

Breast Cancer Atlas for Radiation
Therapy Planning:
Consensus Definitions



Collaborators

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Content

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- Consensus definitions of anatomical boundaries:
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- Illustrative cases:
 - A: Stage I intact post-lumpectomy left breast
(slides 13 - 30)
 - B: Stage III post-mastectomy left breast
(slides 32 - 51)
 - C: Stage III intact post-lumpectomy right
breast (slides 54 - 71)

Overlying principles: Breast Contour

Breast CTV:

- Considers referenced clinical breast at time of CT
- Includes the apparent CT glandular breast tissue
- Incorporates consensus definitions of anatomical borders (see table)
- Includes the lumpectomy CTV

Lumpectomy GTV: Includes seroma and surgical clips when present

Overlying principles: Chestwall Contour

Chestwall CTV:

- Considers referenced clinical chestwall at time of CT
- Incorporates consensus definitions of anatomical borders (see table)
- Includes the mastectomy scar (*may not be feasible for occasional cases where the scar extends beyond the typical borders of the chestwall*)

Overlying principles: Nodal volumes

Regional nodal CTV:

- Nodal volumes contoured for targeting will depend on the specific clinical case
- Considers consensus definitions of anatomical borders (see table)
- The three levels of the axilla can overlap caudal to cranial
- “Axillary apex” was considered level III of the axilla

Breast and Chestwall Contour: Anatomical Boundaries

	<i>Cranial</i>	<i>Caudal</i>	<i>Anterior</i>	<i>Posterior</i>	<i>Lateral</i>	<i>Medial</i>
Breast ¹	Clinical Reference + Second rib insertion ^a	Clinical reference + loss of CT apparent breast	Skin	Excludes pectoralis muscles, chestwall muscles, ribs	Clinical Reference + mid axillary line typically, excludes latissimus (Lat.) dorsi m. ^b	Sternal-rib junction ^c
Breast + Chestwall ²	Same	Same	Same	Includes pectoralis muscles, chestwall muscles, ribs	Same	Same
Chestwall ³	Caudal border of the clavicle head	Clinical reference+ loss of CT apparent contralateral breast	Skin	Rib-pleural interface. (Includes pectoralis muscles, chestwall muscles, ribs)	Clinical Reference/ mid axillary line typically, excludes lattismus dorsi m ^a	Sternal-rib junction ^b

Contouring Comments:

Breast and Chestwall

1. **Breast:** After appropriate lumpectomy for breast only treatment
 - a. **Cranial** border is highly variable depending on breast size and patient position. The lateral aspect can be more cranial than the medial aspect depending on breast shape and patient position.
 - b. **Lateral** border is highly variable depending on breast size and amount of ptosis.
 - c. **Medial** border is highly variable depending on breast size and amount of ptosis. Clinical reference needs to be taken into account. Should not cross midline.

Contouring Comments:

Breast and Chestwall

2. **Breast-Chestwall:** CTV after appropriate lumpectomy for more locally advanced cases includes those:
 - With clinical stage IIb, III who receive neoadjuvant chemotherapy and lumpectomy
 - Who have sufficient risk disease to require post-mastectomy radiation had mastectomy done
3. **Chestwall:** CTV after appropriate mastectomy:
 - a. **Lateral** border meant to estimate the lateral border of the previous breast. Typically extends beyond the lateral edge of the pectoralis muscles but excluded the latissimus dorsi muscle
 - b. **Clinical** reference marks need to be taken into account. The chestwall typically should not cross midline. Medial extent of mastectomy scar should typically be included

Regional Nodal Contours: Anatomical Boundaries

Cranial

Caudal

Anterior

Posterior

Lateral

Medial

Supra-clavicular

Caudal to the cricoid cartilage

Junction of brachioceph.-axillary vns./caudal edge clavicle head **a**

Sternocleido mastoid (SCM) muscle (m.)

Anterior aspect of the scalene m.

Cranial: lateral edge of SCM m.
Caudal: junction 1st rib-clavicle

Excludes thyroid and trachea

Axilla-Level I

Axillary vessels cross lateral edge of Pec. Minor m.

Pectoralis (Pec.) major muscle insert into ribs **b**

Plane defined by: anterior surface of Pec. Maj. m. and Lat. Dorsi m.

Anterior surface of subscapularis m.

Medial border of lat. dorsi m.

Lateral border of Pec. minor m.

Axilla-level II

Axillary vessels cross medial edge of Pec. Minor m.

Axillary vessels cross lateral edge of Pec. Minor m. **c**

Anterior surface Pec. Minor m.

Ribs and intercostal muscles

Lateral border of Pec. Minor m.

Medial border of Pec. Minor m.

Axilla-level III

Pec. Minor m. insert on cricoid

Axillary vessels cross medial edge of Pec. Minor m. **d.**

Posterior surface Pec. Major m.

Ribs and intercostal muscles

Medial border of Pec. Minor m.

Thoracic inlet

Internal mammary

Superior aspect of the medial 1st rib.

Cranial aspect of the 4th rib

- **e.**

- **e.**

- **e.**

- **e.**

Contouring Comments:

Regional Nodal Volumes

- a. **Supraclavicular caudal border** meant to approximate the superior aspect of the breast/ chestwall field border
- b. **Axillary level I caudal border** is clinically at the base of the anterior axillary line
- c. **Axillary level II caudal border** is the same as the cranial border of level 1
- d. **Axillary level III caudal border** is the same as the cranial border of level II
- e. **Internal Mammary lymph nodes**: encompass the internal mammary/ thoracic vessels

Case A- Intact post lumpectomy breast

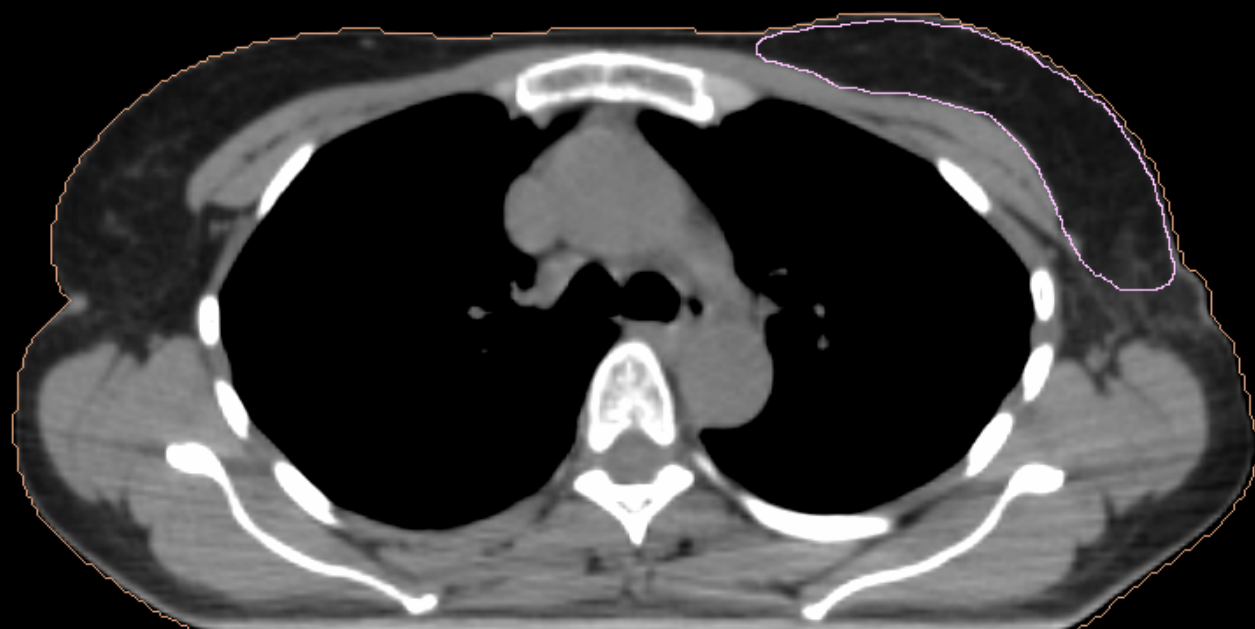
- Stage I (T1c, N0, M0) Left breast cancer
- Surgery: Lumpectomy and sentinel node biopsy
- Radiation: Breast
- Six surgical clips placed at lumpectomy site
- External markers placed at time of CT:
 - BB at AP set-up point
 - 4 wire markers for clinical estimate of cranial, caudal, medial, and lateral extent of anticipated tangents
 - Wire extending from 9-3 o'clock around the inframammary fold
 - Wire over the lumpectomy scar

