well as quilted to the underlying tunica (**Fig. 8.2F**).

Step 4

The urethra is now retubularized starting from the proximal end. The wound is then closed in layers (**Fig. 8.2G**).

Dorsal Free Graft Urethroplasty in Panurethral Strictures

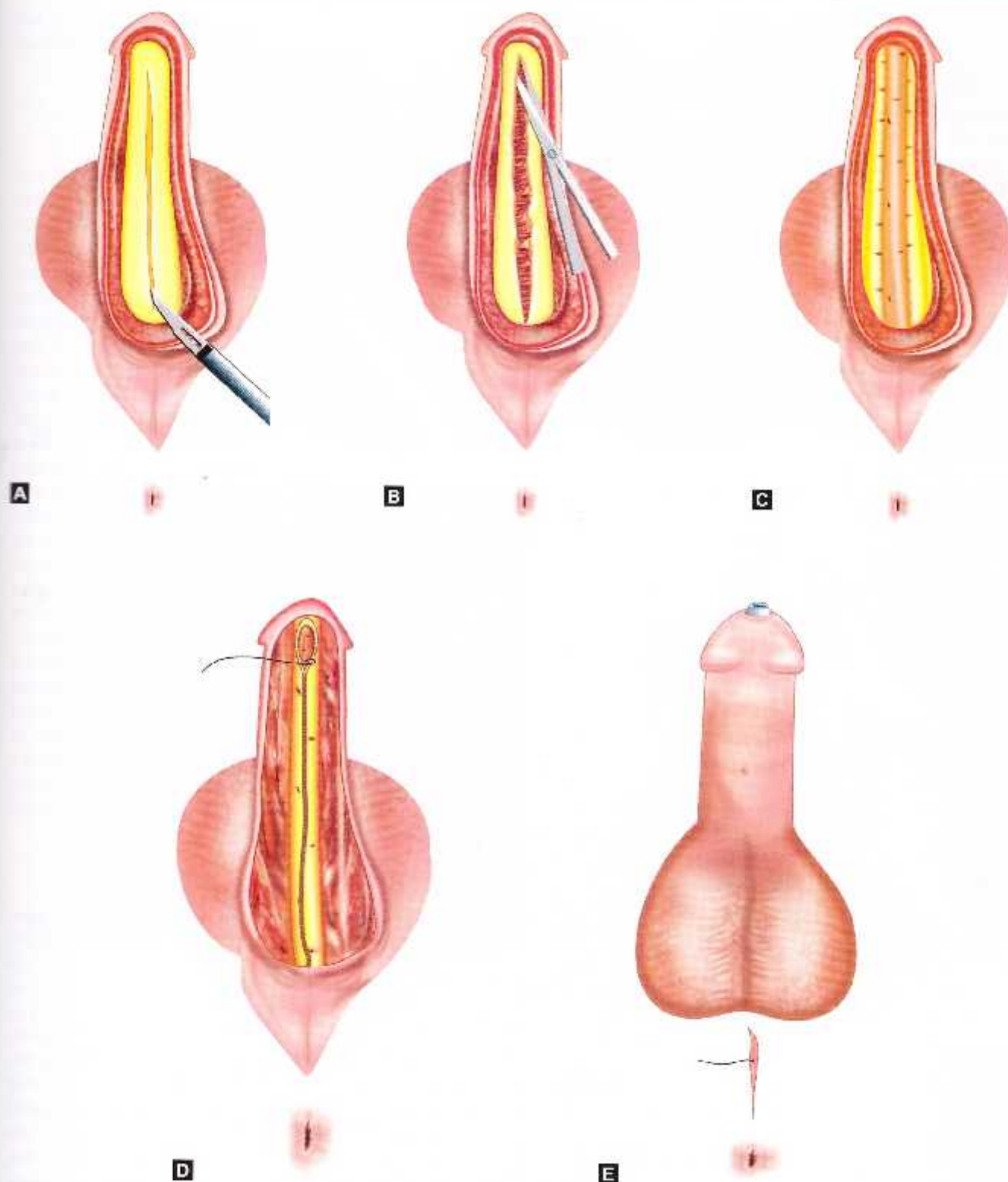
Here also the basic steps are same as illustrated in **Figures 8.3A to E**. Patient is placed in the lithotomy position to enable approach to the bulbar urethra.

