MALE URETHRAL DISEASE

Sarah Faris, MD
University of British Columbia Grand Rounds
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MALE URETHRAL DISEASE – OUTLINE

- Background information
- Work-up and Reconstructive approaches to repair
- Cases
- Current research and future directions
BACKGROUND

- Incidence: 200-600 cases per 100,000 individuals and increases with age
- Location: 92% anterior, 8% posterior
- Etiology: Injury to or changes in the urothelial epithelium or corpus spongiosum result in fibrotic narrowing of the urethra

Hampson et al. 1

ETIOLOGY

• Anterior:
  • Trauma
  • Iatrogenic
  • Idiopathic
  • Radiation
  • Failed hypospadias
  • Infectious
  • Lichen Sclerosus (Balanitis Xerotica Obliterans)
    • Chronic inflammatory disorder with white plaques of the skin of unknown origin

• Posterior:
  • Trauma
  • Pelvic fracture urethral distraction (PFUD)
  • Iatrogenic
  • Prostatectomy
  • TURP
  • Radiation

ANATOMY

ANATOMY

Perineal n.
Dorsal n of penis
Inf. rectal n.
Perineal a.
Art of penis
Inf. rectal a.
Bulbospongiosus m.
Ischiocavernosus m.
Perineal body
Transverse Perineal m.
Dorsal n of penis


ANATOMY

Superficial and deep dorsal veins
Dorsal artery
Dorsal nerves
Skin
Bucks fascia
Bucks fascia
Subtunical space
Cavernosal artery
Erectile tissue
Tunica albuginea
Corpus spongiosum

WORKUP AND RECONSTRUCTIVE APPROACHES TO REPAIR

WORKUP

- Presentation - obstructive voiding symptoms
- UA and Urine culture – sterilize urine prior to OR
- Uroflow
- PVR
- Retrograde urethrogram
- Cystoscopy
- Urethral rest prior to OR
RECONSTRUCTIVE SURGERY

- Challenges in Reconstructive surgery:
  - Patient’s often have had prior operations by other surgeons
  - Location and etiology variable
  - Variable tissue quality

- Typical operative approach to complicated reconstruction:
  1) Find the problem
  2) Cut out the problem
  3) Repair the defect

RECONSTRUCTION TOOLS

- Endoscopic management
  - DVIU or dilation
- Urethroplasty
  - Extended meatothomy
  - Two-stage procedures
  - Perineal urethrostomy
  - Excision and primary anastomosis
  - Penile skin fasciocutaneous flap
  - Penile skin full thickness graft
  - Buccal graft: ventral, lateral, dorsal
    intlay or onlay, double buccal
  - Augmented anastomotic urethroplasty
  - Combined dorsal onlay buccal graft
    and ventral onlay fasciocutaneous flap

- Adjunct procedures:
  - Bulbospongious muscle sparing
  - Tunica vaginalis flap
  - Gracilis flap
  - Split thickness skin graft
  - Corporal body splitting
  - Inferior pubic arch pubectomy
  - Urethral re-routing
  - Y+V plasty
RECONSTRUCTION TOOLS
FLAPS AND GRAFTS

- Axial flaps
- Fasciocutaneous flap
- Musculocutaneous flap

RECONSTRUCTION TOOLS
FLAPS AND GRAFTS

- Avoid redundancy to prevent urethral sacculation and post-void dribbling
- Penile skin – avoid in BXO patients, not always available
- Avoid scrotal skin – hair bearing and prone to leakage and diverticulum
- STSG – increased contracture
- FTSG – viability more tenuous
- Buccal mucosa – complicated harvest

RECONSTRUCTION TOOLS
ENDOSCOPY VS URETHROPLASTY

- Endoscopy
  - Success rates approximately 32% 5,6
- Urethroplasty considered the gold standard
  - Overall success rates between 85-90%
  - Highest success rates with excision and primary anastomosis of 90-95%
  - Success rates for flaps or grafts approximately 85%
- Cost-effectiveness:
  - Recommend a single attempt at Endoscopic management
  - If fails go on to Urethroplasty 7

URETHROPLASTY
PROCEDURE SELECTION

- Location
- Etiology
- Extent of disease
- Patient age and general health
- Patient preference

CASES
URETHROPLASTY
GLANSECTOMY

- 34 yo M with a glanular lesion shave biopsied at OSH
  - Path: Invasive squamous cell carcinoma