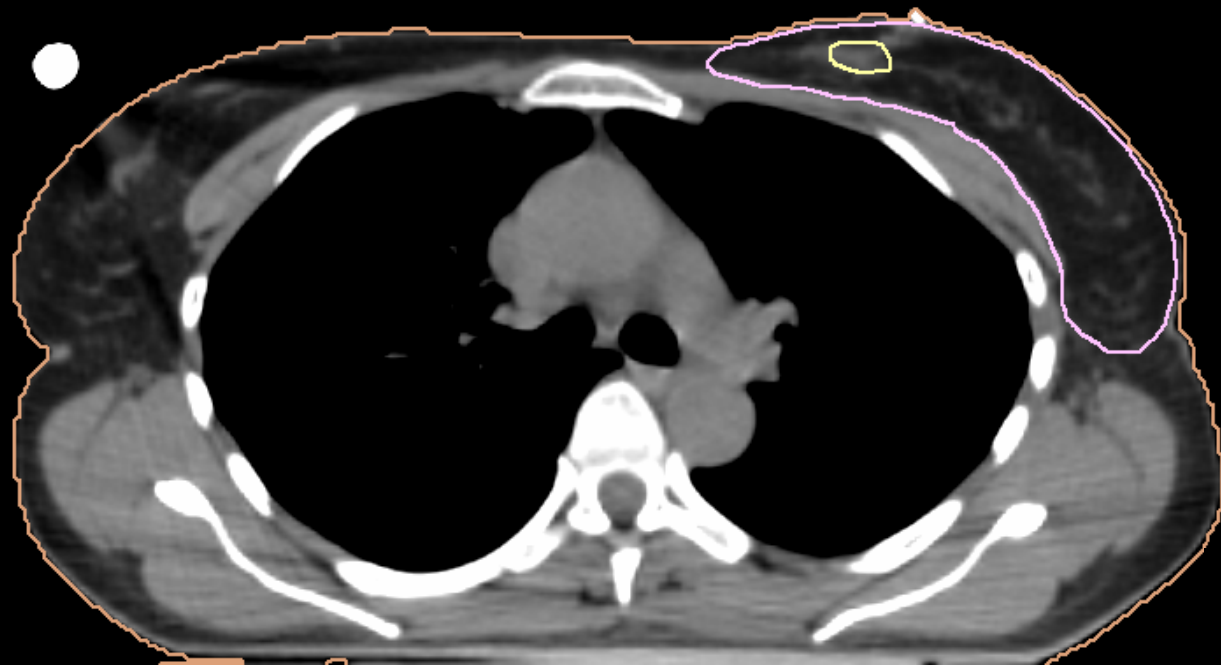


■ Lumpectomy

■ Breast

■ Heart

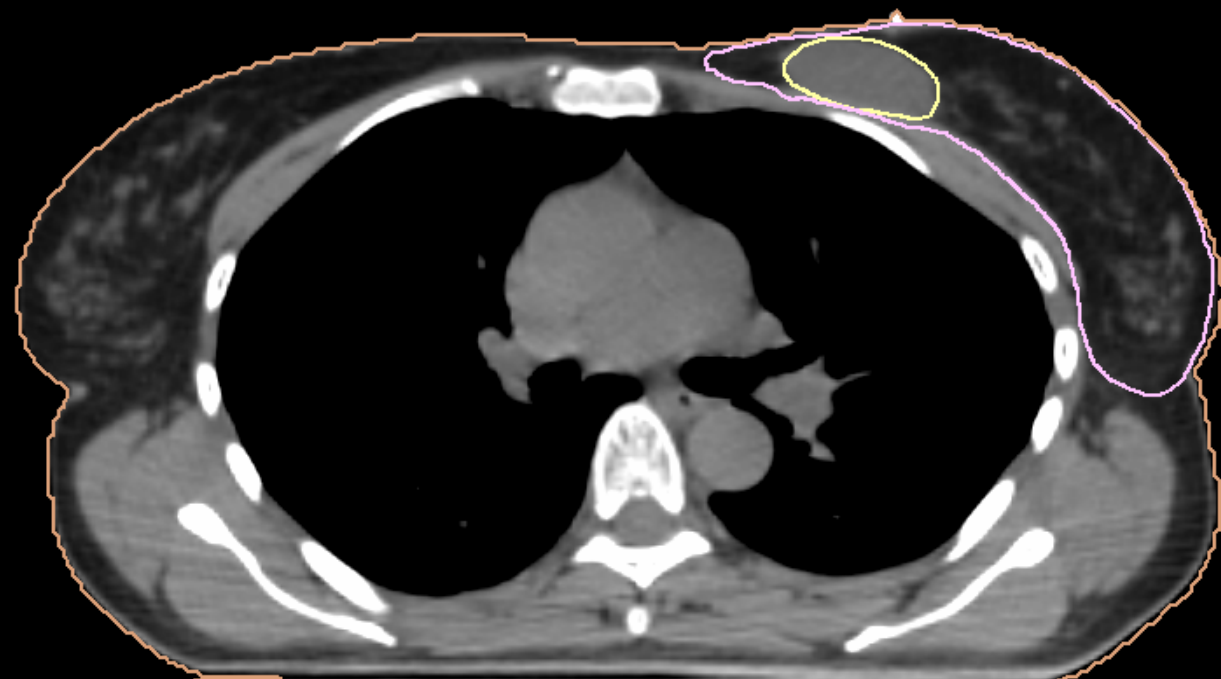


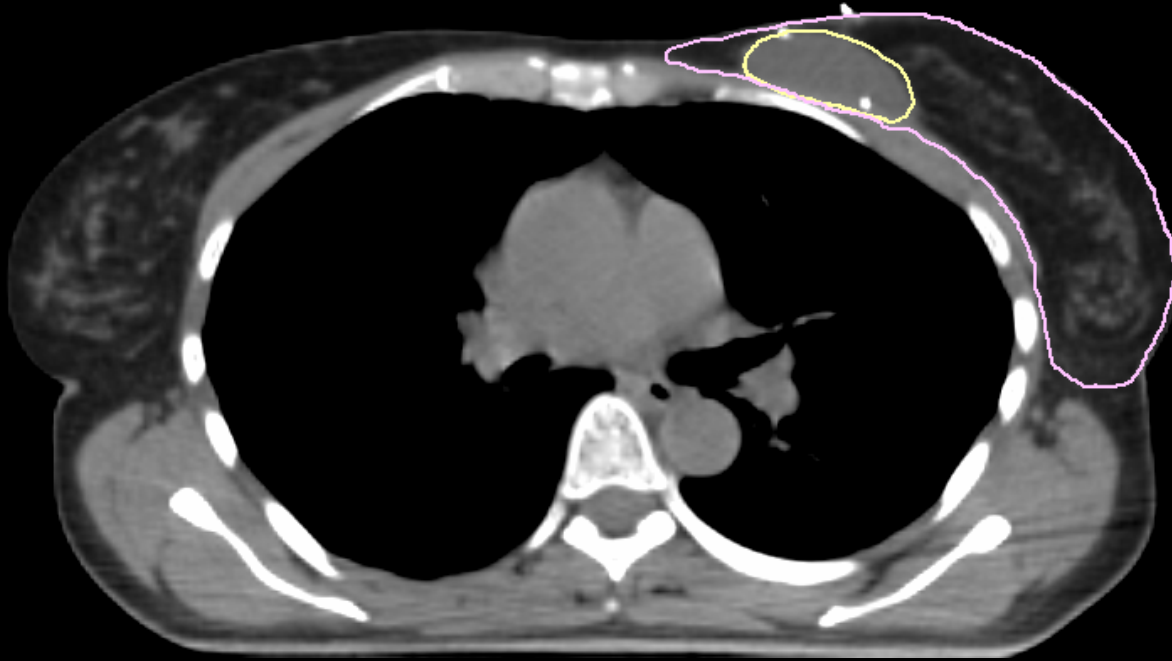


■ Lumpectomy

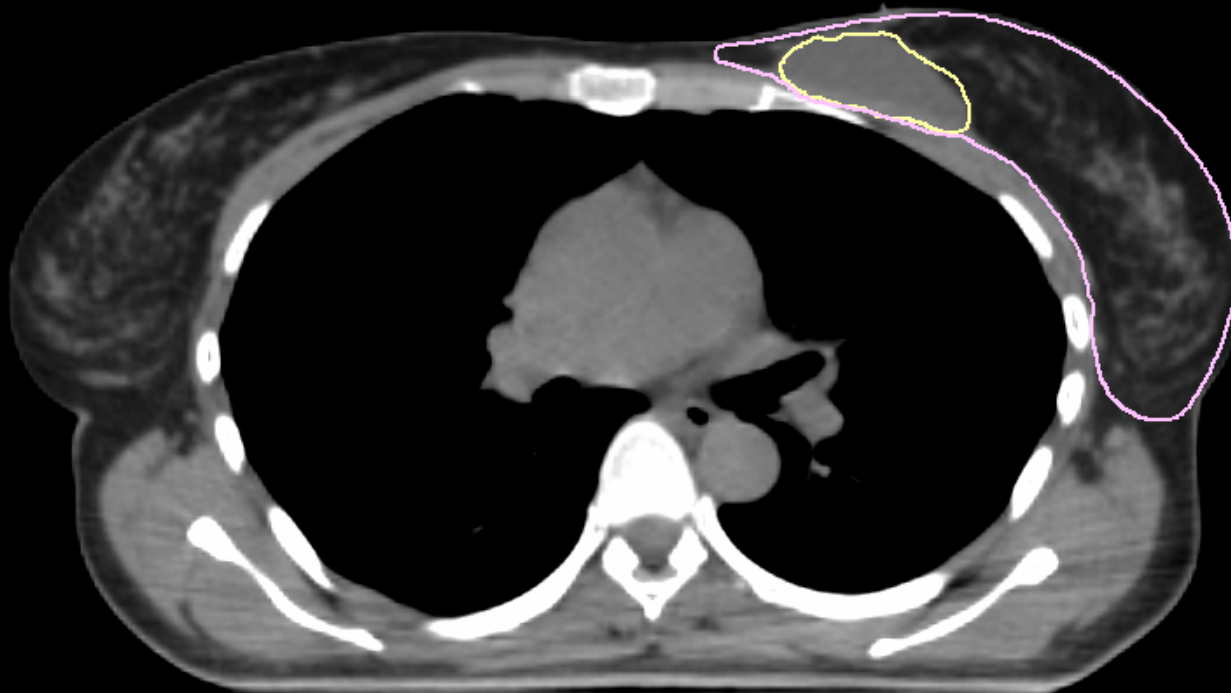
■ Breast

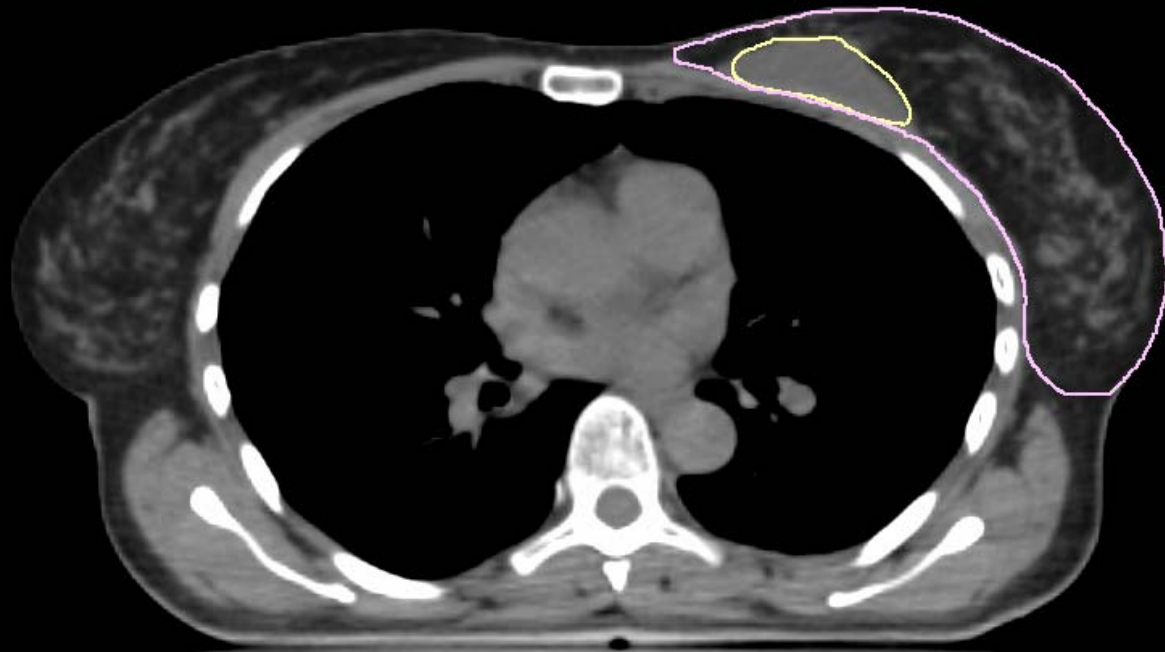
■ Heart



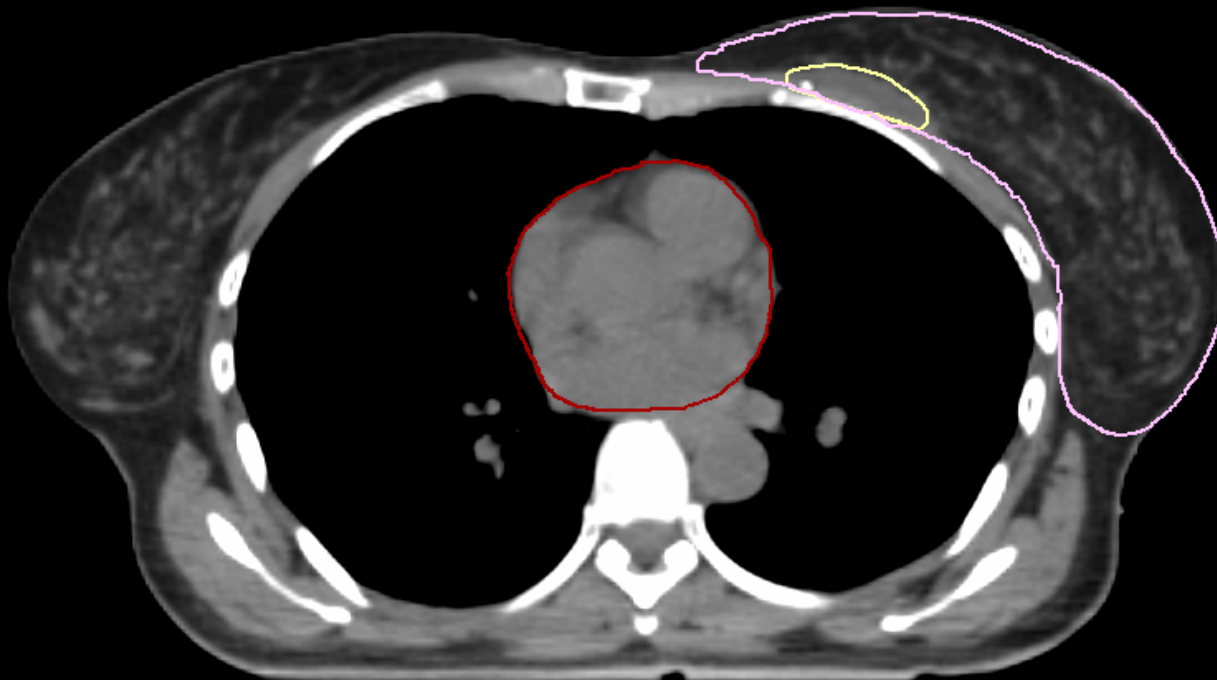


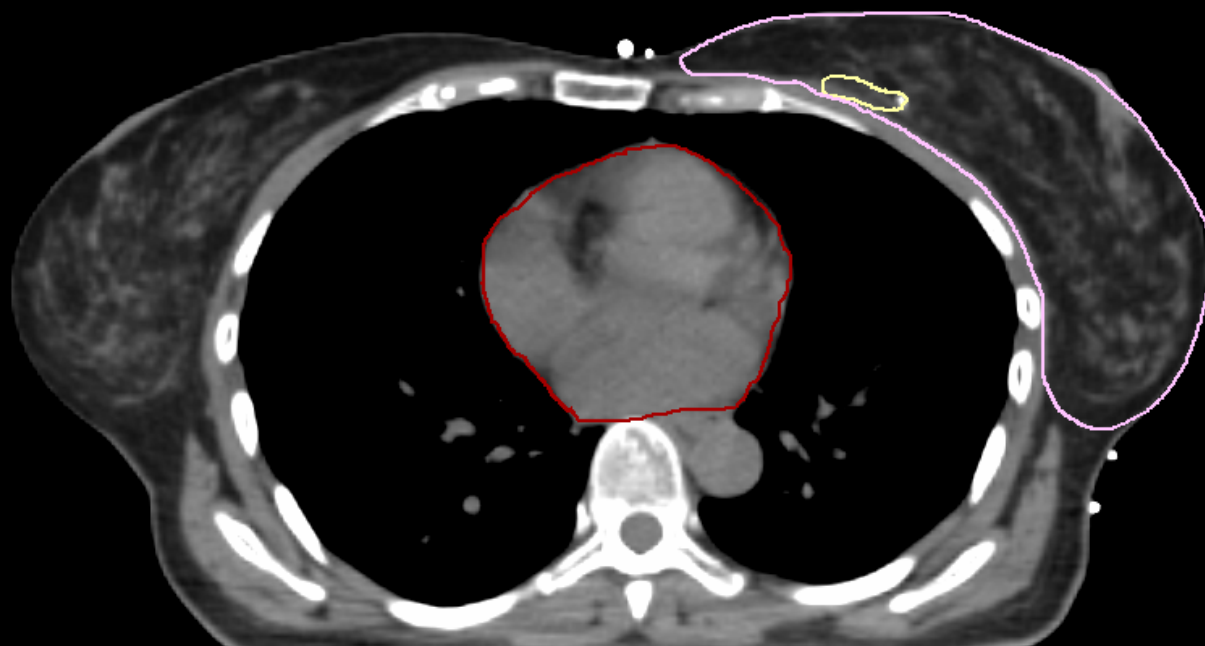
- Lumpectomy
- Breast
- Heart





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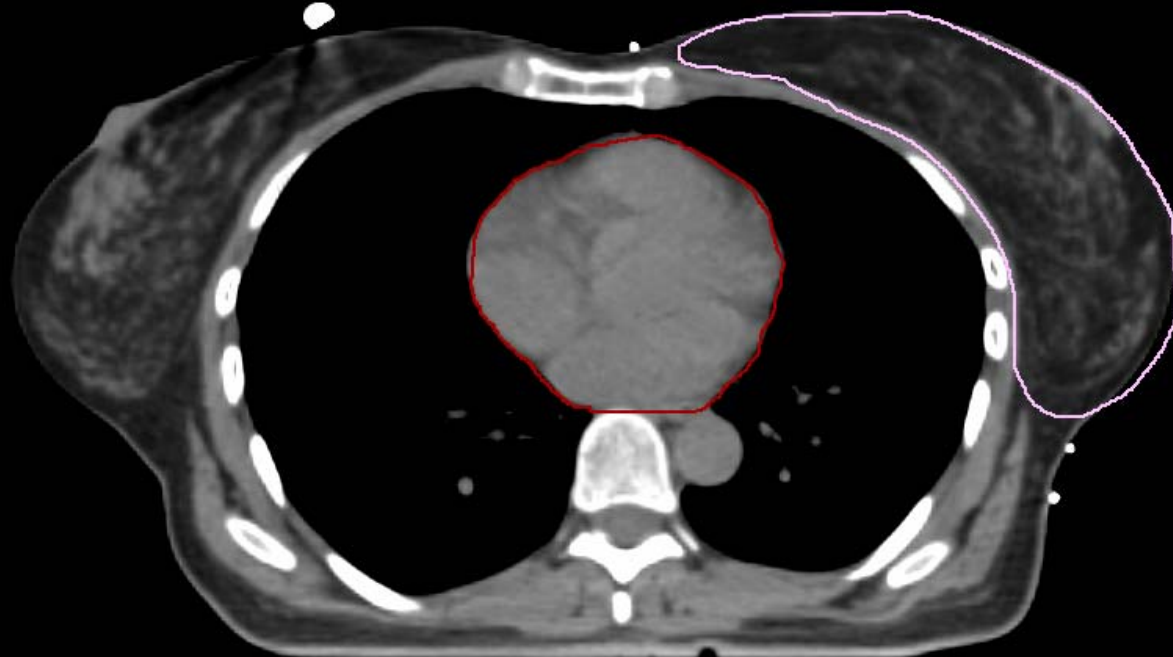