Step 1

Midline penile incision and ventral urethrotomy are given over some sort of guide in the urethra depending upon its calibre (glide wire/infant feeding tube/metal dilator) (**Fig. 8.3A**).

Step 2

Liberal dorsal urethrotomy incision is given in **Figure 8.3B**.



Figs 8.3A to E: (A) Ventral urethrotomy; (B) Dorsal urethrotomy; (C) Free graft placement and fixation as a dorsal inlay; (D) Retubularization of the urethra; (E) Wound closure in layers

Step 3

Buccal mucosal graft is placed with its raw surface on the underlying corpora and the mucosal surface facing the surgeon. It is then fixed to the underlying corpora using 5/8th curve 4'0 or 5'0 vicryl on a cutting needle (**Fig. 8.3C**).

Step 4

The open urethra is now retubularized starting proximal to distal with continuous absorbable suture with interlocking in between. The wound is then closed in layers (**Figs 8.3D and E**).

Combined Dorsal and Ventral Free Graft Urethroplasty by Ventral Sagittal Urethrotomy Approach

Palminteri et al. (2008) described combined dorsal and ventral double buccal mucosa graft in bulbar urethral reconstruction.³²

In tight bulbar and bulbomembranous strictures of varying length, authors have repaired these strictures by combining dorsal and ventral free graft urethroplasty (as suggested by Palminteri et al.) and thus preserved narrow urethral plate to obtain adequate urethral augmentation and to avoid sexual complications.

Surgical Technique

The strictured bulbar urethra is exposed by using ventral sagittal urethrotomy approach [(Asopa et al., 2001) dorsal free graft urethroplasty technique] with the aid of a guide wire and methylene blue, as described earlier and a dorsal free graft is applied (**Figs 8.4A to E**).

Ventral Free Graft

Following dorsal augmentation, the second graft is sutured laterally to the right margin of bisected urethra, by running 5-0 chromic sutures (with epithelial surface facing toward the lumen). Indwelling catheter is inserted and graft is rotated and sutured laterally to the left margins of bisected urethra, by running 5-0 chromic sutures. Thus a neourethra is created by using dorsal and ventral free graft patches to the mucosal margins of bisected urethral plate. A few quilting stitches of 5-0 chromic catgut are given between ventral graft and corpora spongiosum. Finally fascia of corpora spongiosum is closed over the ventral graft with 4-0 running sutures (**Figs 8.4F to I**).

Postoperative Assessment

It includes uroflowmetry and complete urine examination, every 4 monthly for 1st postoperative year and then

annually thereafter. Urethrography and urethroscopy are performed for patients presenting a Qmax of less than 15 ml/sec.

