Clinical Concepts in Radiation Oncology

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2021 Review

Central Nervous System

Epidemiology

- Most are metastatic
- Primary tumors relatively rare

Etiology—Unclear, suspected:

- Exposure to vinyl chloride in gliomas
- Epstein Barr virus in CNS lymphomas

CNS
Signs and Symptoms

- Related to location within the brain and include
  - Headaches
  - Seizures
  - Visual deficits
  - GI symptoms: N/V, loss of appetite
  - Changes in personality, mood, cognitive capacity and concentration
- CT, MRI and biopsy (if possible) to diagnose

CNS Histology

- Adult
  - Most common primary is Glioma
    - Astrocytoma
      - Glioblastoma multiforme
- Others
  - Schwannomas
  - Ependymomas
  - meningiomas

- Pediatric (most common ped. **solid** tumors)
  - Astrocytomas (1)
  - Medulloblastoma (2)
    - cerebellum
    - PNET
    - Propensity to seed into spinal canal
    - Craniospinal irradiation

Primary CNS Tumors

- Staging
  - Uses a grading system
  - G1-G4
    - Grade is most important prognostic indicator
    - No lymphatics in CNS

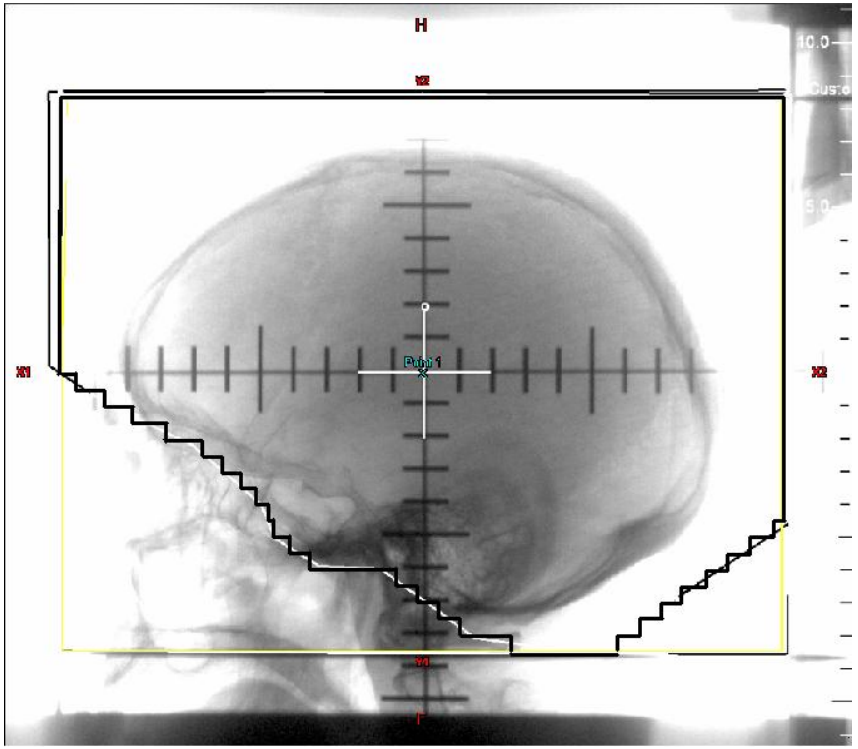
CNS
Treatment of Choice

- Surgery, if location allows
- Radiation therapy post op
- Chemotherapy for high grade gliomas
  - Temozolomide

CNS Radiation—Whole Brain

- Supra-orbital ridge
- Just below the EAM
- At least 1 cm of flash (shine) around anterior, superior and posterior

- Alternative: SRS
- Controversy about which is best option



uwlclinicaloncology2010.wikispaces.com

CNS Radiation Partial Brain

- VMAT/IMRT
- Protons
- Partial brain 3DCRT
  - Tumor and 1-3 cm margin

- TD 5/5
  - Whole Brain 5,000 cGy
  - Partial Brain 6,000 cGy
  - Spinal Cord 4,500-5,000 cGy
  - These are based on TD 5/5
  - Assumes a 5% incidence of complications at a 5 year period

Cancers of the Head and Neck (H&N)

- Will cover:
  - Oral Cavity
  - Pharynx
  - Larynx
  - Sinus
  - Salivary Glands

cancergrace.org

H & N

- Epidemiology
  - About 3% of all cancers in the U.S.
  - Twice as common in men
  - Generally > 50 years old
  - NCI estimated 52,000 men diagnosed in 2012
- Etiology
  - Smoking and drinking
  - Betel nut in oral cavity
  - Salted foods in nasopharyngeal ca.
  - Poor hygiene
  - Radiation exposure
  - Epstein-Barr virus
  - ***HPV***

Signs and Symptoms

- Oral cavity
  - Leukoplakia
  - Swelling of the jaw under dentures
  - Pain or bleeding

Most common site of distant mets for H&N cnacers is **lung

oralmaxillo-facialsurgery.blogspot.com

Signs and Symptoms

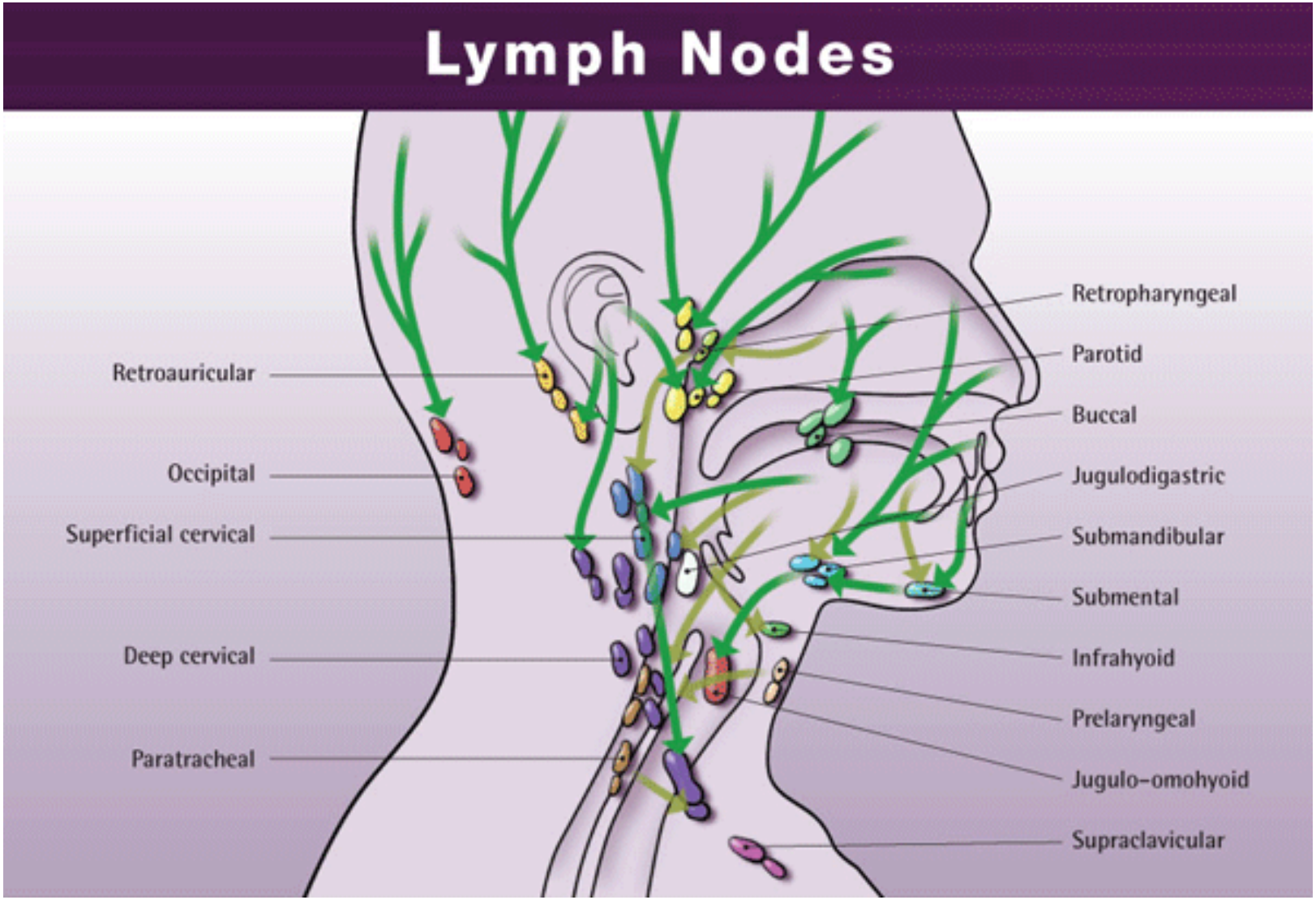
- Pharynx
  - Dysphagia
  - Odynophagia
  - Otalgia
  - Pain in neck area
- Larynx
  - Dysphagia
  - Odynophagia
  - Otalgia

Signs and Symptoms

- Paranasal Sinuses and Nasal cavity
  - Cannot clear sinuses
  - Chronic sinus infections
  - Epistaxis
  - Headaches
  - Pain or swelling in the eyes or upper teeth
- Salivary Glands
  - Swelling or pain under the chin or jaw bone that is not relieved

Histology, Staging and Common Sites

- Most H&N cancers are squamous cell carcinomas
- TNM staging
- **Knowledge of the lymphatic system and where drainage occurs is important for the registry exam**
- Most cancers of the paranasal sinuses occur in the maxillary sinus
- The parotic gland is the most common site of salivary gland ca.