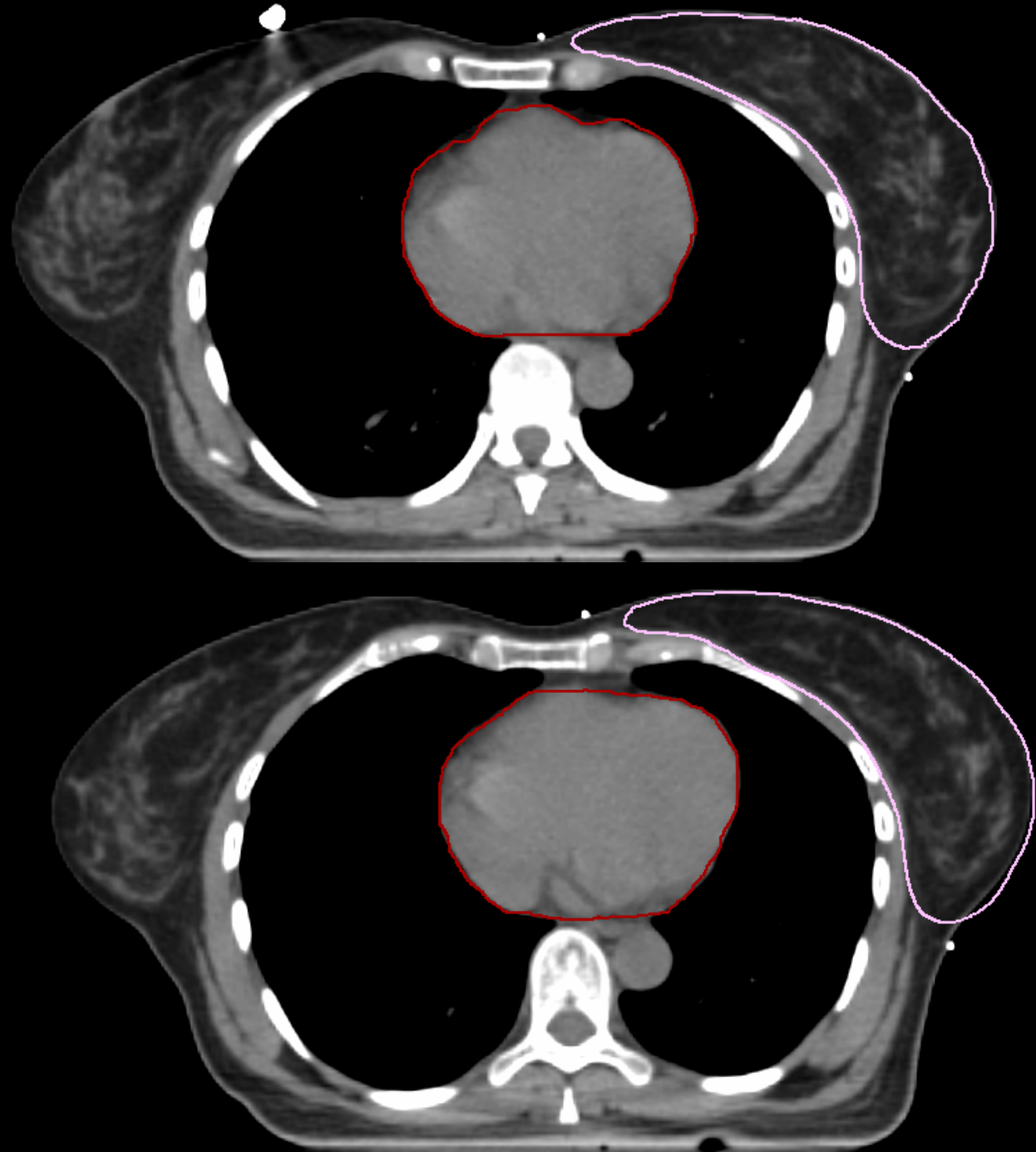


■ Lumpectomy

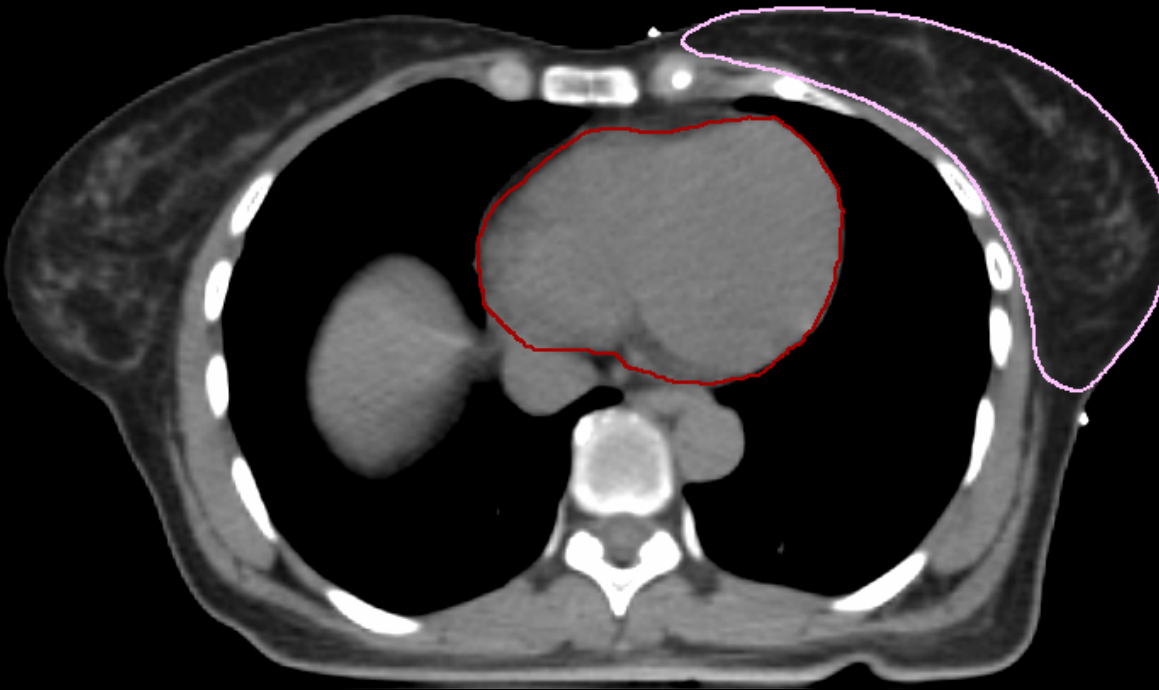
■ Breast

■ Heart

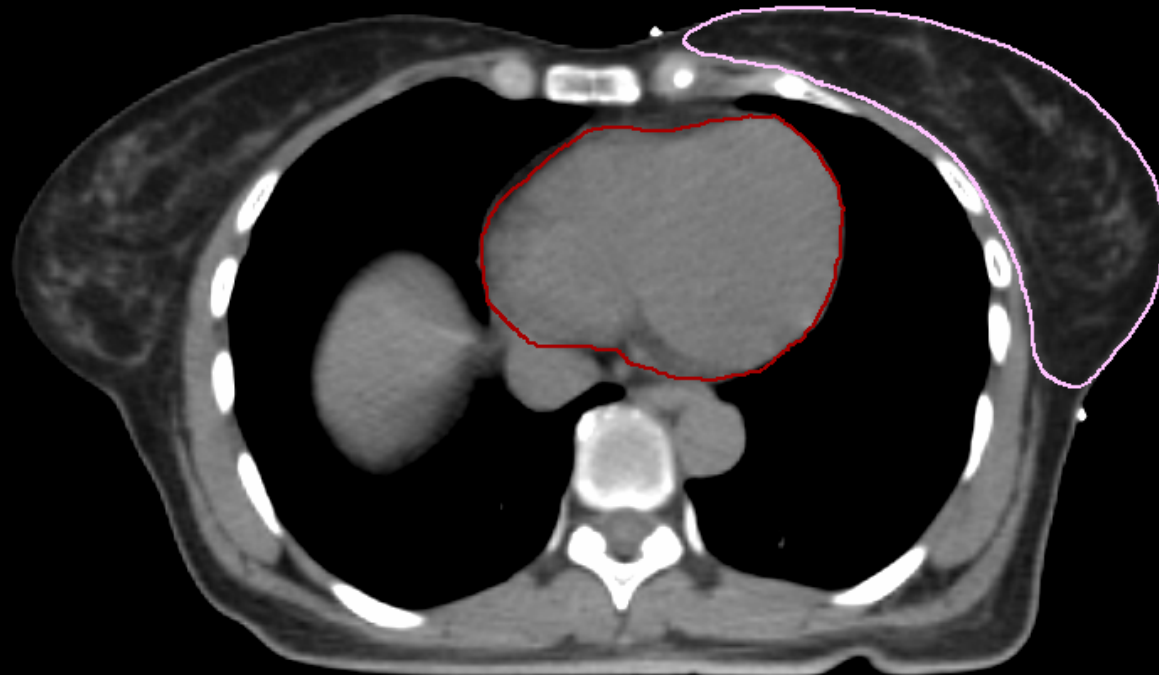


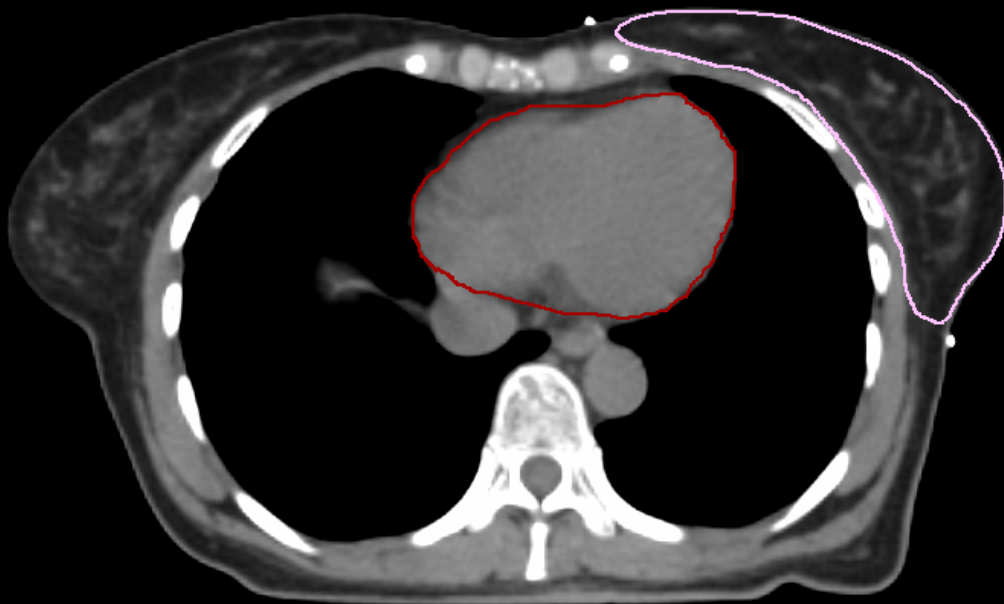


- Lumpectomy
- Breast
- Heart



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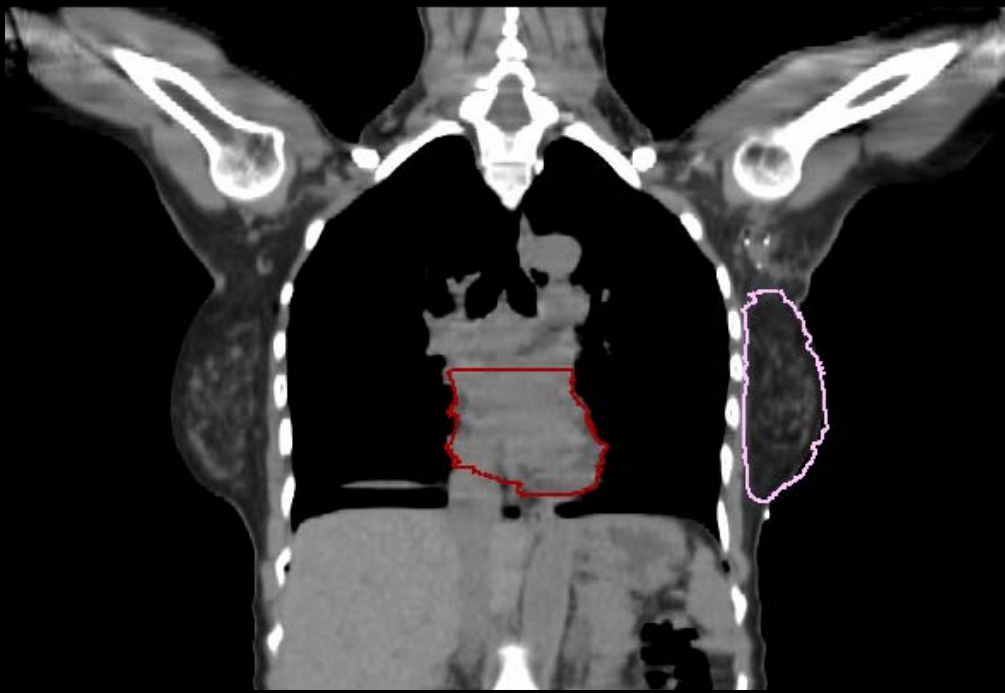


■ Lumpectomy

■ Breast

■ Heart





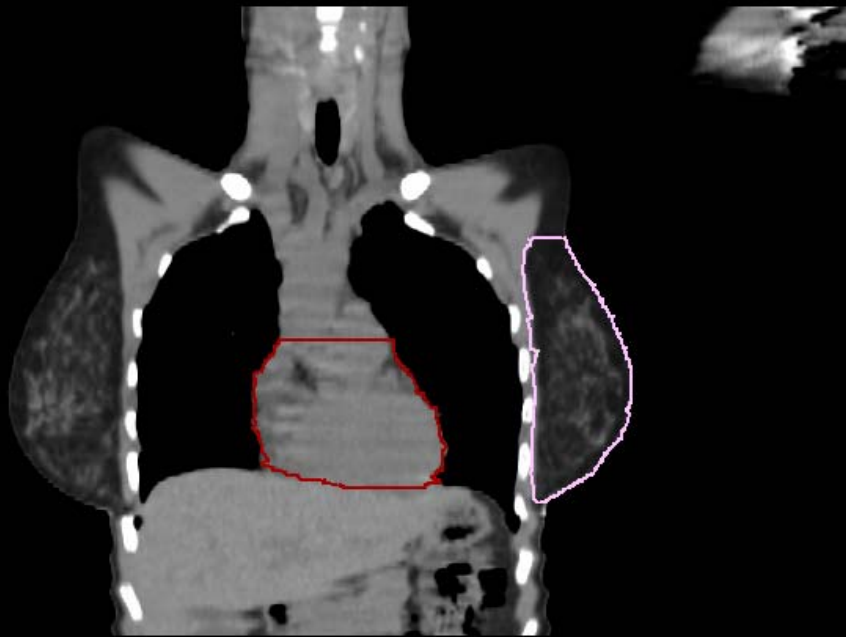
- Lumpectomy
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- Lumpectomy
- Breast
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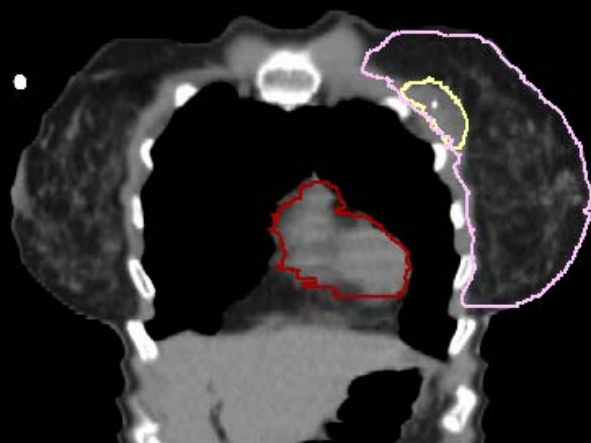


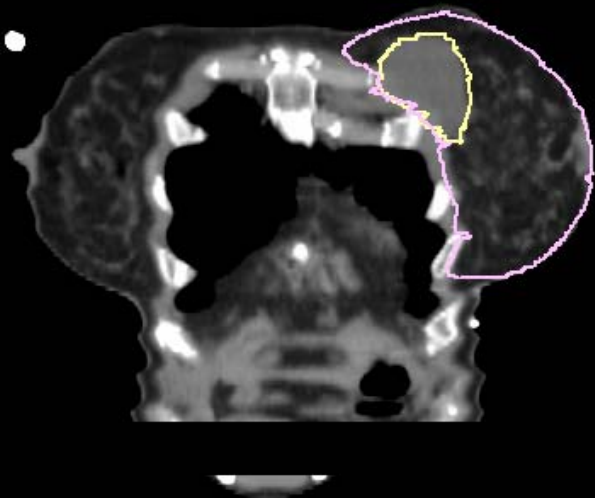
- Lumpectomy
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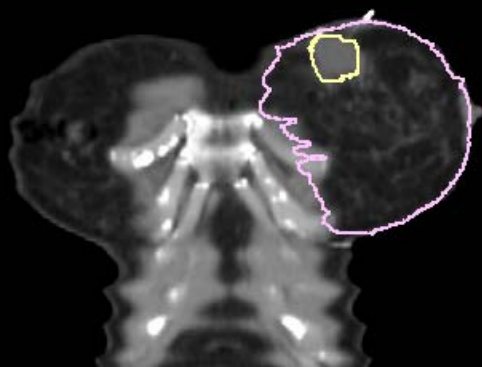


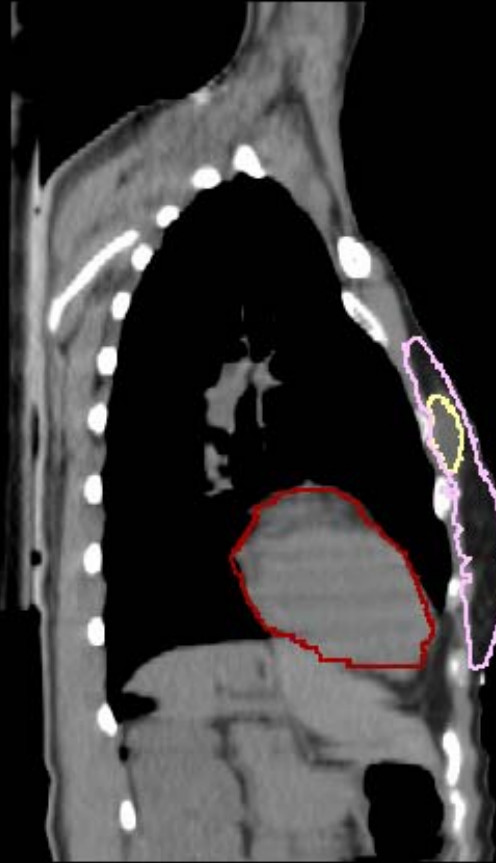
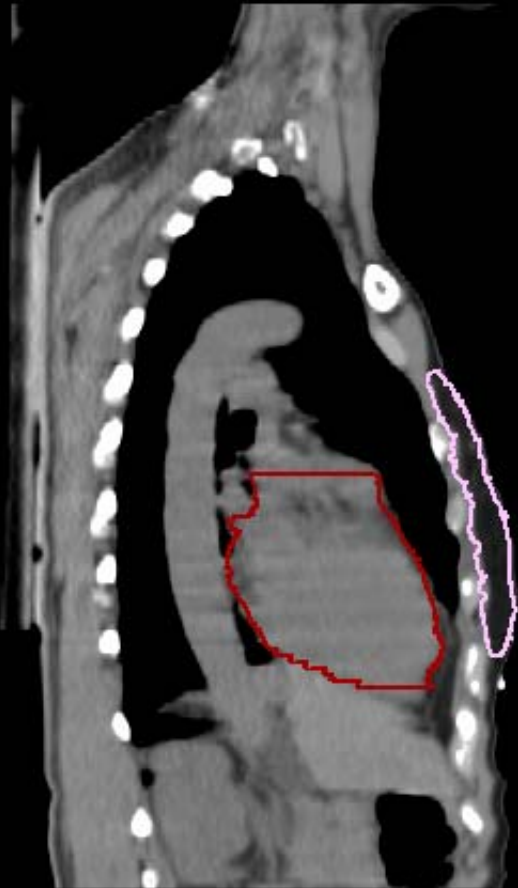
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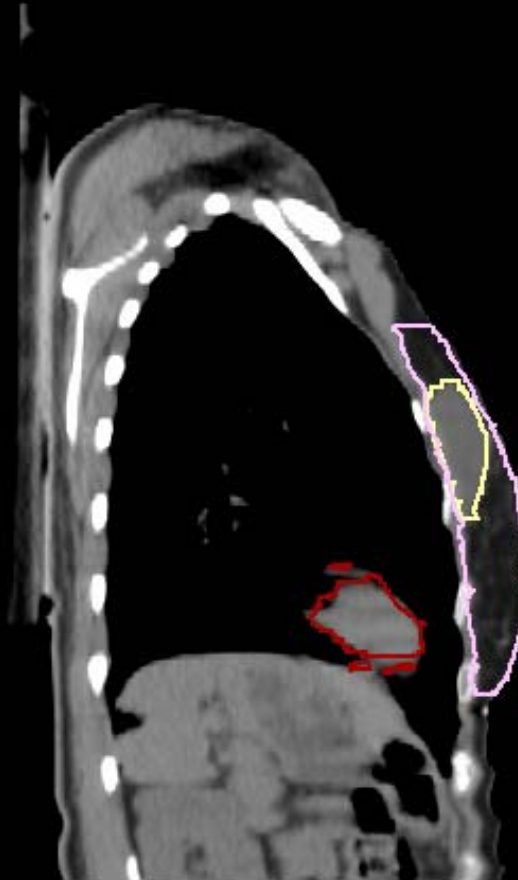
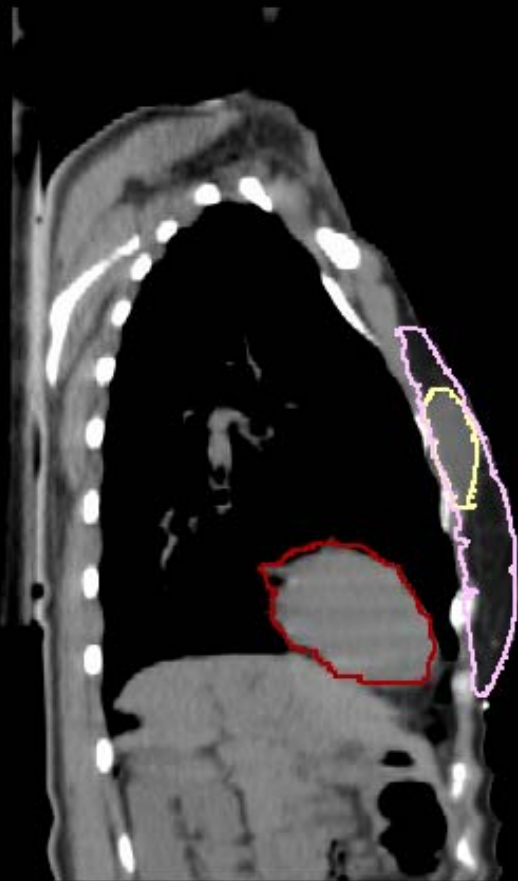


