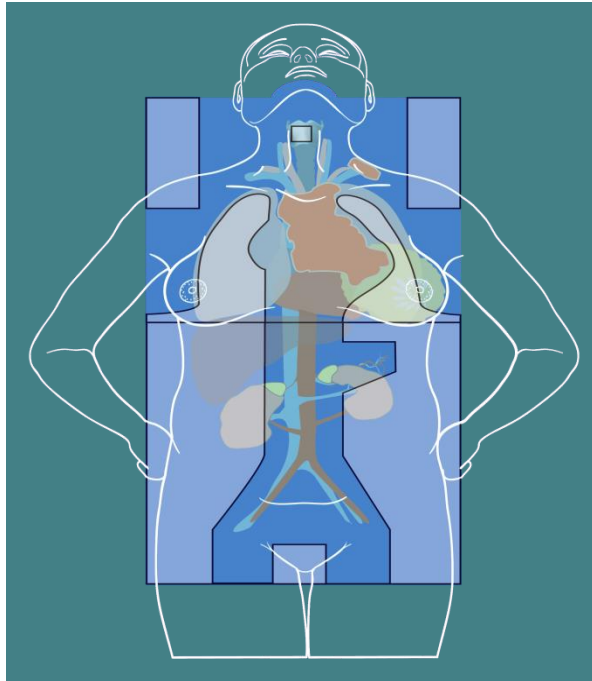


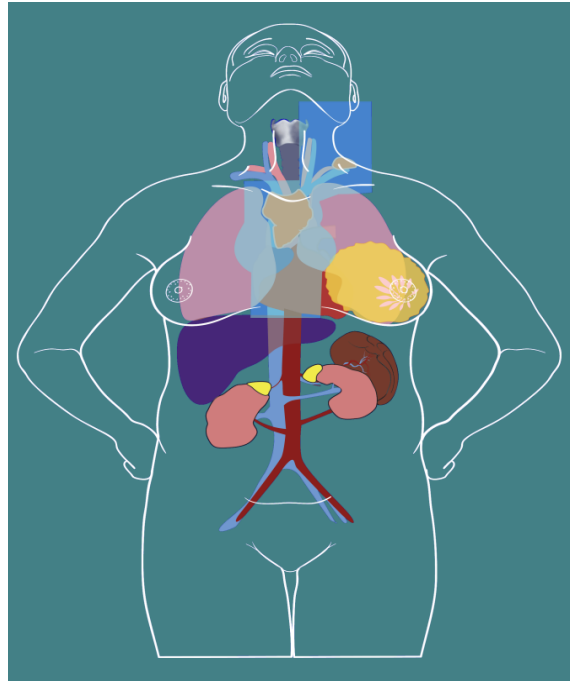
# ASTRO Contouring for Lymphoma

Stephanie Terezakis, MD

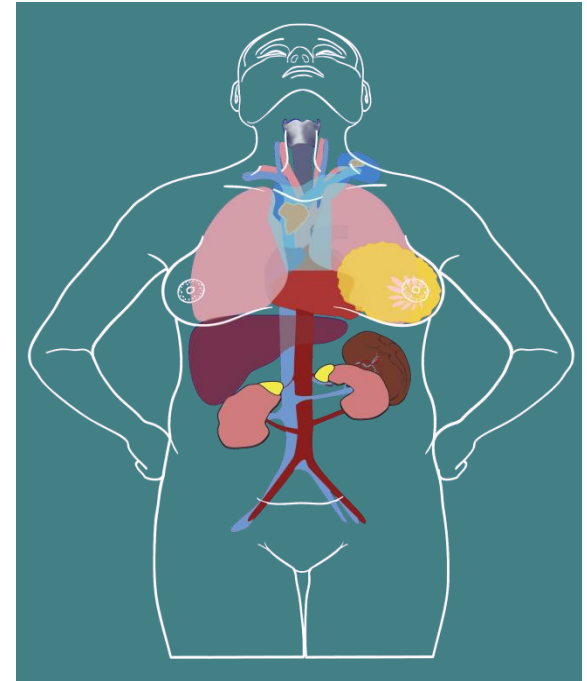




**1970 – Total Lymphoid Irradiation (TLI)**



**1995 – Involved-Field Radiotherapy (IFRT)**

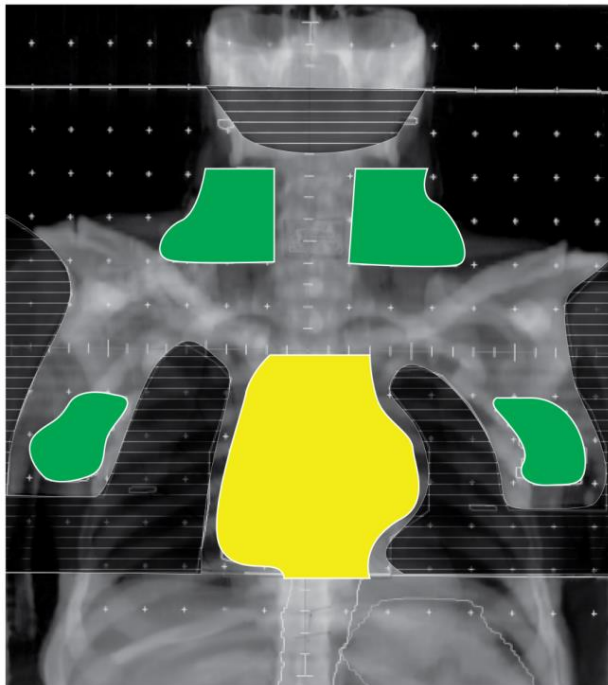


**2008 – Involved Node Radiotherapy (INRT)**

- Accurate target volume definition crucial for conformal RT and INRT

# Extended Field

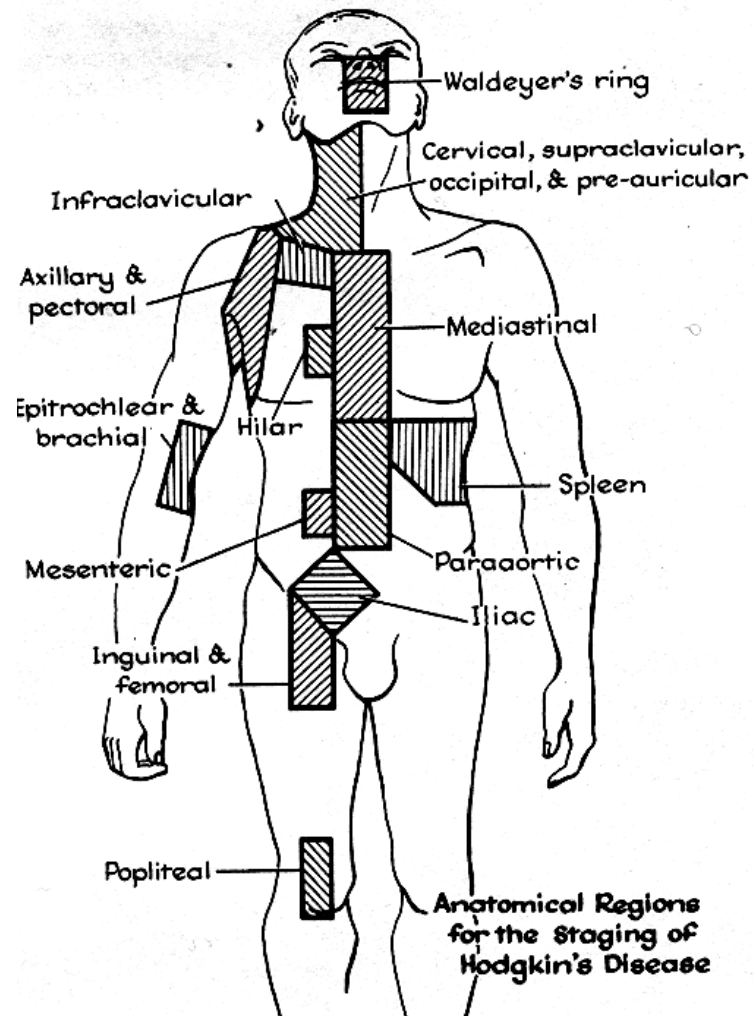
- Supradiaphragmatic nodes including cervical, supraclavicular, axillary, and mediastinal/hilar regions
- Treatment of paraaortics, spleen, pelvic, and inguino-femoral nodes
- Significant dose inhomogeneity can result due to differences in patient thickness



# Involved Field (~Year 2000)

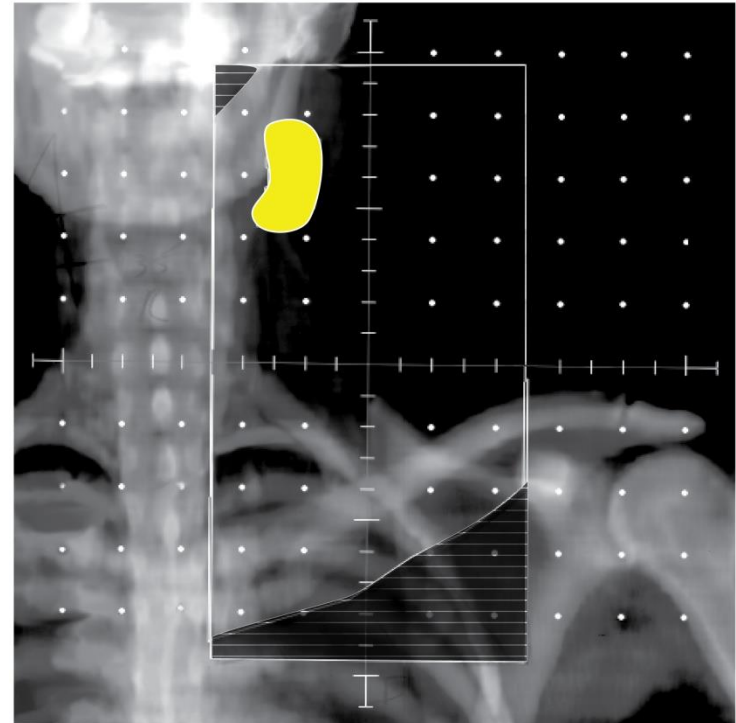
- The site of the clinically involved lymph node group
- Lymph node grouping not clearly defined
- For extra-nodal sites – the organ alone (if no evidence for lymph node involvement)