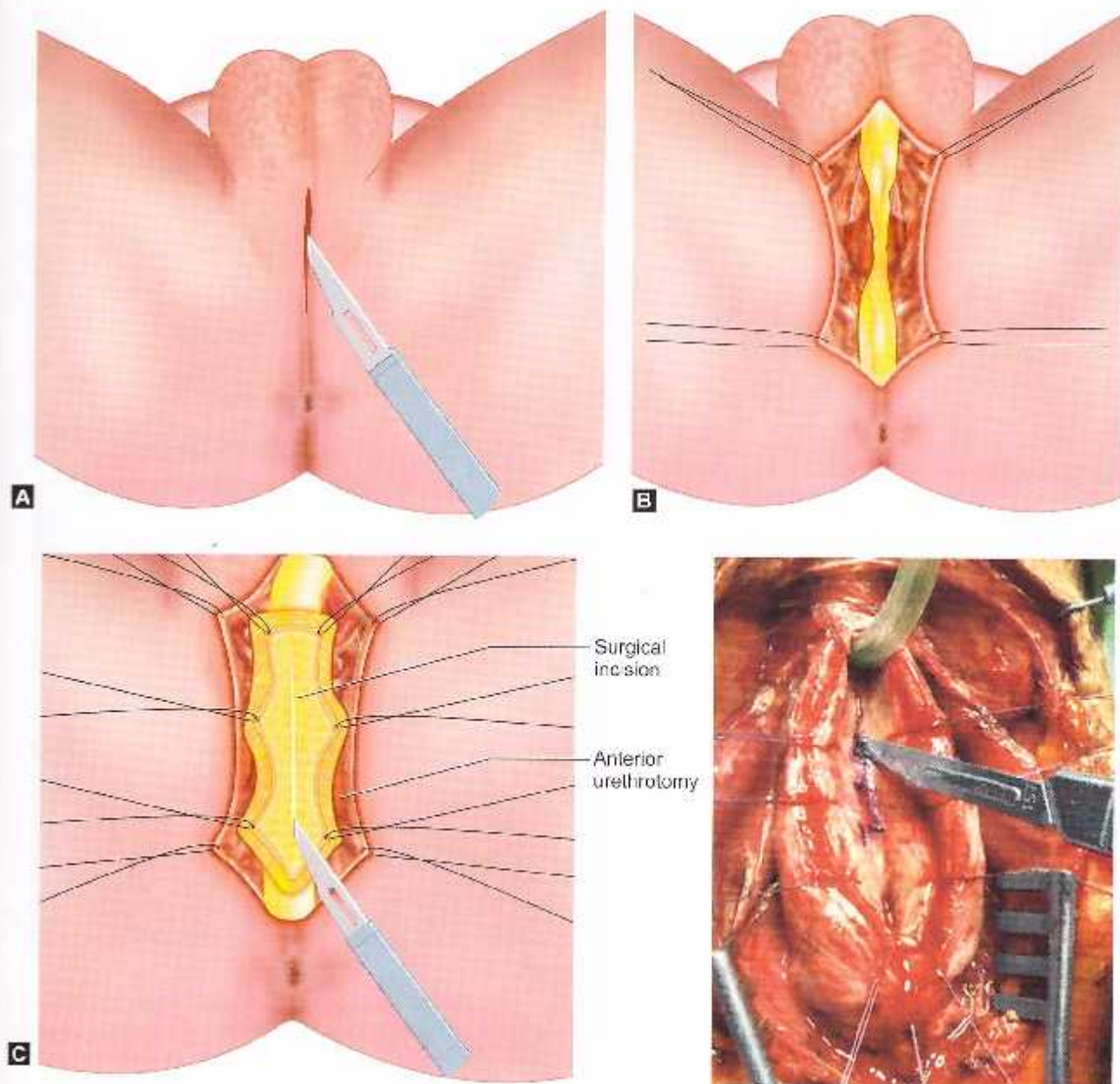
RESULTS OF VENTRAL SAGITTAL URETHROTOMY APPROACH

In authors' series, 219 cases of long anterior urethral and multiple strictures ranging from 2 cm to full length were operated upon between January 1998 and July 2011 with follow-up from 6 months to 11.5 years. Urethroscopy was done in 12 cases, showing good take-up of graft and urethrogram showing normal caliber urethra in all cases after surgery. One patient developed temporary fistula which healed up spontaneously after 2 weeks of further catheterization. Twenty two cases developed resticture, six were controlled on dilatations done three times in 1 year and now voiding normally. Optical internal urethrotomy was done in 3 cases and 13 were operated, 4 by dorsal free buccal mucosal graft and 9 by ventral free graft. Uroflowmetry and calibration were done regularly following the surgery, which confirmed normal diameter of urethra with uroflow rate of more than 15 cc/sec. Of these, 129 patients had a follow-up of more than 1 year. Three patients with long penile stricture who had some chordee before surgery developed significant chordee after surgery, which had to be treated by dorsal plication.