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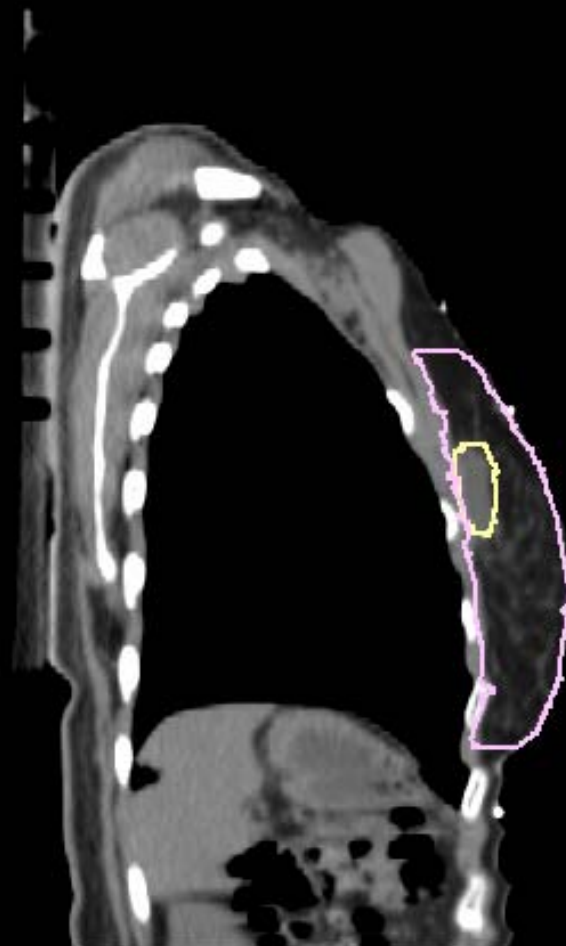




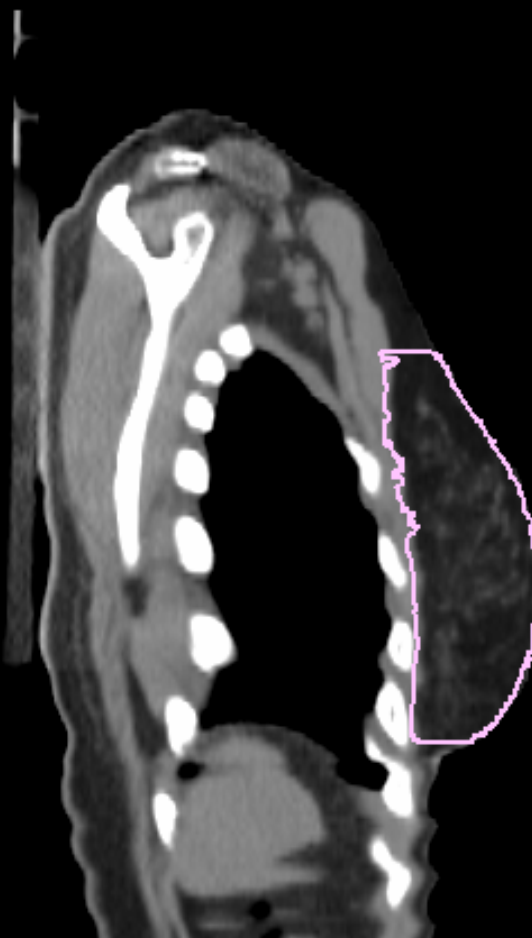
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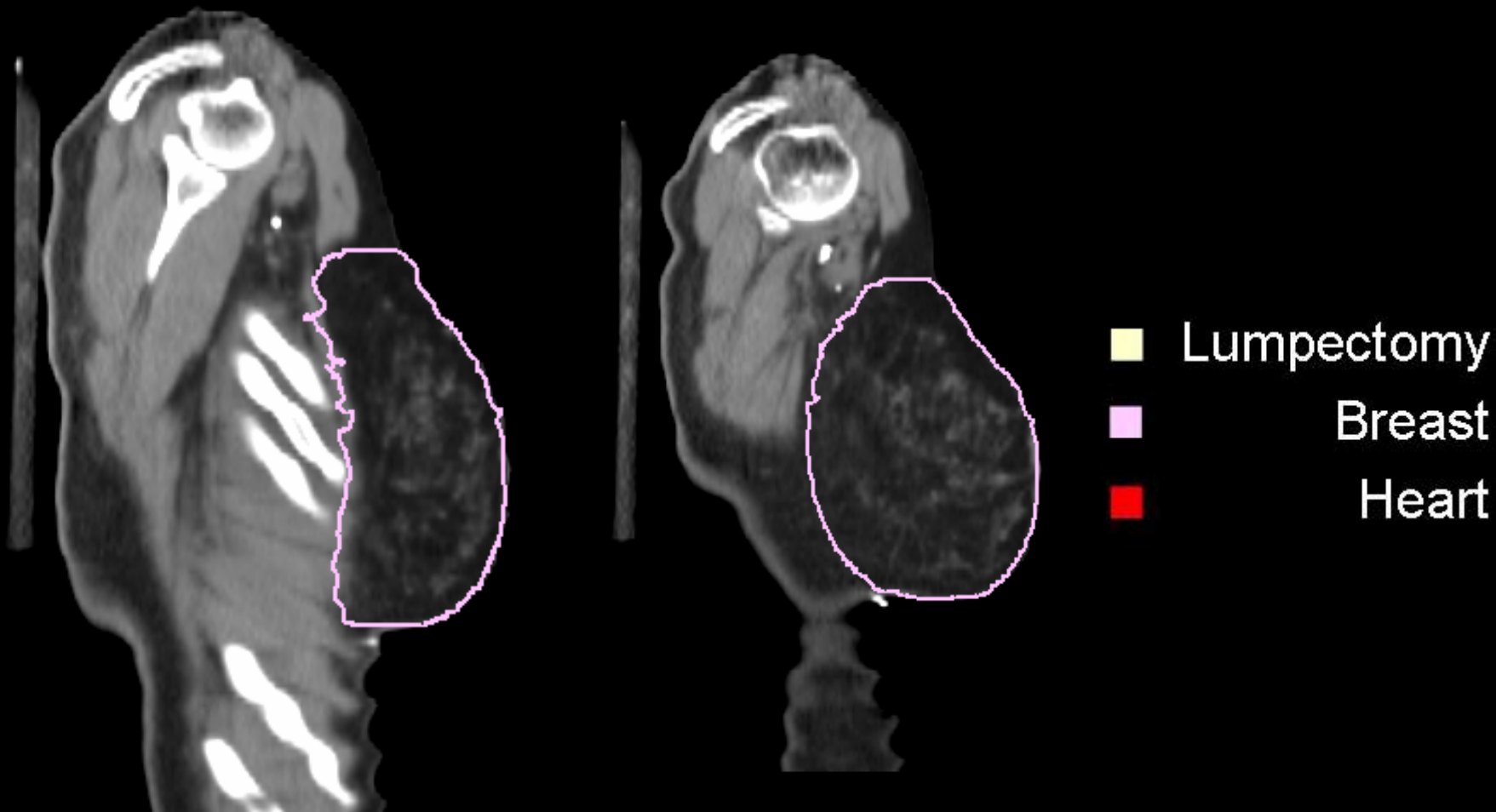
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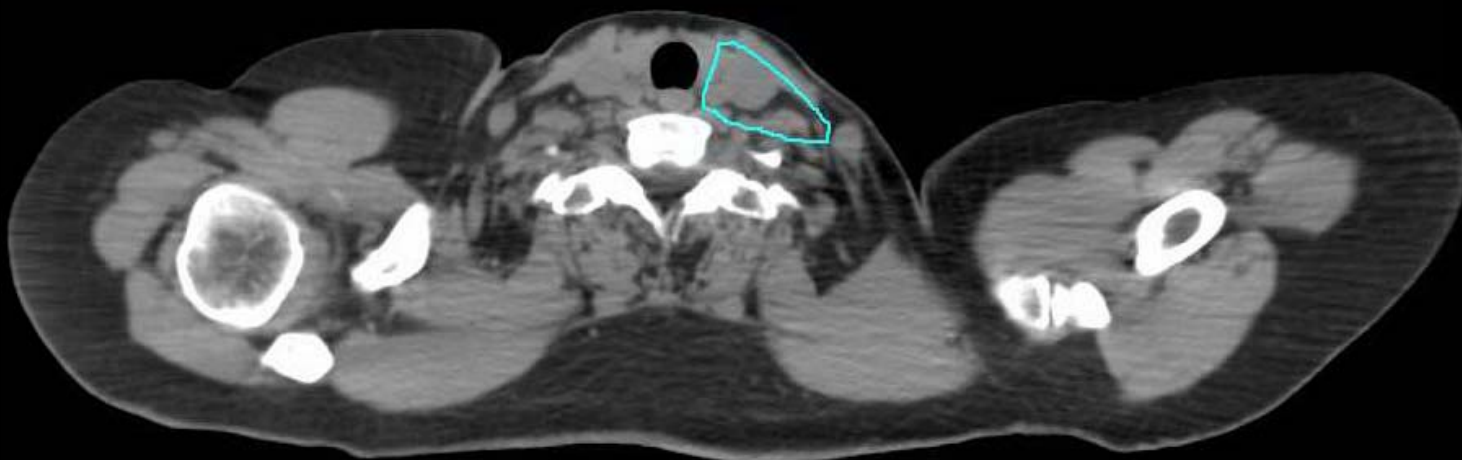
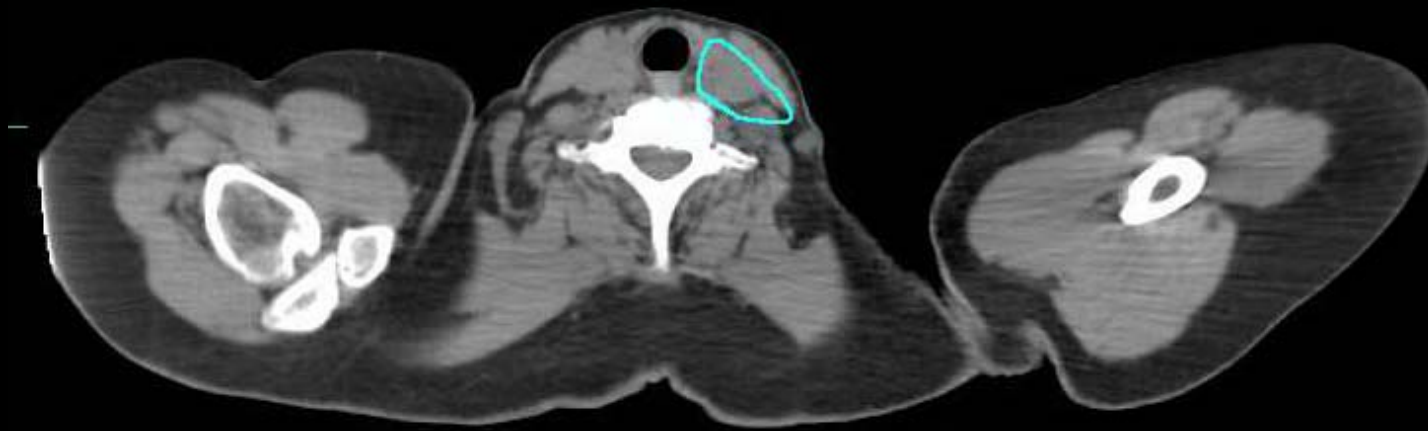


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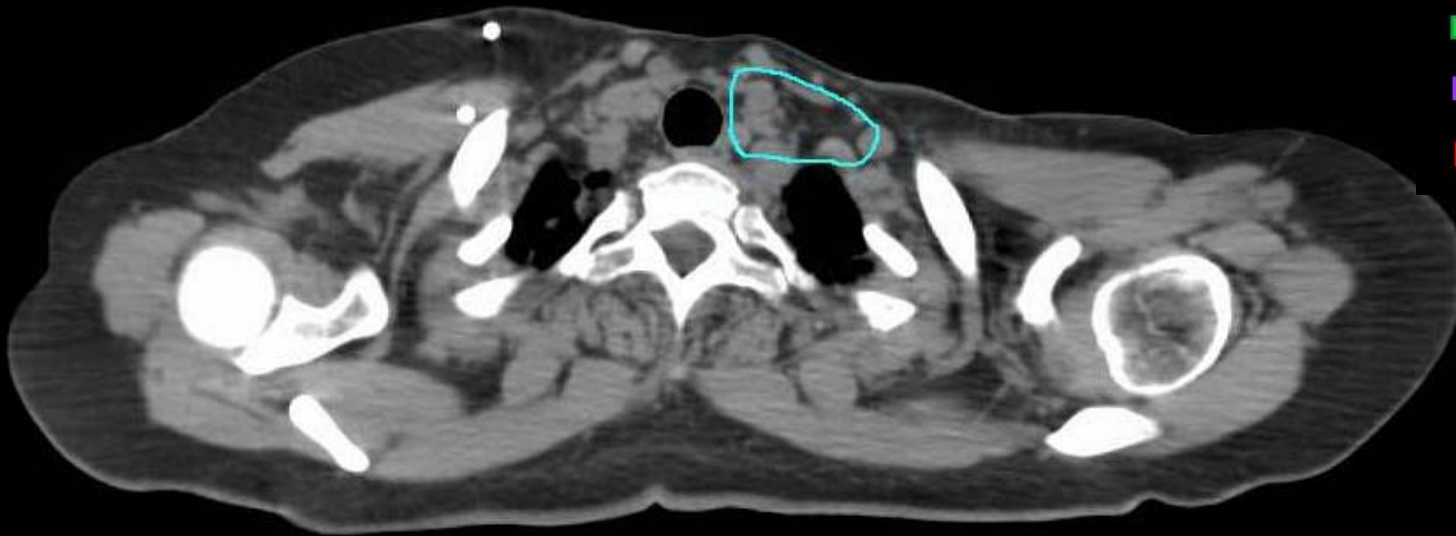


