

Anterior urethroplasty and effects on sexual life: which is the best technique?

E. PALMINTERI ¹, G. FRANCO ², E. BERDONDINI ¹, F. FUSCO ³, A. DE CILLIS ², V. GENTILE ²

ANTERIOR URETHROPLASTY AND EFFECTS ON SEXUAL LIFE: IN SEARCH OF THE BEST TECHNIQUE

Established beliefs concerning outcomes following anterior urethral reconstruction are changing, both with regards to the genital cosmetics and to the impact on sexual activity. To-day, the aim of stricture repair is not only to reinstate urinary function but also to safeguard sexual activity and guarantee genital cosmesis. A thorough evaluation of anterior urethroplasty results should include the sexual viewpoint which appears to play an important role in overall post-operative patient satisfaction. The most commonly reported sexual problems following anterior urethroplasty include: erectile and ejaculatory dysfunction, penile curvature or shortening, dissatisfaction with genital cosmetic appearance, sensorial impairment of glans. The prevalence of specific post-operative sexual problems may be related to the site of reconstruction (penile or bulbar) and to the technique of urethroplasty employed. In penile urethral reconstruction, the wide use of buccal mucosa grafts seems to excel the use of skin flaps which easily distort the cosmesis and elasticity of the penis. In bulbar reconstructions, graft augmentation techniques seem to impact less on sexual outcome than excision anastomotic techniques. Therefore, the policy of primarily indicating an excision anastomotic procedure, whenever pos-

¹Centre for Reconstructive Urethral and Genitalia Surgery, Arezzo, Italy
²U. Bracci Department of Urological Sciences, La Sapienza University, Rome, Italy
³Department of Urology, University Federico II Naples, Italy

sible, should come under scrutiny. Eventual sexual outcomes should be incorporated in the choice of the optimal anterior urethral reconstruction and in pre-operative patient counselling.

Key words: Urethra - Urethral stricture - Sexual dysfunctions, psychological.

Established beliefs concerning outcomes in anterior urethral reconstruction are changing, with regard both to the genital cosmetic appearance and the impact on sexual activity.

Following repair of anterior urethral strictures, successful outcome is generally defined as normal voiding without further invasive procedures. However, the urethra is also involved in sexual and genital functions and most patients undergoing urethroplasty are sexually active.

The aim of stricture repair is not only to reinstate urinary function but also to safeguard sexual activity and guarantee genital cosmesis.

A complete evaluation of anterior urethroplasty should include the sexual point

Received April 22, 2010.

Accepted for publication on July 22, 2010.

Corresponding address: E. Palminteri, Centre of Urethral and Genital Reconstruction, via Fra' Guittone 2, 52100 Arezzo, Italy. E-mail: enzo.palminteri@inwind.it

of view, which seems to play an important role in overall postoperative patient satisfaction. Despite the importance of the sexual outcome, following penile or bulbar urethroplasty techniques, very few studies have focused on these aspects so far.

The most commonly reported sexual problems following anterior urethroplasty include: erectile and ejaculatory dysfunction, penile curvature or shortening, dissatisfaction with genital cosmetic appearance, sensorial impairment of glans.

The prevalence of specific postoperative sexual problems may be related to the site of urethral reconstruction (penile or bulbar) and to the technique of urethroplasty employed.

In penile urethral reconstruction, the wider use of buccal mucosa grafts seems to provide better results than the use of skin flaps which easily distorts the cosmesis and elasticity of the penis thus increasing the risk of complications.

In bulbar reconstructions, graft augmentation techniques seem to have less effect on sexual outcome than the excision anastomotic techniques, considered, so far, the gold standard and, therefore, primarily indicated.

Aim of the present investigation was to analyse the various anterior urethroplasty techniques used in penile and bulbar reconstructions and the related post-operative sexual complaints, providing also some technical hints on the surgical procedures in order to improve the sexual outcome.

Materials and methods

A MEDLINE search (key words: sexual complaint, erectile dysfunction, penile urethroplasty, bulbar urethroplasty, anterior urethroplasty) was performed in September 2009. All articles in English language were analyzed.

Sexual complaints following penile urethroplasty

As far as concerns penile urethroplasty, recent changes have been introduced to

improve urinary, sexual and cosmetic outcomes. These changes include the wider use of buccal mucosa grafts and the use of dorsal urethral augmentation.

