Urethral strictures

Urethral stricture = scarring of corpus spongiosum and overlying urothelium

Occurs in anterior urethra only: posterior urethral ‘strictures’ more correctly referred to as either distraction defects (after pelvic #), or contractures (prostate/BN)

Normal urethral diameter 30F

Eccentric (dorsal) placement of bulbar urethra within corpus spongiosum.

C. spongiosum (urethra) has dual blood supply – antegrade artery to the bulb (internal pudendal) and retrograde dorsal penile artery

Aetiology

Traumatic
  - Straddle injury
  - Perineal trauma
  - Urethral instrumentation

Inflammatory
  - BXO

Infective
  - Gonococcus, chlamydia

Presentation

Asymptomatic
Obstructed voiding
UTI
Prostatitis
Impaired ejaculation
Rarely acute urinary retention

Evaluation

Crucial to determine the length, location, depth, and density

Endoscopy

Ascending and descending urethrography

? USS for depth of fibrosis (underestimates degree of fibrosis)

Operative bouginage (distal and proximal with Fogarty catheter)

Management

Reconstructive ladder considered outdated

Internal urethrotomy appropriate for primary management of short bulbar urethral strictures; urethroplasty should be considered as primary management for all others

(i) Dilatation

Canny-Ryalls or Cluttons

Stretch stricture without tearing – frequently forgotten

Ideally sequential catheters over period of weeks

Equally effective as optical urethrotomy provided done carefully to avoid tearing urethral mucosa (Steenkamp 1997)

(ii) Internal urethrotomy

30-40% overall success rate

74% overall success rate for short (<1.5cm) bulbar urethral strictures a/w minimal spongiofibrosis (Pansadoro 1996); ~ 50% of all short bulbar urethral strictures cured by first urethrotomy
Poor results for non-bulbar and multiple strictures; Overall 32% success rate for anterior urethral strictures at 98 months (Pansadoro 1996)

Maintaining urethral patency
- 3-7 days urethral catheterisation equivalent to 6 weeks
- Urethral patency can be maintained by urethral dilatation, but this needs to be performed long-term (> 12 months); stricture typically returns after cessation of ISD
- No role for urethral stents — success rates and satisfaction levels at 10 yrs very low (~20-30%); also can migrate, cause perineal pain and difficult to remove (absolutely contraindicated in non-bulbar urethral strictures and after substitution urethroplasty using skin islands)

Recurrent strictures
- Repeat internal urethrotomy a/w poor outcome (~ 6% cure)
- Urethroplasty recommended in patients fit enough (physically and mentally)
- Role of laser urethrotomy undefined

(ii) **Anastomotic urethroplasty** (excision and primary anastomosis)
- Most reliable method
- Ideal for bulbar strictures < 2cm
- Not suitable for penile strictures as unacceptable rates of chordee
- 4 elements: excision, mobilisation, spatulation, anastomosis
- Crucial to observe good tissue handling techniques, preventing ischaemia and allowing a tension-free anastomosis

A number of steps may be employed to adequately bridge defect without introducing tension and subsequent chordee (4):
  - (i) Distal mobilisation o suspensory ligament of penis (2-3cm)
  - (ii) Separation of proximal corporal bodies
  - (iii) Inferior pubic osteotomy
  - (iv) Re-routing of urethra around lateral corporal body

(iii) **Substitution urethroplasty** (incision/excision and tissue transfer)
- May utilise graft or flap [grafts derive blood supply from new site – imbibition and inosculation; flaps take blood supply from donor site]
- Grafts (4) Skin (full thickness or partial thickness)
  - Buccal mucosa
  - Bladder mucosa (largely historical)
Urethral stricture disease

Rectal mucosa (historical)
Either one-stage onlay technique (ventral, lateral or dorsal) or two-stage (excision, onlay graft & second-stage tubularisation – Shreiter and Noll)

Flaps
Penile or de-epithelialised scrotal skin, raised on dartos fascia of penis or scrotum
Grafts much easier to perform and suited to proximal anterior urethra; flaps difficult but good for distal urethra.
For both grafts and flaps, onlay techniques better than tubularisation
High rates of recurrence following use of skin for BXO strictures (known as Koebner phenomenon) – potentially improved results with buccal mucosa grafts, which is resistant to BXO

Typically
- Bulbar stricture
  - Dorsal onlay buccal mucosa graft
- Penile stricture
  - BXO
  - Two-stage buccal mucosa graft*
  - Non-BXO
    - Flap (Orandi) or graft
  - Hypospadias
    - Flap or two-stage post-auricular (Wolfe)