Case B: Post-mastectomy, Stage III

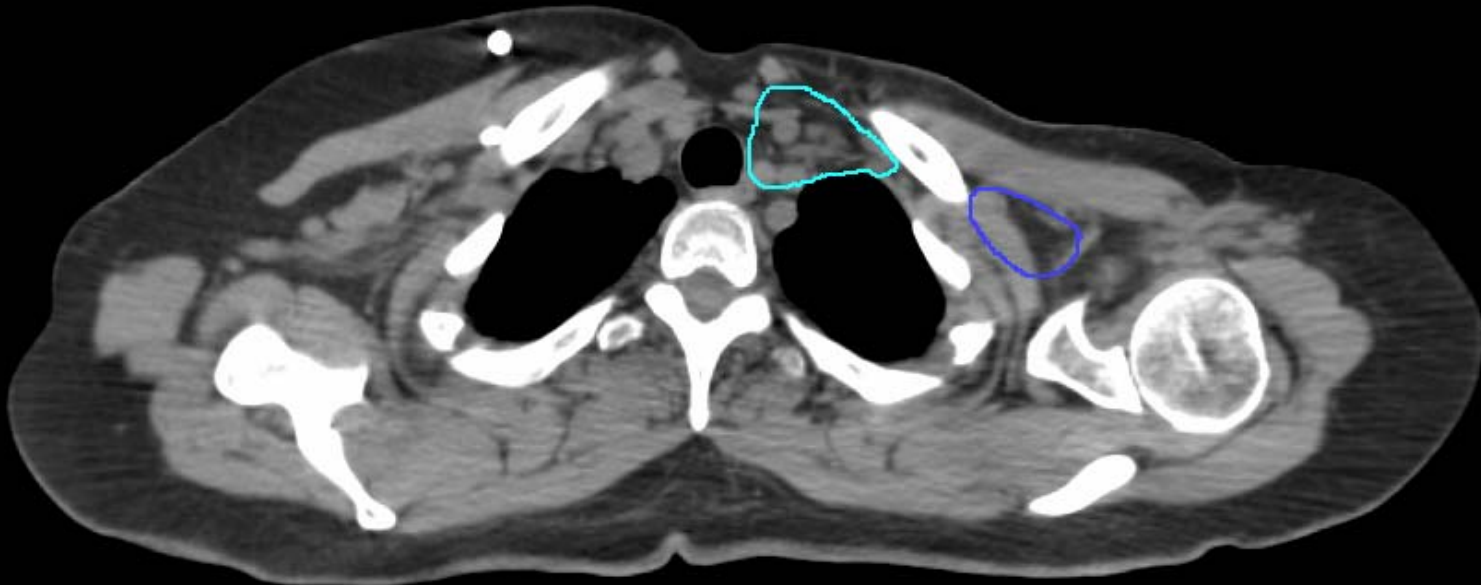
- Stage IIIB (T-3, N-3, M-0) left breast cancer, tumor size 7 cm, 11/15 nodes positive
- Surgery: total mastectomy and axillary done dissection
- Radiation: chestwall \pm regional lymph nodes
- External wires present on CT:
 - Wire on mastectomy scar
 - BB on AP set-point at clinically estimated level of the match for the supraclavicular \pm axilla with the chestwall \pm IMC fields
 - Wires at lateral and inferior clinically estimated extent of the chestwall



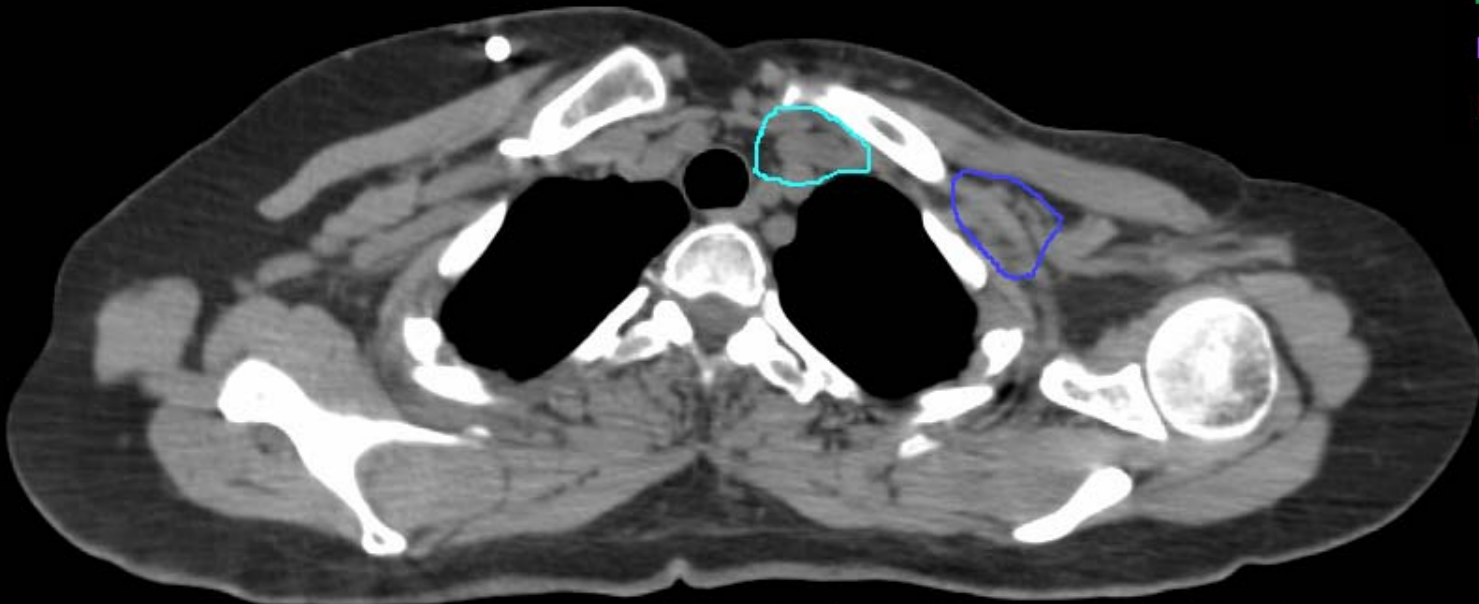
- Supraclavicular
- Axilla level 3
- Axilla level 2
- Axilla level 1
- Internal mammary
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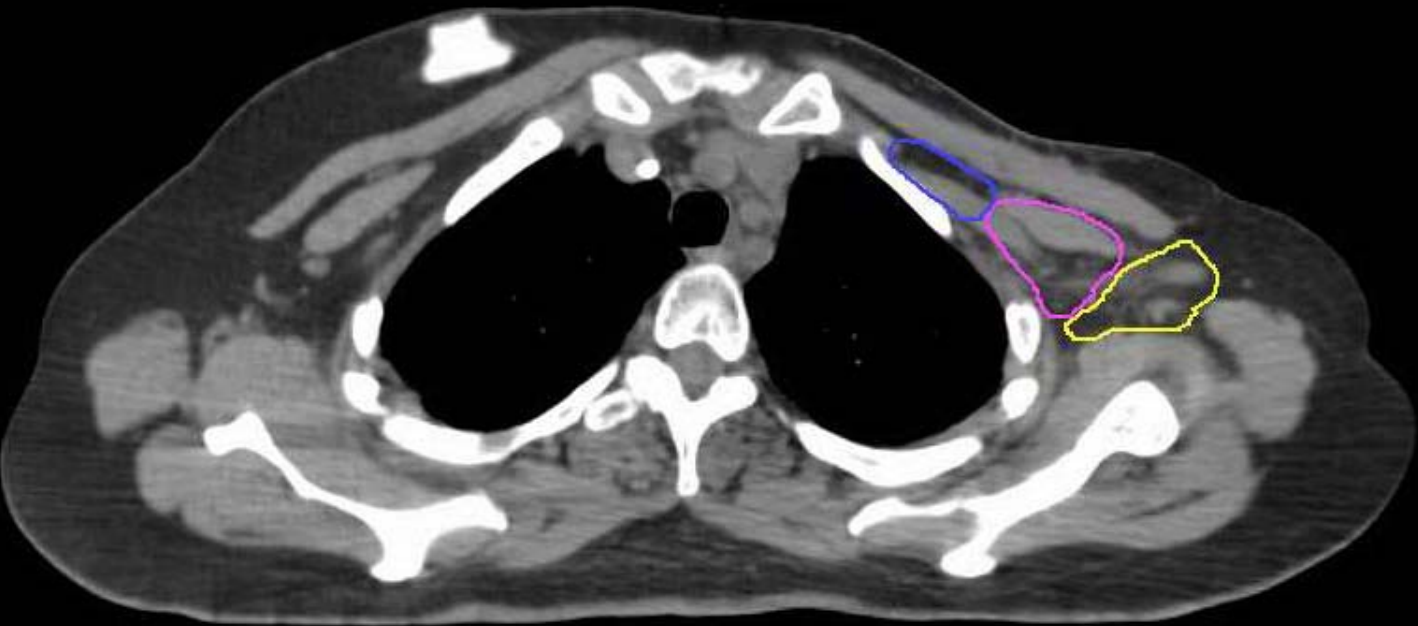
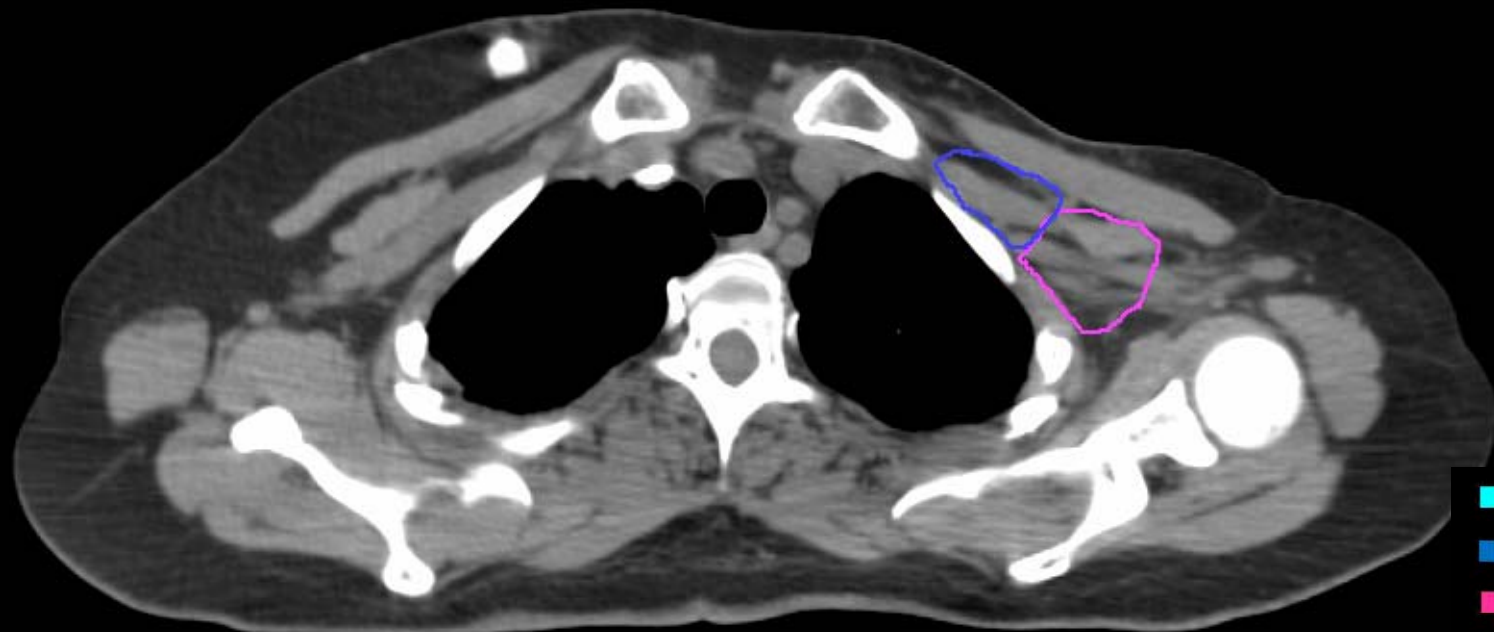


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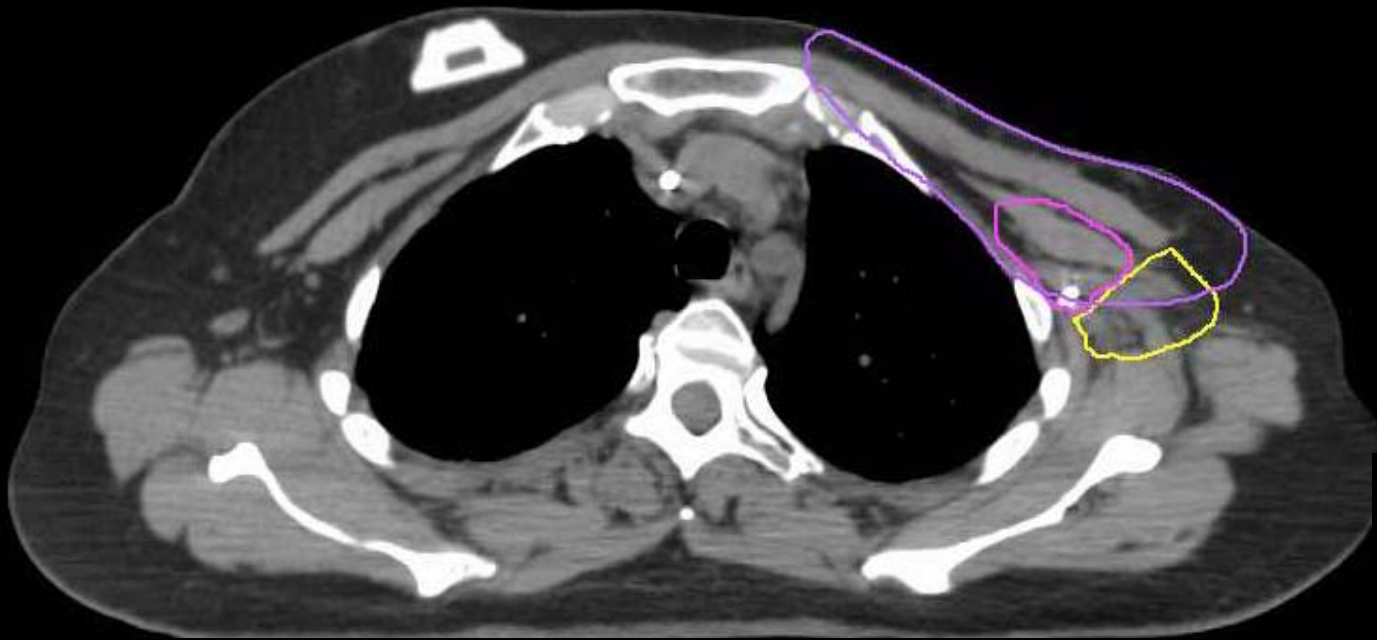


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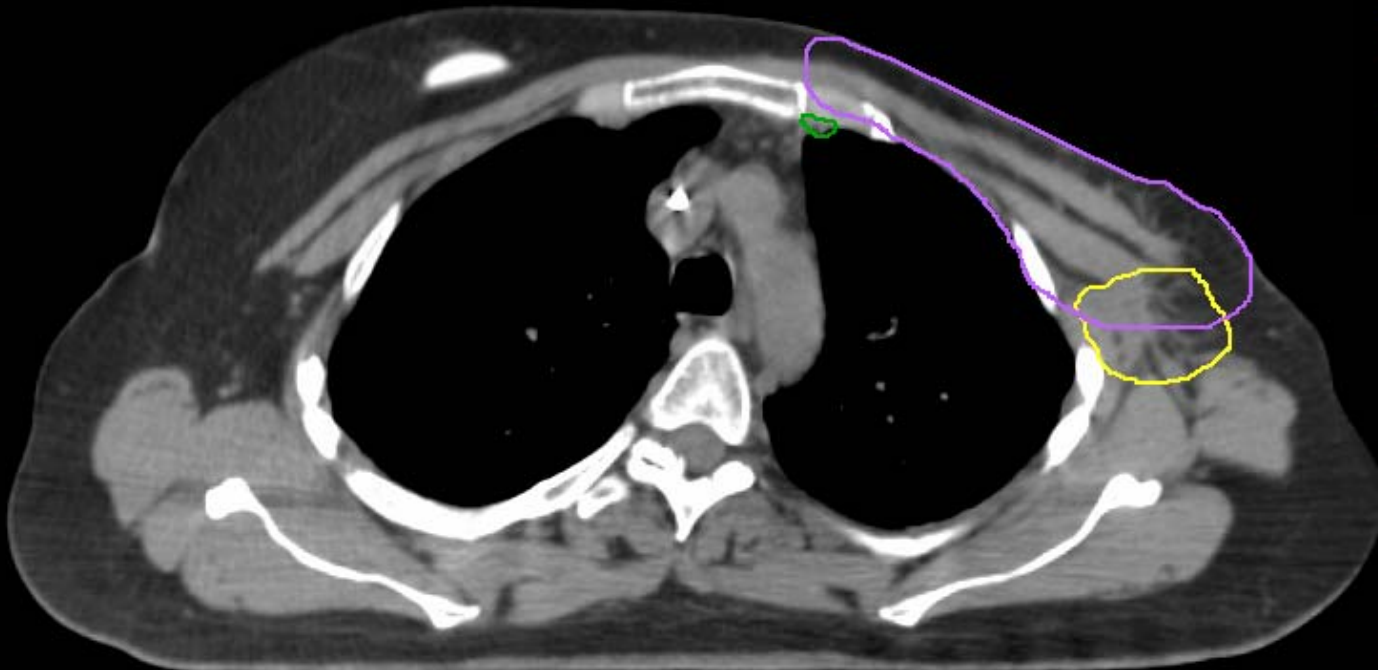