Penile urethroplasty can be performed in either a one-stage or two-stage procedure, the choice being based on the etiology of the stricture and on the local conditions of the urethral and penile tissues.¹

In a normal penis (*i.e.*, ischemic strictures) with penile skin, *dartos fascia*, *corpus spongiosum* and urethral plate available for urethral reconstruction, a one-stage urethroplasty is the technique of choice worldwide. Conversely, in an abnormal penis (*i.e.*, failed hypospadias repairs or *Lichen sclerosus*) where the penile skin, *dartos* and urethral plate are not available for urethral reconstruction, a multistage urethroplasty is generally recommended.¹⁻⁶

The choice of the surgical technique must also be based on the exact anatomic characteristics of the local tissue in order to ensure flap or graft take and survival. Furthermore, sexual function can be placed at risk by any type of surgery on the genitalia, and dissection must avoid interference with the neurovascular supply to the penis. The use of flaps or grafts should not compromise penile length, and certainly should not untowardly affect the penile appearance.

Today, the use of the penile flaps is less frequent since this kind of surgery requires appropriate and difficult training. Making flaps, easily distorts the cosmesis as well as the elasticity of the penis. Furthermore, flaps increase the risk of complications impacting upon sexual life: hairs in the urethra, urethral weakening with diverticula (causing semen sequestration), fistulas, wide foreskin necrosis, chordee and penile rotation (Figures 1-3).

The advent of buccal mucosa as a substitute material has led to an improvement in the functional and cosmetic results and has improved the sexual outcome. Conversely, anastomotic procedures are contraindicated in the pendulous urethra because shortening, during erection, would easily result in chordee also impairing sexual life.

However, when compared to bulbar urethroplastic procedures, penile urethroplastic procedures are unlikely to be associated with erectile dysfunctions due to the involvement and damage to the cavernous nerves and/or arteries. On the other hand, the altered appearance of the penis, sometimes observed following difficult reconstructions, may be the cause of dysmorphophobia and psychogenic erectile dysfunction.

Sexual complaints following bulbar urethroplasty

Bulbar strictures are usually repaired by means of anastomotic procedures or by patch buccal mucosa graft (BMG) urethral augmentation.

Short stenoses can be treated by excision and primary anastomosis (EPA), and, an extended anastomosis urethroplasty (EAU) has been advocated for stenoses even up to 5 cm.^{7, 8} However, it should not be forgotten that, spatulation of the two stumps lengthens the urethral gap, increasing the risk of complications.^{9, 10} Furthermore, the problem of vascular damage after complete urethral transection must also be taken into consideration. Indeed, compared with BMG urethroplasties, the anastomotic techniques were accompanied by a higher incidence of penile curvature, penile shortening, alteration in erectile angle, impaired erection, temporary impotence, impaired sexual life, overall dissatisfaction in erection and a less overall satisfaction regarding sexual life. Morey *et al.* reported complete loss of erection in 9% of patients following anastomotic procedures (Tables I, II).^{7, 11-13} Further complications following bulbar EPA have been reported, such as, cold glans (11.6%), glans that was not full during erection (18.3%) and decreased glans sensitivity.¹⁴ Perhaps these glans complaints are related to vascular impairment of the spongiosum distal to the urethral section.

Long strictures are usually treated by patch graft urethroplasty. BM represents the graft of choice, and different series shift from ventral to dorsal urethral augmentation.¹⁵⁻¹⁷ Dorsal graft augmentation can be

performed by dorsal sagittal urethrotomy (Barbagli's approach) or by a ventral sagittal urethrotomy (Asopa's approach). One disadvantage of the first technique is the more extensive dissection and mobilisation of the urethra; furthermore, this approach might damage erectile function and the bulbar arteries when dissection from the corpora is very proximal.^{17, 18} Conversely, Asopa's procedure is easier since the scarred urethra is not mobilized; there is less harm to the urethral plate as the space for grafting is created without lifting the two urethral halves from the corpora and the blood supply is guaranteed by the saved circumflex and perforating arteries.¹⁹

