Treatment for Complications of Radiation Therapy in the Cancer Survivor

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Disclosures:

American Medical Systems: Unrestricted Educational Grant, Investigator

Coloplast: Unrestricted Educational Grant
Pelvic Malignancies

Wide range in treatment options:-

Patient and Disease factors

Non-Surgical options

More than you think:-

Brachytherapy
[LDR, HDR]

EBRT
[3D-CRT, IMRT, SBRT]

Proton Beam

IORT

Cryotherapy

HIFU
People living with Cancer
(N = 14.5M survivors)
(>19 M by 2024)

Recto-Urethral Fistula; What is Repairable, What is Not?
Radiation and RUF

Rectourethral Fistula After Combination Radiotherapy for Prostate Cancer

Charles Marguet, Ganesh V. Raj, James H. Brashears, Mitchell S. Anscher, Kirk Ludwig, Vladimir Mouraviev, Cary N. Robertson, and Thomas J. Polascik

6 cases

Ave time to RUF 22.6 months

4/6 had hyperbaric oxygen treatment prior to development of RUF

2 patients with pelvic exenteration

2 successful gracilis interposition

2 remain doubly diverted
Radiation and RUF: 2004
Brigham and Women Study


7 brachytherapy
All diverted
5/7 remain diverted
Diverse operations
Ileal loop
Gracilis
RUF Repair Post Radiation

- **CCF series of 22 patients**
- **17 definitive repair following double diversion**
- **6/17 with preserved fecal and urinary function**

<table>
<thead>
<tr>
<th></th>
<th>No. BT Alone</th>
<th>No. EBRT Alone</th>
<th>No. BT + EBRT</th>
<th>No. Radical Prostatectomy + Salvage EBRT</th>
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<tbody>
<tr>
<td>No. pts</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>1</td>
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<tr>
<td>Diversion alone</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Transanal repair</td>
<td>2*</td>
<td>0</td>
<td>1*</td>
<td>0</td>
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<tr>
<td>APR +:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Permanent fecal + urinary diversion</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Preserved fecal or urinary function</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
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<tr>
<td>Preserved fecal + urinary function</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>0</td>
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<tr>
<td>ARB + prostate transurethral needle ablation before fistula development</td>
<td>1</td>
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<tr>
<td>Salvage cryotherapy</td>
<td></td>
<td></td>
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<tr>
<td>ABR before fistula</td>
<td></td>
<td></td>
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<tr>
<td>TURP:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Before EBRT</td>
<td>1</td>
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<tr>
<td>Yrs before BT, EBRT + transurethral bladder neck incision before fistula detection</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>Rectal ulcer ARB</td>
<td></td>
<td></td>
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</tbody>
</table>

* Lane et al J Urology 175:1382-1388, 2006*
CCF RUF Repair Post Radiation Algorithm

Radiotherapy-induced RUF

Initial Control
- Fecal Diversion: Stoma
- Urinary Diversion: Suprapubic catheter / Other
- Antibiotics

Wait 3 – 9 months

Medically Unfit
- Future urinary and bowel function not likely to be adequate

Future urinary and bowel function likely to be adequate
- Cystoprostatectomy and ileal conduit; Proctectomy and continue current fecal diversion

Future urinary function not likely to be adequate, with likely adequate bowel function
- Cystoprostatectomy and ileal conduit; Restoration of bowel function via primary repair or proctectomy and colo-anal pullthrough

Future bowel function not likely to be adequate, with adequate urinary function
- Repair of urethral defect with buccal mucosa graft and omental or gracilis interposition; Proctectomy and continue current fecal diversion

Future urinary and bowel function likely to be adequate
- Repair of urethral defect with buccal mucosa graft +/- gracilis interposition; Restoration of bowel function via primary repair or proctectomy and colo-anal pullthrough

Lane et al J Urology 175:1382-1388, 2006
Suspected Rectourethral Fistula

Appointment with Dr. Peterson @ Duke
or
Appointment with Dr. Lentz @ Duke Raleigh

Suprapubic Tube +/- nutrition evaluation

Referral to Dr. Mantyh, Dr. Migaly, or Dr. Thacker @ Duke
or
Referral to Dr. Farkas or Dr. Hopkins @ Duke Raleigh

Voiding symptom score, proctoscopy +/- anorectal manometry

Fecal Diversion +/- nutrition evaluation

Non-radiated RUF

Suprapubic tube or Foley, Heal 3 months +/-
Hyperbaric oxygen treatments

Cystoscopy, RUG/VCUG, proctoscopy
+/- nutrition labs

<2cm, no stricture, no BNC, distal rectal RUF, good anal fxn

YORK/MASON REPAIR

Foley x 3 weeks; SPT x 6 weeks

Periath RUG/VCUG, proctoscopy

Consider Reversal of Fecal Diversion

If urinary reoccurrence, consider artificial urinary sphincter at least 6 months after RUF repair