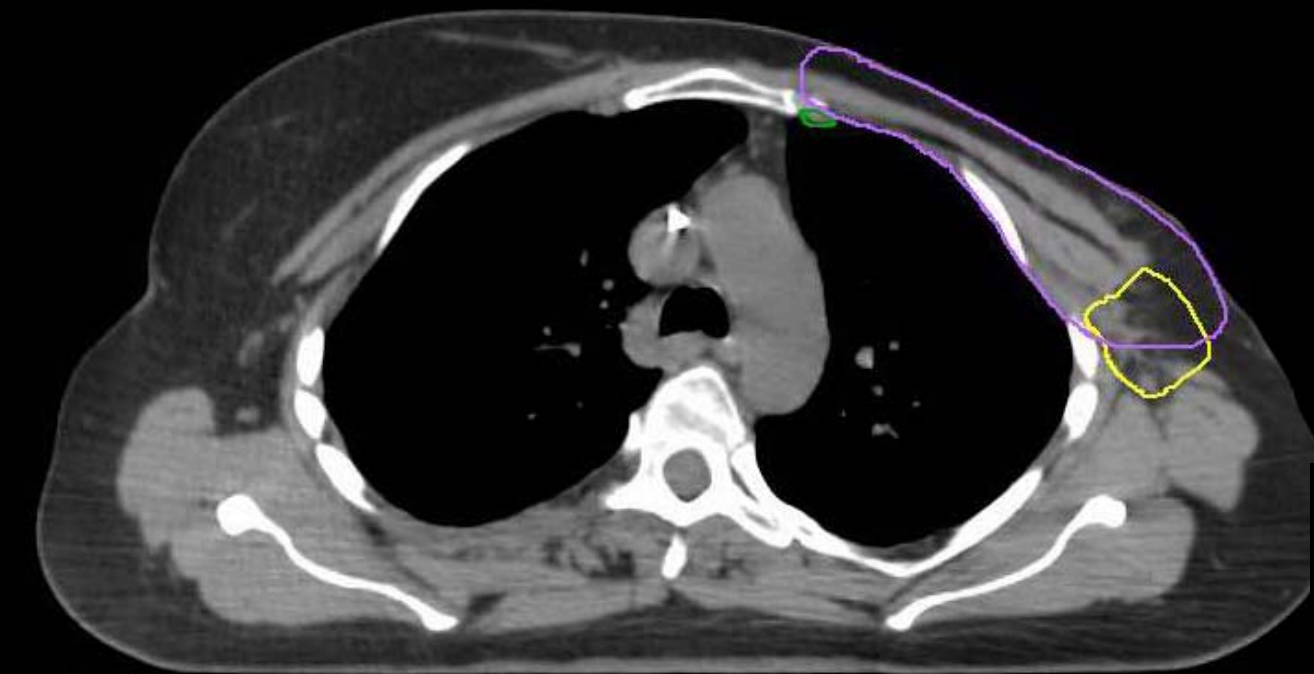


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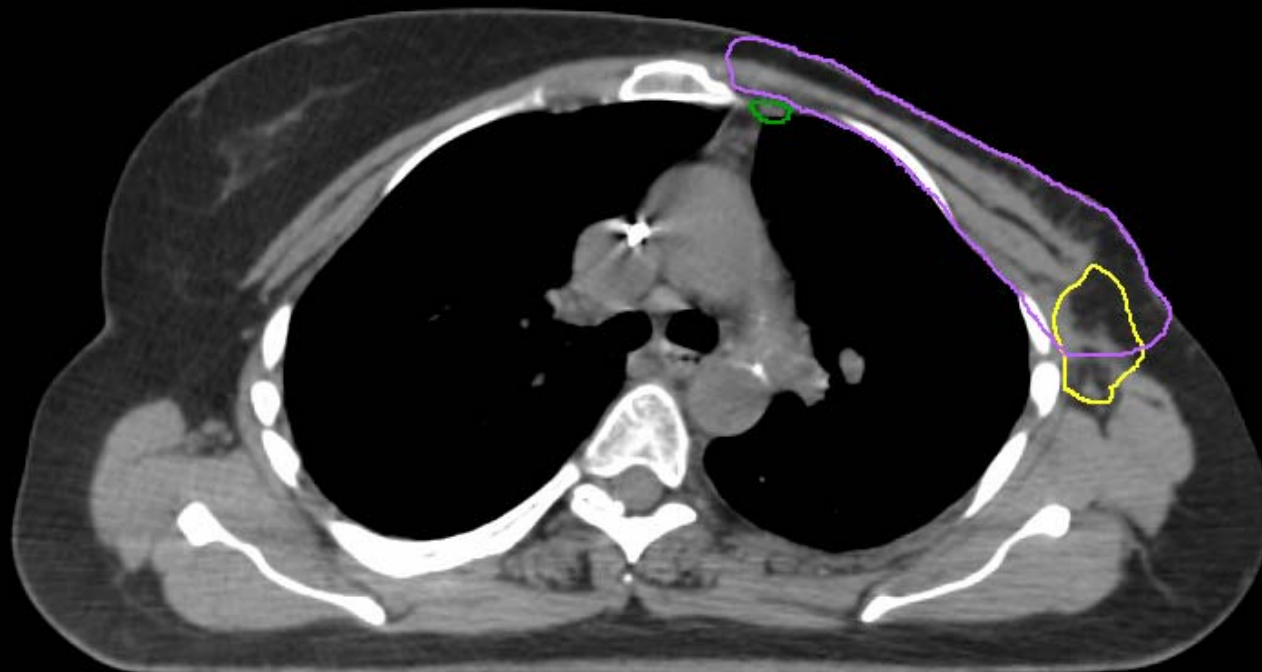


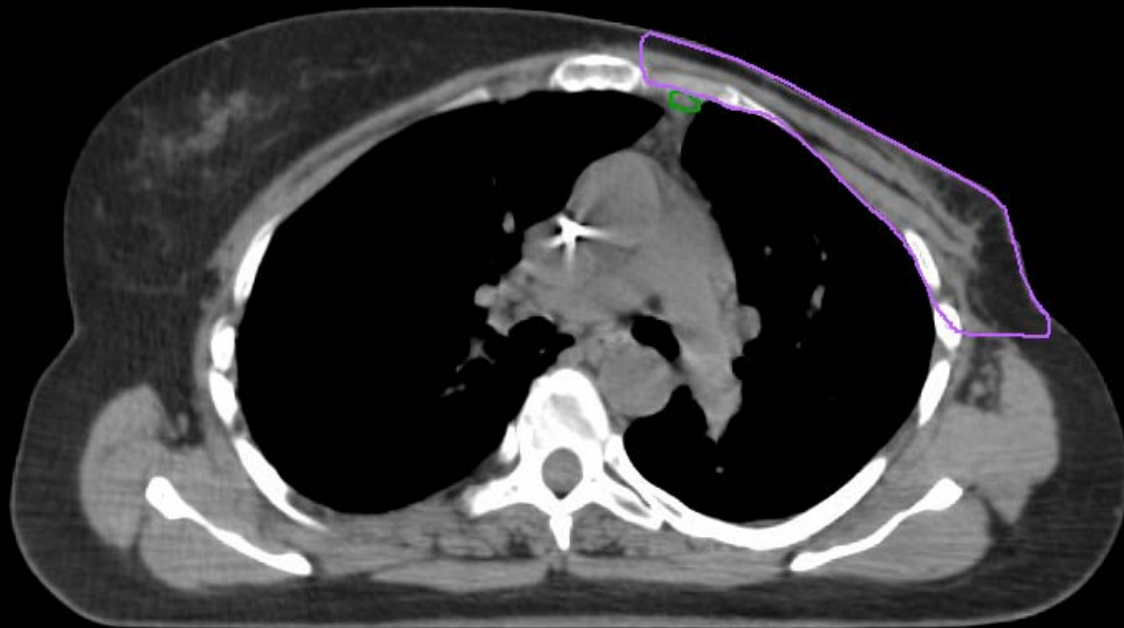
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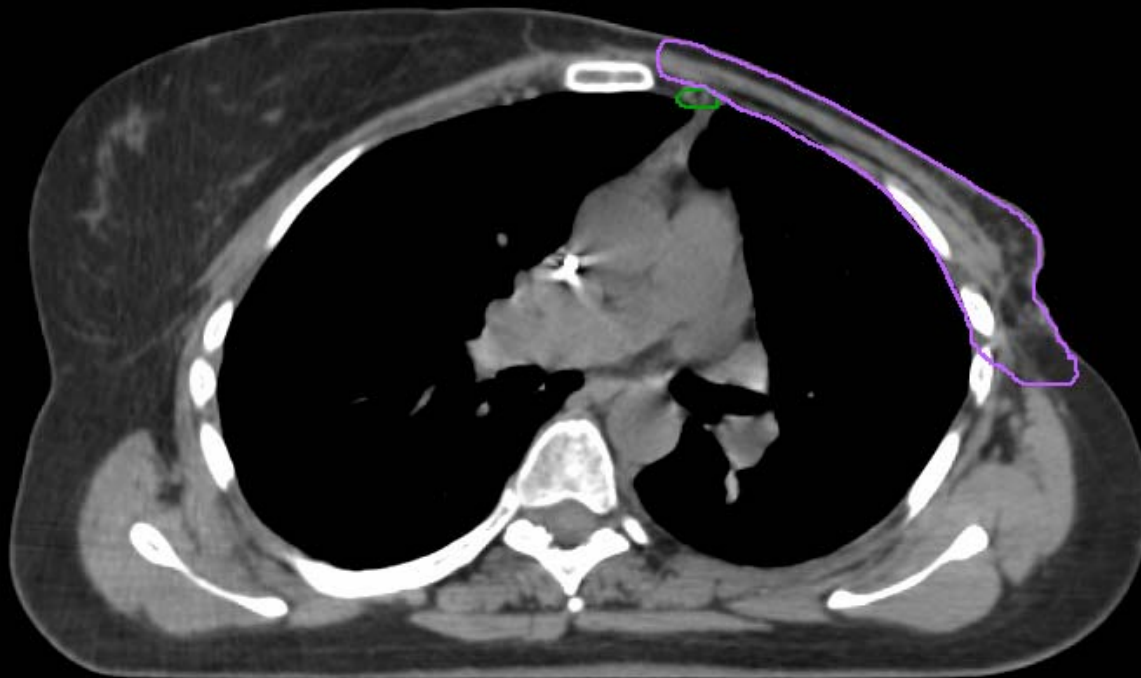


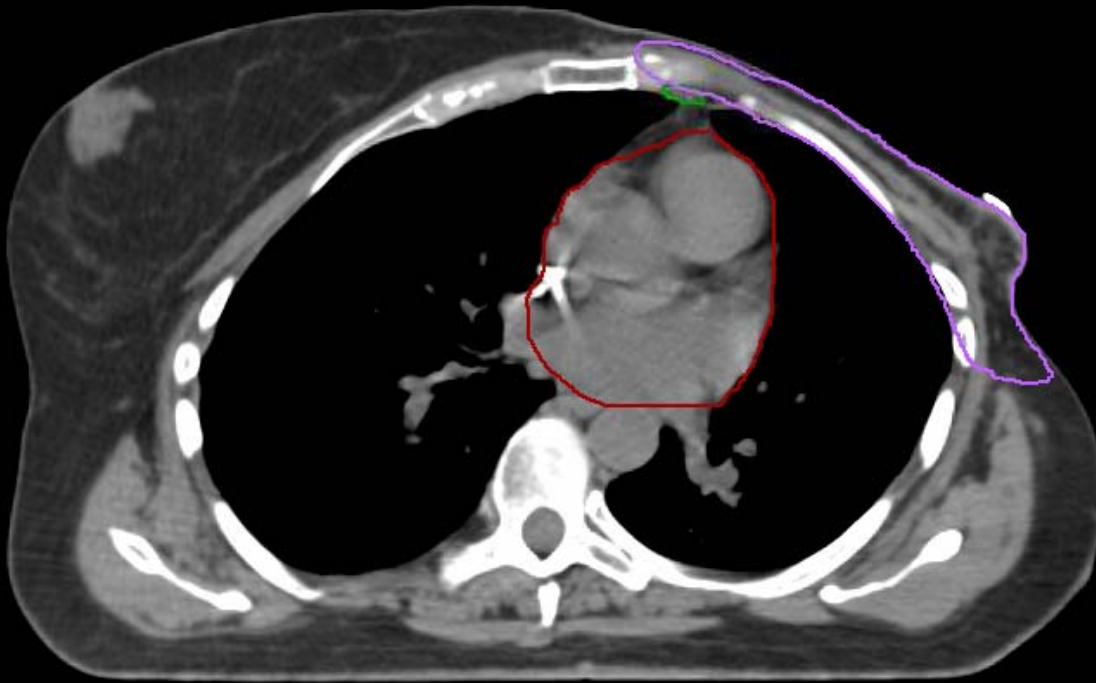
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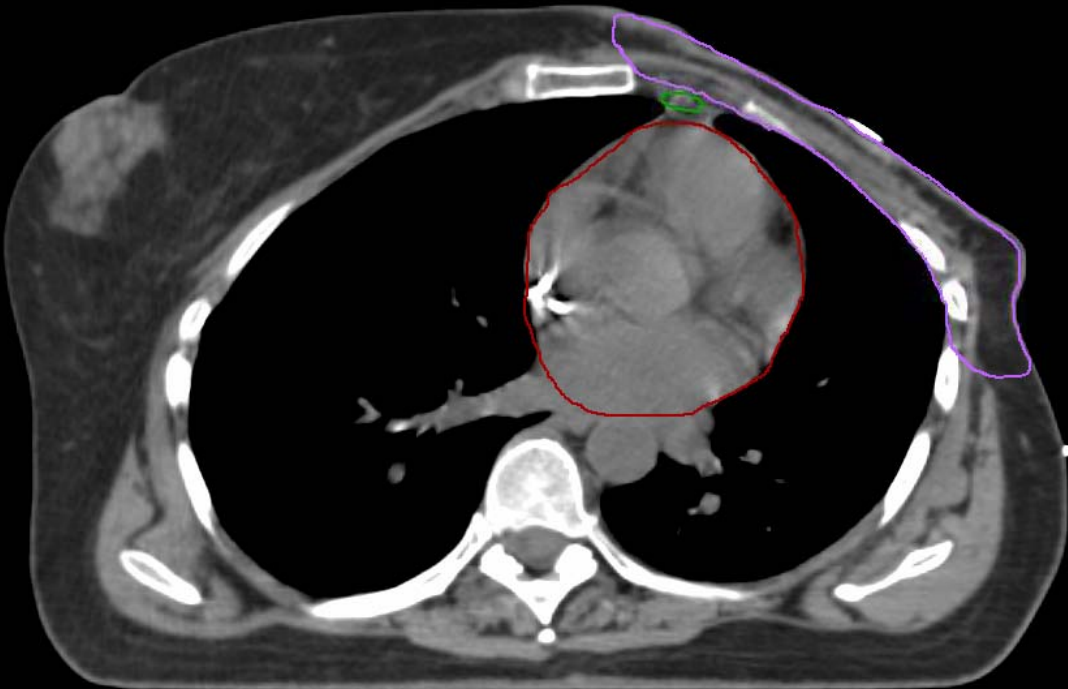