Usually, dorsal or ventral single graft urethroplasty are performed without resection of the diseased tissues; conversely, in the dorsal plus ventral double graft (DVDG) enlargement, the fibrotic tissue is partially excised from the urethral margins following the ventral and dorsal opening. This will preserve the remaining urethral plate and will allow the creation of a sufficiently wide

TABLE I.—*Sexual complaints reported following bulbar urethroplasty.*^{7, 11-13}

	Anastomotic procedures (%)	BM graft (%)
Penile curvature	36	8
Penile shortening	38	11
Impaired erection	79	15
Complete loss of erection	9	0
Overall dissatisfaction in erection	26	19
Temporary impotence	53	33
Impaired sexual life	57	19
Overall satisfaction regarding sexual life	74	97

TABLE II.—*Results of erectile function questionnaire following EPA or EAU.*⁷

	EPA* %	EAU** %
Chordee	44.4	0
Decreased length	22.2	33.3
Erectile worsening noted by partner	33.3	16.7
Decreased intercourse frequency	22.2	16.7
Complete loss of erection	18.2	0
Overall satisfaction in erection	55.6	83.3

* for strictures <2.5 cm; ** for strictures >2.5 cm.

lumen. Furthermore, reducing the width of a single ventral graft, the double graft technique may decrease the risk of diverticulum with postejaculation dribbling and semen sequestration.²⁰

We compared our DVDG sexual results to those previously reported using the same erectile function questionnaire after EPA or EAU.^{7, 20} In the DVDG series, none of the patients referred to postoperative erectile problems or overall dissatisfaction regarding sexual life; conversely, erectile improvement was noted by the partner in 19%, while 7% reported an increase in the frequency of intercourse [unpublished data].

Anastomotic procedures may be associated with a high rate of factors impairing sexual life which have a higher negative impact on quality of life than the risk of resticture itself.

Double patch enlargement may avoid, in tight strictures, the most aggressive anastomotic procedures with complete urethral transection affecting spongiosum vascularity. By avoiding urethral transection occurring in the anastomotic procedures, BMG urethroplasty retains the important concept of preserving the urethral plate, urethral vascularity and urethral length: the aim is to maintain, as far as possible, the urethral axial integrity and length, reducing the sexual complications related to anastomotic techniques. On the other hand, in some traumatic strictures, due to the hard scarring, the urethral plate may not be preserved and enlarged by graft, making resection followed by an anastomotic procedure unavoidable. Thereby, the quality of the urethral plate influences the choice of the technique.

It would be interesting to establish whether graft techniques could represent a valid alternative also for short, but not obliterative, bulbar strictures, traditionally treated by anastomotic procedures. Therefore, the next question to answer, in bulbar reconstruction, will be "to transect or not the urethra".

Many patients (approximately 12% with lifetime risk of prostate cancer) will undergo radical prostatectomy and may later require a sphincter: in patients with bulbar stric-

tures, preserving the urethral blood supply during urethroplasty may decrease the risk of cuff erosion when an artificial sphincter implantation is required for incontinence following radical prostatectomy.²¹

The bulbar urethra is emptied, following micturition, by its closure mechanism created by the elasticity of the spongy tissue, combined with the voluntary contraction of the bulbospongiosus muscle; in a similar way, an efficient urethral emptying, during ejaculation, is achieved by the combination of the bulbo-penile urethral closure-pressure with the intermittent reflex contractions of the spongiosus muscle. In particular, erection of the spongy tissue not only considerably increases the passive urethral closure-pressure but it also increases the bulk of the bulb which, in turn, increases the effect of the reflex ejaculatory contractions of the surrounding bulbo-spongiosus muscle. Thus, orgasmic emission is a function of the posterior urethra resulting from a simultaneous contraction of the bladder neck, sustained contraction of the seminal vesicles and opening of the distal sphincter. Once the emission has passed the distal sphincter, the continuous flow of the semen is converted into a forceful intermittent ejaculation by the anterior bulbo-penile urethral structure.

The bulbar-cavernous muscles, together with the perineal central tendon, on which they pivot, contribute to the ejaculatory and urinary emission; for this reason, during urethroplasty, it is advisable to attempt to spare the central tendon and to reconstruct the muscles (Figures 4-6).