Seventy seven patients of bulbar and bulbomembranous urethral stricture (1–5 cm long) have been treated by dorsal and ventral free graft urethroplasty by ventral sagittal urethrotomy approach with follow-up from 6 months to 6 years. All these patients have uroflow of 15–40 ml/sec (mean preoperative flow rate < 7 ml/sec). Three patients developed dense stricture and were managed by perineal urethrostomy after counseling.

COMMENTS

Substitution urethroplasty is the mainstay of treatment for long anterior urethral strictures, anterior and multiple urethral and penile strictures. Either skin or mucous membrane graft or vascularized graft from genital area has been used for several years. Free graft when used as a patch ventrally in penile urethral stricture is easy to perform but is without support of spongiosa ventrally, leading to pooling of urine, ballooning and restriking making these less reliable in long-term. Free extragenital full thickness or partial thickness skin graft fares the worst.⁶ It was believed that vascularized genital skin flap in one-stage or two-stages would fare well because of its own blood supply. Vascularized inner preputial or penile skin islands, when used as a tube, have the same fate due to ballooning and pooling of urine in proximal

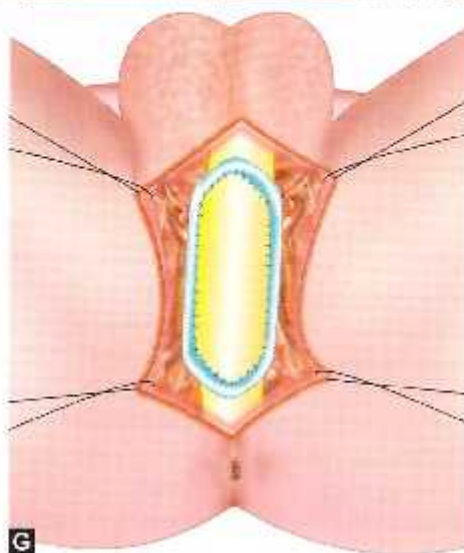
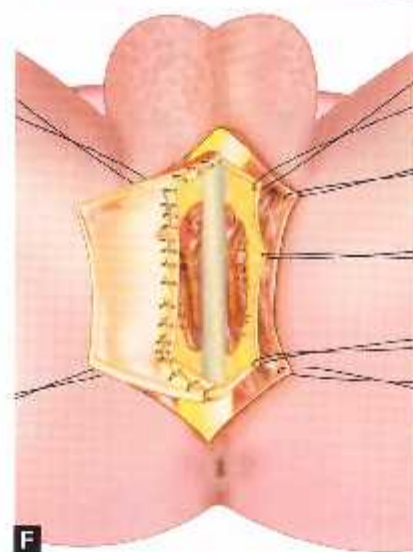
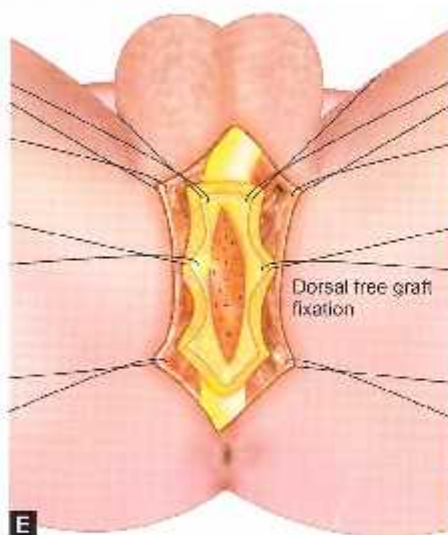
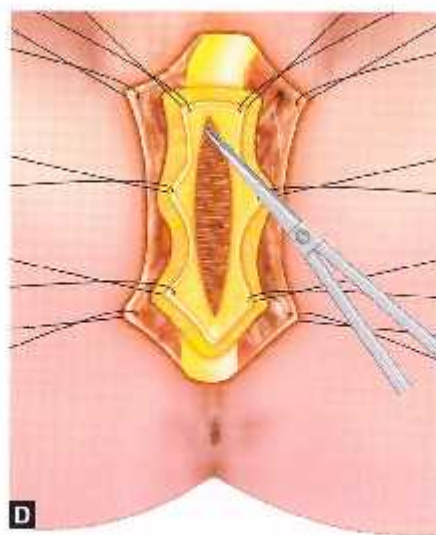