- Wedge resection performed by Uro Oncologist
  - Path: Moderately differentiated squamous cell carcinoma, invasive to depth of 0.15cm, tumor present at the urethra margin and radial margin, no LVI

- CT negative for adenopathy

- Discussed at Tumor Board: High risk of recurrence
URETHROPLASTY
GLANSECTOMY

URETHROPLASTY
GLANSECTOMY
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GLANSECTOMY

URETHROPLASTY
GLANSECTOMY
URETHROPLASTY
GLANSECTOMY

• Frozen margin: Positive for CIS at the urethral margin
• Additional 1.5 cm of urethra resected: Frozen margins negative
• Final pathology
  • Focal residual invasive squamous cell carcinoma
  • Extensive squamous cell carcinoma in situ (CIS) of urethra, final margin negative
  • Skin margin negative
• Foley removed at 1 week
• Having erections and voiding well at 6 week follow-up appointment
URETHROPLASTY
GLANSECTOMY

Resurfacing and Reconstruction of the Glans Penis

Enzo Palminteri, E., Elisa Berdondini, E., Massimo Lazzeri, E., Francesco Mirri, E., Guido Barbagli, E.

* Center for Urologic and Genitourinary Reconstruction Surgery, Ancona, Italy
* Department of Urology, Santa Chiara–Menor, Florence, Italy
* Sezione di Anatomo-Fisiologica, Ospedale S. Maria alla Grazia, Montecatini, Italy

- 17 patients with glans resurfacing or reconstruction
  - 5 glans skinning and resurfacing
  - 5 glans amputation and neoglans reconstruction
  - 7 partial penectomy and neoglans reconstruction
- No local premalignant/malignant recurrence at mean f/u of 32 mo
- All maintained sexual function and activity
- Decreased sensitivity as consequence of glans/penile amputation


URETHROPLASTY
PENILE AND BULBAR URETHRA

- 58 yo M with a history of urethral stricture
- Dilated in 1991 and 1997
- SPT placed recently for acute urinary retention
- RUG 11cm stricture from proximal penile to mid-bulbar urethra
- Options:
  - Perineal urethrostomy
  - 2 stage
  - Single stage (30% risk of failure)
URETHROPLASTY
PENILE AND BULBAR URETHRA

8.5 x 2.5 cm graft from one cheek
Stricture measured 7 cm
URETHROPLASTY
PENILE AND BULBAR URETHRA

URETHROPLASTY
PENILE AND BULBAR URETHRA

URETHROPLASTY
PENILE AND BULBAR URETHRA

URETHROPLASTY PENILE AND BULBAR URETHRA

75 men with bulbar strictures
88% success rate (did not require secondary procedure)
Mean stricture length 3.3 cm in successful cases v 3.9 cm in failures
Good sexual function and no curvature in the 49 sexually active men

URETHROPLASTY DOUBLE BUCCAL

Two-Sided Bulbar Urethroplasty Using Dorsal Plus Ventral Oral Graft: Urinary and Sexual Outcomes of a New Technique
Enzo Palminteri,* Elisa Berdondini, Ahmed A. Shokeir, Luca Iannotta, Vincenzo Gentile and Alessandro Sciarra
From the Center for Urological and Genital Reconstructive Surgery, Avera (EP, ER), U. Brescia Department of Urological Sciences, "La Sapienza" University, Rome, Italy, and Urology & Nephrology Center, Milan, Italy: Epub Ahead

- 75 men with bulbar strictures
- 88% success rate (did not require secondary procedure)
- Mean stricture length 3.3 cm in successful cases v 3.9 cm in failures
- Good sexual function and no curvature in the 49 sexually active men

• 50 bulbar strictures treated with buccal grafts
  • 17 Ventral – 84% success
  • 27 Dorsal – 83% success
  • 6 Lateral – 83% success
  • Overall similar success rates and outcome not affected by the surgical technique

• 2000 anterior urethroplasty procedures in the literature
• No significant difference between average success rates of the dorsal and ventral onlay procedures (different grafts used, buccal most common)
  • Dorsal 934 pts, 88.4% success
  • Ventral 563 pts, 88.8% success

• 30 yo M with a history of childhood trauma to his perineum
• 3 prior operations for his stricture, patient unsure what they were
• Recurrent urinary hesitancy and straining
URETHROPLASTY
BULBAR URETHRA