Hypothetical surgical damage to the branches of the perineal nerves, during bulbar urethroplasty, may be responsible for the loss of rhythmic bulbar urethral contractions, causing difficulty in expelling semen and urine.²² Sexual dysfunctions (decreased force of semen emission, ejaculation only by manual compression of the perineum at the level of the urethral bulb) either after end-to-end anastomosis or BMG augmentation bulbar urethroplasty. They hypothesised that these sexual complaints could be caused by extensive dissection of the bul-

bo-spongiosum muscles, or by sectioning the central tendon, or by the neural damage to the perineal nerves during preparation of the bulbar urethra. Therefore, they suggested a new approach for bulbar urethroplasty preserving the bulbo-spongiosum muscle, the central tendon, and the perineal nerves.²³

Once again it is worthwhile stressing the importance of preserving the central tendon, and of gently handling the bulbospongiosum muscles and reconstructing them at the end of any bulbar urethroplasty. In fact, urethral reconstructive procedures inevitably impair the natural emptying mechanism of the spongy tissue, since they interrupt the structural muscle-elastic circularity of the urethral tube which may stop the rhythmic urethral voiding contractions. Furthermore, urethral elasticity is often already impaired, to some extent, by the spongio-fibrotic disease.²⁴

The limited number of studies addressing this topic and the inconsistency of the methods used makes evaluation of the incidence of sexual dysfunction, following urethral reconstruction. Using a validated questionnaire (BMFSI), Erickson *et al.* tested the sexual function in 52 patients who underwent anterior urethral reconstruction. Non-postoperative sexual complications were observed and patients in the 40-49 years age group experienced an improvement in ejaculatory function probably on account of the relief of urethral obstruction, but their series was very limited, and questionnaires poorly adapted to the subject.²⁵

Conclusions

Anterior urethra stricture repair should guarantee the best urinary and sexual outcomes. When possible, the recommended technique should offer a wide enlargement of the urethral lumen by preserving the urethral plate, urethral blood supply and length.

Successful outcome, in anterior urethral repair, should be assessed not only by objective voiding parameters but also by sub-

jective parameters influencing sexual life satisfaction. Potential postoperative sexual complaints, therefore, must also be taken into consideration when making the choice of the most suitable surgical technique and in the pre-operative patient counselling.

Riassunto

Uretroplastica anteriore e suoi effetti sulla vita sessuale: alla ricerca della tecnica migliore.

Le credenze condivise riguardo ai risultati conseguenti alla ricostruzione uretrale anteriore sono cambiate, sia per quanto riguarda la cosmesi dei genitali sia riguardo all'impatto sull'attività sessuale. Oggi lo scopo dell'uretrocplastica non è solo quello di ripristinare la funzione urinaria, ma anche quello di salvaguardare l'attività sessuale garantendo la cosmesi dei genitali. Una valutazione approfondita dei risultati dell'uretrocplastica anteriore dovrebbe includere il punto di vista sessuale, che gioca un ruolo importante nella soddisfazione complessiva postintervento del paziente. I problemi sessuali più comunemente riportati dai pazienti dopo un'uretrocplastica anteriore includono: disfunzioni erettili e dell'eiaculazione, curvatura peniena o accorciamento dell'asta, insoddisfazione circa l'aspetto esteriore e compromissione sensoriale del glande. La prevalenza di specifici problemi sessuali postoperatori può essere correlata al sito della ricostruzione (peniena o bulbare) e alla tecnica d'uretrocplastica impiegata. L'ampio utilizzo di innesti di mucosa buccale nella ricostruzione uretrale peniena sembra eccellere sull'utilizzo di lembi cutanei, che facilmente distorcono la cosmesi e l'elasticità del pene. Le tecniche di ampliamento con innesti nella ricostruzione dell'uretra bulbare sembra incidere meno sulla vita sessuale rispetto alle tecniche di escissione e anastomosi. Perciò, la politica che primariamente indicava una procedura di escissione e anastomosi, quando possibile, dovrebbe essere posta sotto scrutinio. Gli eventuali risultati sessuali dovrebbero essere presi in considerazione durante la scelta della tecnica per una ricostruzione ottimale dell'uretra, nonché nella consulenza preoperatoria del paziente.

Parole chiave: Uretra - Stenosi uretrale - Disfunzioni sessuali psicologiche.