* Two-stage procedures reduce recurrence rate c.f single stage tubed graft, but revision rate higher

Dorsal onlay buccal mucosa graft (Barbagli 1995)
Reliable technique, esp for bulbar urethral strictures
Inner cheeks (~6cm) and lower lip donor sites
Dorsal urethral incision, application of buccal mucosa to ventral tissue (corpus cavernosum or triangular ligament)
Excellent results (see below)
Standard ETT satisfactory for buccal harvesting; infiltration with adrenaline and lignocaine.
Consent for

Outcomes
Anastomotic urethroplasty much more reliable than substitution urethroplasty
Recurrence rates:

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<tr>
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<th>3 yrs</th>
<th>10 yrs</th>
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<tr>
<td>Anastomotic urethroplasty</td>
<td>90%</td>
<td>90%</td>
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| Substitution urethroplasty  | 95%   | 60%    | (5% per year attrition rate)
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<tr>
<th></th>
<th>Anastomotic urethroplasty</th>
<th>Substitution urethroplasty (Pedicled foreskin)</th>
<th>Substitution urethroplasty (Buccal mucosa)</th>
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<tr>
<td>5 year recurrence rate</td>
<td>12%</td>
<td>21%</td>
<td>4% at 38 months for dorsally placed graft</td>
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<tr>
<td>10 year recurrence rate</td>
<td>13%</td>
<td>31%</td>
<td>15% at 37 months for ventrally placed graft</td>
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<tr>
<td>15 year recurrence rate</td>
<td>14%</td>
<td>58%</td>
<td>19% at 37 months for tubed graft</td>
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<tr>
<td>Complication rate</td>
<td>7%</td>
<td>33%</td>
<td>NR</td>
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<tr>
<td>Complications</td>
<td>NR</td>
<td>Erectile dysfunction</td>
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<td>Post void dribble</td>
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<td>UTI</td>
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<td>Chordee</td>
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Appendix

Grafts and flaps

Graft  ‘tissue excised from a donor site which re-establishes its blood supply by revascularisation’
   Process by which revascularisation occurs = ‘take’
   Take = 3 to 4 days
   2 processes – imbibition and inosculation
   Imbibition
      48 hours
      Graft survives by ‘drinking’ nutrients from host bed
      Graft temperature lower than host temperature
   Inosculation
      48 hours
      Development of true circulation
      Graft temperature rises to that of host
   Features affecting ‘take’
      Graft type (see below)
      Donor site vascularity (tendon, smoking, PVD etc.)
      Infection
      Movement

Grafts

Superficial plexus aka intradermal plexus – lies below epidermis in papillary dermis
Subdermal plexus lies at interface between skin and subcutaneous fascia.
Subdermis has high collagen and lymphatic content but fewer larger vessels – therefore elasticity maintained (less likely to shrink) but less favourable vascular characteristics
Split skin graft
   Epidermis only
   Favourable vascular characteristics
   More likely to shrink and be brittle
Full thickness skin graft
   More durable
   Less favourable vascular characteristics
Bladder mucosa
   Superficial and deep plexi but much more cross communication
Buccal mucosa*
   True panlaminar vascular plexus
   Thought to be ideal graft
Flap
   The term flap implies that the tissue is excised and transferred with the blood
   supply either preserved or surgically re-established at the recipient site
   May be cuticular, fasciocutaneous or musculocutaneous based on location of
   defined vascular supply

* Advantages of buccal mucosa
   Easy to harvest
   Easy to handle
   Thaick
   Panlaminar vascular plexus – good take
   Waterproof
   Antibacterial
   Resists skin diseases

Harvesting buccal mucosa
   Normal intubation OK vs. nasal intubation
   Avoid Stensen’s duct opposite second upper molar
   Mark excision site
   0.5% lignocaine and adrenaline
   Tenotomy scissors (superficial vs. deep)
   2cm wide, at least 1cm from vermillion border
   Side effects worse for closure vs. secondary intention (Mundy J Urol 2004)
   Lignocaine lozenges

Reconstructive ladder for urethral strictures
   Urethral dilatation
   Optical urethrotomy
   Urethroplasty
      Anastomotic urethroplasty
      Substitution urethroplasty
         Graft
            One-stage
            Two-stage
         Flap
            Local rotation flap (Orandi)
   Urethral stent
      Uroleum
      Memokath