# HD Staging Regions (1971): not an involved-field chart



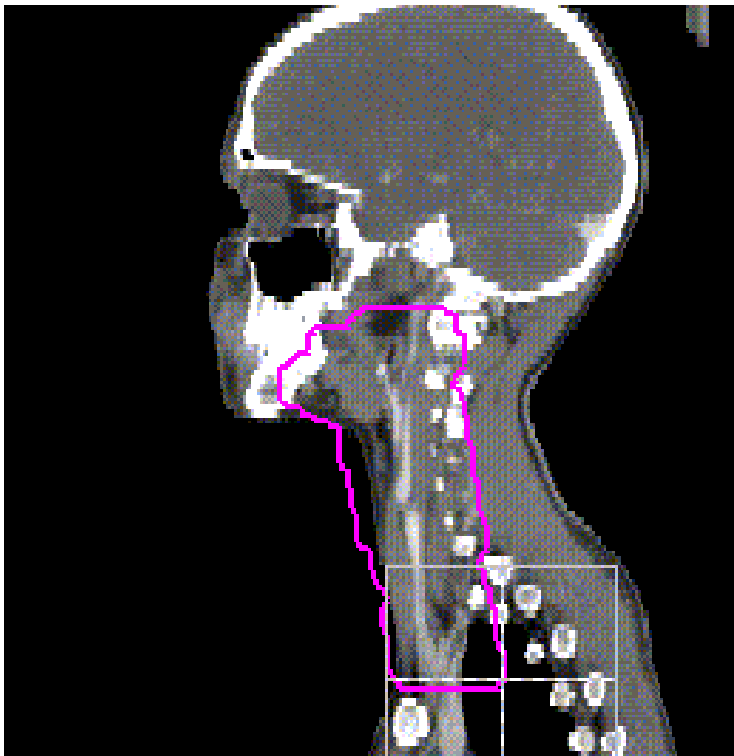
# IFRT - Cervical Chain

- Unilateral or bilateral neck nodes including supraclavicular region extending from skull base to clavicle(s)
- Patient positioned supine with Aquaplast mask
- Oral cavity block placed if tumor coverage will not be compromised