Treatments H&N Cancer

- Treatments often depend on the size and location of the tumor
- Cosmesis and function are important factors
- Treatment for advanced H&N cancer uses chemotherapy (cisplatin)

- Oral cavity
  - Surgery for smaller lesions < 1.5 cm
  - XRT for positive margins and neck nodes
  - Lip cancers can be treated with electrons

Treatments H&N Cancer

- Nasopharynx
  - Surgery typically not viable
  - ChemoRT
- Oropharynx
  - Robotic surgery
  - XRT for early stage disease
  - ChemoRT for advanced disease

Treatments H&N Cancer

- Hypopharynx/Larynx
  - Surgery
  - XRT for early lesions
  - XRT post op for larger lesions

Treatments H&N Cancer

- Salivary gland
  - Surgery
  - Radiation
- Maxillary Sinus
  - Surgery
  - Radiation

Thyroid Cancer

- Papillary is most common form
- Treatment
  - Surgery
  - I-131

Doses

- Most are IMRT
- Lip, oral cavity, oropharynx, hypopharynx
  - XRT only 66-74 Gy
  - Post-op 60-66 Gy
- Nasopharynx
  - 66-70 Gy
- Glottis and Supraglottis
  - 70-74 Gy
  - Post op 60-66 Gy

**Any s'clav fields = 45-50 Gy

Breast Cancer

Epidemiology

- Most common malignancy in women
- 2nd leading cause of cancer deaths
- Upper outer quadrant

Etiology

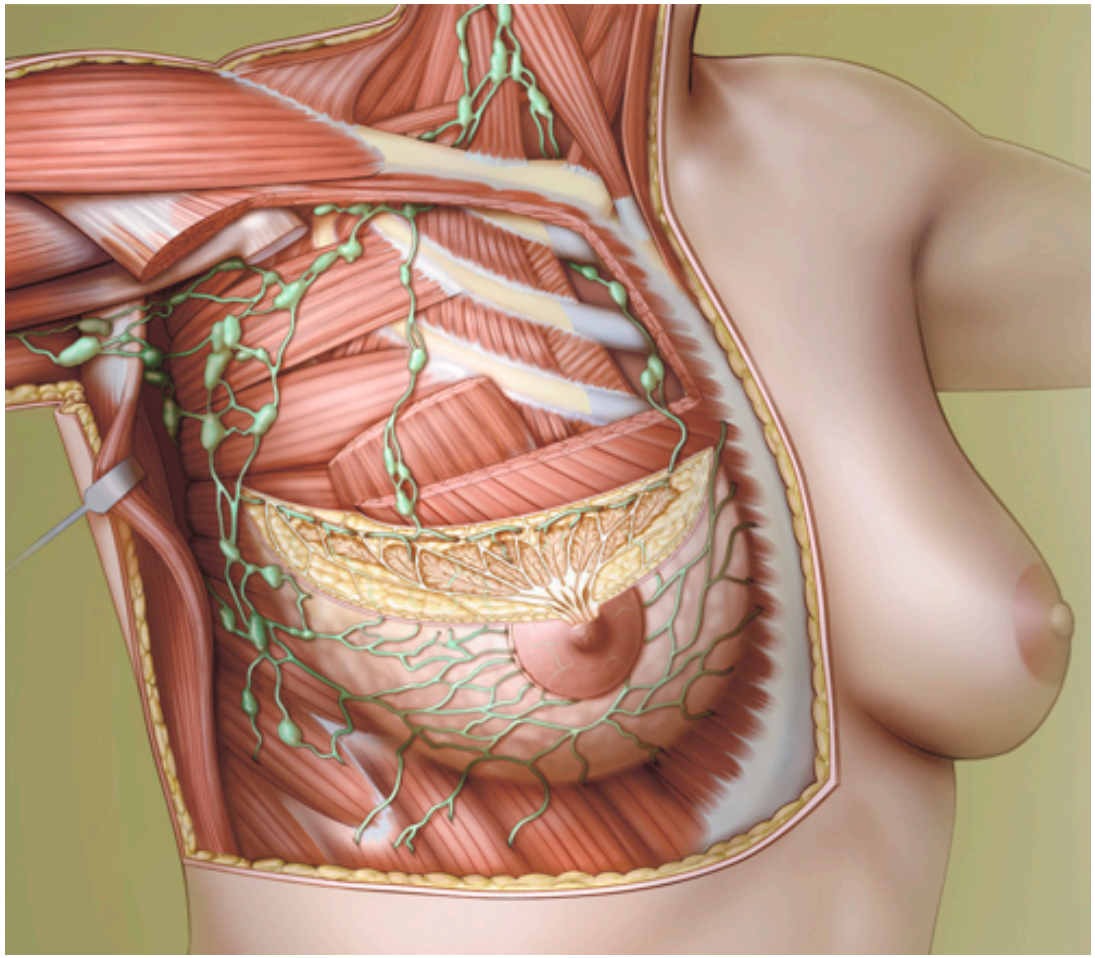
- Gender
- More common in older women
- Obesity
- Hormone therapy
- Long menstrual history
- Genetics—BRCA1 and BRCA2
- Many others

Breast Cancer—Signs and Symptoms

- 3 step detection system
  - Monthly self exam
  - Yearly clinical exam
  - Yearly mammogram after 40
    - Sentinel node biopsy
    - Knowledge of breast lymphatic drainage is important for registry exam
- Symptoms
  - Lump or mass felt on palpation
  - Nipple discharge or retraction
  - Paget's disease
  - Lymphadenopathy
  - Arm edema

**can spread to brain, lung, liver and bone

Breast Lymphatics



gentryvisualization.com

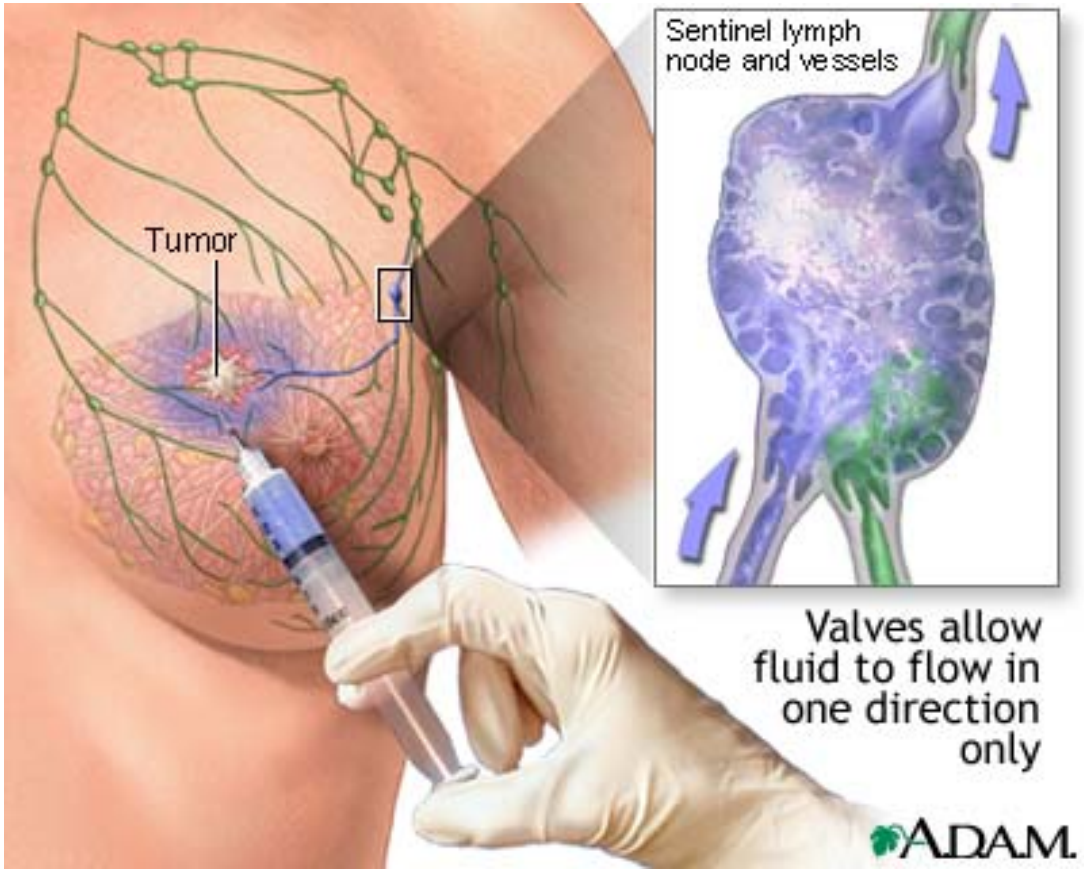
Histology

- TNM Staging
- Infiltrating Ductal carcinoma is most common 70-80%
- Second is infiltrating lobular carcinoma 5-10%
- Other rare types exists
- Inflammatory breast cancer 1:100 breast cancers
  - Peau d'orange
  - Warmth
  - Painful, tenderness
  - Diffuse induration
  - Very deadly

Treatments

- Surgery
  - Lumpectomy sentinel node biopsy
- Chemo
  - Doxorubicin (Adriamycin) is cardio-toxic
- Hormones
  - Depends on receptor status (ER/PR/Her-2)
- Radiation
  - Whole breast tangents
  - Boost with electrons of photons
    - Extensive lymphatic disease may require s'clav and PAB radiation
  - Accelerated Partial Breast Irradiation 10 treatments, BID 5 days
  - Hypofractionated Schedules