Figs 8.4A to C

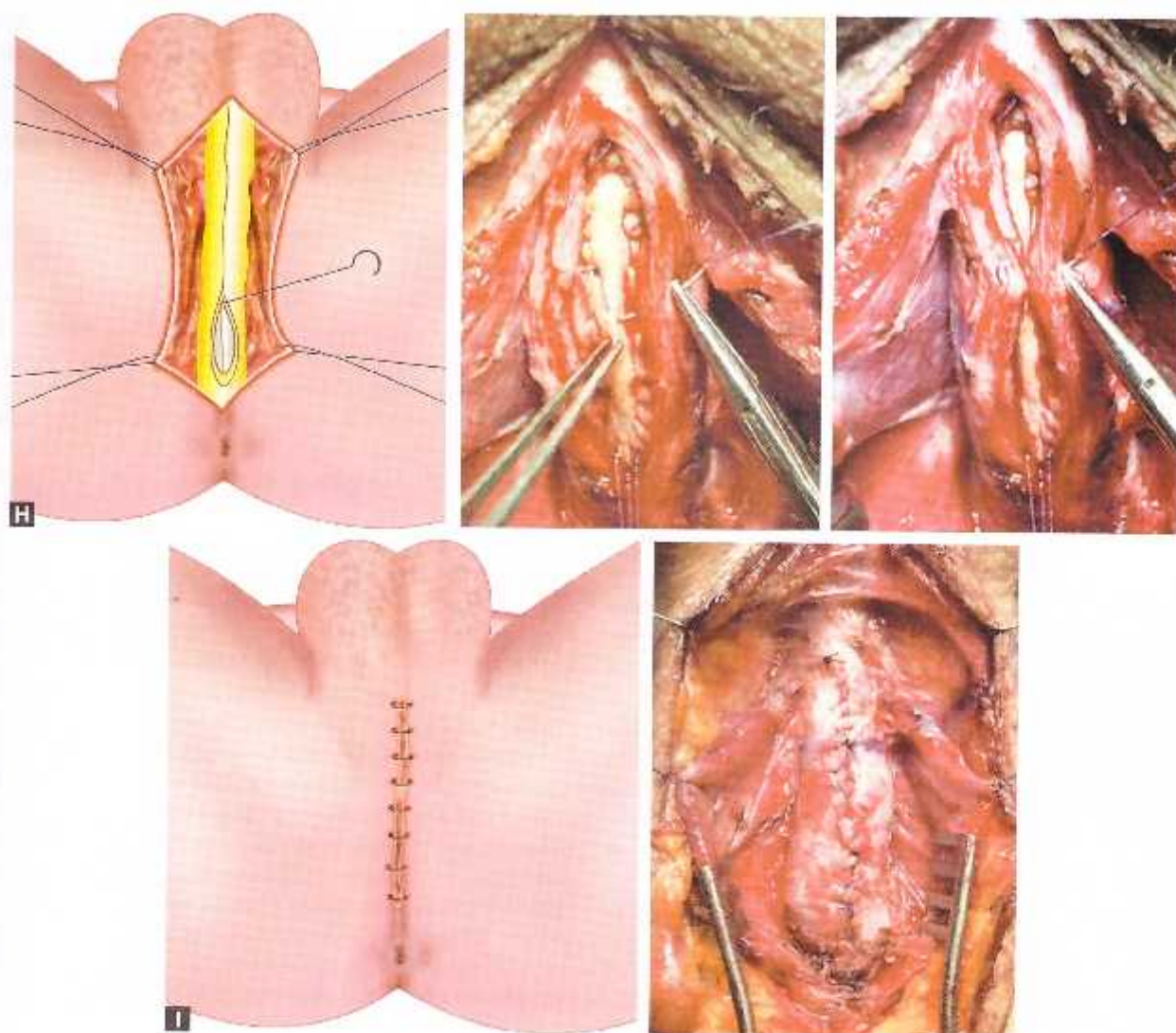
anterior urethral strictures. Recent introduction of a technique, which places the free graft dorsally over the tunica after mobilizing the strictured urethra and a dorsal stricturotomy has found favor as it eliminates the outpouching and ballooning of the graft, because it is supported by corporal bodies (Barbagli).^{3,9} In the present approach the urethra is not mobilized. Even long urethral strictures can be managed and approach is easy. The two halves of the urethra derive their blood supply from circumflex vessels and perforating vessels,^{10,11} and these