INTRAOPERATIVE ULTRASOUND
INTRAOPERATIVE ULTRASOUND

- Stricture measured 3 cm intraoperatively

INTRAOPERATIVE ULTRASOUND

- 67 patients with bulbar strictures < 25 mm
- Trend for RUG to underestimate stricture length (p < 0.0001)
- 26 patients with RUG strictures < 11 mm underwent EPA
- 15 of the 41 patients (37%) with strictures of 11-25 mm on RUG had change in procedure selection

URETHROPLASTY
BULBAR URETHRA

• EPA is considered the gold standard for short bulbar strictures but may have higher ED rates
• Nontransecting techniques do not allow for removal of all the scarred tissue and risks failure of graft take on a poor urethral bed
• Current literature review:
  • 404 patients transecting repair (EPA, augmented anastomotic repair) with success rate 90-98.6%
  • 522 patients nontransecting repair (nontransecting anastomotic, oral grafting) with success rate 81.8-100%
• Concluded that have similar success rates but no evidence in the literature on the impact of urethral transection on sexual function using validated questionnaires

URETHROPLASTY
BULBAR URETHRA


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URETHROPLASTY
BULBAR URETHRA
BULBOSPONGIOSUS MUSCLE SPARING

Muscle- and Nerve-sparing Bulbar Urethroplasty: A New Technique

Guido Barbagli \textsuperscript{a}, Stefano De Stefani \textsuperscript{b}, Filippo Amnino \textsuperscript{b}, Cosimo De Carne \textsuperscript{b}, Giampaolo Bianchi \textsuperscript{b}

\textsuperscript{a} Center for Reconstructive Urethral Surgery, Ancona, Italy
\textsuperscript{b} Department of Urology, University of Modena-Reggio Emilia, Modena, Italy

- Bulbospongiosum muscle propels seminal fluid during ejaculation via rhythmic contractions and may have a role in expelling urine
- Innervation through Perineal nerve (branch of Pudendal nerve) via fine branches that penetrate the corpus spongiosum
- Bulbospongiosus muscle sparing less invasive and more anatomic approach
- 12 patients with bulbar urethral strictures
- 6 Ventral buccal onlay & 6 Dorsal buccal onlay
- No stricture recurrence, urethral sacculation, post-void dribbling or semen sequestration at 12 mo follow-up


URETHROPLASTY
BULBAR URETHRA
URETHROPLASTY
URETHRAL DIVERTICULUM

• 68 yo M with longstanding history of urethral stricture s/p multiple urethroplasty (> 5 including scrotal flap) and ED s/p malleable penile prosthesis

• SICU admission for urosepsis found to have a perineal and perirectal abscess with placement of a SPT and perineal drains without improvement

• IPP removed for infection and foley catheter placed past diverticulum

• OR for EUA, cystoscopy, RUG, colonoscopy

• 10 x 4 x 5 cm urethral diverticulum

• No suspicious areas on colonoscopy

• Plan: Urethral diverticulectomy with tunica vaginalis flap
URETHROPLASTY
URETHRAL DIVERTICULUM

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URETHROPLASTY
URETHRAL DIVERTICULUM

- Voiding well without UTI and open urethra on cystoscopy at 3 mo follow-up

TUNICA VAGINALIS FLAP

Tunneled Tunica Vaginalis Flap is an Effective Technique for Recurrent Urethrocutaneous Fistulas Following Tubularized Incised Plate Urethroplasty

Jonathan C. Routh, James J. Wolpert and Yuri Reinberg

From the Department of Urology, Mayo Clinic, Rochester (JCR) and Division of Pediatric Urology, Pediatric Surgical Associates, Minneapolis, Minnesota

- 16 males with 1 – 4 urethrocutaneous fistulas after failed tubularized incised plate urethroplasty
- 4 patients no prior attempts after fistula repair
- 12 patients with 1 – 4 prior failed fistula repairs
- No patients had recurrence of urethrocutaneous fistulas
URETHROPLASTY
PROSTATIC URETHROCUTANEON FISTULA

- 50 yo male with prostatic urethral injury during robotic APR for colorectal cancer (prostate intentionally entered to obtain negative margins)
- Catheter removed POD 5 and patient had urine per APR incision
- Exploratory surgery performed and catheter replaced
- Complicated by abscess in pelvic cavity near his prostate which was drained
- OR for EUA, cystogram, RUG, Cystoscopy, bilateral RPG