Sentinel Node Biopsy



umm.edu

NCCN Guidelines

- Lumpectomy with surgical axillary staging

1. Negative nodes—XRT to whole breast with or without boost or partial breast irradiation
2. 1-3 nodes—XRT to WB w or wo boost strongly consider s'clav & infraclav and IM nodes
3. ≥ 4 nodes—XRT to WB w or wo boost, s'clav & infraclav and strongly consider IM nodes

NCCN Doses (In general)

- 180-200 cGy per fraction
- New Hypofractionated regimens
- Boost to 6000-6600 cGy
  - Electrons or smaller photon fields
  - 2.0 Gy per day

(Whole)Organs At Risk TD 5/5

• Heart	40 Gy	Pericarditis
• Lung	14-17.5 Gy	Pneumonitis
• Brachial Plexus	55-60 Gy	Nerve Damage

Lung Cancer

- Epidemiology
  - Most common cancer in U.S. (sexes combined)
  - Incidence for both sexes declining,
    - Decline just begun in women
  - Most deaths from cancer (sexes combined)
- Etiology
  - Smoking
  - Radon
    - Others
      - Second hand smoke
      - Asbestos (mesothelioma)
      - Occupational exposures
        - » Rubber
        - » Metals et.c

http://www.cancer.org/acs/groups/content/@epidemiologysurveilance/documents/document/acspc-036845.pdf

Clinical Presentation—Lung Cancer

- Difficult to differentiate between tumor and COPD
- Presenting features are associated with
  1. Local disease in bronchopulmonary tissues
  2. Regional extension to lymph nodes, chest wall and neurologic structures
  3. Distant dissemination

- Cough in 75% of early disease
  - Severe and unremitting 40%
- Hemoptysis 60%
- Dyspnea 15%
  - Can spread to:
  - Cervical lymph nodes
  - Liver
  - Brain
  - Bones
  - Adrenal glands
  - Kidneys
  - Contralateral lung

Common Histologies—Lung Cancer

- Non Small Cell
  - 7 out of 8 are Non-Small Cell
  - Squamous: tumor located centrally
  - Adenocarcinoma: tumor located in bronchioles, alveoli
  - Large cell: peripheral, smaller bronchi; aggressive
- Small Cell
  - About 1:8
    - Oat cell: occur centrally
    - Met rapidly
    - Alw
    - always from smoking
- Others
  - Mesothelioma
  - Pancoast tumors
    - Horner's syndrome

Radiation Therapy

- Current Standard Generally Includes
  - Concurrent, sequential or alternating chemotherapy and radiation
  - 6000-6600 cGy at 180-200 cGy per day
  - 4500 cGy BID for small cell lung cancer
  - IGRT increasing
  - Respiratory gaiting
  - ABC
  - SBRT for Stage I lesions

Staging and Treatment—Lung Cancer

- TNM staging used
- Post op chemoradiation
- For Small Cell: Consider PCI 2500 cGy in 10 fractions

OAR and TD 5/5—Lung Cancer

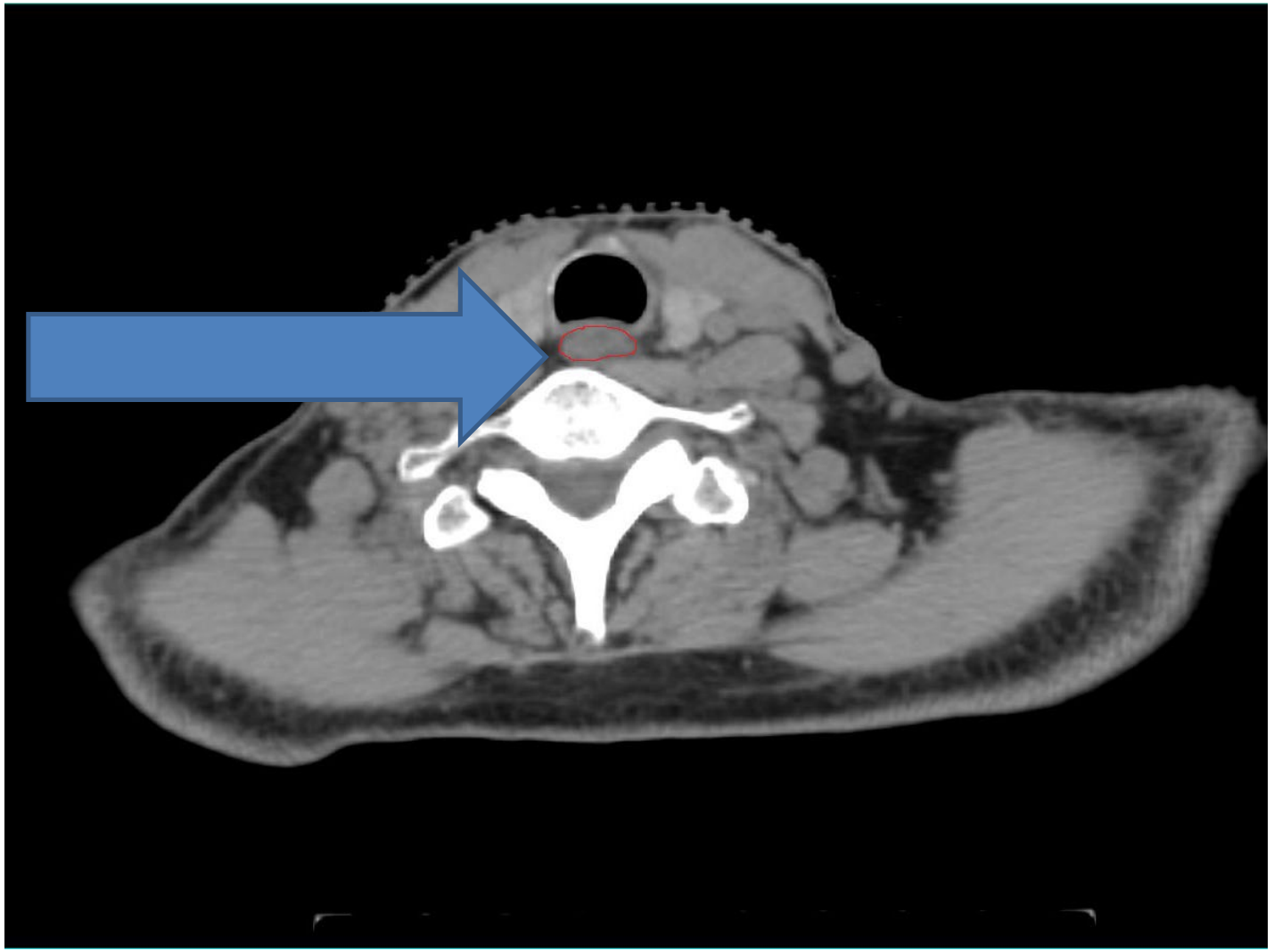
- Cord 4500-5000 cGy
- Normal Lung 2000 cGy
- Heart 4300 cGy
- Esophagus 5000 cGy
- Bone Marrow 2500 cGy
- Skin 5500 cGy
- Liver 3500 cGy
- Bone 6500 cGy

Esophageal Cancer

- Epidemiology
  - 18,000 cases per year
  - About 15,000 deaths
  - 1% of all cancers
  - More in men
  - More in Asia
- Etiology
  - Smoking and drinking
  - Caustic injuries
  - Diets low in fruits and vegetables
    - Pre existing conditions
      - Barrett's
      - Achalasia
      - Plummer Vinson

Signs and Symptoms--Esophageal

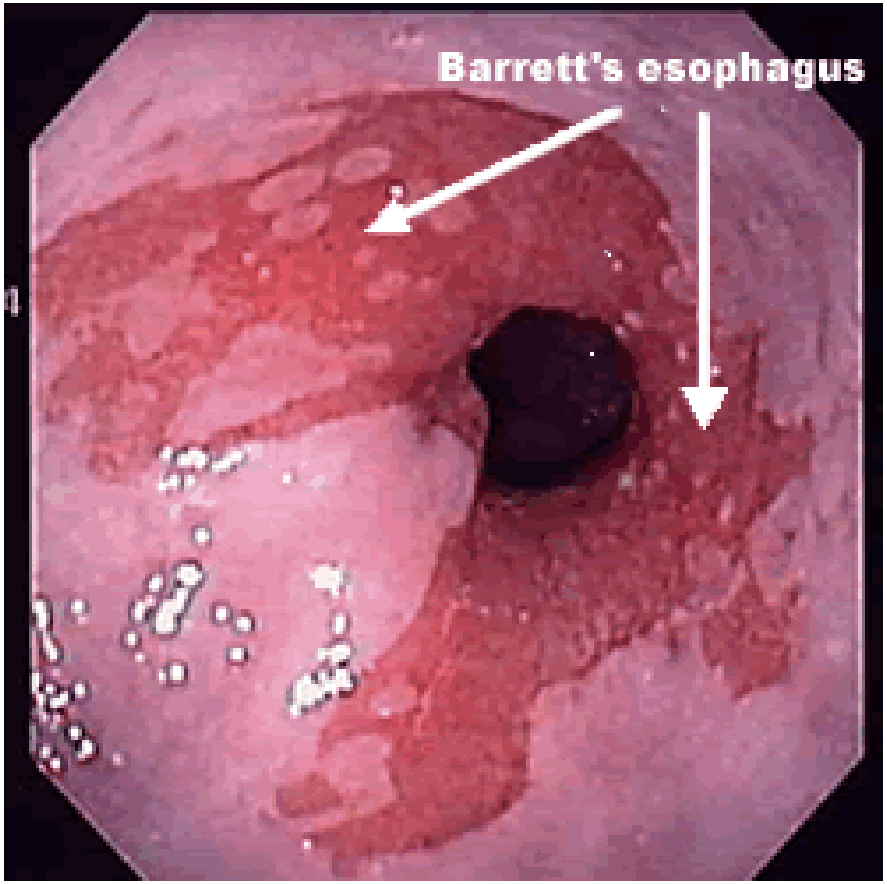
- Dysphagia
- Odynophagai
- Weight loss
- Hematemesis
- Hemoptysis
- Hoarse voice