are preserved in this approach. In the approach in which the urethra is mobilized, these vessels are severed, thus compromising the vascular supply to the native urethral plate.

Dorsal and ventral graft urethroplasty technique in nonobliterative bulbar urethral strictures is an alternative to aggressive anastomotic urethroplasty as it provides enlarged urethral lumen, preserves vascularity and nerve supply, thus improving urinary flow and better ejaculatory sensations.



Figs 8.4D to G



Figs 8.4H and I

Figs 8.4A to I: (A) Midline perineal incision for exposing the stricture of bulbar urethra; (B) Exposed strictured bulbar urethra; (C) Dorsal midline urethrotomy in ventrally laid open urethra; (D) Mobilization of bisected urethra from the tunica (without lifting two halves of the bisected urethra); (E) Anchoring and quilting of dorsal free graft; (F) Suturing of ventral free graft; (G) Completed dorsal free graft-ventral free graft; (H) Bulbospongiosa closed over ventral free graft taking few bites through the graft in between, as quilting sutures; (I) Completed dorsal and ventral graft urethroplasty

The present study only suggests an alternative approach to apply the free grafts. It is easier to perform as the scarred urethra is not mobilized. The patients who required dorsal placcation had a full length penile urethral stricture with marked spongiofibrosis and mild chordee preoperatively. Patients with periurethral abscess and fistula were also dealt with, by staged procedures.

Advantages

- Easy to learn and does not require extensive training
- Can be done by circumcoronal or midline perineal incision, thus minimizes the risk of fistula and provides good esthetic outcome
- Respect of penile shaft components

- Flexibility to use preputial skin graft or oral mucosa
- As this technique requires no mobilization of urethra vascular and circumflex nerve supply is maintained
- Accurate sizing of graft minimizes pooling of urine and semen
- Dorsal and ventral graft technique provides better augmentation and thus wider lumen
- Provides good urinary flow and at the same time preserves ejaculatory sensations
- Dorsal and/or ventral free graft can be used in repeat procedure in cases of restenosis
- May be used in patients of strictures after hypospadias surgery
- Can be used in selected patients with strictures caused by lichen sclerosis or balanitis xerotica obliterans.

EDITORIAL COMMENTS

Dr Rajesh Gulia

Nowhere in the whole write-up has the author used the term "Asopa's urethroplasty". Very modest indeed. But we all know that the credit for this technique goes to Professor HS Asopa. The main strength of this technique lies in its simplicity. It follows the basic surgical principle of minimal tissue dissection to preserve maximal neural and vascular supply to the tissues undergoing handling. No wonder they are able to produce such excellent results (90% success). This is a very useful technique every urethral surgeon must have in his armamentarium.