References

1. Barbagli G, Palminteri E, De Stefani S, Lazzeri M. Penile urethroplasty: techniques and outcomes using buccal mucosa grafts. *Contemporary Urology* 2006;16:25-33.
2. De Pasquale J, Park AJ, Bracka A. The treatment

- of balanitis erotica obliterans. *BJU Int* 2000;86:459-65.
3. Bracka A. Hypospadias repair: the two-stage alternative. *Br J Urol* 1995;6:31-41.
 4. Andrich DE, Mundy AR. Substitution urethroplasty with buccal mucosal-free grafts. *J Urol* 2001;5:1131-4.
 5. Barbagli G, De Angelis M, Palminteri E, Lazzeri M. Failed hypospadias repair presenting in adults. *Eur Urol* 2006;49:887-95.
 6. Barbagli G, Palminteri E, Bracka A, Caparros J. Penile urethral reconstruction: concepts and concerns. *Arch Esp Urol* 2003;56:549-56.
 7. Morey AF, Kizer WS. Proximal bulbar urethroplasty via extended anastomotic approach – what are the limits? *J Urol* 2006;175:2145-9.
 8. Santucci RA, Mario LA, McAninch JW. Anastomotic urethroplasty for bulbar urethral stricture: analysis of 168 patients. *J Urol* 2002;167:1715-9.
 9. Webster GD, Koefoot RB, Sihelnik SA. Urethroplasty management in 100 cases of urethral strictures: a rationale for procedure selection. *J Urol* 1985;134:892-8.
 10. Guralnick ML, Webster GD. The augmented anastomotic urethroplasty: indications and outcome in 29 patients. *J Urol* 2001;165:1496-9.
 11. Coursey JW, Morey AF, McAninch JW, Summerton DJ, Secrest C, White P *et al.* Erectile function after anterior urethroplasty. *J Urol* 2001;166:2273-6.
 12. Kessler T, Fish M, Heitz M, Olianias R, Schreiter F. Patient satisfaction with the outcome of surgery for urethral strictures. *J Urol* 2002;167:2507-11.
 13. Mundy AR. Results and complications of urethroplasty and its future. *Br J Urol* 1993;71:322-5.
 14. Barbagli G, De Angelis M, Romano G, Lazzeri M. Long-term follow-up of bulbar end-to-end anastomosis: a retrospective analysis of 153 patients in a single center experience. *J Urol* 2007;178:2470-3.
 15. Elliott SP, Metro MJ, McAninch JW. Long-term follow-up of the ventrally placed buccal mucosa onlay graft in bulbar urethral reconstruction. *J Urol* 2003;169:1754-7.
 16. Barbagli G, Palminteri E, Rizzo M. Dorsal onlay graft urethroplasty using penile skin or buccal mucosa in adult bulbourethral strictures. *J Urol* 1998;160:1307-9.
 17. 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;174:955-8.
 18. Iselin CE, Webster GD. Dorsal onlay graft urethroplasty for repair of bulbar urethral stricture. *J Urol* 1999;161:815-8.
 19. 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;58:657-9.
 20. Palminteri E, Manzoni G, Berdondini E, Di Fiore F, Testa G, Poluzzi M *et al.* Combined dorsal plus ventral double buccal mucosa graft in bulbar urethral reconstruction. *Eur Urol* 2008;3:81-90.
 21. Jordan GH, Eltahawy EA, Virasoro R. The technique of vessel sparing excision and primary anastomosis for proximal bulbous urethral reconstruction. *J Urol* 2007;177:1799-802.
 22. Yucel S, Baskin LS. Neuroanatomy of the male urethra and perineum. *BJU Int* 2003;92:624-7.
 23. Barbagli G, De Stefani S, Annino F, De Carne C, Bianchi G. Muscle- and nerve-sparing bulbar urethroplasty: a new technique. *Eur Urol* 2008;54:335-43.
 24. Turner-Warwick R. The anatomical basis of functional reconstruction of the urethra. In: Droller M, editor. *Surgical anatomy*. Boston, MA: Mosby Year Book; 1992. p. 740-814.
 25. Erickson BA, Wysock JS, McVary KT, Gonzalez CM. Erectile function, sexual drive, and ejaculatory function after reconstructive surgery for anterior urethral stricture disease. *BJU Int* 2007;99:607-11.