Post-Radiation/HIFU/Cryoablation RUF

Heal 44-6 months +/- Hyperbaric oxygen Treatments

Cystoscopy, RUG/VCUG, +/- urodynamic, pelvic MRI, proctoscopy, +/- nutrition labs

If <2cm

Foley x 6 months

Periath RUG/VCUG

 Heal x 6 months

Gastrograffin enema, proctoscopy

Cystoscopy, RUG, urodynamics, voiding diary, pad weights, quality of life questionnaires

Consider Reversal of Fecal Diversion

If >2cm or fixed tissues, distal fistula, poor anal tone

Pelvic exenteration with PSU, URO, and CRS

If Prostatic RUF:
(1) Salvage prostatectomy
(2) Omental vs gracilis flap

If Prostate: RUF
(1) Primary healing Repair
(2) Gracilis flap

(1) Transperineal +/- transabdominal excision of cavity
(2) inferior pubectomy
(3) Rectal closure
(4) Omental vs gracilis flap
(5) Vesicourethral anastomosis

If >3cm

(1) Transperineal +/- transabdominal excision of cavity
(2) inferior pubectomy
(3) Rectal closure
(4) Omental vs gracilis flap
(5) Vesicourethral anastomosis

If urinary incontinence, consider artificial urinary sphincter at least 6 months after RUF repair

Duke Multidisciplinary Approach to RUF
Multidisciplinary Approach

- Colo-Rectal Surgery
- Plastic Surgery
- Nutrition
- Wound Care/Stoma nurse

- Clinic appointments scheduled on the same day for patient convenience
Suspected RUF

→

Appointment with Duke Urology

→

Patients should have voiding diary, 24-hr pad weight, AUA symptom score, IIEF-5 score, ICS male SF questionnaire, RUG, cystoscopy, check nutrition labs, +/- smoking referral

Upper tract evaluation

Suprapubic Tube +/- nutrition evaluation

Referral to Duke Colorectal Surgery

→

Wexner symptom score, proctoscopy +/- anal manometry

→

Fecal Diversion +/- nutritional evaluation
Non-radiated RUF

Suprapubic tube/Foley, fecal diversion Heal x3 months +/- hyperbaric oxygen treatments

Cystoscopy, RUG/VCUG, proctoscopy +/- nutrition labs

<2cm, no stricture, no BNC, distal rectal RUF, good anal fxn

York Mason Repair

Foley x 3 weeks; SPT x 4 weeks

Pericath RUG/VCUG, proctoscopy

Consider Reversal of Fecal Diversion , GGE

If urinary incontinence, consider artificial urinary sphincter at least 6 months after RUF repair

>2cm or in proximal location

Consider perineal repair +/- PSU involvement
Radiated RUF

If Prostatic RUF:
(1) Salvage prostatectomy
(2) Omental vs gracilis flap

If <2cm:
(1) Primary Urethra Repair
(2) Gracilis Flap

If >2cm or BNC or Membrane Stricture:
(1) Buccal Only
(2) Gracilis Flap

If Ablative Tx:
(1) Transperineal +/- transabdominal excision of cavity
(2) Inferior pubectomy
(3) Rectal closure
(4) Omental vs gracilis flap
(5) Vesicourethral anastomosis
(6) Wound drainage

Foley x 6 weeks, SPT x 8 weeks

Pericath RUG/VCUG

Heal x 6 months

Gastrograffin enema, proctoscopy
Cystoscopy, RUG, urodynamics, voiding diary, pad weights, quality of life questionnaires

If urinary incontinence, consider artificial urinary sphincter at least 6 months after RUF repair