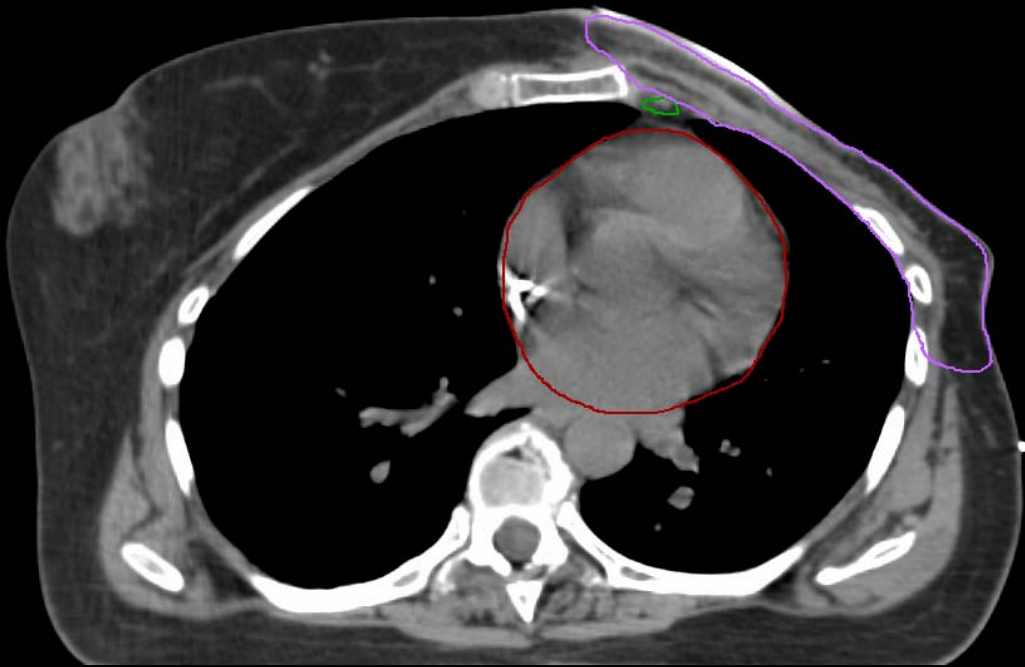
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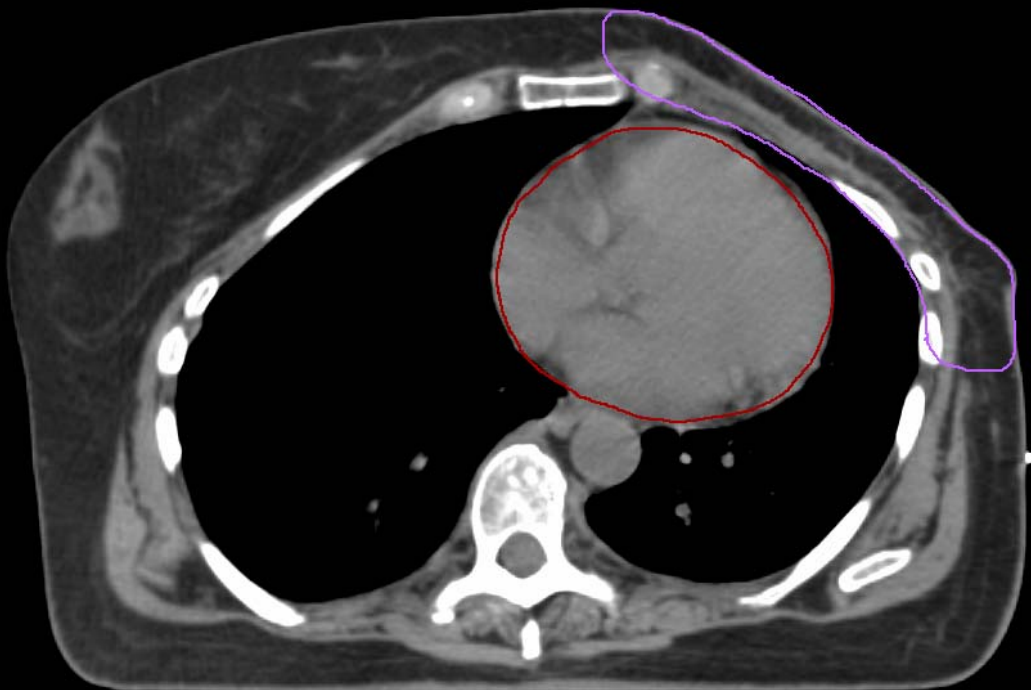


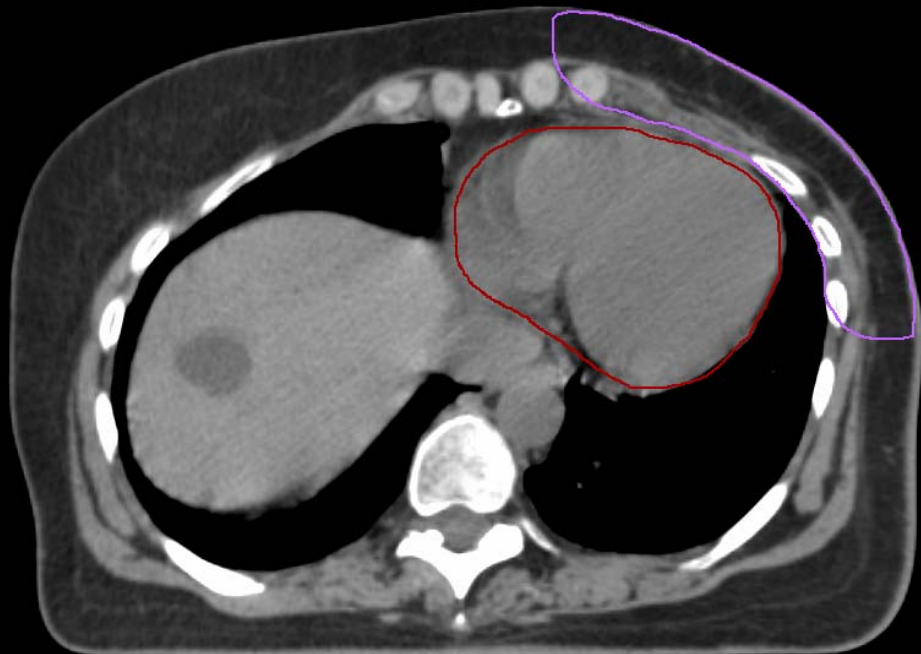
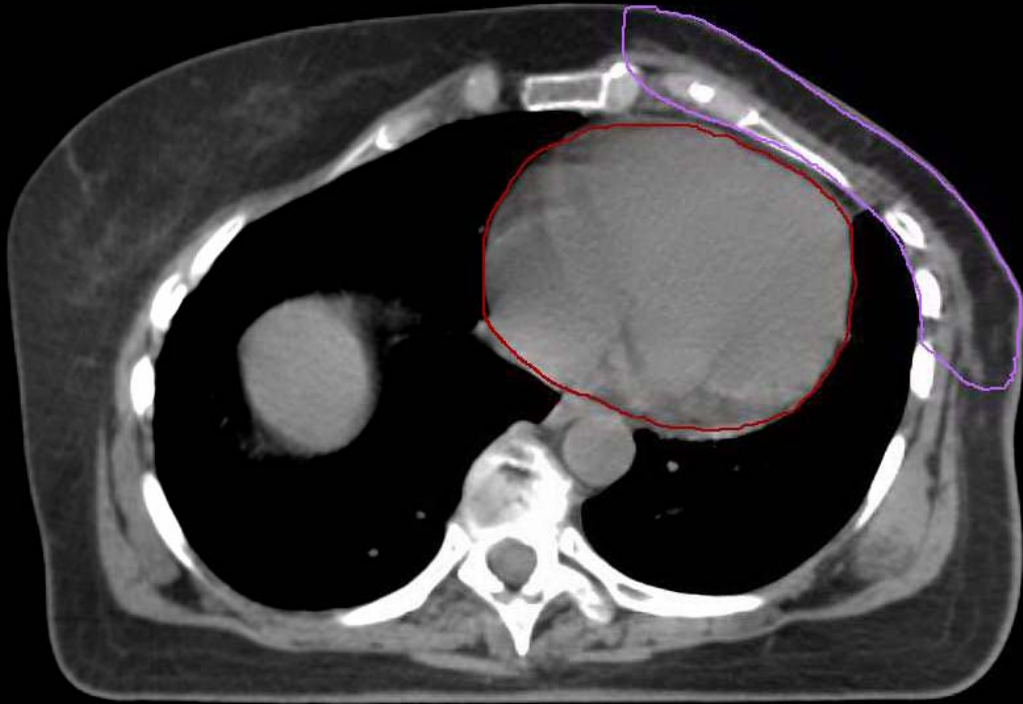
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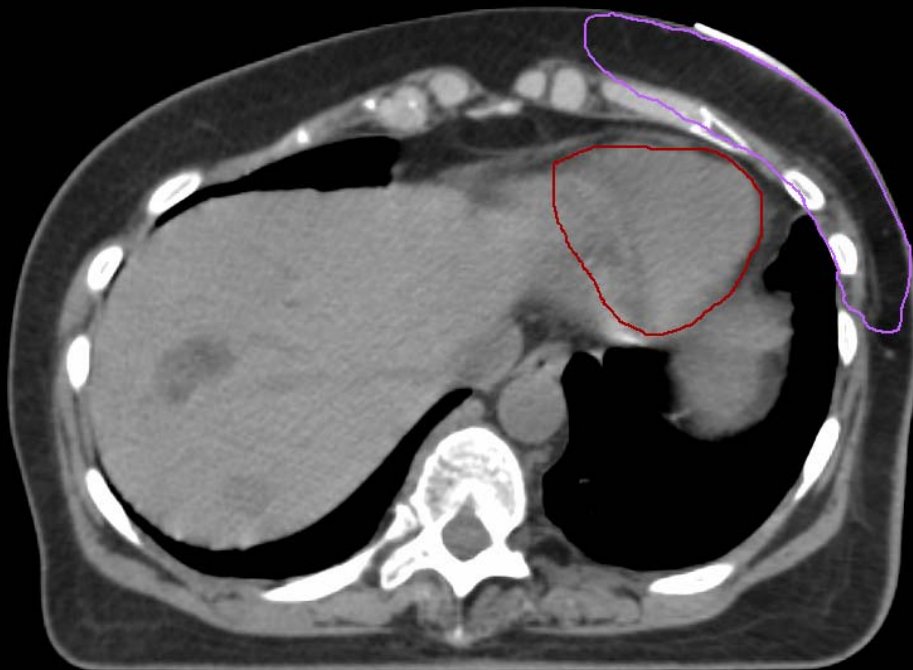
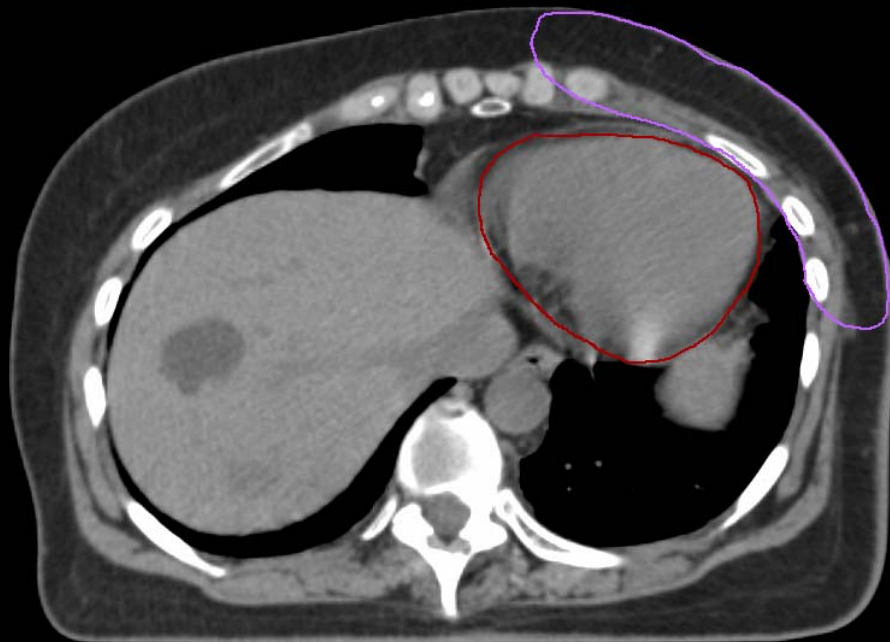


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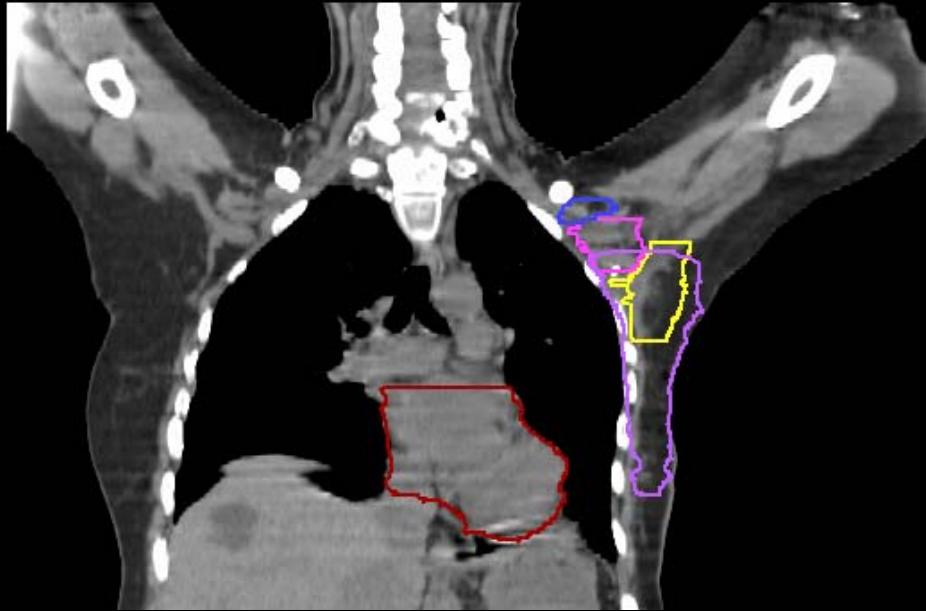




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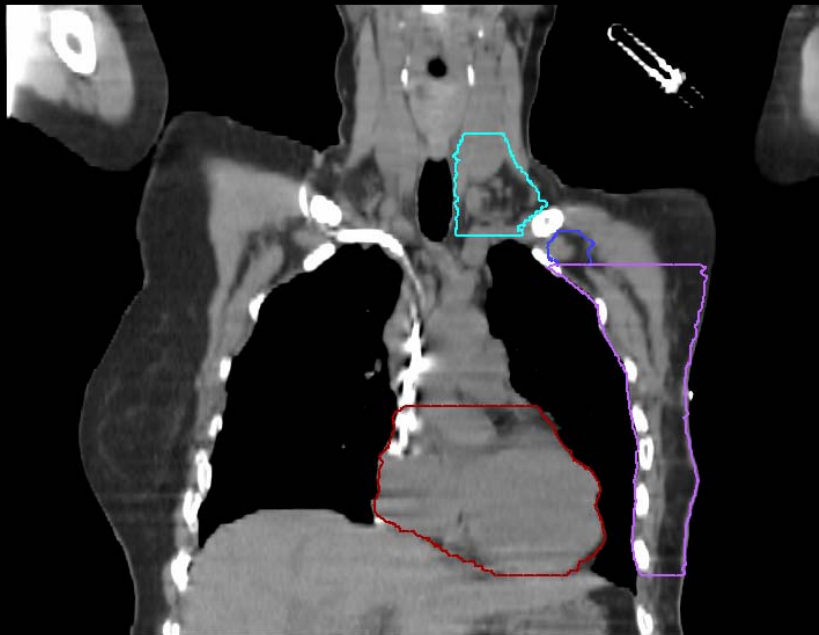


