Welcome

- 19th Annual ROC Niagara Conference
- 2019 Pelvic Radiation Symposium
- 19 Presenters and Topics
Disclosure

- I have no disclosures relative to the presented materials
- The following presentation is a reflection of studies, protocols, and opinions
- No honorarium has been received in regards to the subsequent material
- Eclipse v15
Meet The Speaker

• Lee Culp, M.S CMD RT(T)
• Dosimetrist at Roswell Park Comprehensive Cancer Center
• Previously at THE Ohio State University
• Masters in Dosimetry from University of Wisconsin – La Crosse
• Business and Communication BS from University of Buffalo
My Pride and Joy

Luna

Stella
Radiotherapy at Roswell

- Treat all sites, including Brachy and Gamma
- 4 vaults & Brachy suite
- 1 CT
- 17 Radiation Therapists
- 8 Medical Dosimetrists
- 11 Radiation Physicists
Roswell Park

• Founded in 1898
• First institution in the world to focus exclusively on cancer research
• Mission includes patient care, cancer prevention, and education
• Ranked 14th in the nation for top cancer hospitals in the US News
What is This Talk About?

- Dosimetrists Guide to Pelvis Irradiation
- We’ll discuss sites, preferred treatment/dosages, tips & tricks
Will This be Relevant to Therapists?

YES!
Gynecologic Cancers

- Ovaries
- Uterus
- Cervix
- Vagina
- Vulva
Gynecologic Cancers

- 4th most common malignant tumors diagnosed in women in the US
- 20% of all cancers
- 1 million cases diagnosed per year, worldwide
Gynecologic Cancers

- Radiation Therapy is commonly used as definitive treatment in early stages
- For locally advanced stages Radiation in conjunction with surgery and/or chemotherapy
- Palliative patients also receive Radiation
Cervical Cancer

Radiotherapeutic approaches

Extended field RT – with evidence of paraortic involvement
- Includes inguinal nodes with lower vaginal involvement

Brachytherapy in conjunction with pelvic RT
- Preoperatively, and intracavitary

VMAT – if Simultaneous Integrated Boost (SIB), or lymph involvement
- Center specific
Cervical Cancer

- Radiation used for nearly all stages
- Cure rates: 80%
- Radiation for early stages, alone
- If tumor exceeds 4cm surgery then RT
Uterine Cancer

• Receive Surgery upfront (total abdominal hysterectomy and bilateral salpingo-oophorectomy)
• RT is delivered postop
  • Either pelvic RT or brachytherapy
• RT may help risk of locoregional recurrence, along with chemo after surgery as well
Ovarian Cancer

- No longer used alone following surgery
- Used conjunctively with chemo and surgery
- Standard practice is adjuvant chemo
- RT is important in palliative treatments
Vulvar Cancer

- Upfront surgery
- Followed by adjuvant RT or chemo
- Adjuvant RT significantly reduced the risk of recurrence in the inguinal nodes
  - Treatment of choice after surgery
Vulvar Cancer

RT Techniques

• Pelvic-inguinal irradiation (unresectable)
  - Followed by a boost with a midline block
• High dose to control primary tumor
• Limited use of Brachy in these cases
Vaginal Cancer

- RT is treatment of choice
- Excellent outcomes
- Locally advanced receive RT and Brachy
- Low number of Vaginal cases diagnosed yearly
External Beam RT

- Used to irradiate multiple targets within pelvis
  - Uterus/cervix
  - Upper vagina
  - Paracervical/parametrial tissues
  - Pelvic lymph nodes
External Beam RT

- AP/PA fields
- Four-field (AP/PA plus laterals)
  - Allows for more normal tissue sparing
    - Small Bowel
    - Posterior Rectum
- VMAT
External Beam RT

- Superior Border: L4-L5 to include common iliac lymph nodes
- Inferior Border: Inferior obturator foramen
- Lateral Borders: 1-1.5cm beyond pelvic brim
External Beam RT

- Anterior Border: lateral the pubic symphysis for external iliac nodes coverage
- Posterior Border: S2-S3 interspace
- Customized blocking (MLCs) to decrease dose to surrounding normal tissues
External Beam RT
External Beam RT

Positioning
- Most centers: Supine
- Some centers: Prone with a Bellyboard
  - to help reduce the volume of small bowel irradiated
  - Usually only three fields used
- Some centers prefer to treat with a full bladder to displace small bowel

*Consistent bladder and rectal filling throughout treatment is key*
External Beam RT

- Moderate-high energy photon beams (10+ MV)
- Lower energies can be used in thin patients (6 MV)
- Wedges added to lateral fields to decrease “hot spots”
External Beam RT

- Doses range from 3960 – 5040cGy
- 180 – 200cGy per fraction

- Higher doses used in patients undergoing external beam alone
- Lower doses for external beam + Brachy
External Beam RT

- Midline block used sometimes
  - Allows higher total dose utilizing Brachy
  - Cervical patients
  - Typically 1000 – 1200cGy
  - 5 – 6 fractions
External Beam RT