Consider Reversal of Fecal Diversion
Radiated RUF

If >3cm or fixed tissues, distal fistula, poor rectal tone

Pelvic exenteration with PSU, URO, and CRS

These are fortunately rare, but heroic efforts to fix a huge radiated RUF will usually disappoint the patient and surgeon
<table>
<thead>
<tr>
<th>Variable</th>
<th>Irradiated (N = 21)</th>
<th>Nonirradiated (N = 16)</th>
<th>p</th>
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<tbody>
<tr>
<td>Healing</td>
<td>14 (67)</td>
<td>14 (88)</td>
<td>0.16</td>
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<tr>
<td>Median time to healing, wk (range)</td>
<td>16.9 (3.8–41.7)</td>
<td>4.7 (3.1–55.4)</td>
<td>0.08</td>
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<tr>
<td>Urinary incontinence</td>
<td>4 (19)</td>
<td>4 (25)</td>
<td>0.68</td>
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<tr>
<td>Fecal incontinence</td>
<td>1 (5)</td>
<td>0 (0)</td>
<td>0.39</td>
</tr>
<tr>
<td>Recurrence(^a)</td>
<td>1/14 (7)</td>
<td>2/14 (14)</td>
<td>0.60</td>
</tr>
<tr>
<td>Median time to recurrence, wk (range)</td>
<td>45.1(^b)</td>
<td>46.6 (21.8–71.5)</td>
<td>0.98</td>
</tr>
<tr>
<td>Ostomy reversal</td>
<td>6/11 (55)</td>
<td>10/11 (91)</td>
<td>0.08</td>
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<tr>
<td>Median time to ostomy reversal, wk (range)</td>
<td>37.7 (76.5–282.0)</td>
<td>14.7 (11.5–33.2)</td>
<td>0.04</td>
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<tr>
<td>Overall mortality</td>
<td>9 (43)</td>
<td>1 (6)</td>
<td>0.08</td>
</tr>
<tr>
<td>Median time to death/ follow-up, mo (range)</td>
<td>55.1 (9.0–144.0)</td>
<td>61.9 (22.6–205.7)</td>
<td>0.59</td>
</tr>
</tbody>
</table>
Thank You

- **Duke Urology**
  - Erin McNamara, Ray Bernal

- **Duke Plastic Surgery**
  - Detlev Erdmann, Howard Levinson

- **Duke Colorectal Surgery**
  - Chris Mantyh, John Migaly, Julie Thacker, Ben Hopkins, Linda Farkas, Jennifer Hanna, Ryan Turley
Osteomyelitis of the Pubic Symphysis
We recognized a strange syndrome

Long-term survivors presenting with:

Chronic pelvic pain, "prostatitis"
Recurrent UTI
Recurrent skin infections
Recurrent AUS/IPP Infections
Strange thigh and abdominal wall abscess
Pain with walking
Our Patient

78 year old male with prior Gleason 6 CaP
Treated with Brachytherapy 7 years ago
Developed stricture
TUR

Pain + Stricture
Redo-TUR

Problems walking
Chronic UTI
Pain
Clearly demonstrated bone infection

Recognized the etiology

MRI for possible spine etiology of pain

Through serendipity:
**Our Series**

**Patients**

23 between 2011 and 2016  
Mean age 70

<table>
<thead>
<tr>
<th>Cancer Treatment</th>
<th>#</th>
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<tbody>
<tr>
<td>EBRT</td>
<td>6</td>
</tr>
<tr>
<td>RP + EBRT</td>
<td>8</td>
</tr>
<tr>
<td>Brachy + EBRT</td>
<td>6</td>
</tr>
<tr>
<td>EBRT + salvage cryo</td>
<td>2</td>
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<tr>
<td>HIFU</td>
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</table>

Precipitating procedure in 18 out of 23 cases
Presentation

**Average Time from treatment**

- **Pelvic pain**: 22 (96%)
- **Perineum, groin, thigh abscess/sinus**: 13 (57%)
- **Recurrent UTIs**: 15 (65%)
- **Sepsis**: 5 (22%)
- **Cellulitis**: 5 (22%)

**8 years**
**Imaging**

**All:** Increased T2-weighted sequences
Decreased signal on T1-weighted sequences

69%: High T2 signal at the origin of the obturator and adductor muscle groups

63%: Diastasis of the pubic symphysis with cortical bone erosion

75%: Fluid collection associated with the periprostatic space, parasymphseal region and rectus muscle

65%: Plain films demonstrated no radiographic evidence of pubic symphysis osteomyelitis
Imaging!
Imaging!
Imaging!
Imaging!
Imaging!
The Duke Algorithm

Stage Disease
Severity, Assess
Entire GU Tract

Orthopedics+ Infectious disease Eval;
CT urogram, cystoscopy, urodynamics

Involves CRS if associated RUF
Involves PSU if complex wound

Surgical Preparation,
Nutrition improvement,
Cessation of antibiotics

Healthy bladder with no
other organs involved
Non-Salvageable
bladder/missed organ
Non-Salvageable bladder
of associated RUF

Bone
debridement + IV
antibiotics
Cystectomy and
diversion with
bone debridement
+ IV antibiotics
Pelvic exenteration
with bone
debridement + IV
antibiotics
Surgery!
Surgery!
Surgery!
Results
2011 - 2016

Osteomyelitis
23

Surgery
21

+ Cystectomy
20

- Cystectomy
1

Redo Debridement
2

Resolved
2

Stable without surgery
2
Outcomes

Mean length of stay: 10 days (range 6-24)
Post-op ileus
Hernia
Fluid collection

Immediate resolution of pain in all!
Pubovesical Fistula: A Rare Complication After Treatment of Prostate Cancer

