Robotic Ureteral Reconstruction

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Director, Robotic Urologic Oncology and Reconstructive Surgery
Director, Urologic Robotic Fellowship Program
Chief of Robotic Surgical Services
Professor of Urology
Lewis Katz School of Medicine at Temple University
DISCLOSURES

• Intuitive Surgical: lecture, consultant, proctor, meeting participant
• Melzi Corporation: co-Founder/owner
Traditionally, complex upper urinary tract reconstruction...
Limited traditional approaches

Mid-distal ureteral strictures
- Reimplant
- +/- Psoas Hitch
- BoariFlap

Proximal-Mid ureteral strictures
- Short
  - Uretero-ureterostomy
  - ??? Appendix (right side)
- Unfavorable
  - Ileal ureter
  - Autotransplant
  - Nephrectomy
1) **Robotic access: visualization and precision**
   - Complex anatomy and reoperative fields are not contraindications

2) **Near-Infrared fluorescent imaging guidance**
   - Perfusion
   - Identifying the unidentifiable

3) **Buccal mucosa graft ureteroplasty, appendiceal interposition/onlay**
   - Old principles to new application
Michael Metro MD
Director of Reconstructive Urology
Lewis Katz School of Medicine at Temple University
Innovations in technology have enabled innovations in procedures

- **Standard** $\rightarrow$ **S** $\rightarrow$ **Si** $\rightarrow$ **Xi**
  - Instrument length + ROM
  - Resolution
  - Tile pro
  - Monopolar cut, coag, ERBE
  - Vessel sealer
  - Stapler
  - Near-infrared fluorescence
Proliferation of robotic application in urology
Robotic and reconstruction

- Eun surgical experience
- 2008: Reconstruction <5%
- 2018: Reconstruction 40%
Robotic reconstructive urology

Lower urinary tract
- Simple prostatectomy
- Bladder diverticulectomy
- Cystolithotony
- VVF, UVF, CVF
- Augmentation ileocystoplasty
- Ileal conduit
- Neobladder/continent diversion
- Repair BNC

Upper urinary tract
- UPJO, Pyelopyelostomy
- Ureterocalycostomy
- Ureteroureterostomy
- Buccal mucosa ureteroplasty
- Transureteroureterostomy
- Ureter or appendix calycostomy
- Reimplant, Psoas Hitch, Boari flap
- Downward nephropexy
- Nephropexy, ureteropexy
- Ureterolysis
- Omental wrap/interposition
- Calyceal diverticulectomy
- Pyelolithotomy, ureterolithotomy
- Ileal ureter
- Appendix interposition
- Autotransplant (Abaza Jurol 2014)
Robotic Reconstructive Options for Ureteral Obstruction

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*Extensive: Ileal Ureter, Autotransplant, Nephrectomy
Robotic Reconstructive Options for Ureteral Obstruction

1) Need to understand perfusion
2) Need to specifically identify structures
3) Need to identify precise location in ureter

Appendix interpos.

*Extensive: Ileal Ureter, Autotransplant, Nephrectomy
Technology: Near Infrared Fluorescence Imaging

- Near infra-red fluorescence imaging
- Indocyananine Green
- IV route
  - Vessel identification
  - End organ perfusion
  - Urology: Selective arterial clamping
Augmented Decision-making Using Near Infrared Fluoroscopy
-- 2-3 cc IV Indocyanine Green followed by 10 cc quick saline bolus
Augmented Decision-making Using Near Infrared Fluoroscopy
-- 2-3 cc IV Indocyanine Green followed by 10 cc quick saline bolus
2012: With growing complexity of ureteral reconstructive cases: Could ICG be used directly in the ureter for ureter specific identification?

- Fibrosed ureter
- Avulsed/transected ureter
- Ectopic location of ureter
- Supernumerary ureters

NOTE: INTRAURETERAL ICG- OFF LABEL USAGE (US)
Novel Use of Indocyanine Green for Intraoperative, Real-time Localization of Ureteral Stenosis During Robot-assisted Ureteroureterostomy

Zhao Lee, Jay Simhan, Daniel C. Parker, Christopher Reilly, Eton Liukani, David I. Lee, Jack H. Mydlo, Daniel D. Eun

Received: April 25, 2013; Accepted: May 30, 2013;

available at www.sciencedirect.com
journal homepage: www.europeanurology.com

Surgery in Motion

Use of Indocyanine Green During Robot-assisted Ureteral Reconstructions

Ziho Lee, Blake Moore, Laura Gusto, Daniel D. Eun*

Department of Urology, Temple University School of Medicine, Philadelphia, PA, USA

NOTE: INTRAURETERAL ICG - OFF LABEL USAGE (US)
Near Infrared Fluorescence Imaging

- **Ureter specific identification**
  - Pyeloplasty
  - Ureteral reimplant
  - Uretero-ureterostomy
  - Ureterolysis
  - Uretero-vaginal fistula
  - Early ureteral ID/avoidance: ureteral duplication, malrotation, bladder diverticulectomy, VVF
  - GYN and Colorectal applications

NOTE: INTRAURETERAL ICG- OFF LABEL USAGE (US)
Intraureteral ICG in supernumerary ureter identification

NOTE: INTRAURETERAL ICG- OFF LABEL USAGE (US)
Intraureteral ICG in Ureteroenteric Stricture Repair