Common Histology—Esophageal

- Adenocarcinoma
  - Occurs in the distal esopahagus
  - More common in the US
    - Obesity
    - Acid reflux
    - Barrett's
- Squamous Cell Carcinoma
  - Proximal esophagus
  - Drinking
  - Smoking

Barrett's



markfuscomd.com

Treatment of Choice—Esophageal

- TNM staging
- 2 most common treatments
  - Definitive Chemoradiation
  - Neoadjuvant pre-op chemoradiation

NCCN Doses—Esophageal

- Radiation Alone
  - AP/RPO/LPO to avoid cord
  - IMRT
  - 65 Gy
- With chemo 50.4 Gy
- Multiple regimens depending on location

OAR and TD 5/5--Esophageal

• Heart	• TD 5/5 = 4000 (whole)
• Cord	• TD 5/5 = 4500-5000
• Lung	• TD 5/5 = 2000-3000 cGy (whole)
• Liver	• < 60% should receive < 30 Gy
• Kidney	• At least 2/3 of one kidney should < 20 Gy

Colorectal

- Epidemiology
  - In XRT we mostly see rectal
  - Third most common cancer in men and women
  - Incidence decreasing
    - Screening and awareness
  - More common in men
- Etiology
  - > 50 years old
  - Obesity, poor diet, lack of exercise, red processed meat, alcohol, smoking
  - Hereditary
  - History of polyps
  - Inflammatory bowel disease

http://www.cancer.org/acs/groups/content/@epidemiologysurveilance/documents/document/acspc-036845.pdf

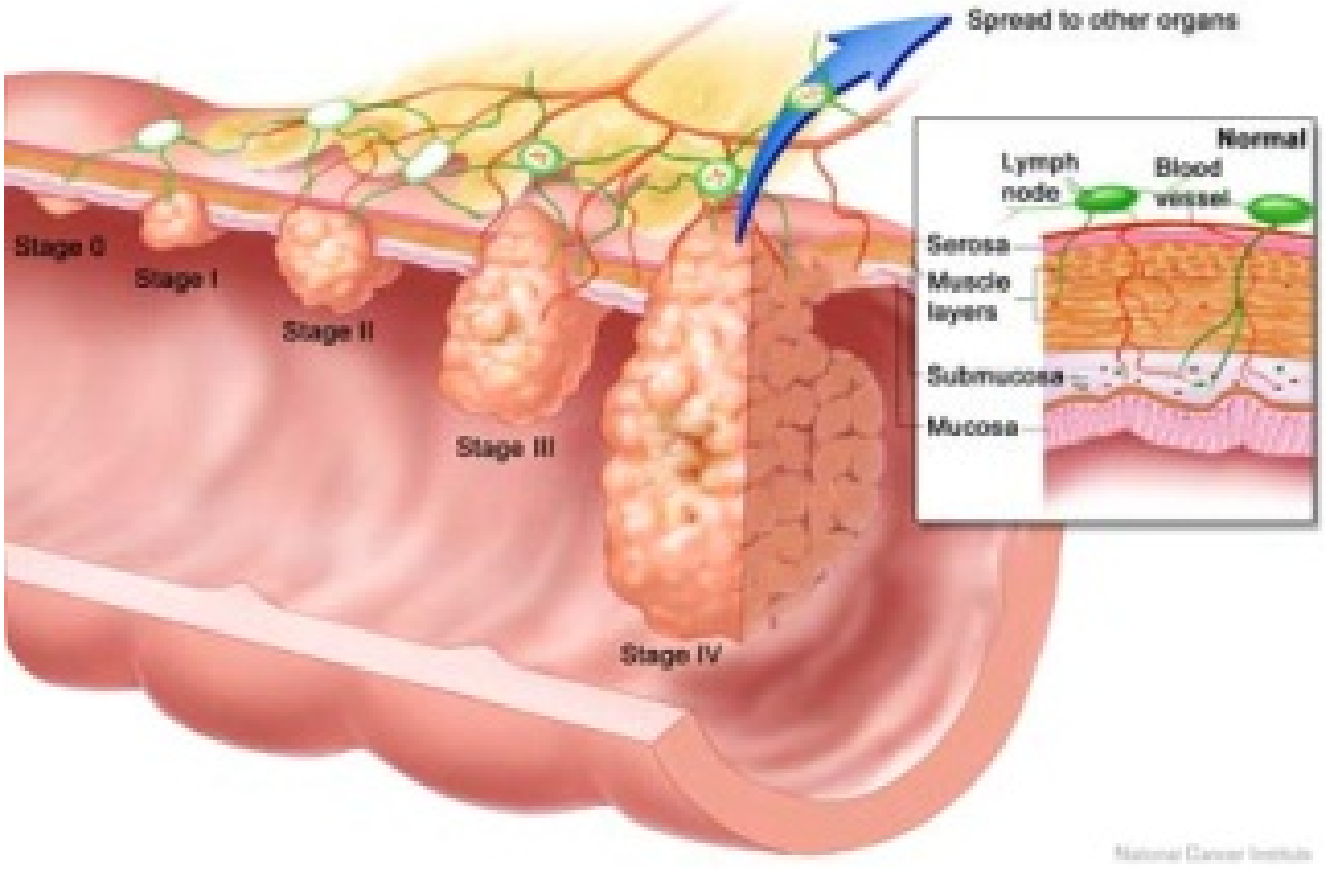
Signs and Symptoms—Colorectal

- Symptoms not evident in early disease
  - Screening after 50
    - colonoscopy
- More advanced disease
- Rectal bleeding, blood in stool, change in bowel habits
- Cramping, lower abdominal pain

http://www.cancer.org/acs/groups/content/@epidemiologysurveilance/documents/document/acspc-036845.pdf

Common Histology--Colorectal

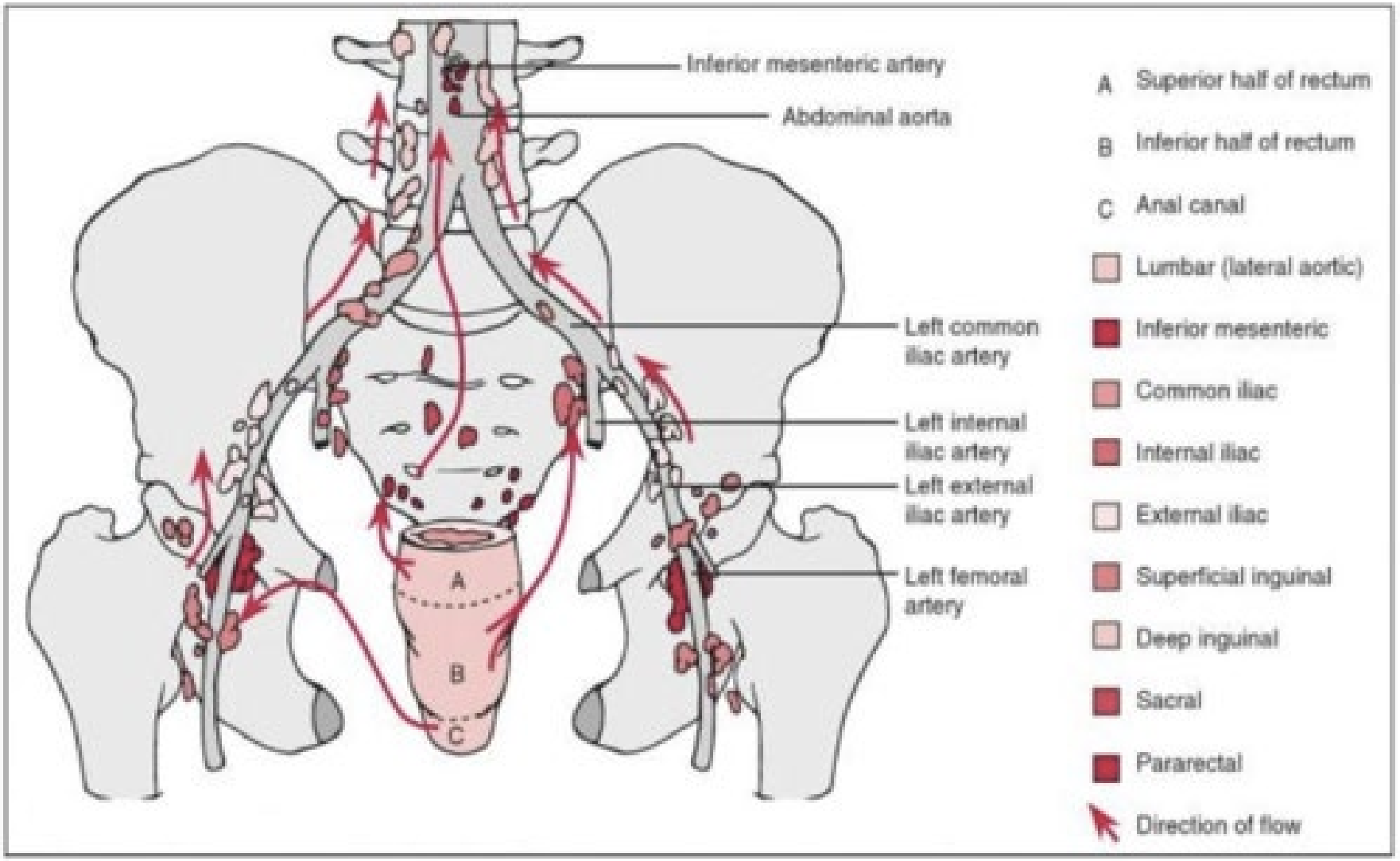
- Most are adenocarcinoma
  - Glandular organ
- Staging
  - TNM
  - Duke's
  - Modified Astler Coller