URETHROPLASTY
PROSTATIC URETHROCUTANEON FISTULA

- Normal bilateral RPG and cystogram
- RUG with extravasation of contrast at the distal prostatic urethra, no strictures
URETHROPLASTY
PROSTATIC URETHRO-CUTANEOUS FISTULA
URETHROPLASTY
PROSTATIC URETHROCUTANEOUS FISTULA

URETHROPLASTY
PROSTATIC URETHROCUTANEOUS FISTULA
URETHROPLASTY
PROSTATIC URETHROCUTANEOUS FISTULA

• Foley removed at 3 weeks post-op
• 2 mo post-op some SUI – working with PT on kegels
RESEARCH AND FUTURE DIRECTIONS

RESEARCH RECONSTRUCTIVE RESEARCH CHALLENGES

- Small case numbers
- Case heterogeneity
- Heterogeneity of surgical approach
- Case classification
- Lack of classic “endpoints”
RESEARCH TURNS GROUP

- Trauma and Urologic Reconstruction Network of Surgeons (TURNS)
  - Prospective database for anterior urethral strictures
    - Pre-op demographics
    - Operative information
    - 3 mo, 12 mo and Annual followup
      - Uroflow
      - Cystoscopy
      - Questionnaires
RESEARCH CURRENT PROJECTS – TURNS PROFICIENCY

- Learning curve vs proficiency?
- What does it mean to obtain proficiency?
- How do you evaluate proficiency?
- Is surgical skill correlated with improved outcomes and decreased complication rates?

RESEARCH CURRENT PROJECTS – TURNS PROFICIENCY

- No objective measures to define expertise with RALP
- Determined that “expert status” depends on surgeon’s comfort, experience and results with alternative approaches
- Senior author had experience with > 2500 radical retropubic prostatectomy
- Assess his learning curve to achieve comparable results and comfort with the procedure
- 150 cases for prospectively collected results comparable to radical retropubic prostatectomy
- 250 cases to achieve comparable comfort and confidence

Sought to evaluate the influence of surgeon experiences on the success of primary hypospadias repair using the tubularized incised plate urethroplasty technique.

Reviewed cases by single pediatric urologist soon after his fellowship training.

Analyzed overall complication rate and created a model to estimate the change over the years.

96 patients had a total of 133 complications and 53 underwent a secondary operation.

On multivariate analysis only factor that increased the complication rate was non-distal meatus.

Complication rate stabilized after 50-75 cases and continued to decrease confirming a steady, gradual learning curve.

Non-linear model demonstrated a significant learning curve with a decreasing complication rate over the years.

RESEARCH
CURRENT PROJECTS – TURNS PROFICIENCY

Technical Proficiency in Hand-Assisted Laparoscopic Colon and Rectal Surgery

Determining How Many Cases Are Required to Achieve Mastery

- Previously shown that a minimum of 25 HALS cases required to master the learning curve
- Proficiency implies attainment of some level of mastery that comes from increased experience and results in improved outcomes
- Aimed to describe how many cases required to achieve significant improvement in operative time by two surgeons
- Assessed demographics, operative variables and post-op short-term outcomes
- Changes in operative time detected using Change Point Analysis (CUSUM analysis with 1000 bootstraps)


- Change-Point Analysis to detect change with 100% confidence
- Change:
  - 108th case for surgeon A
  - 105th case for surgeon B

RESEARCH
CURRENT PROJECTS – TURNS PROFICIENCY

Technical Proficiency in Hand-Assisted Laparoscopic Colon and Rectal Surgery

Determining How Many Cases Are Required to Achieve Mastery

- Operative duration is a technical end point vs post-op outcomes an overall quality-of-care end point
- Found that overall 30 day complications, readmissions, infectious complications and length of hospital stay all significantly reduced after the change point


RESEARCH
CURRENT PROJECTS – TURNS PROFICIENCY

- Urethral reconstruction has a high success rate though is often technically demanding
- Assumed that success rates increase with surgeon experience however learning curve has not been previously analyzed
- Retrospective review of all anterior urethroplasty cases from prospectively maintained multi-institutional database
- Success analyzed at the 18 month mark and defined as freedom from stricture recurrence requiring a secondary operation
- Analyzed success rates relative to the total number of cases performed after fellowship training
- Comparisons made between surgeons and broken down by location and repair type
RESEARCH
CURRENT PROJECTS – TURNS PROFICIENCY

- 613 cases from 7 surgeons
- Overall functional success rate of 87.3%
- Success for bulbar repairs higher than for penile repairs (88.2% vs 78.3%, p = 0.0116)
- Success for anastomotic repairs higher than for substitution repairs (95.0% vs 82.4%, p = 0.0001)

Success rates by number of cases and broken down by type of repair using Trend test in SAS

Overall statistically significant trend towards improved outcomes by number of cases (p = 0.0422)

No statistical improvement in penile repairs over time

Case number to reach proficiency (defined as success rate of > 90%):
- Approximately 100 cases for all types of reconstruction
- Approximately 70 cases for bulbar urethroplasties
There were statistical differences in success rates for all types of repairs between surgeons ($p = 0.0014$).