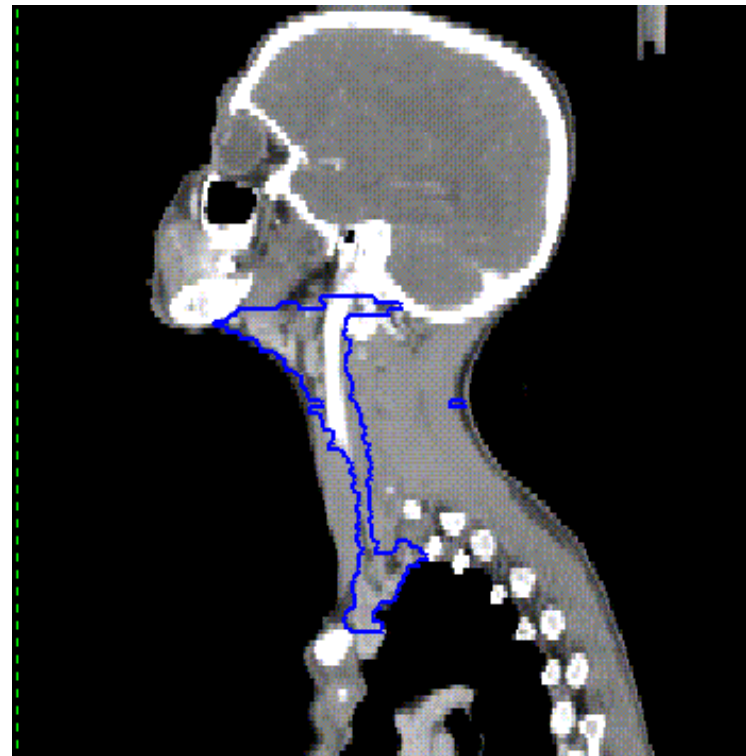


# Neck Treatment Positioning

Neutral



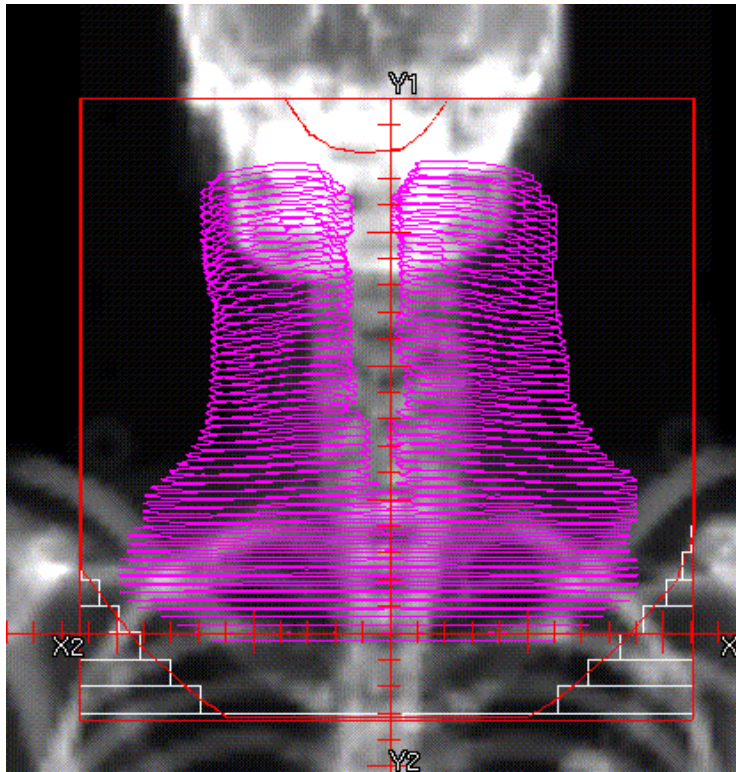
Hyperextended



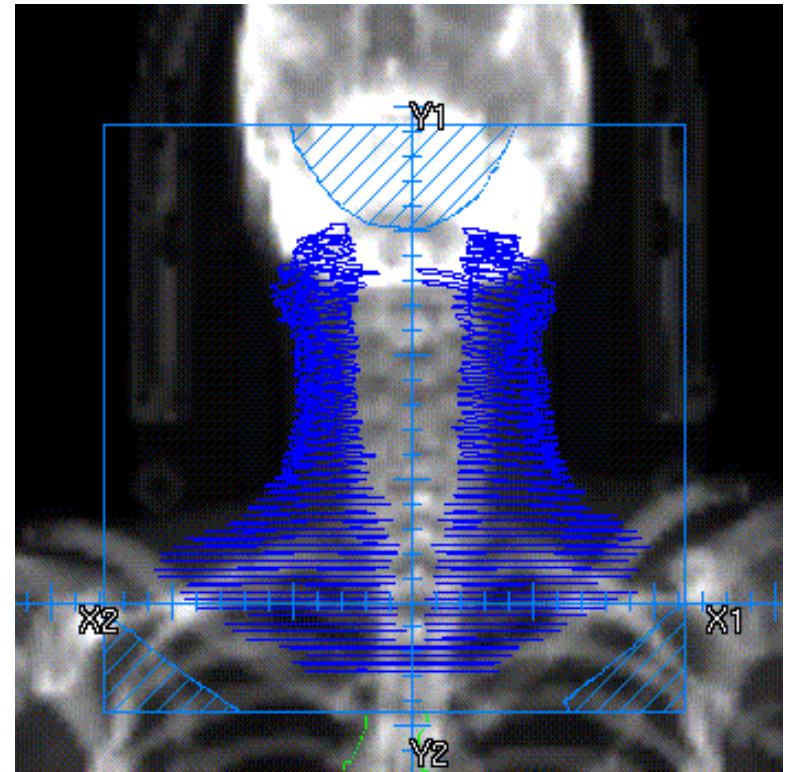


# Neck Treatment Positioning

Neutral



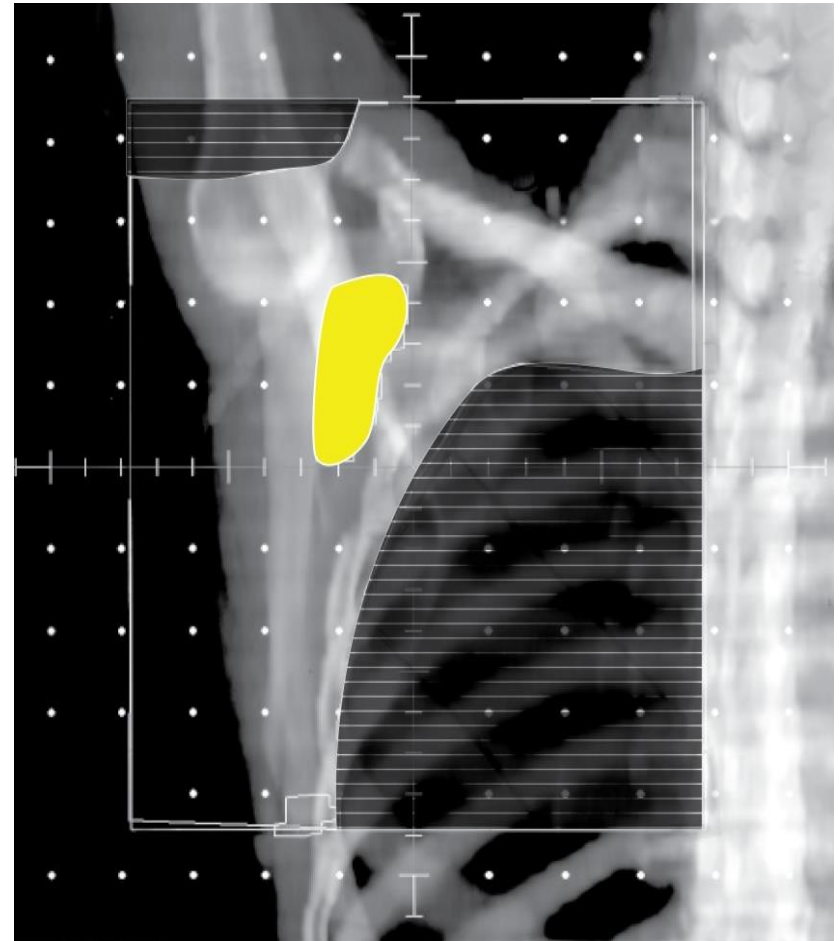
Hyperextended





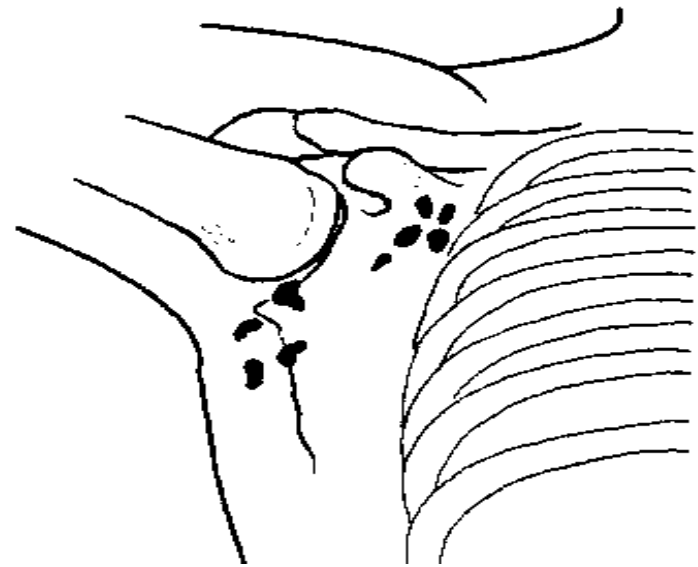
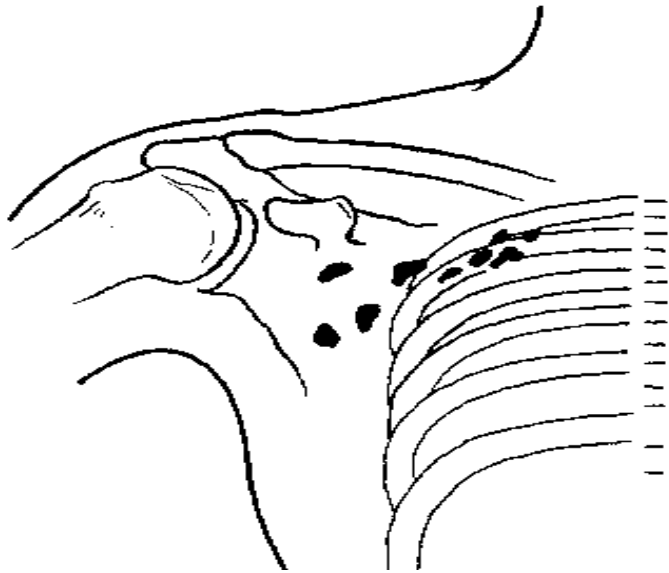
# IFRT - Axillary Field

- Treatment of axillary, supraclavicular, and infraclavicular nodes