Nowadays there is an ongoing debate on "to transect or not to transect" in nonobliterative bulbar urethral strictures. The combined dorsal and ventral free graft by the ventral sagittal urethrotomy approach is easy, fast and preserves the vascular and neural supply. This is important in preservation of the graft suture lines that give better outcome compared to situation in which the urethra is mobilized of the underlying tunica to make a dorsal urethrotomy. More important for the patient is that it preserves his natural ejaculatory action, which is a result of preserved bulbospongiosus muscle innervations. Also, the phenomena of cold or insensate glans is avoided, when the transection of bulbar urethra is avoided. All this translates into better preservation of sexual function, which nowadays patients are realizing and proactively questioning. That is why Professor Barbagli now talks of one-sided urethral mobilization off the tunica albuginea, to place the free oral buccal graft dorsally.

However, there are certain caveats I would like to re-emphasize to underline their unquestionable significance.

While giving a dorsal urethrotomy through the stricture, any fibrosis or unhealthy tissue in this area is also excised by sharp dissection. The end point being mild oozes from the raw bed.

The author's statement in step 4, "Urethra is retubularized by continuous sutures of 4-0 polyglactin on an appropriate sized catheter", requires further elaboration. It may not be prudent to place a large sized catheter thinking that it will act as a better splint in giving an adequate caliber urethra. In fact it proves to be counterproductive. It hinders drainage of the natural urethral secretions, which then become inspissated and predisposes to infection and disruption of the urethral closure suture line.

Following the retubularization of urethra, attempt is made to mobilize surrounding dartos fascia to cover the urethral suture line. Some surgeons have even described covering the urethral closure with tunica vaginalis flap. So far I have not had any strong compulsion to use it. More often than not I am able to put a second layer of dartos fascia. Having said this, these layers do not undermine the importance of a sound suture line. Further preparing a tunica vaginalis flap does entail an extra dissection time.

One must also be very careful, while applying pressure dressing lest it leads to pressure ischemia of the urethra resulting in disastrous consequences. Adequate fluffy layers of sterile cotton must be placed before any sticking plaster is applied. This provides as a cushioning space for the resultant postoperative tissue edema, without compromising on the vascularity.

REFERENCES

1. Andrich DE, Mundy AR. Urethral strictures and their surgical treatment. *BJU Int.* 2000;86(5):571-80.
2. Venn SN, Mundy AR. Early experience with the use of buccal mucosa for substitution urethroplasty. *Br J Urol.* 1998;81(5):738-40.
3. Barbagli G, Selli C, Tosto A, et al. Dorsal free graft urethroplasty. *J Urol.* 1996;155(1):123-6.
4. Asopa HS, Garg M, Singhal GG, et al. Dorsal free graft urethroplasty for urethral stricture by ventral sagittal urethrotomy approach. *Urology.* 2001;58(5):657-9.
5. Iselin CB, Webster GD. Dorsal onlay graft urethroplasty for repair of bulbar urethral stricture. *J Urol.* 1999;161(3):815-8.

5. Palminteri E, Manzoni G, Berdondini E, et al. Combined dorsal plus ventral double buccal mucosa graft in bulbar urethral reconstruction. *Eur Urol*. 2008;53(1):81-9.
6. Palminteri E, Berdondini E, Shokeir AA, et al. Two-sided bulbar urethroplasty using dorsal plus ventral oral graft: urinary and sexual outcomes of a new technique. *J Urol*. 2011;185(5):1766-71.
7. Webster GD, Brown MW, Koefoot RB Jr, et al. Suboptimal results in full thickness skin graft urethroplasty using an extra penile skin donor sites. *J Urol*. 1984;131(6):1082-3.
8. Barbagli G, Lazzeri M. Penile urethral stricture reconstruction—flap or graft? *J Urol*. 2011;186(2):375-6.
9. Mundy AR. The long-term results of skin inlay urethroplasty. *Br J Urol*. 1995;75(1):59-61.
10. Barbagli G. Editorial comment on: Dorsal buccal mucosal graft urethroplasty for anterior urethral stricture by Asopa technique. *Eur Urol*. 2009;56(1):205-6.