80 yM after cystectomy
with complete obstruction
of left distal ureter

NOTE: INTRAURETERAL ICG- OFF LABEL USAGE
Near-Infrared fluorescence using white light ureteroscopy (without ICG)
Firefly: Ureteroscopy white light without ICG
Use of Indocyanine Green (ICG) for Complex Robotic Reconstruction Involving Bowel Urinary Diversions

Blake W. Moore, Laura L. Giusto, Zihao Lee, Andrew C. Harbin, Daniel D. Eun

Temple University School of Medicine
Philadelphia, PA
2015 SIU, Melbourne
3 ways to use Near Infrared Fluorescence Imaging

- **Intravenous injection:** ON LABEL- US
  - Purpose: assess real-time ureteral perfusion
  - IV route 3 cc ICG → 10 cc saline chaser
  - Wait 30-45 seconds
  - Tip: Washes out, can repeat dose

- **Intraureteral injection (Ante/Retro): OFF LABEL- US**
  - Purpose: locate ureter in a fibrotic/inflamed field
  - 5cc via PCN/ureteral catheter, clamp catheter
  - Wait 5-6 minutes
  - Tip: Helpful at start of case, benefit lost if urine spilled

- **No ICG: White light from cystoscope/ureteroscope**
  - Purpose: identify stricture, bladder, rectum, bowel segment
  - No ICG needed. Use white light of scope and turn on firefly
  - Turn off light when done to avoid thermal trauma
Distal and mid ureter: Traditional options

Robotic Boari Flap for Distal Ureteral Stricture
Mid Ureter-ureteroureterostomy: Traditional options
Well established concept in urethroplasty
Initially tested in baboon live survival model
1999: 1st human series- 4 patients

2013-14: 1st robotic series- 4 patients
33\textsuperscript{rd} WORLD CONGRESS OF ENDOUROLOGY & SWL

In recognition of excellence in Endourological Research, we are honored to award

"Multi-Institutional Study of Robotic Assisted Buccal Mucosa Graft Ureteroscopy: Initial Results"


With the Olympus Prize for the Best Laparoscopy/Robotic Paper at the WCE 2015 Meeting in London, England

James Lingeman, M.D.
President, Endourology Society
Robotic Ureteroplasty with Buccal Mucosa Graft for the Management of Complex Ureteral Strictures

Ziho Lee, Benjamin T. Waldorf, Eric Y. Cho, Jeffrey C. Liu, Michael J. Metro, Daniel D. Eun
Department of Urology, Temple University School of Medicine, Philadelphia, Pennsylvania
Department of Otolaryngology (JCL), Temple University School of Medicine, Philadelphia, Pennsylvania

Robotic Ureteral Reconstruction Using Buccal Mucosa Grafts: A Multi-institutional Experience

Lee C. Zhao, Aaron C. Weinberg, Ziho Lee, Mark J. Ferretti, Harry P. Koo, Michael J. Metro, Daniel D. Eun, Michael D. Stifelman

A Review of Buccal Mucosa Graft Ureteroplasty

Ziho Lee, Aryeh Y. Keehn, Matthew E. Sterling, Michael J. Metro, Daniel D. Eun
36th WORLD CONGRESS OF ENDUROLOGY

In recognition of excellence in Endourological Research,
We are honored to award

Functional Outcomes of Robotic Ureteroplasty with Buccal Mucosa Graft after Previously Failed Ureteral Reconstruction in Patients With more than 1 Year Follow-up


With the Olympus Prize for the Best Laparoscopy/Robotic Paper at the WCE 2018 Meeting in Paris, France

OLYMPUS
Your Vision, Our Future

Ali Riza Kural, M.D.
President, Endourological Society
Buccal graft ureteroplasty
General principles

• Minimal dissection as necessary
  • Reduce multiple perforation sites
  • Preserve blood supply
  • Save time, effort and high stress
• Longitudinal ureterotomy (open to open)
  • Anterior-medial
  • Avoids spatulation/shortening problem
• Measure to fit- don’t oversize!
• Omentum wrap- fix carefully
• Doesn’t preclude a subsequent traditional option (ie U-calycostomy, ileal ureter, nephx)
Mid Ureter-buccal mucosa graft ureteroplasty

Robotic Augmented Ureteroplasty with Buccal Mucosa Graft Onlay, Downward Nephropexy and Omental Flap Interposition

Daniel Eun MD
Lewis Katz School of Medicine at Temple University

Center for Advanced Robotic Surgery
T U R O L O G Y
72 y/o M

- Dx: Rectal CA s/p pelvic XRT/chemotherapy (2013)
- s/p APR and diverting colostomy (2013)
- 1 year later developed 8cm left-sided distal ureteral stricture with ipsilateral hydrenephrosis.
- Retrograde: complete ureteral obliteration
- L PCN tube placed
Catastrophic near-complete ureteral avulsion

Robotic Management of a Complete Ureteral & Renal Pelvis Avulsion: Appendiceal Transposition with Downward Nephropexy, Calycostomy, and Reimplant

Daniel Eun MD
Lewis Katz School of Medicine at Temple University
Thank you!
From Philadelphia with…

QUESTIONS?
1 YEAR ROBOTIC FELLOWSHIP INQUIRIES OPEN FOR 2021-22
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