- Superior border – C5-C6 interspace
- Inferior border – Tip of scapula or 2 cm below most inferior node
- Medial border – Ipsilateral transverse process
- Lateral border – Flash axilla



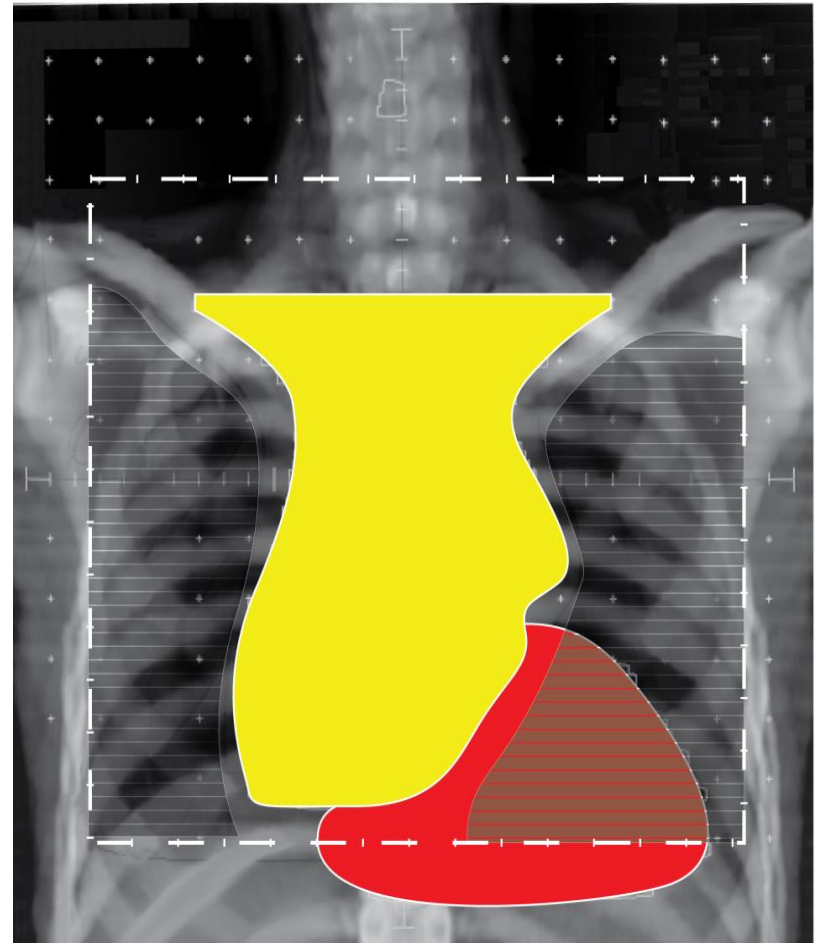
# Arm Positioning

- Arms overhead or akimbo
- Raising arms alters axillary lymph node position



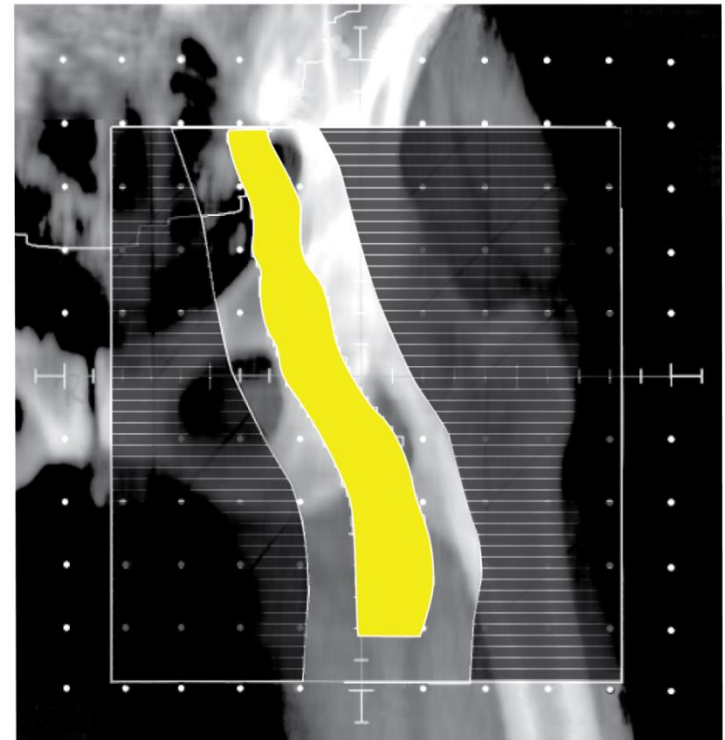
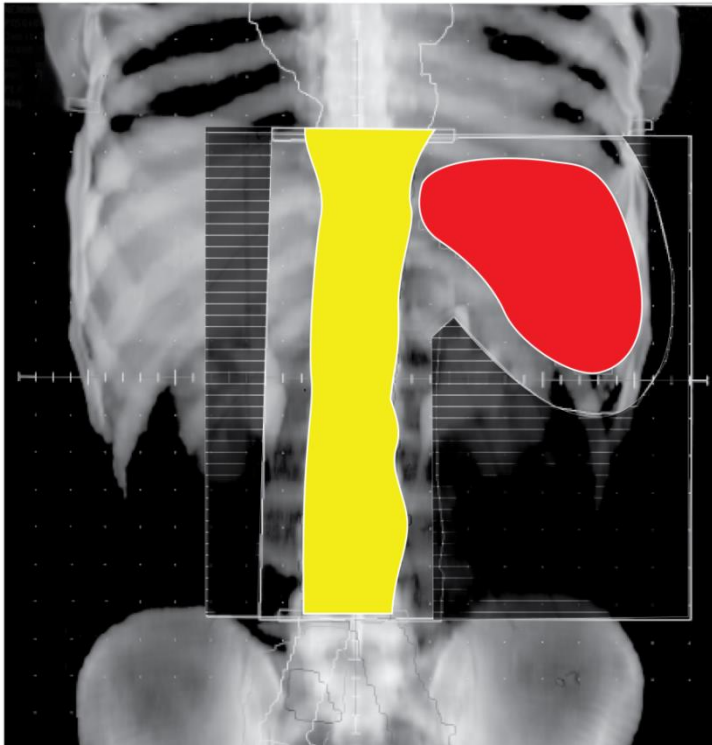
# IFRT - Mediastinum