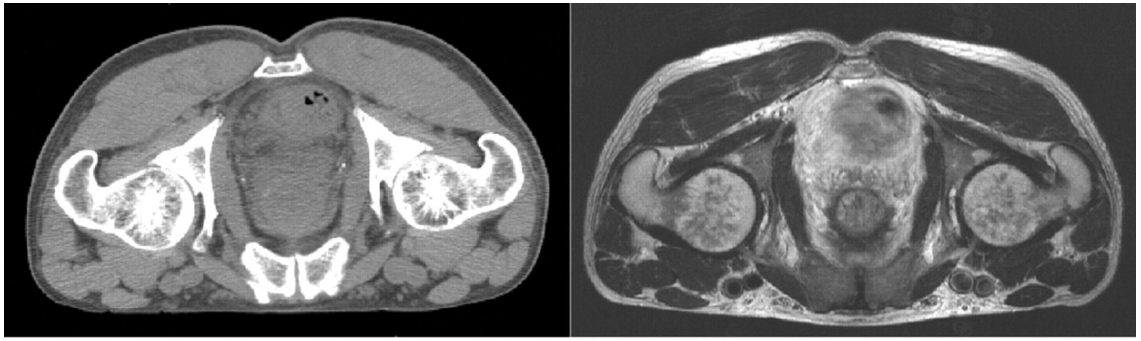


colorectal.surgery.ucsf.edu

Treatment—Colorectal

- For large and small tumors, surgery is treatment of choice
- Rectal
  - Surgery with adjuvant radiation and chemo
  - Techniques
    - Usually prone, belly board to displace the bowel
    - 3 field technique; PA/RT Lat/Lt Lat
    - IMRT
    - Pelvic lymphatic consideration is important


Inferior mesenteric artery
Abdominal aorta
Left common iliac artery
Left internal iliac artery
Left external iliac artery
Left femoral artery
A
B
C
A Superior half of rectum
B Inferior half of rectum
C Anal canal
Lumbar (lateral aortic)
Inferior mesenteric
Common iliac
Internal iliac
External iliac
Superficial inguinal
Deep inguinal
Sacral
Pararectal
Direction of flow



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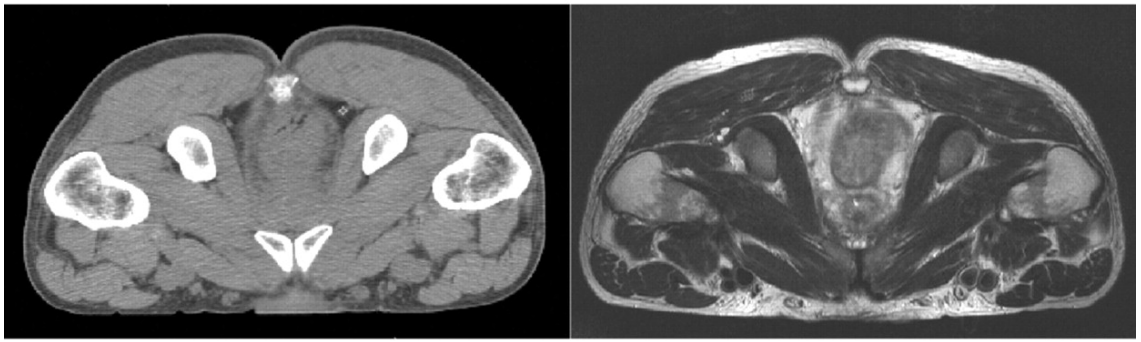

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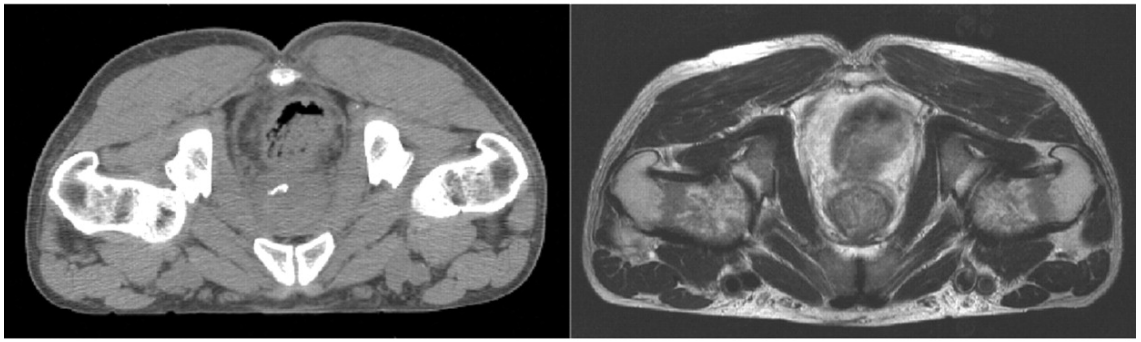

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http://bjr.birjournals.org/content/85/1009/61/F1.large.jpg

NCCN Doses—Rectal

- 3 field 4500 cGy
- 180 per fx
- Boost to 5000-5500 Gy

OAR and TD 5/5--Colorectal

- Small bowel is the major OAR when irradiation the pelvis
- Small bowel should receive less than 45 Gy
- Fields designed to minimize bowel exposure
- Achieved through positioning, bladder distention, multiple shaped fields and field weighting
- PA field used to spare anterior organs and bowel
- TD 5/5 Small Bowel 45 Gy

Anal Cancer

- Epidemiology
  - 1-2 % of cancers in the US
  - Mostly in women
  - Increasing in men
  - HPV
- Etiology
  - Anal intercourse
    - Genital warts, genital infections, HPV
    - Immunosuppression
    - Smoking

Signs and Symptoms—Anal Cancer

- Bleeding
- Pain
- Palpation of a mass
- Pruritus and itching, but not as common

Histology—Anal Cancer

- Squamous Cell Carcinoma
- TNM staging used

Treatment—Anal Cancer

- Combination chemo and XRT is treatment of choice
- IMRT or AP/PA
- Inguinal node consideration is important

NCCN Doses and OAR TD 5/5—Anal Ca.

- 45 Gy
- Boost to 60 Gy to spare small bowel

- Small Bowel 45Gy
- Large Bowel 45Gy
- Rectum 60 Gy
- Femoral Head 52 Gy

Pancreatic Cancer

- Epidemiology
  - 3% of new cancers annually
  - 6% of cancers deaths
    - 4th most
  - Most patients die within first year of diagnosis
- 6% 5 year survival
- 30% more in men
- Highest in African Americans

- Etiology
  - > 50 years old
  - Smoking
  - Obesity
  - Poor diet
  - Genetics
  - Diabetes

http://www.cancer.org/acs/groups/content/@epidemiologysurveilance/documents/document/acspc-036845.pdf

Signs and Symptoms—Pancreatic

- Early symptoms are usually non-existent
- Contributes to the diseases lethality
  - Spreads before caught

- Symptoms may include:
  - Mild abdominal discomfort
  - Back pain
  - Jaundice
  - Weight loss
  - N/V in advanced disease

Histology—Pancreatic Cancer

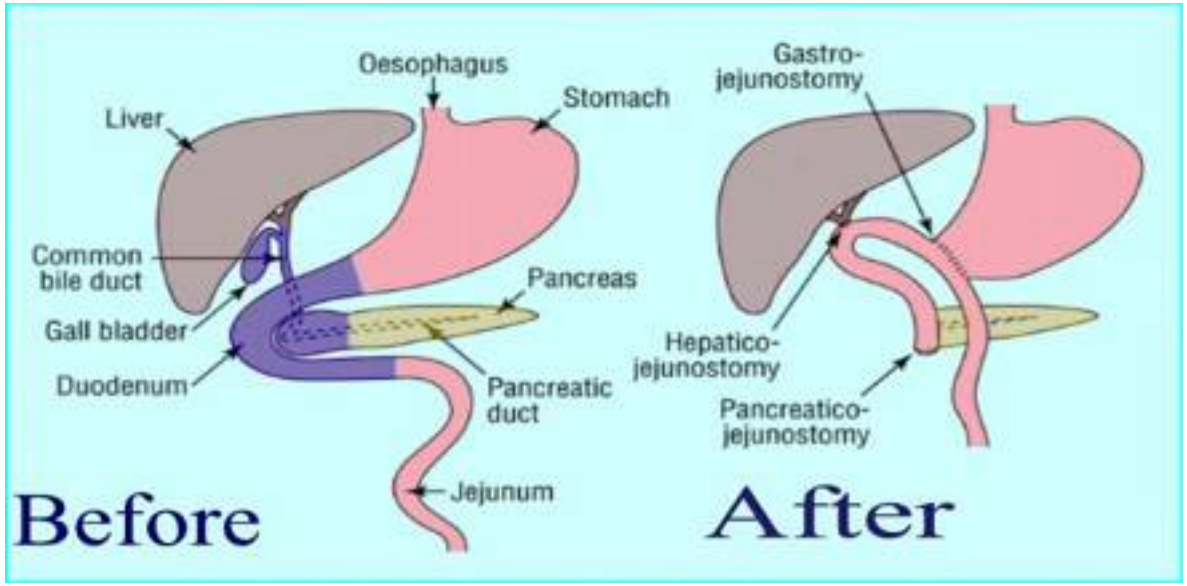
- Most are adenocarcinomas
  - Glandular organ
- TNM staging
- Numerous lymphatics in that region
  - Contributes to early local and distal metastases

http://www.cancer.org/acs/groups/content/@epidemiologysurveilance/documents/document/acspc-036845.pdf