Conclusions:
- Success rates for anterior urethroplasty improve significantly with surgeon experience
- Proficiency occurs after approximately 100 cases
- The significant differences in success rates between surgeons highlight the potential opportunity to improve outcomes through continuing surgical education after fellowship training.
RESEARCH
FUTURE PROJECTS – TURNS PROFICIENCY

Clinical outcomes between surgeons vary widely but empirical data lacking on the relationship between technical skill and postoperative outcomes

20 surgeons submitted a single representative videotape performing lap gastric bypass

Videos rated in technical skill domains on a scale of 1-5 by 10+ peer surgeons

Assess relationships between skill ratings and risk-adjusted complication rates

Mean ratings of technical skill ranged from 2.6 to 4.8

Bottom quartile of surgical skill, compared to top quartile:
  - Higher complications rates (14.5% vs 5.2%, p < 0.001)
  - Higher mortality (0.26% vs 0.05%, p = 0.01)
  - Longer operative time (137 min vs 98 min, p < 0.001)
  - Higher rates of reoperation (3.4% vs 1.6%, p = 0.01)
  - Higher rates of readmission (8.3% vs 2.7%, p < 0.001)

Findings suggest that peer rating of operative skill work to assess a surgeon’s proficiency

References:
RESEARCH
FUTURE PROJECTS – TURNS PROFICIENCY

• Difficult to tape open surgery
  • GoPro® (neck stiffness, movement)
  • University video services (expensive, coordination issue)
  • Stryker Wingman®

RESEARCH
CURRENT PROJECTS – STRicture RECURRENCE

• Definition of stricture recurrence is variable in reconstructive literature
• Overall recurrence rate is 15.6%
• Recurrence defined as the need for an additional surgical procedures or dilation in 75% and 52% of articles, respectively23

• Many studies report the need for secondary procedure when assessing their outcomes, none report directly on the success of a secondary endoscopic procedure

• Repeat urethroplasty has been shown to have an approximately 78% success rate24

RESEARCH
CURRENT PROJECTS – STRICURE RECURRENCE

• Evaluate the success rate of initial endoscopic management of stricture recurrence after anterior urethroplasty
• Retrospectively analyzed the TURNS prospectively maintained database
• Successful endoscopic management defined as the ability to pass a 17F flexible cystoscopy at one year
• Compared urethroplasty characteristics, stricture recurrence length and endoscopic management strategy

52 anatomic recurrences requiring endoscopic management

• DVIU was significantly more successful than Dilation (49% vs 8%, p < 0.001)
• Success rates for both types of endoscopic management higher in cases where substitution urethroplasty with buccal mucosa used for primary repair compared to EPA (42% vs 14%, p = 0.0012)
• Mean length of stricture recurrence was shorter in successfully managed cases (0.6 +/- 0.4 cm vs 2.0 +/- 4.5 cm, p = 0.06)
• Penile vs bulbar stricture recurrence did not affect success (38% vs 40%, p = 0.2)

Conclusions:
• Endoscopic management successful in nearly half of the cases
• Predictors of success include use of DVIU, failure at a buccal graft anastomotic site, shorter recurrent stricture length
RESEARCH
FUTURE PROJECTS - TURNS

• Bulbospongiosus m sparing – randomized controlled study to assess if improves erectile and ejaculatory function

• Substitution urethroplasty with buccal mucosal graft placement - Dorsal v Ventral onlay randomized controlled study to assess success and complication rates

• Surgeon proficiency assessment

• AUS after XRT – transcorporal vs standard treatment randomized controlled study

CONCLUSIONS

• Reconstructive urologic surgery is complex and requires a unique knowledge of different surgical treatment options and intraoperative decision making

• Outcome studies are stymied by case numbers, case and surgical approach heterogeneity, variable follow-up regimens, variable definition of “failure”

• Future directions include the need for collaborative groups, multi-institutional studies, standardization of outcome variables and randomized controlled studies
THANK YOU