- Mediastinal nodes, bilateral hila, and bilateral supraclavicular nodes
- Superior border – C5-C6
- Inferior border – 2 cm below pre-chemotherapy extent
- Lateral border – 1.5 cm on post-chemotherapy volume



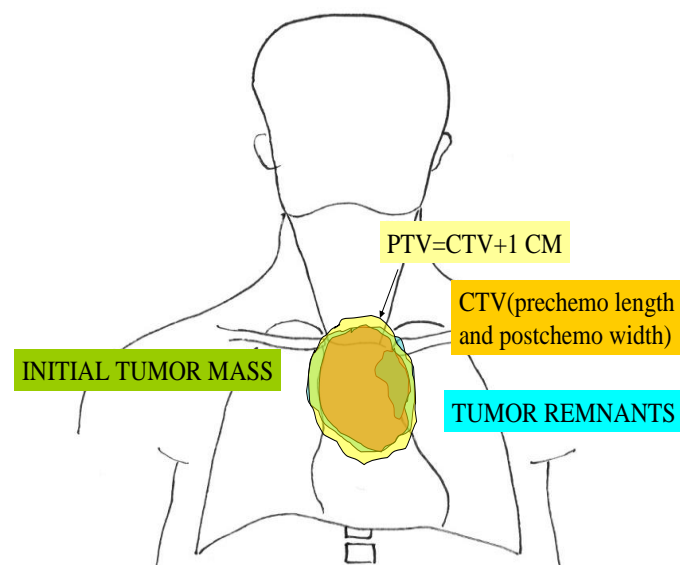
# IFRT - Para-aortics/Groin

- Para-aortic +/- spleen : T10-T11 down to L4-L5
- Groin: External iliac, femoral, and inguinal lymph nodes
- Account for spleen respiratory motion



# The Evolution of INRT and ISRT

- Definitions of IFRT dependent on bony landmarks without 3D target delineation
- Involved-nodal radiotherapy (INRT) was introduced in Europe for Hodgkin Lymphoma and markedly reduced the irradiated volume
- INRT design requires accurate pre-chemo or pre-biopsy information obtained in the treatment position



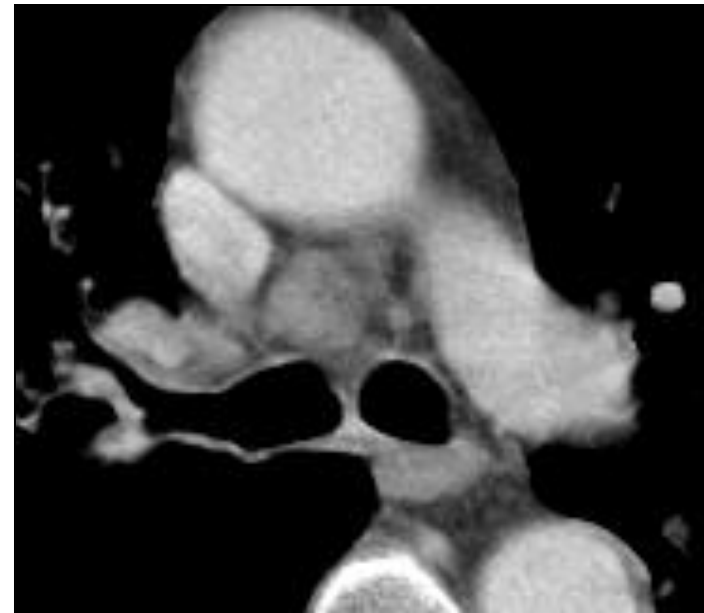
# Principles of ISRT

- ISRT utilizes ICRU definitions
  - Ideal to take advantage of pre-treatment imaging
  - ISRT recognizes detailed pre-treatment evaluation may not always be optimal
  - In most cases, smaller volumes than IFRT
- Planning requirements: CT-based simulation
- Goal to target site of originally involved lymph node(s)
  - Field encompasses the original volume prior to surgery or chemotherapy
  - Spares uninvolved organs once lymph node has regressed



# CT Simulation

- CT simulation with IV contrast for accurate identification of vessels, heart, kidneys, and spleen
- Immobilization is site specific



# Target Volumes

- Pre-chemotherapy Gross Tumor Volume (GTV)
  - Pre-chemotherapy or pre-surgery volume
  - Should be encompassed by the CTV taking into account change in normal anatomy after initial treatment response
- Post-chemotherapy GTV
  - Potential Boost
- Clinical considerations must ultimately be used to determine the final CTV

# Target Volumes

- Certain sites may be subject to internal motion
  - If necessary the CTV may be expanded to the ITV (internal target volume) using either 4D-CT or fluoroscopy
- CTV (or ITV) expansion to the planning target volume (PTV) depends on expected daily setup uncertainty
  - Immobilization device or patient setup
  - Body site
  - Individual characteristics

# Treatment Planning

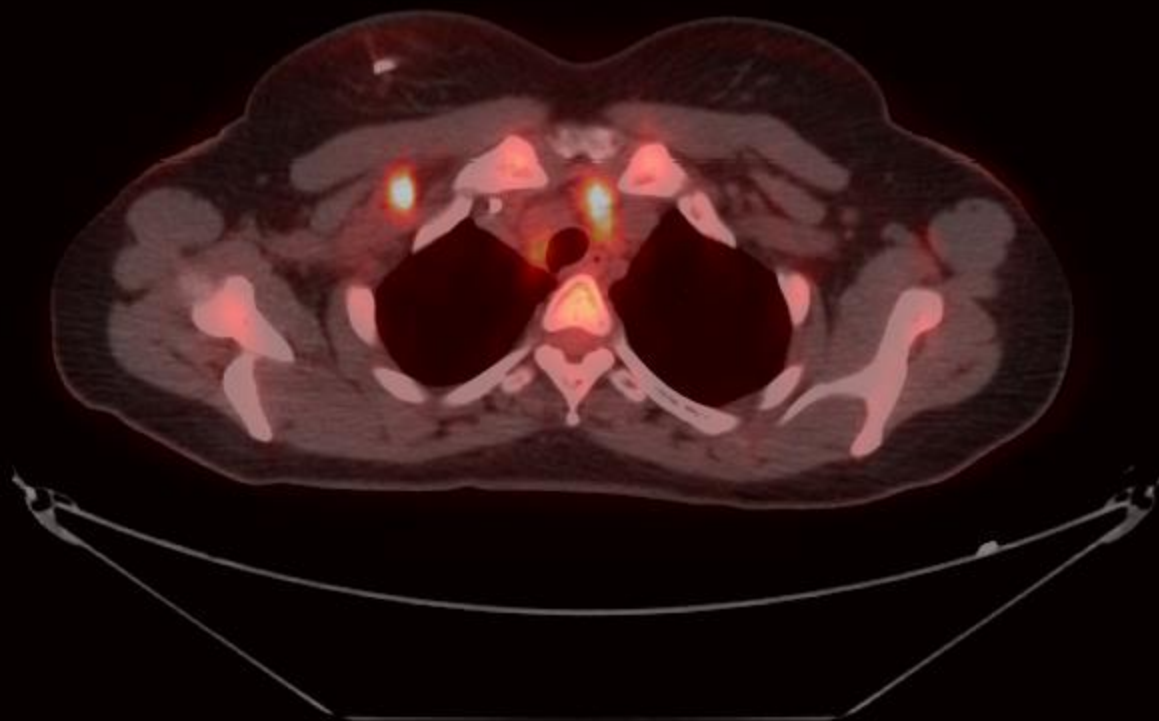
- Organs at risk (OAR) should be identified and contoured
- For many cases, conventional treatment may still be appropriate
- 3D-CRT or IMRT techniques should be considered depending on clinical judgment, individual treatment characteristics and availability considerations