Treatment of Choice

- Surgery
  - Cephalic pancreatoduodenectomy
    - Whipple procedure
  - Only 20% of patients are candidates for surgery
  - Experienced surgeon is essential
- Post chemo and/or radiation

Whipple



pancreaticcancerjourney.com

NCCN Doses—Pancreatic Cancer

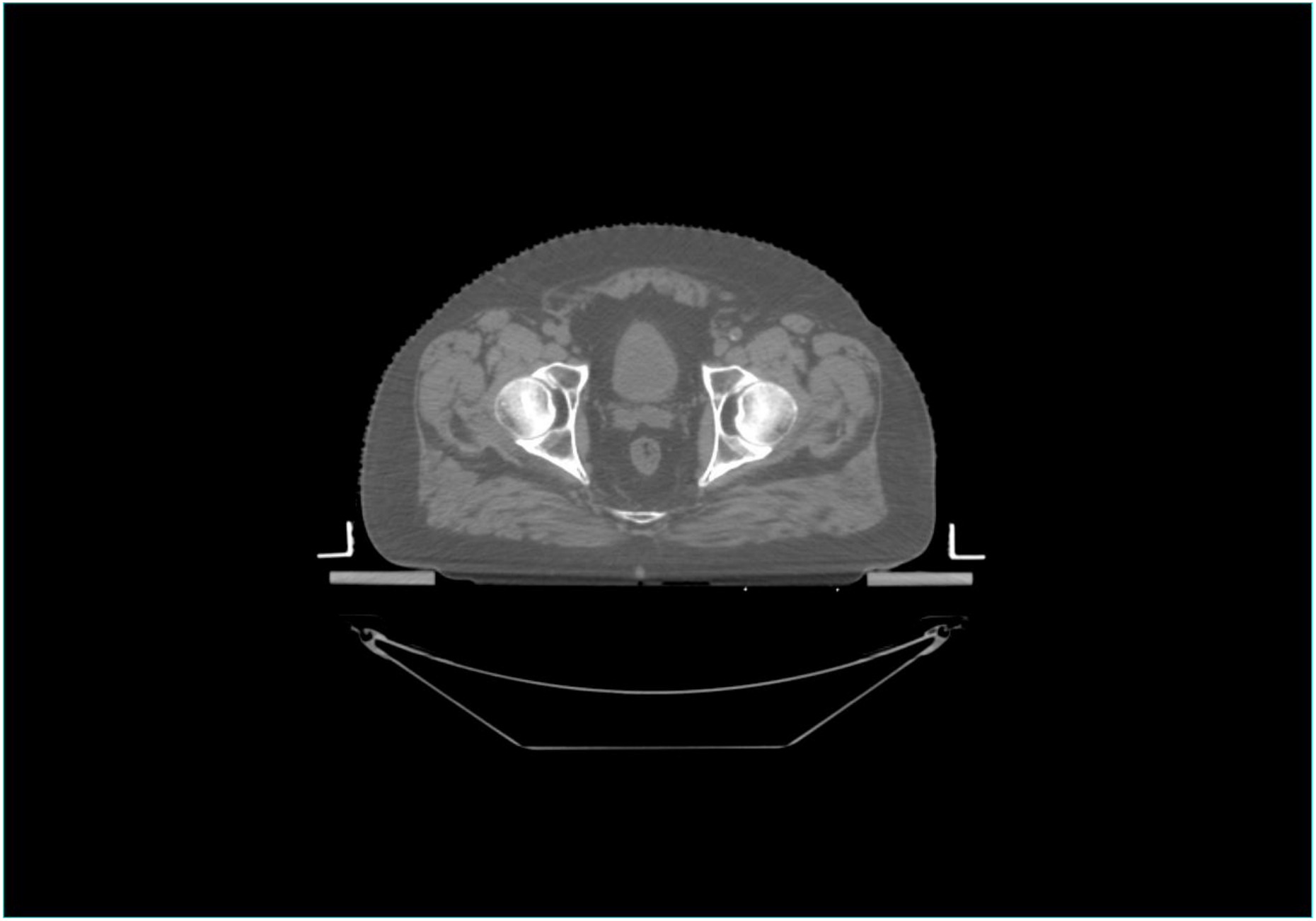
- 45-54 Gy
  - IMRT SBRT, 3 field AP and Lateral 3DCRT
- IORT in some cases 10-20 Gy electrons
  - Boost to 50.4 Gy with EBRT

OAR and TD5/5—Pancreatic

- Kidneys 1800-2300 cGy
- Liver 3000-3500 cGy
- Small Bowel 4000-4500 cGy
- Cord 4500-4700 cGy
- Stomach 5000 cGy

Bladder Cancer

- Epidemiology
  - Occurs 4 times more in men
  - 4th most common cancer in men
- Etiology
  - Smoking
  - Chronic bladder infections
  - Second hand smoke
  - Fat diet
  - Workers in rubber, dye, leather industries
  - Arsenic in water



Signs and Symptoms—Bladder Cancer

- Most common is painless hematuria
- Vesical irritability
- Frequency
- Urgency
- Hematuria
- Dysuria

Histology—Bladder Cancer

- TNM Staging combined with grading
- Transitional cell carcinoma is most common
  - Also common in ureteral cancer

Treatment—Bladder Cancer

- Most common for early stage disease is transurethral resection of bladder tumor (TURBT)
  - Followed by intravesical chemo
    - BCG mitomycin-C and Interferon
- Invasive disease requires radical cystectomy
- XRT therapy less common, inoperable patients
  - 4 field box pelvis, treat with empty bladder
  - IMRT

NCCN Doses—Bladder Cancer

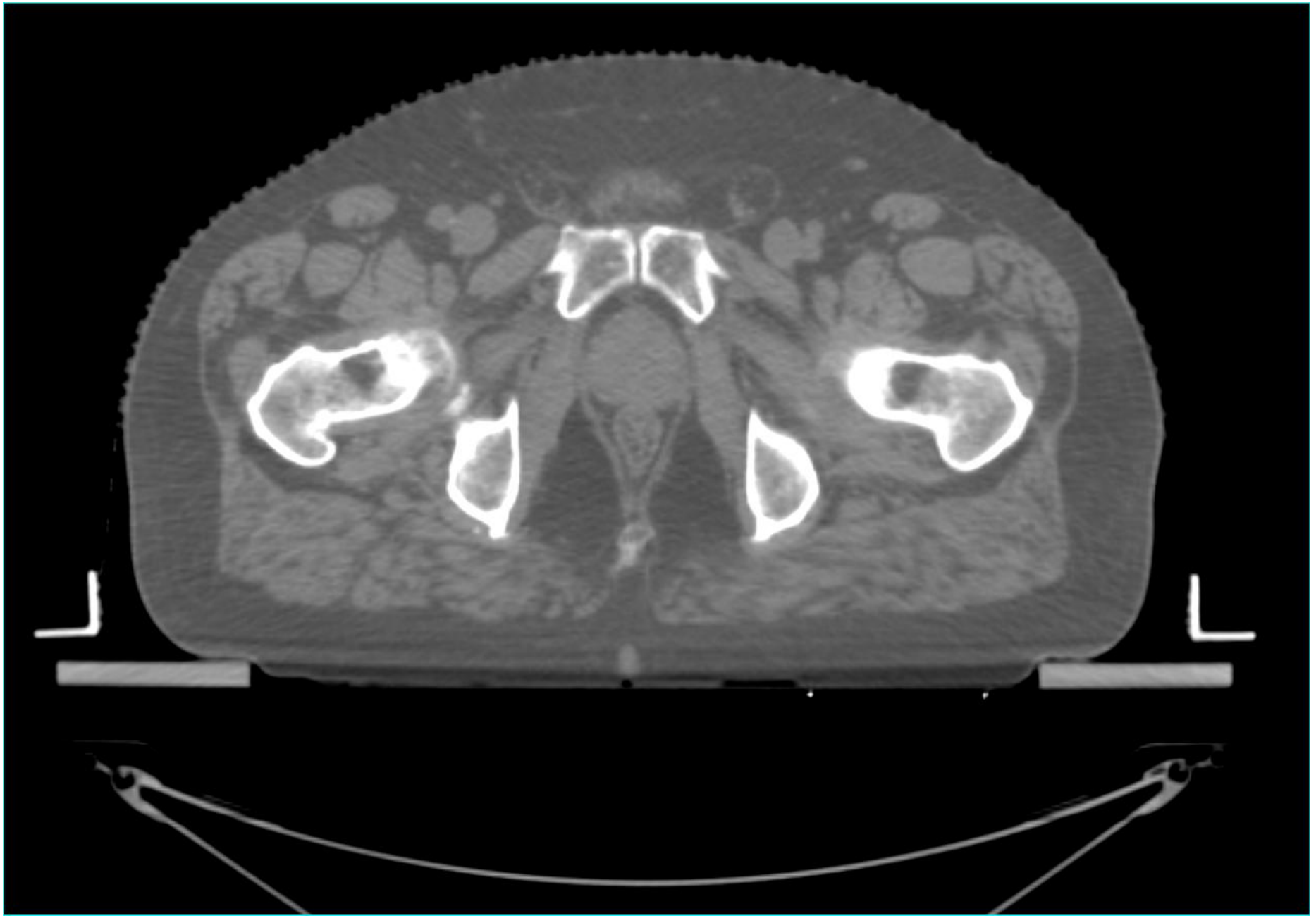
- Whole bladder 40-45 Gy with or without pelvic nodes
  - Boost to 66 Gy, excluding healthy bladder if possible
- Pre-op low dose radiation
- Chemotherapy: Cisplatin