Kazuhito Matsushita, Lauren Ginsburg, Badar M. Mian, Elise De, Bilal I. Chughtai, Melanie Bernstein, Peter T. Scardino, James A. Eastham, Bernard H. Bochner, and Jaspreet S. Sandhu

UROLOGY 80 (2), 2012

Reconstructive Urology

Pubic Symphysis Osteomyelitis in the Prostate Cancer Survivor: Clinical Presentation, Evaluation, and Management

Shubham Gupta, Robert D. Zura, Edward F. Hendershot, and Andrew C. Peterson

UROLOGY 85 (3), 2015

The Journal of Urology

Available online 22 August 2015

In Press, Accepted Manuscript — Note to users

Fistulation into the Pubic Symphysis following treatment of Prostate Cancer - an important and surgically correctable complication

Simon Bugeja, Daniela E. Andrich, Anthony R. Mundy
Take Home Point: -

What to look for?

“Pelvic pain and/or I keep getting infections”

Osteomyelitis
Thank You

- **Duke Urology**
  - Shubham Gupta  
  - Jim Belsante  
  - Patrick Selph  
  - Uwais Zaid  
  - Garjae Lavien

- **Duke Orthopedic ID**
  - Ted Hendershot

- **Duke Orthopedics**
  - Bob Zura
  - Will Eward

- **Duke Plastic Surgery**
  - Detlev Erdmann
EVALUATION AND MANAGEMENT OF URINARY INCONTINENCE IN FEMALE PATIENTS AFTER RADIATION: Complex Vesico-vaginal Fistula
33 y/o AA Female with history of cervical cancer

- Referred for possible reconstructive options.

CC: “I was sent here to fix the urine from my vagina”
CC: “And...to get rid of this tube!”

Finished radiation 10 months ago!
- Living with incontinence
- Had flank pain.
- Imaging: hydronephrosis on right.
- Had PCN placed
Severe Genitourinary Toxicity Following Radiation Therapy for Prostate Cancer—How Long Does it Last?

Sung Kim, Dirk F. Moore, Weichung Shih, Yong Lin, Hui Li, Yu-Hsuan Shao, Shunhua Shen and Grace L. Lu-Yao*

From The Jean and Betty Gale Prostate Cancer Center (SK, GLY), Cancer Institute of New Jersey (SK, DFM, WS, HL, YHE, GLY), and Departments of Radiation Oncology (SK, GLY) and Medicine (YHS, GLY), University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, New Brunswick and Department of Biostatistics, School of Public Health, University of Medicine and Dentistry of New Jersey (DFM, WS, HL), Piscataway, New Jersey, and Smith Barney Consulting Group,Syn Mauer, Pennsylvania

![Graph showing event rate per 1000 person-years over time after radiation for Radiation and Observation groups.]
Urinary Diversion:
More Options, Better Outcomes
Proper Patient Selection

Goals of urinary diversion:

- Safest procedure for the patient
- Minimize complications
- Maximize quality of life

Continent diversion not always the best choice
Quality of Life

Most reports compare continent to loop diversion

Little to no difference found

Few reports comparing different continent diversions
Source of Diversion
TRANVERSE COLON CONDUIT: A PREFERRED METHOD OF URINARY DIVERSION FOR RADIATION-TREATED PELVIC MALIGNANCIES

JOSEPH D. SCHMIDT, CHARLES E. HAWTREY AND HERBERT J. BUCHSBAUM

From the Departments of Urology and Obstetrics-Gynecology, University of Iowa Hospitals and Clinics, Iowa City, Iowa

MATERIAL AND METHODS

Since 1970, 8 patients (2 men and 6 women) have been selected for supravesical urinary diversion using an isolated segment of transverse colon.
**Ileal Conduit**

*No CIC*

*Incontinent diversion*
Continent Urinary Diversion

Must be able to CIC
Right Colon Pouch
The Bladder

“To take... or not to take?”

Yes

Minimal morbidity
30 Minutes
<300 cc EBL
Pyocystis
Risk of cancer
Bleeding
Pain

No

Less morbidity
Less time
Less blood loss
Not needed

Wound closure issues
Extirpative Surgery:

Sometimes necessary

Beware progressive disease with radiation

Select for continent and non-continent diversion options

Can use small bowel – cautiously

Consider removal of the native bladder
Conclusion

• Radiation survivors are common
  • May be tough to care for
    • Solutions exist
• Beware the lower tract in the radiated survivor
“The best interest of the patient is the only interest to be considered.”

William J. Mayo, M.D.
1861-1939