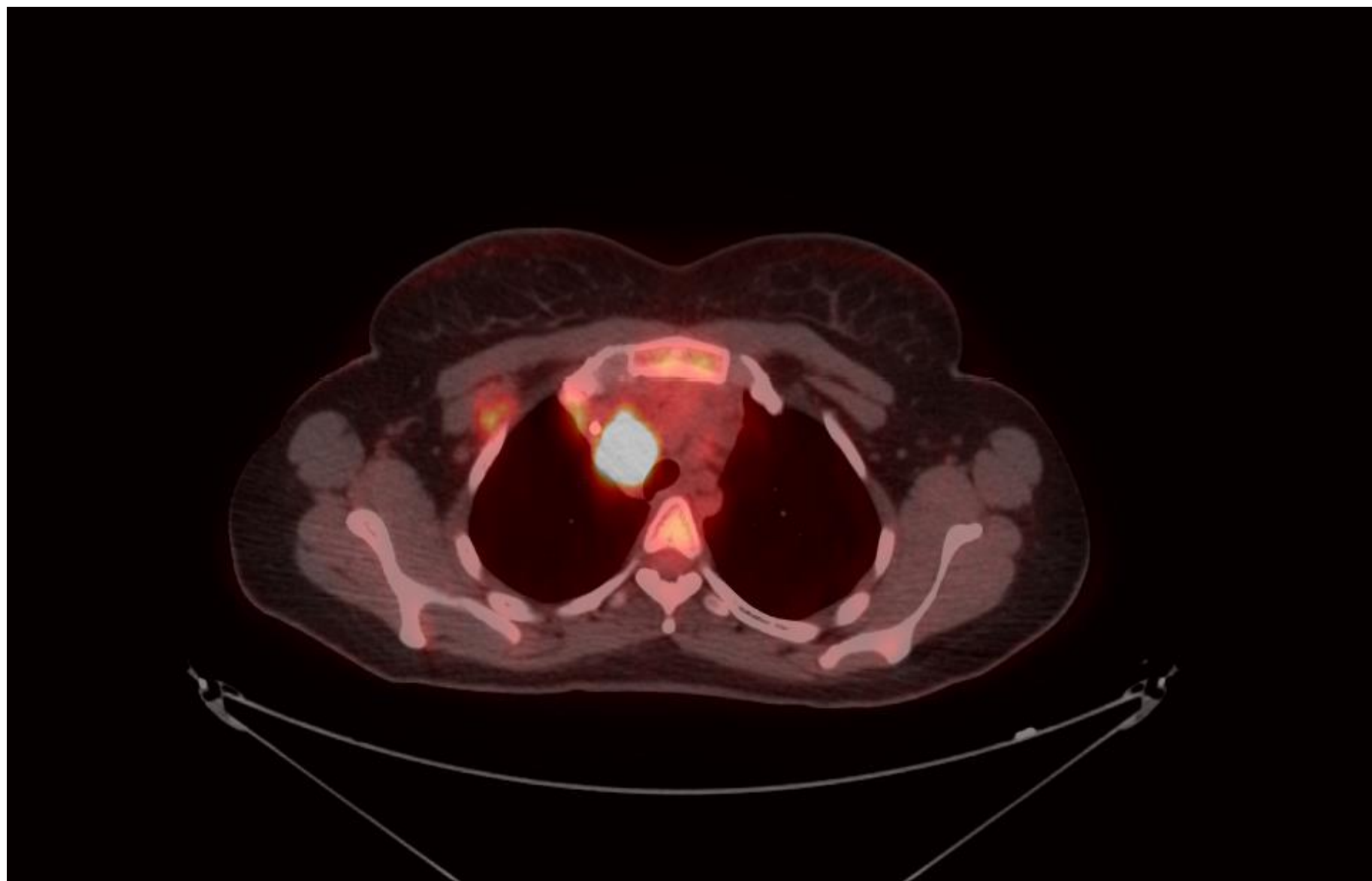
# Clinical Example

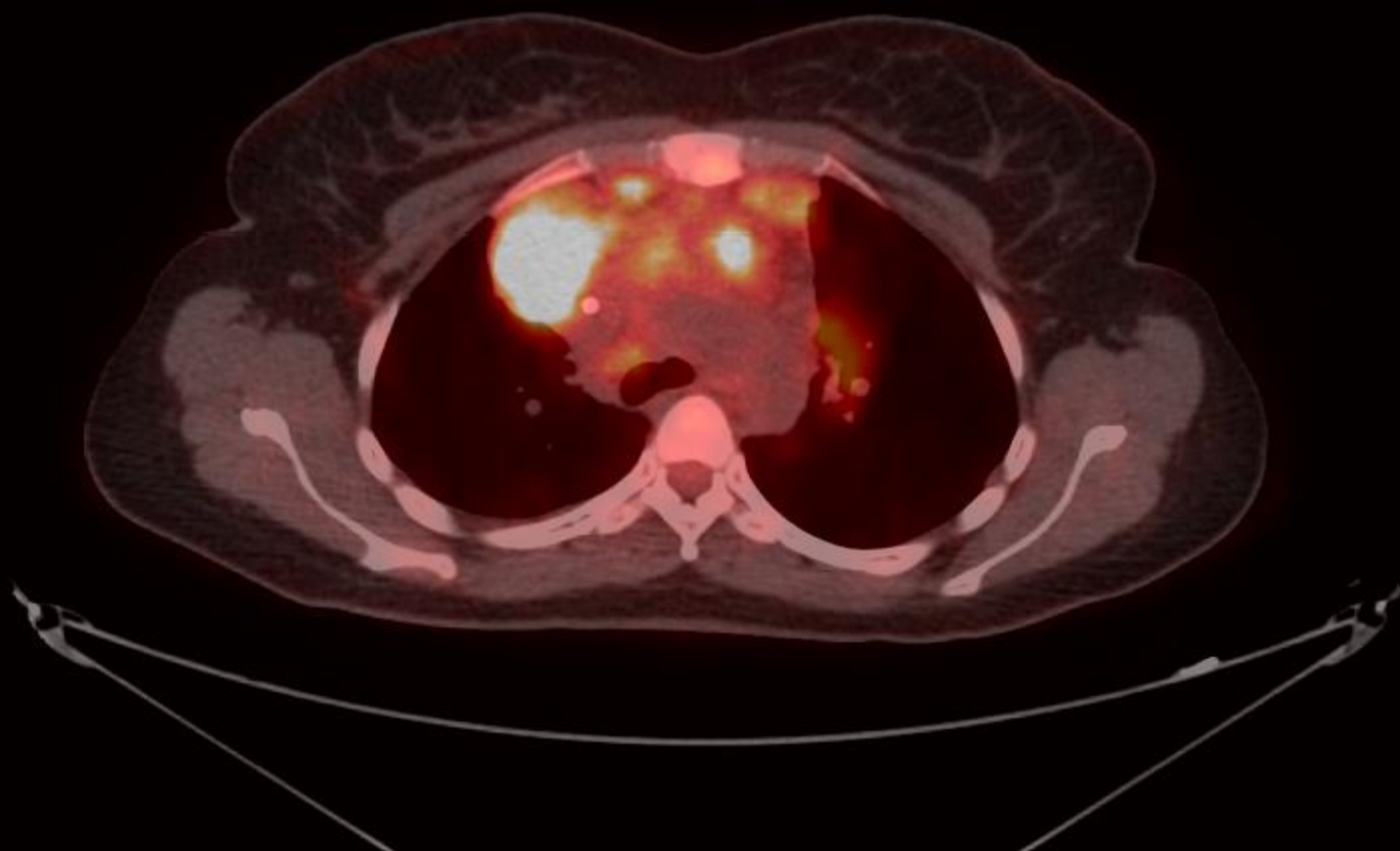
# Case Example

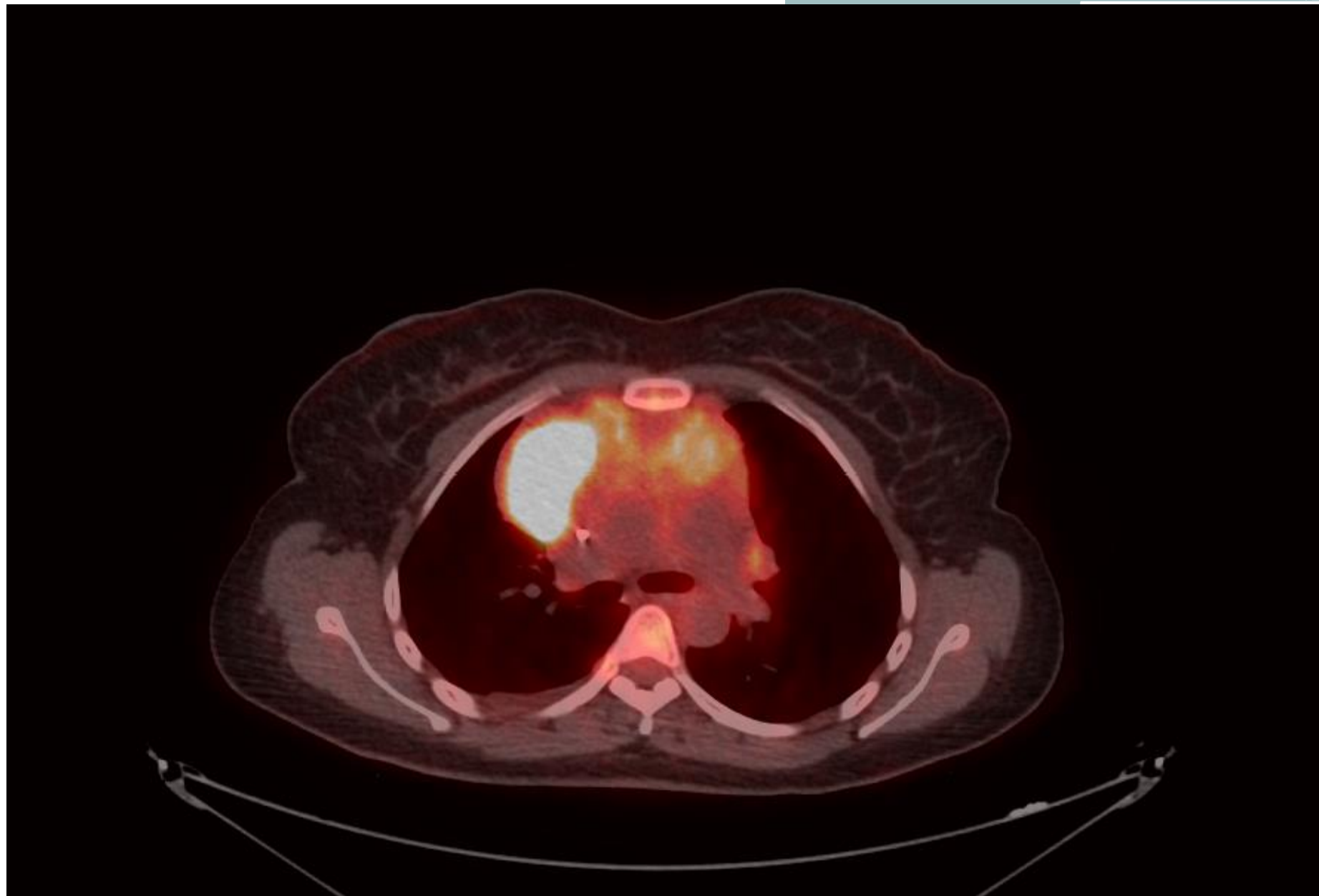
- 37 year old female
- Progressing shortness of breath over 1 month
- Chest CT scan demonstrates large mediastinal mass
- Excisional biopsy performed: Nodular sclerosing Hodgkin lymphoma
- PET/CT = Uptake in bulky mediastinal lymph nodes and right subpectoral region
- Treatment Plan:
  - ABVD x 6 + Involved site RT