OAR and TD 5/5—Bladder Cancer

- Bladder 65 Gy
- Rectum 60 Gy
- Femoral head 52 Gy

Prostate Cancer

- Epidemiology
  - Most common cancer in American men
  - 2nd most deaths
    - PSA and Screening
- Etiology
  - The only known risk factors are age and race
    - > 50
    - African American or Jamaican men



Signs and Symptoms—Prostate Cancer

- Early signs and symptoms are rare
- More advanced disease symptoms are related to urinary function
  - Frequency (at night), difficulty starting or stopping
  - Blood and pain
  - Bone pain
    - Most common site of metastasis is bone

Histology—Prostate Cancer

- TNM Staging
  - Gleason Score for disease extent
- Most common disease is adenocarcinoma (glandular)

Treatment—Prostate Cancer

- Early disease
  - EBRT, brachytherapy, surgery
    - OR, wait and see, especially in older men
- More advanced disease
  - Hormone, EBRT, chemotherapy

NCCN Doses

- Today, IMRT, protons or arc therapy is the standard in XRT
- IGRT is necessary when treating to doses of 78-81 Gy
  - Cone beam CT
  - kV/kV imaging
  - Ultrasound
  - Fiducial matching
- 1.8-2.0 Gy/day (SBRT, Hypofractionated)

OAR and TD 5/5—Prostate Cancer

- Rectum 65 Gy
- Bladder 60 Gy
- Femur 52 Gy

Testicular Cancer

- Epidemiology
  - Overall occurrence is rare
    - NCI estimates 7,900 new cases 2013
    - 370 deaths
    - However, is the most common cancer in men aged 20-39 years old
    - Seminomas are very curable
- Etiology
  - Undescended testicles
  - Abnormal development of the testes
  - Family risk
  - Pesticides
  - Previous testicular cancer

Signs and Symptom--Testiclular

- Painless swelling or lump
- Dull ache accompanied by a pulling sensation in the scrotum
- Gynecomastia (rare)

Histology—Testicular

- Seminomas are most common
  - Arise from germ cells
  - TNM staging
  - Knowledge of lymphatics is important

Treatment—Testicular

- Ultrasound performed to determine density of mass
- Inguinal orchiectomy
- No biopsy, why?
- Treatment after orchiectomy depends on stage
  - Observation
  - Chemo
  - Radiation—very radiosensitive

NCCN Doses and Side Effects--Testicular

- 2000-3000 cGy
- AP/PA post orchiectomy
  - Para-aortic and iliac nodes
  - “Dog leg field”
  - Clam shell
  - Not as common today
- Generally well tolerated
- N/V, diarrhea; usually controlled with meds
- Long term effects occurs with wide fields >2500 cGy
- Sperm bank!

Seminoma Fields—(Dog Leg on Left)

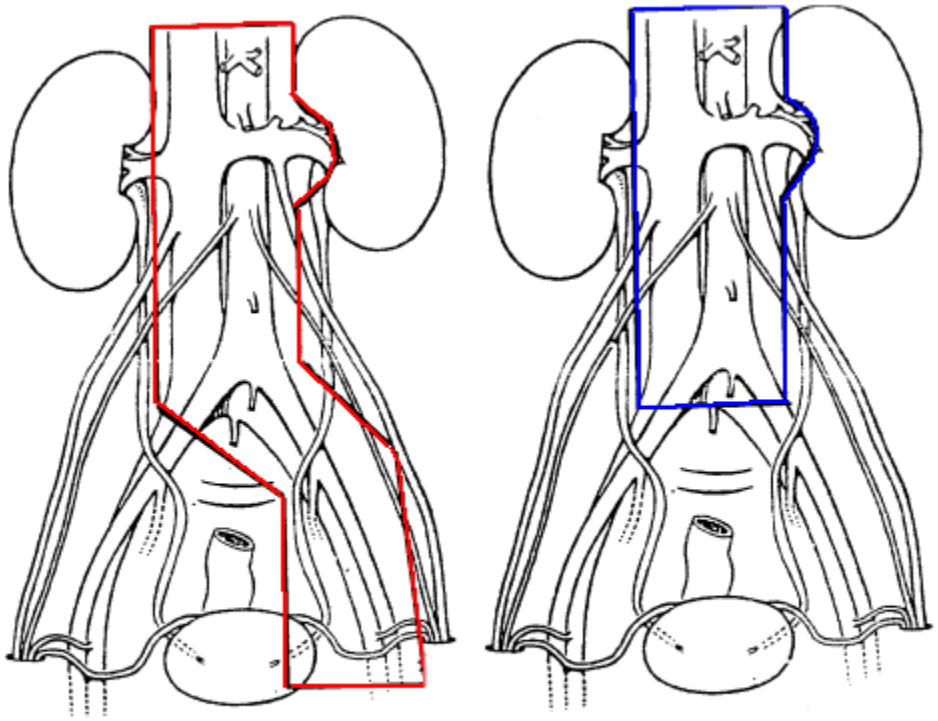


diagram of field
for left-sided tumor

diagram para-aortic
field for low risk

aboutcancer.com

Female GYN Cancers

- Incidence (greatest to least common)
  - Endometrial
  - Ovarian
  - Cervical
  - Vulvar
  - Vaginal
- Mortality (greatest to least deadly)
  - Ovarian (5th in women)
  - Cervical
  - Endometrial

Female GYN Cancers

- Etiology
  - Ovarian
    - Older age
    - Issues relating to hormonal exposure
      - Late menopause
      - Late or few pregnancies
      - Breast cancer
      - Family history
      - Poor diet
      - Hormone replacement therapy

Female GYN Cancers

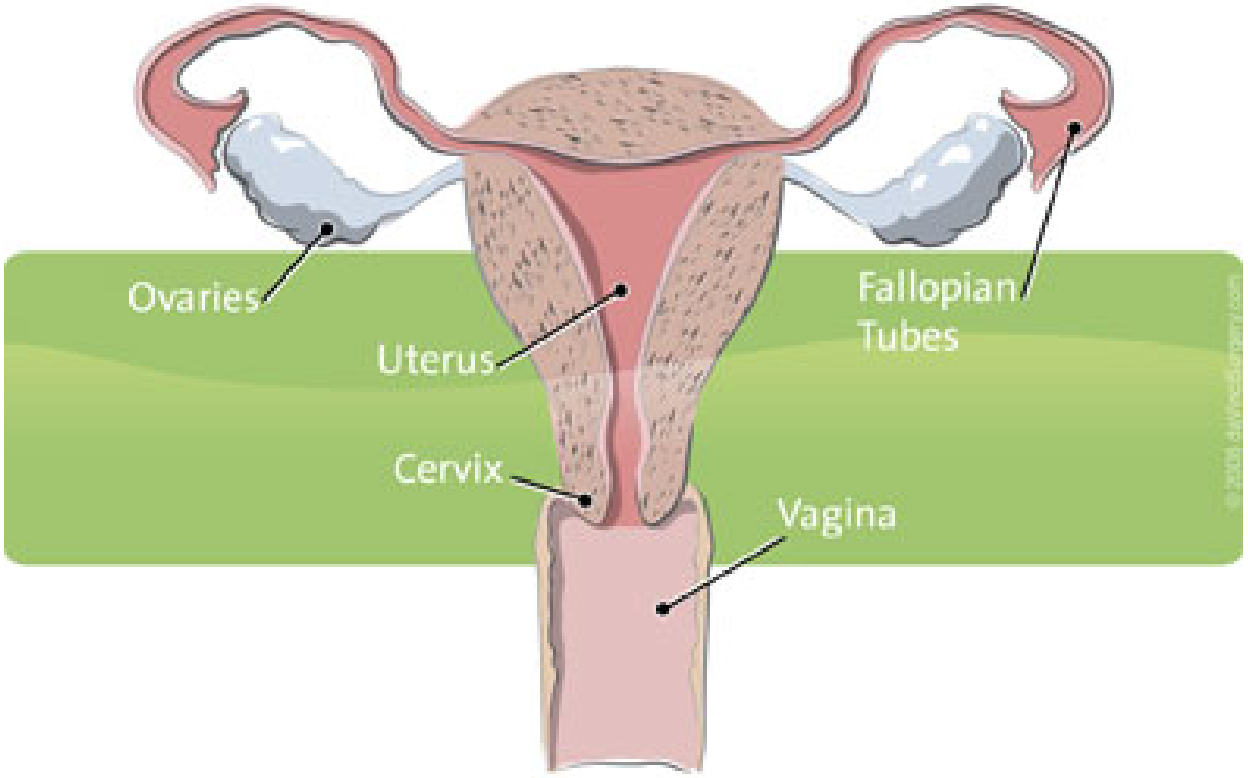
- Etiology
  - Endometrial
    - Older women
    - Obesity
    - High fat and calorie diet
    - Increases in estrogen

Female GYN Cancers

- Etiology
  - Cervical Cancer
    - Increased detection: Pap smear
    - Poor younger women at higher risk
    - Early sexual activity
    - Multiple partners
    - HPV
    - Multiple pelvic infections
    - Husbands with penile cancer