- IMRT has seen in increase in GYN cancers
- Effective in reducing pelvic bone marrow irradiation
  - This is especially useful with patients receiving concurrent chemo
External Beam RT

- IMRT
  - Utilized to deliver higher doses
  - Conventional techniques made it hard to deliver doses above 6000cGy
  - Can use SIB with IMRT
External Beam RT

- SIB
  - Utilized with involved para-aortic nodes
  - Para-aortic receives conventional Fractions
    - 180cGy/day 4500cGy total dose
  - Involved Nodes receive *Higher* than conventional fraction
    - 240cGy/day 6000cGy total dose
External Beam RT

Targets based on ICRU 50 Guidelines

- GTV – Gross tumor volume
- CTV – Clinical target volume
- $CTV_{Nodes}$ – Common, external and internal iliac nodes and pre-sacral space
- $CTV_{Vagina}$ – vaginal cuff + paravaginal/parametrial tissues
- PTV – CTV + 1-2cm
  - For Patient setup uncertainty and organ motion
External Beam RT

Normal Tissues:
• Small Bowel
• Bladder
• Rectum
• Sigmoid Colon
• Pelvic Bones/Femoral Heads
External Beam RT

VMAT plans
- Typically 4500cGy
- 180cGy daily

VMAT + Brachy plans
- Higher doses at 5040cGy
External Beam RT

Frog Leg?

Lower Vaginal, Pelvic-inguinal Irradiation
Supine
Minimize skin folds
-Reducing Hot spots
External Beam RT

Constraints

- Small bowel max < 4500cGy
- Kidneys <33% to receive less than 1000cGy
- Spinal Cord max <4500cGy
- Rectum <50% to receive less than 5000cGy
- Bladder <50% to receive less than 5500cGy
Prostate Cancer

- Most common malignant tumors diagnosed in men in the US
- 190,000 new cases yearly
- 27,000 men die annually
- PSA tests improve outcomes
Prostate Cancer

RT Techniques

• External photon beam
  - CT/MRI - IMRT
• Low Dose rate Brachy
• High Dose rate Brachy
Prostate Cancer

Radical Prostatectomy
• Substantial risk or impotence
• Urinary incontinence
• Sexual dysfunction
Prostate Cancer

External Beam Radiation Therapy

• Prostate always be treated
• Include?
  • Seminal Vesicles
  • Pelvic Lymph Nodes
• Associated with high risk nodal disease and worse clinical outcome
Prostate Cancer

External Beam Radiation Therapy

• Normal Structures/OAR
  • Rectum
  • Bladder
  • Femoral Heads
  • Penile Bulb
  • Small/Large Bowels
Prostate Cancer

External Beam Radiation Therapy
• Traditionally four field technique
• Inverse-planned IMRT
  • Improved normal tissue DVH
  • Receive higher doses with IMRT
Prostate Cancer

External Beam Radiation Therapy

• Fractionation:
  • 7020 – 8000 cGy
  • Fossa 6800 cGy
  • 180 – 200 cGy/day
Tips & Tricks - Planning

• 6X or 10X (if possible)
  • 10X can cool off the plan
• Full Bladder/Empty Rectum
  • Should be similar for each treatment
Tips & Tricks - Planning

Isocenter: Central to PTV
- Beam is most intense at the center
- Minimize travel of x jaws which is 15 cm
- ANT/POST where rectum/prostate meet
- Can help decrease rectal dose
Tips & Tricks - Planning

• Collimator angles should be the slope of the rectum
• Playback arc rotation prior to Optimization
  - Ensures jaws not too tight on PTV
  - Will cause plan to be hot
Trick Structures – _pPTV
Trick Structures – _Bladder OUT
Trick Structures – Rectum OUT
Trick Structures – _POST Avoid
Trick Structures – _Rectum Avoid
Trick Structures – _Rectum IN
Trick Structures – Bladder IN
Trick Structures – Ring50
Trick Structures –

- 2 arcs
  - Small, round, simple structure
  - Bladder or prostate
  - 1st arc 5-30° collimator
  - 2nd arc 90° collimator
Trick Structures –

- 3 arcs
  - Nodal patients
  - 1\textsuperscript{st} arc 5-30\(^\circ\) collimator
  - 2\textsuperscript{nd} arc 88-90\(^\circ\) collimator
  - 3\textsuperscript{rd} arc 90-92\(^\circ\) collimator
2nd & 3rd arc
2nd & 3rd arc
Tips & Tricks - Optimizer

- Make most changes in MR Level 1
Tips & Tricks - Optimizer

• NTO
  • Priority 100-150
  • Distance Target: 0.5cm
  • Start Dose: 95
  • End Dose: 60
  • Fall-off: 0.05-0.3
Any Questions?
Thank You

Lee Culp MS, CMD, RT(T)
Lee.Culp@Roswellpark.org