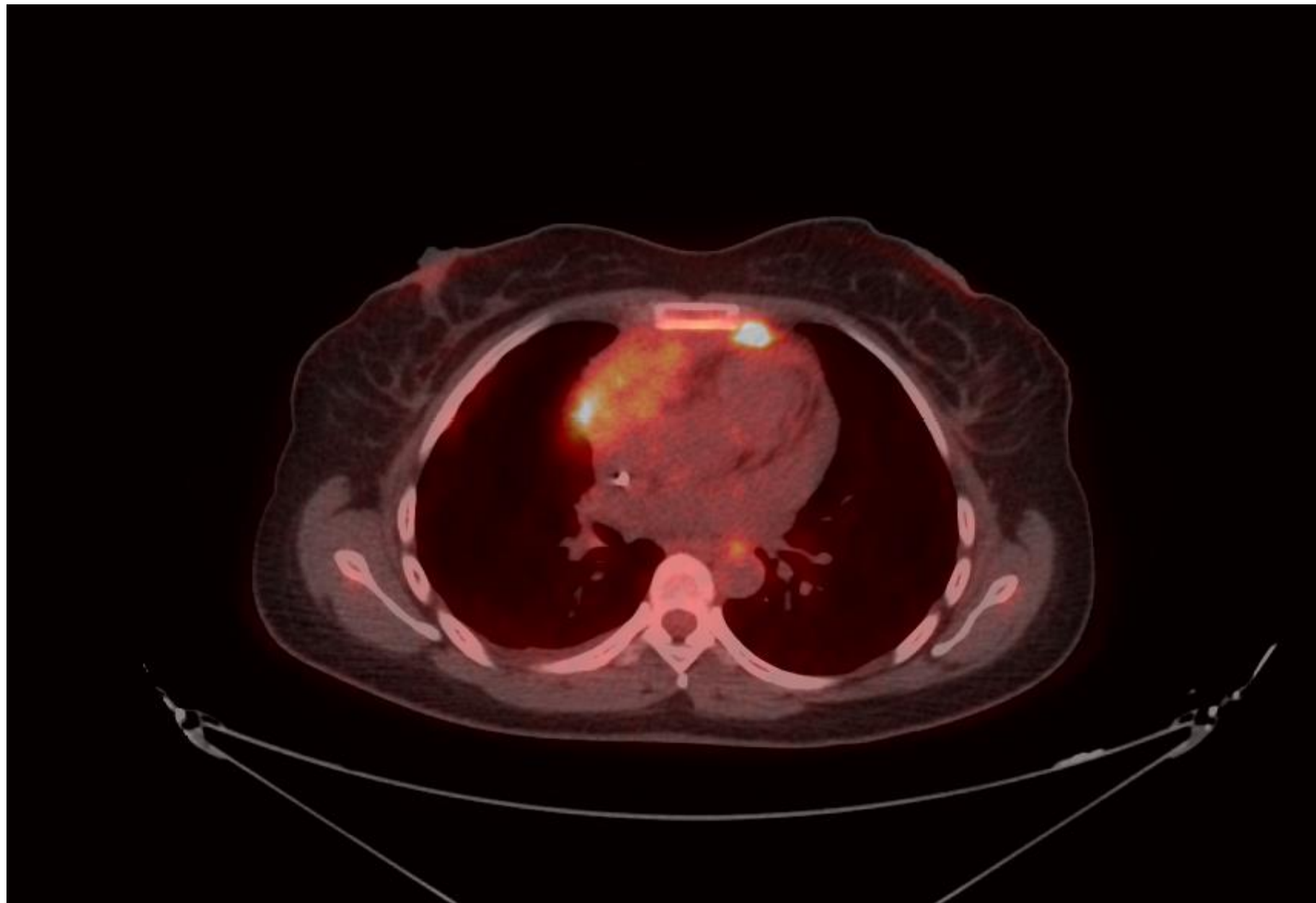


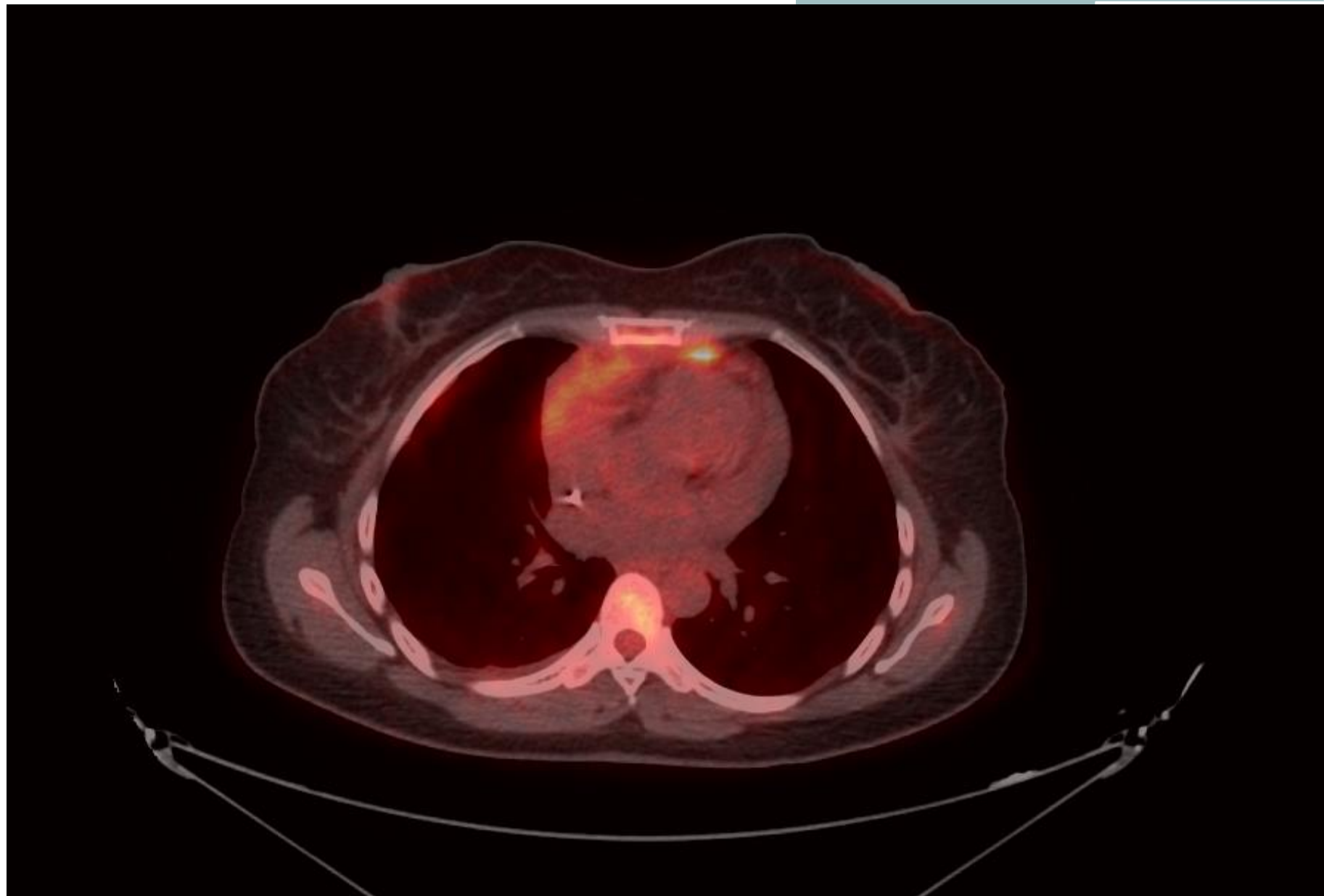






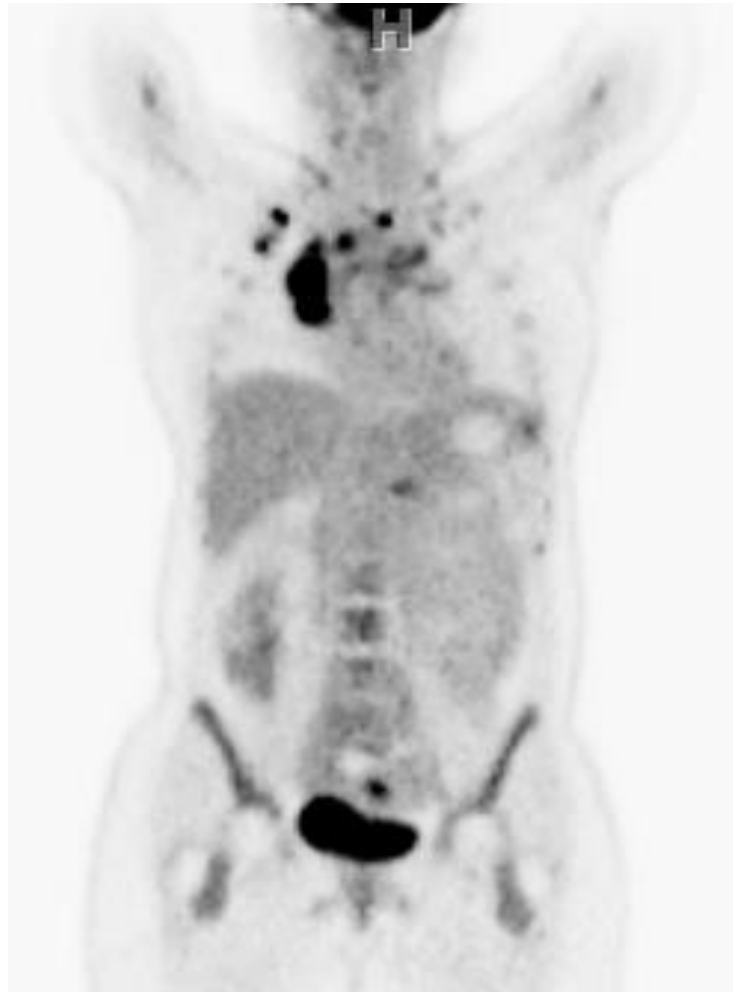








# Pre-chemotherapy PET/CT

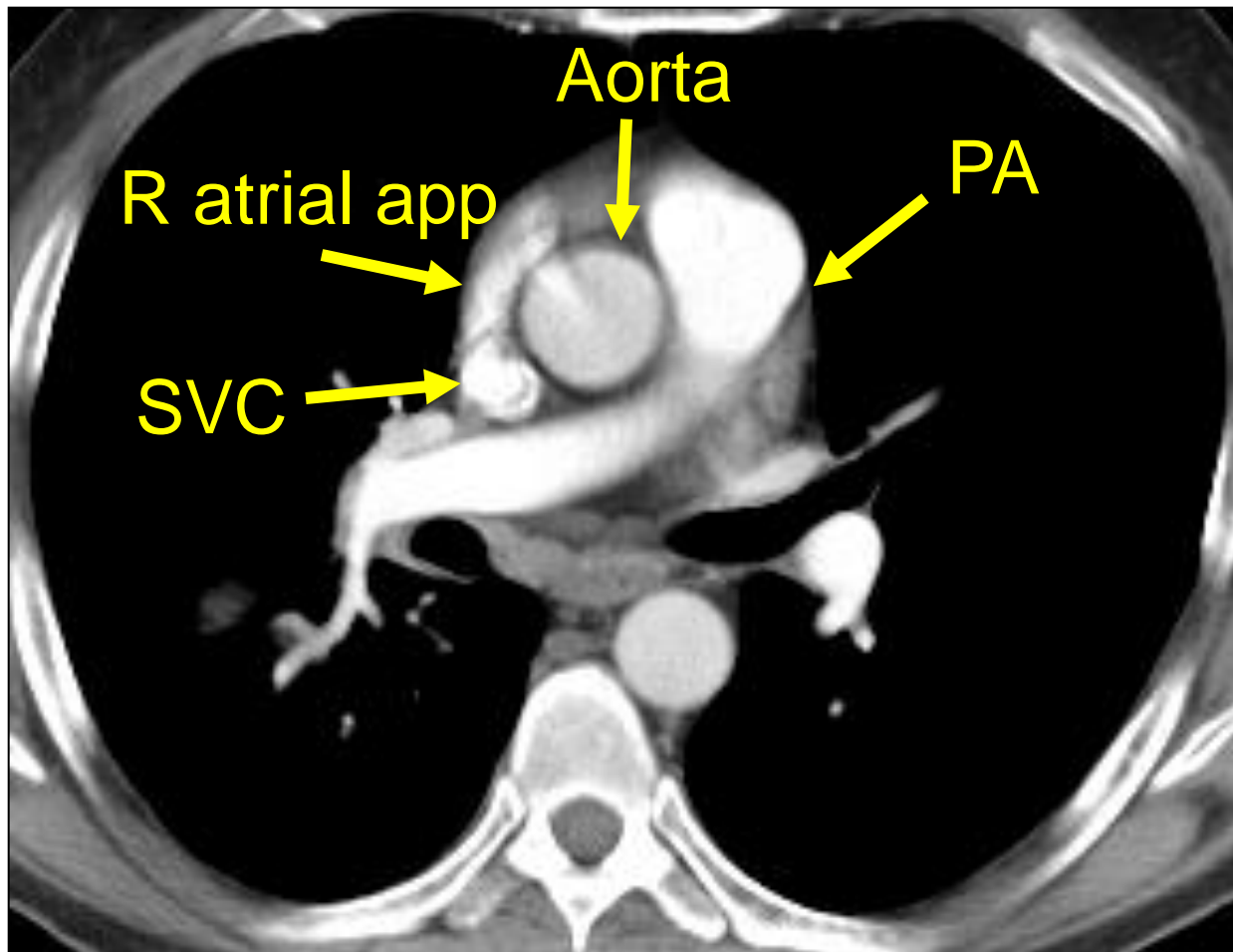


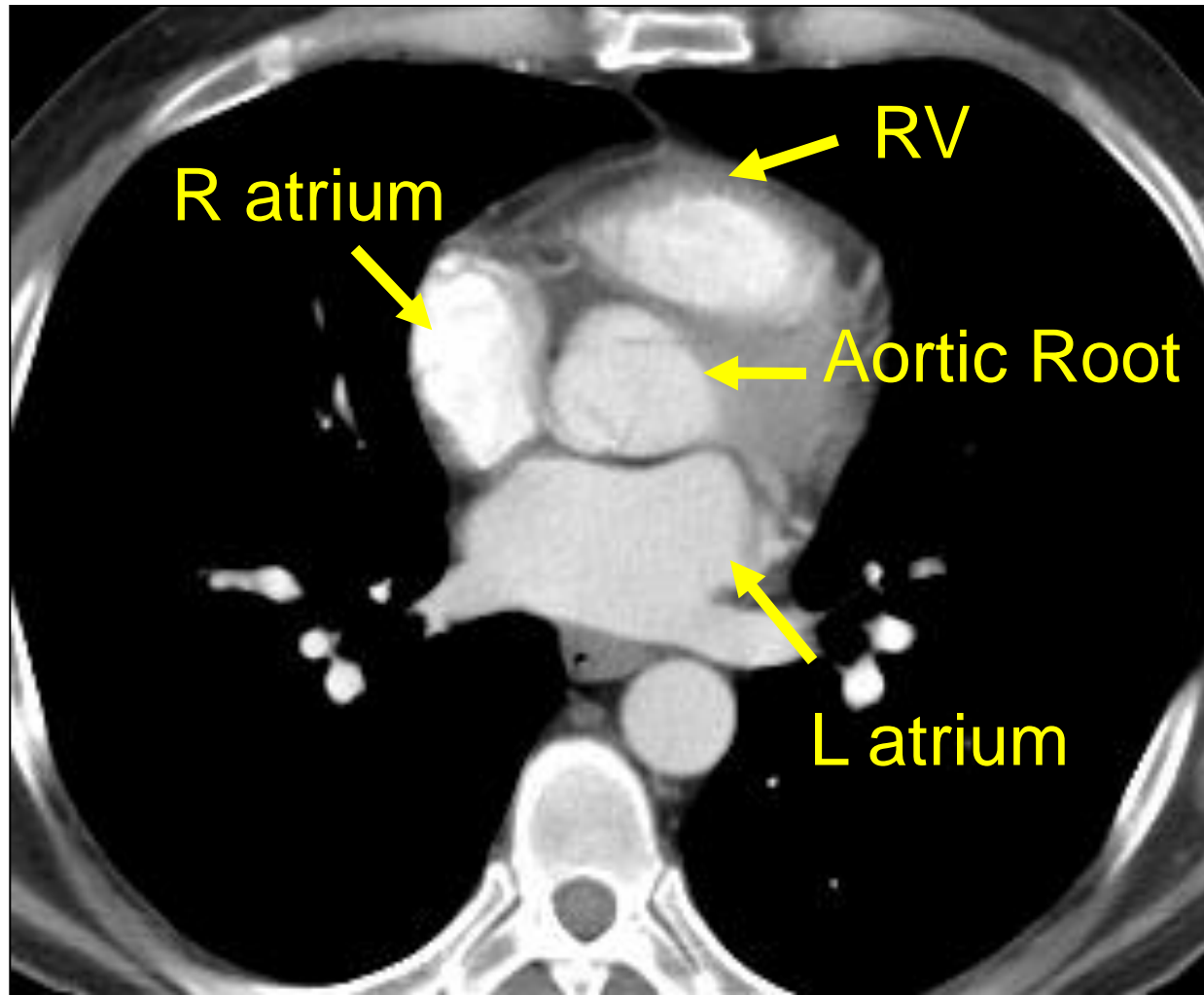
# Post-chemotherapy PET/CT

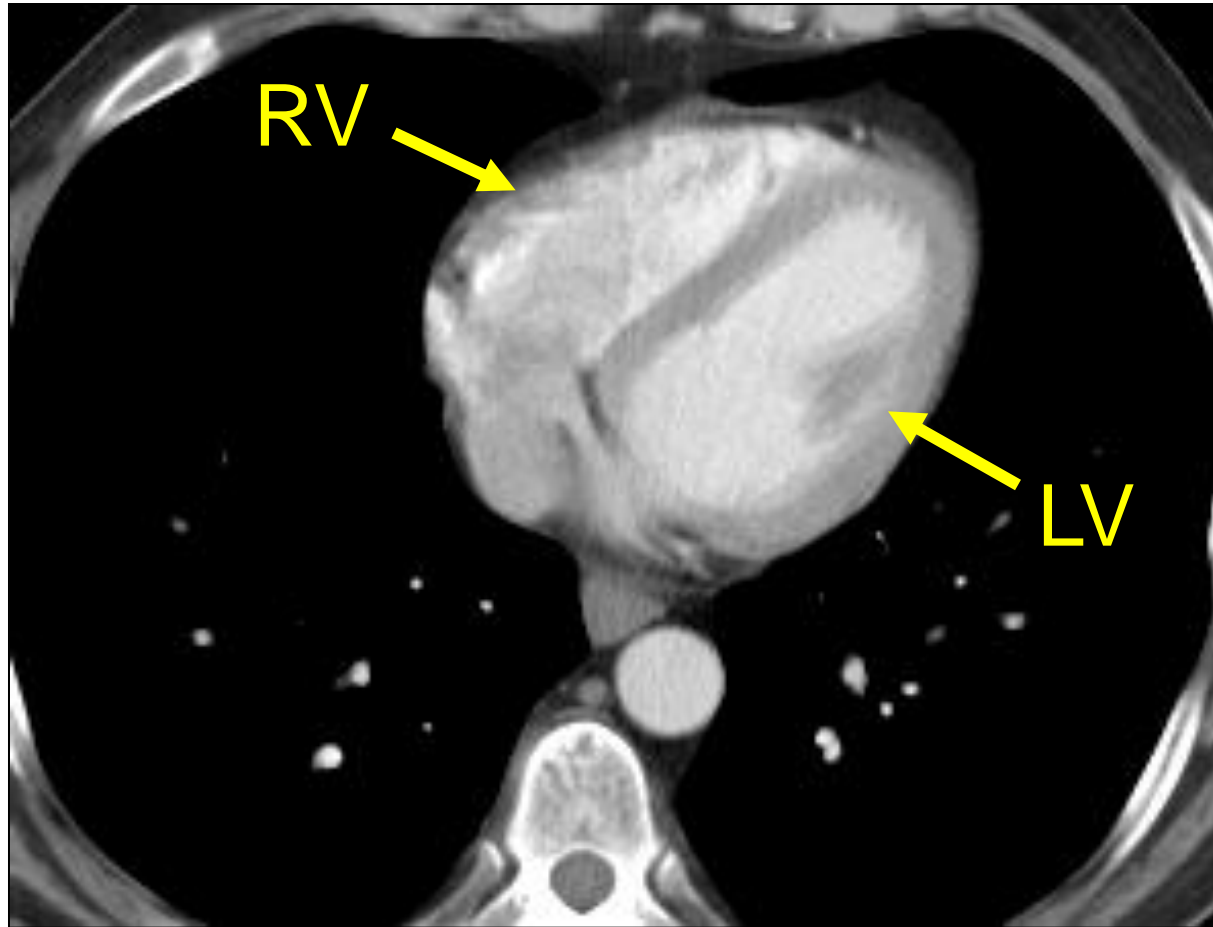
- PET was negative after cycle 3 and at end of all 6 chemotherapy cycles
- Referral for radiation treatment
- ISRT recommended per new guidelines