Female GYN Cancers

- Etiology—Vulvar
  - Diabetes
  - STDs
  - Poor hygiene
    - Melanoma sometimes occurs
- Etiology—Vaginal
  - Exposure to DES in utero
    - Diethylstilbestrol, was used to prevent miscarriage



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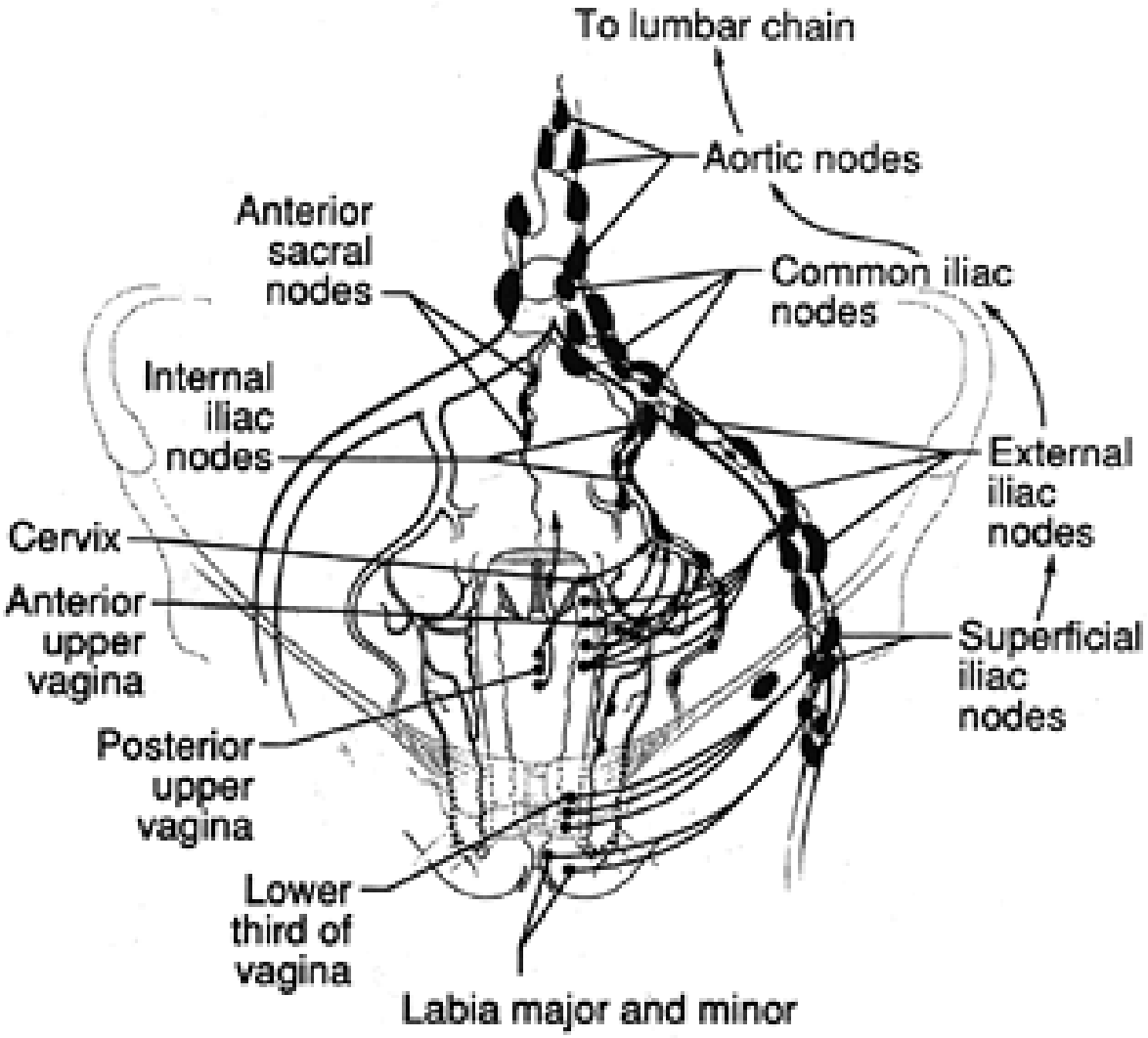
To lumbar chain
Aortic nodes
Anterior sacral nodes
Common iliac nodes
Internal iliac nodes
External iliac nodes
Cervix
Anterior upper vagina
Superficial iliac nodes
Posterior upper vagina
Lower third of vagina
Labia major and minor

Female GYN Cancers—Signs and Symptoms

- Endometrial
  - Vaginal bleeding
  - Odorous discharge
- Ovarian
  - Early symptoms are non-specific and contribute to the mortality rate
  - Early detection is difficult, but ovarian cancer is actually curable if caught early

Female GYN Cancers—Signs and Symptoms

- Cervical
  - Post coidal bleeding
  - Heavy menstrual periods
  - Discomfort during intercourse
  - Abnormal HPV
  - Odorous discharge
  - Pelvic pain
  - ***Similar symptoms for vaginal
- Vulva
  - Suspicious lump
  - Exophytic mass
  - Most common in labia majora
  - Chronic irritation

Histology—GYN Cancers

- Endometrial
  - Adenocarcinoma
- Ovarian
  - Epithelial tumors
- Cervical
  - Squamous cell carcinoma
- carcinoma
- Vulva
  - Squamous cell carcinoma
- Vaginal
  - Squamous cell
- Staging for GYN
  - FIGO
  - TNM

Treatment—Endometrial

- Surgically staged
- Brachy alone 2100 cGy in 3 fractions
- EBRT with brachy boost
  - 50 Gy with IMRT
  - 18 Gy boost in 3 fractions
- OAR and TD 5/5
- Bladder and Rectum < 65-75 Gy
- Small bowel < 45-50 Gy

Treatment—Ovarian

- Chemo and Surgery
- No XRT generally

Treatment—Cervical

- Early disease TAH
- More extensive disease can be treated with EBRT and brachy to as much of a total dose 80-85 Gy
- Cisplatin
- OAR and TD 5/5
  - Same as endometrial

Treatment—Vulva and Vagina

- Vulvar
  - Post op XRT
  - 50 Gy
  - Boost 15-20 Gy
    - May be electrons
    - Bolus
      - Skin reactions
      - Sitz bath
    - Inguinals
- Vaginal
  - Radiation and surgery
  - 45-50 Gy EBRT
  - Boost with implants to 65-85 Gy
  - Vaginal cylinders

Miscellaneous

- The following slides pertain topics in oncology that we don’t often see in Radiation Oncology but may appear in the Registry Exam

Skeletal

- Most skeletal tumors are metastatic
- Osteogenic sarcomas or Osteosarcomas are the most common primary bone tumor
  - Occur mostly in adolescents and young adults
  - radioresistant
- Ewings Sarcoma
  - Occur mostly in 2nd decade in life
  - Surgery, chemo and radiation can be used
- Myeloma
  - Disease of the bone marrow
  - No cure, multiple lesions = multiple myeloma
    - Lytic lesions

Soft Tissue Sarcomas

- Tumors of connective tissues
  - Muscles, ligaments, fat, cartilage, etc.
  - Extremities, Head and Neck, retroperitoneum
  - Grow longitudinal within compartments in extermities
  - Distant spread hematogenously to the lung
  - 2-3 cm margins
  - High doses
  - Radioresistant

Some Sarcomas

- Leiomyosarcoma—smooth muscle
- Liposarcoma—fat tissue
- Chondrosarcomas—cartilage
- Rhabdomyosarcoma—striate muscle
  - Occurs in children
  - Often near the eyes

Lymphomas

- Hodgkin's
  - Reed Sternberg Cells
  - Spreads in predictable manner
  - Defective T-Cells
  - 1/3 experience B symptoms
    - Fever
    - Night sweats
    - Weight loss
- Ann Arbor staging system
- Treatment: Chemo and Radiation, mantle field, extended field, total nodal
- Younger patients—lymphomas are the 3rd most common cancer in children

Non-Hodgkin's Lymphoma

- Many subtypes
- No Reed Sternberg cell
- Unpredictable spread
- Primarily in older patients
- Treatment depends on disease

Skin Cancer

- 3 main types
  - Basal Cell Carcinoma—most common cancer in US but not required to be reported
    - Most common, most curable
  - Squamous Cell carcinoma
    - Less common but less curable
  - Melanoma
    - Least common but least curable
    - Surgery and treatment of choice
      - Radioresistant
- Exposure to UV A and B rays and occupational exposures

Skin Cancer

- Radiation Therapy
  - Can treat SCC or BSC with surgery and electrons
  - Depends on patient wishes and location
  - 100 SSD
  - Protect nasal cavities, oral cavities with lead shielding, covered in wax to prevent scatter
  - Bolus to bring dose closer to lesions
    - Superflab, wet gauze, rice bags, water bags, “super stuff”

Mycosis Fungoides

- Common form of Cutaneous T-Cell lymphoma
- Total Skin Electrons
  - Stanford Technique
  - 6 fields AP/PA and 4 obliques

Leukemia

- Most Common Pediatric Malignancy
- Malignancy of blood forming components
- 4 main types ALL, AML, CLL, CML
  - ALL most common in children
  - Philadelphia Chromosome in CML
- Chemo
- Bone marrow transplant sometimes required
  - Craniospinal irradiation and TBI pre-BMT
  - Most desirable donors are identical twins

Thank You!

GOOD LUCK!

Other References

- **Washington & Leaver: Principles and Practice of Radiation Therapy, 3rd Edition**
- National Comprehensive Cancer Network
  - www.nccn.org
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