# Simulation

- CT Simulation performed with IV contrast
- Right arm up
- Patient immobilized in alpha cradle
- AP/PA plan with segments







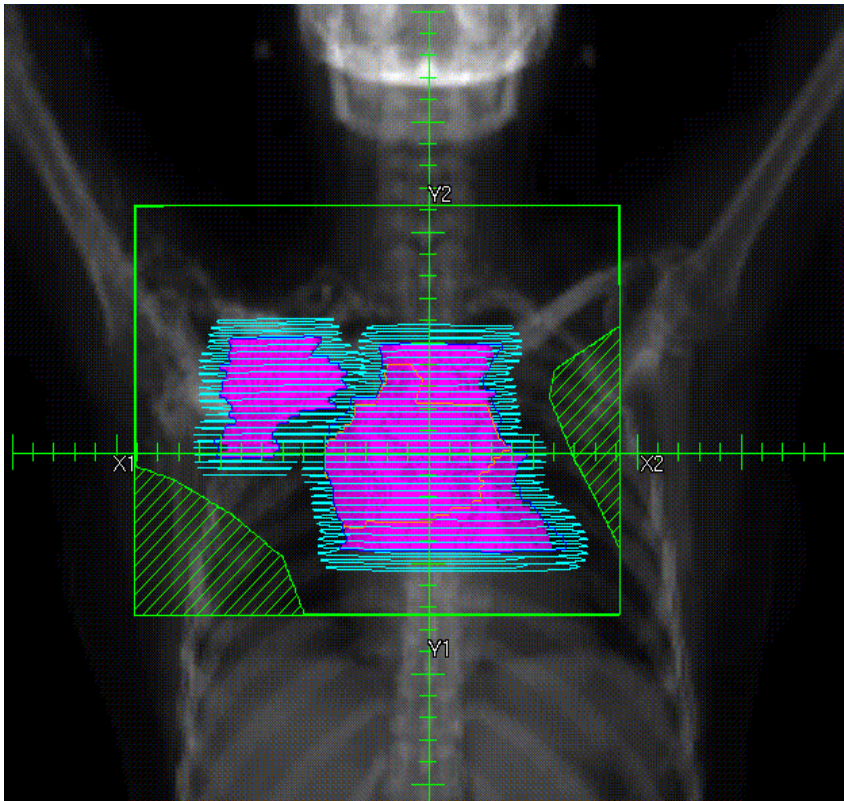




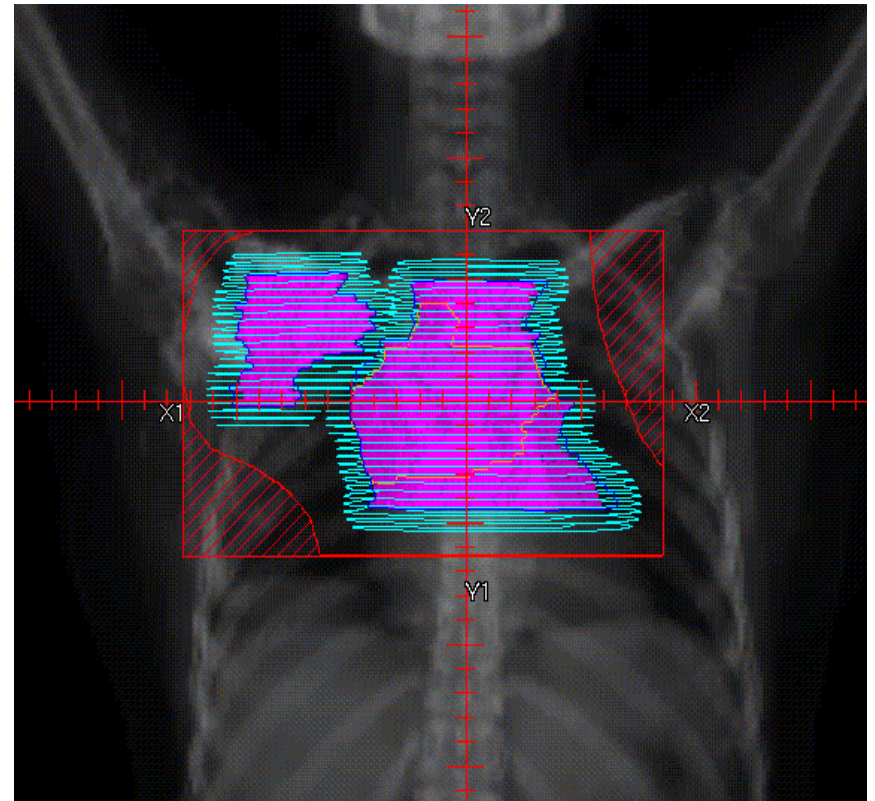
# Treatment Volume Contours

# Comparison of IFRT and ISRT

IFRT



ISRT



# Thank You

A series of horizontal lines in teal and light blue colors, some solid and some dashed, extending across the bottom of the slide.