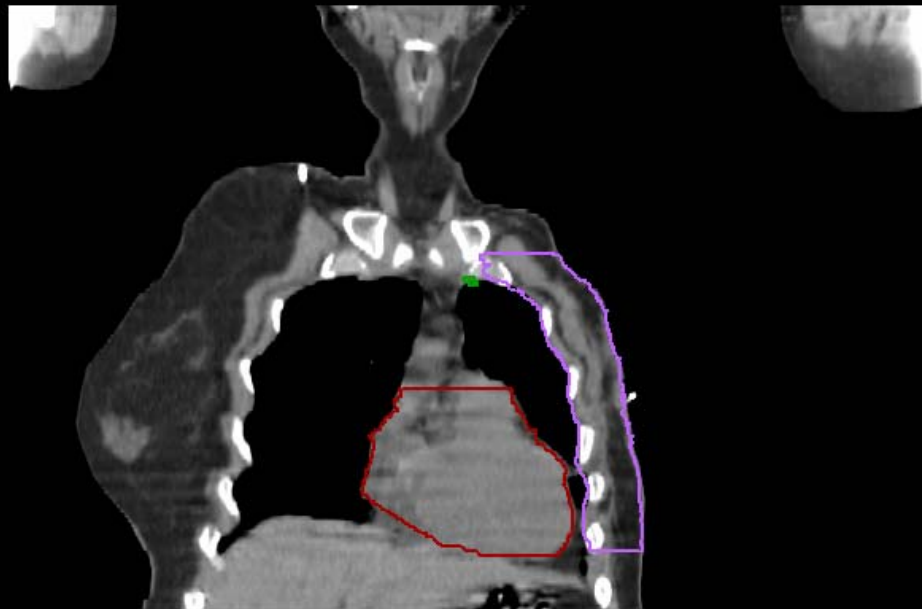
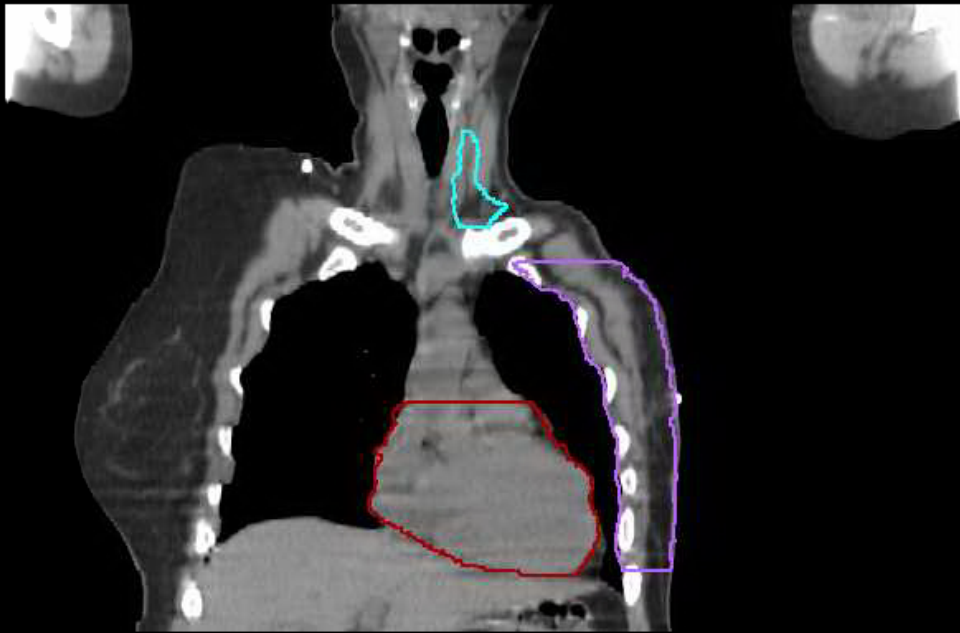
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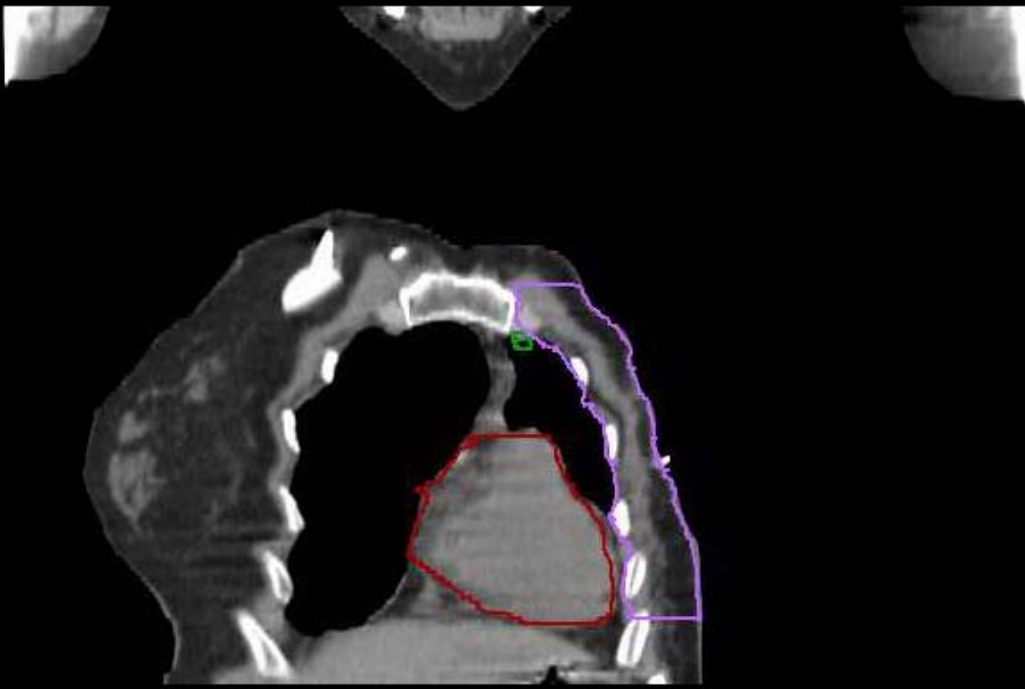


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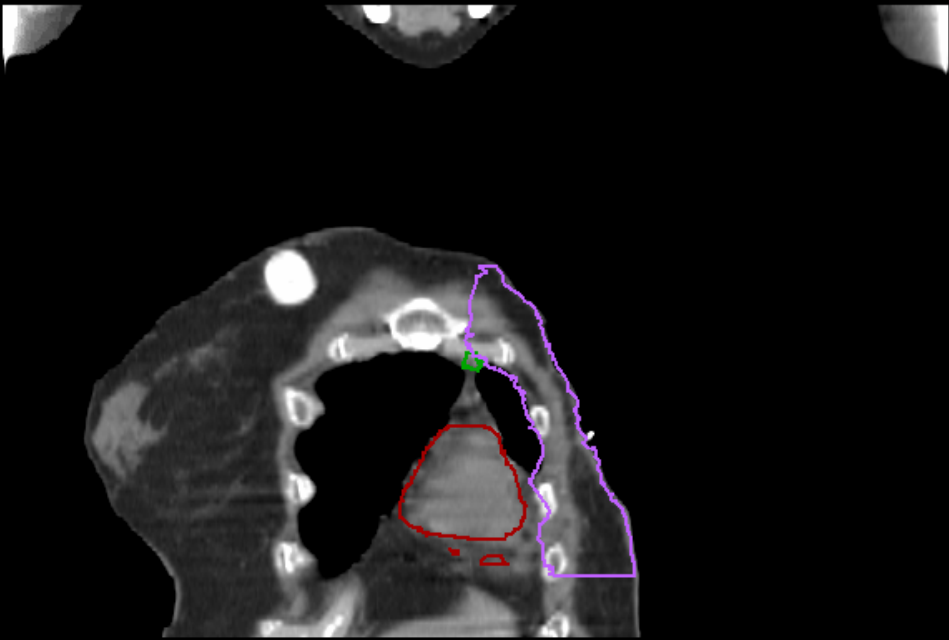


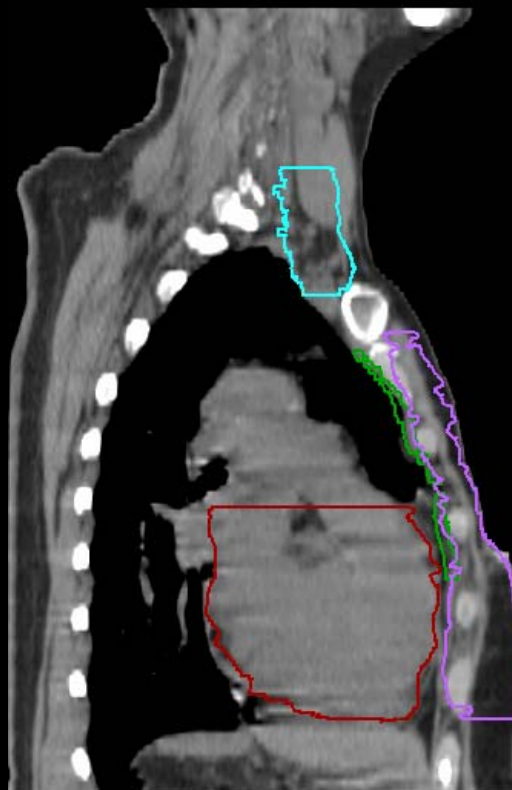


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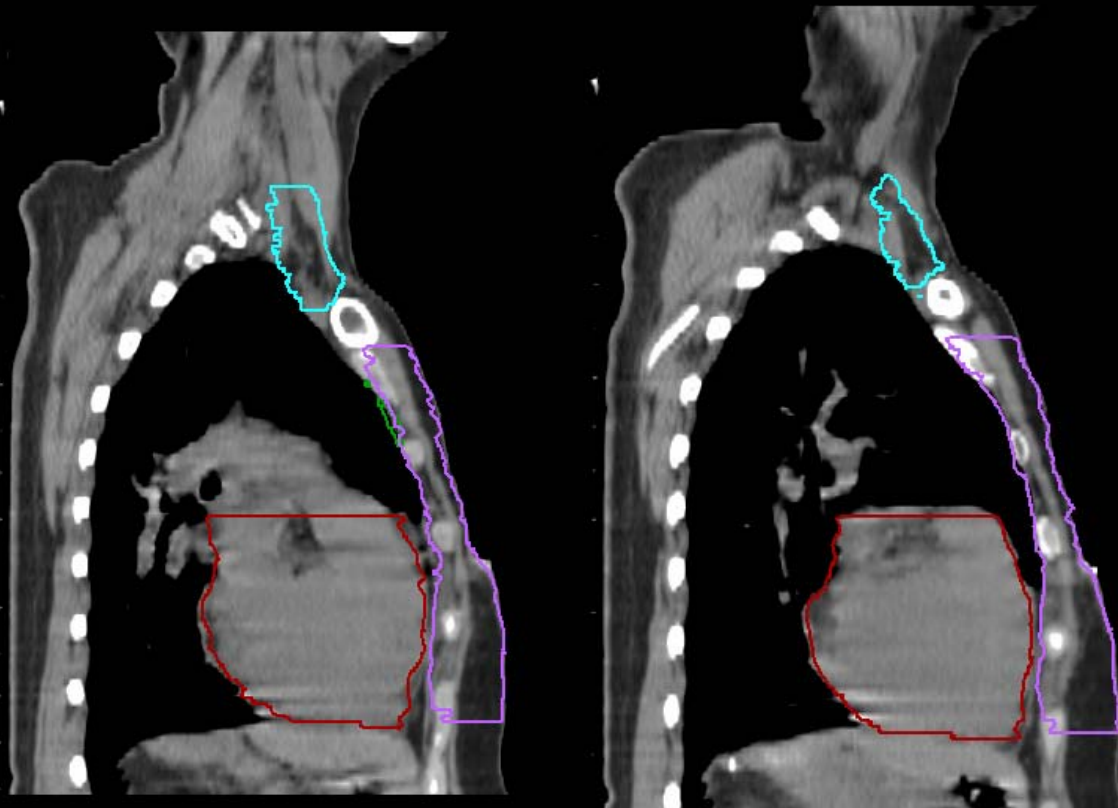


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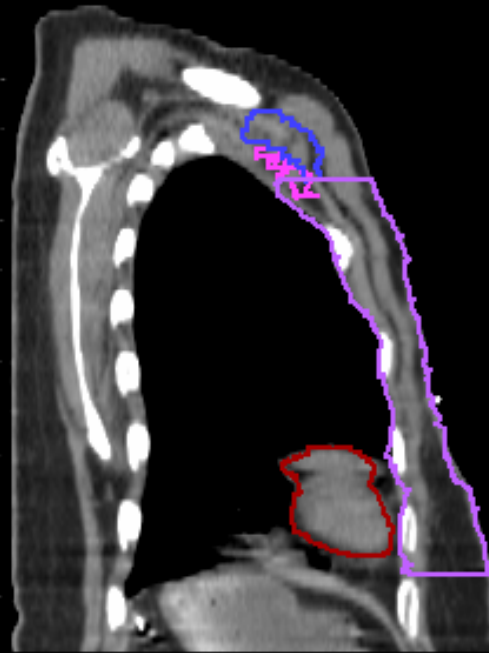
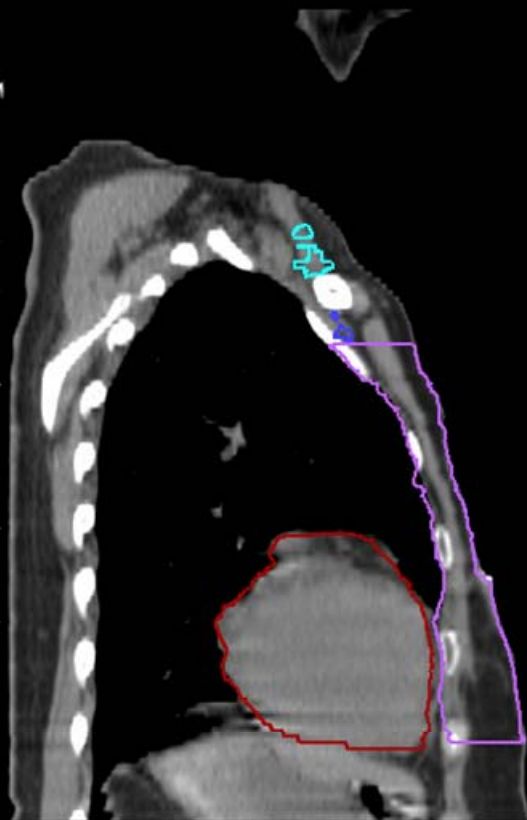




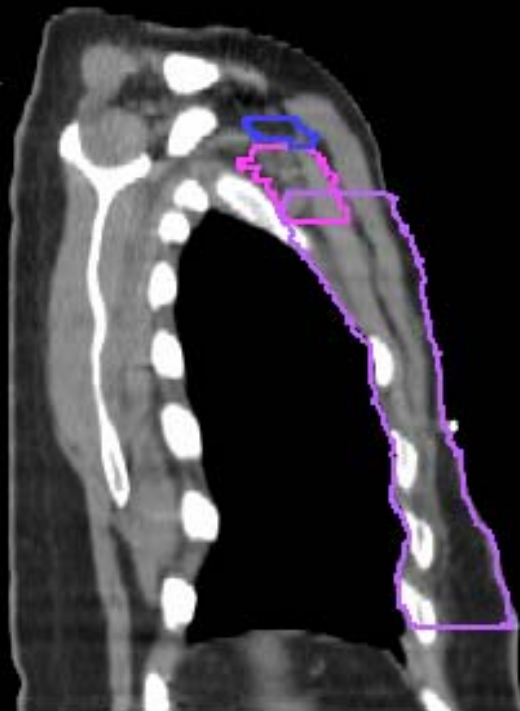
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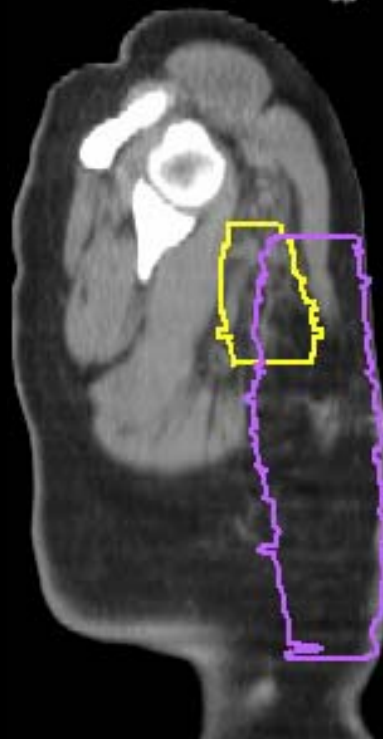
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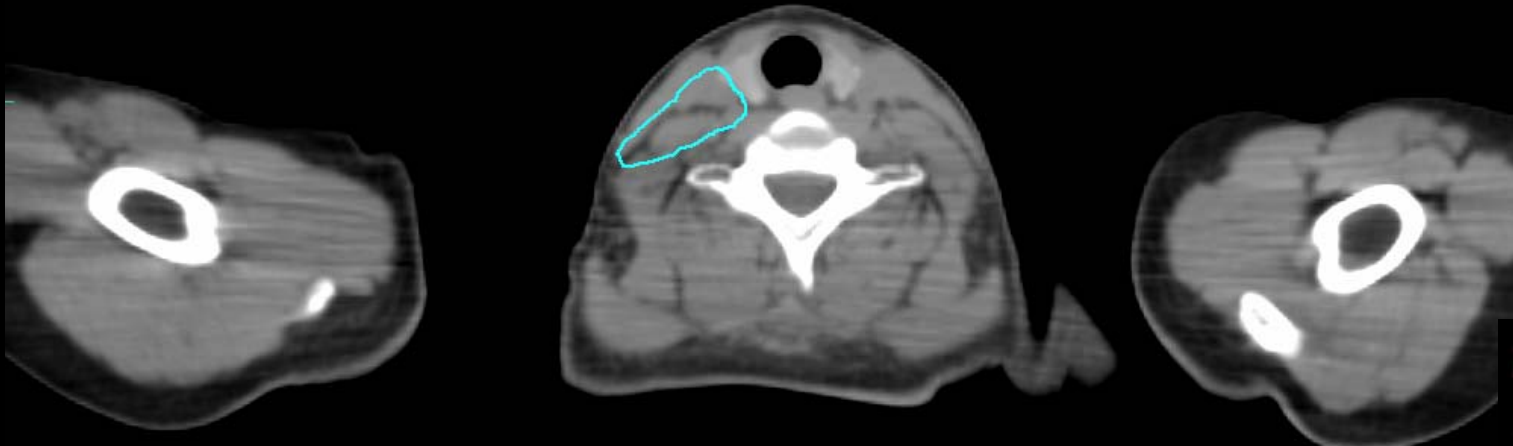
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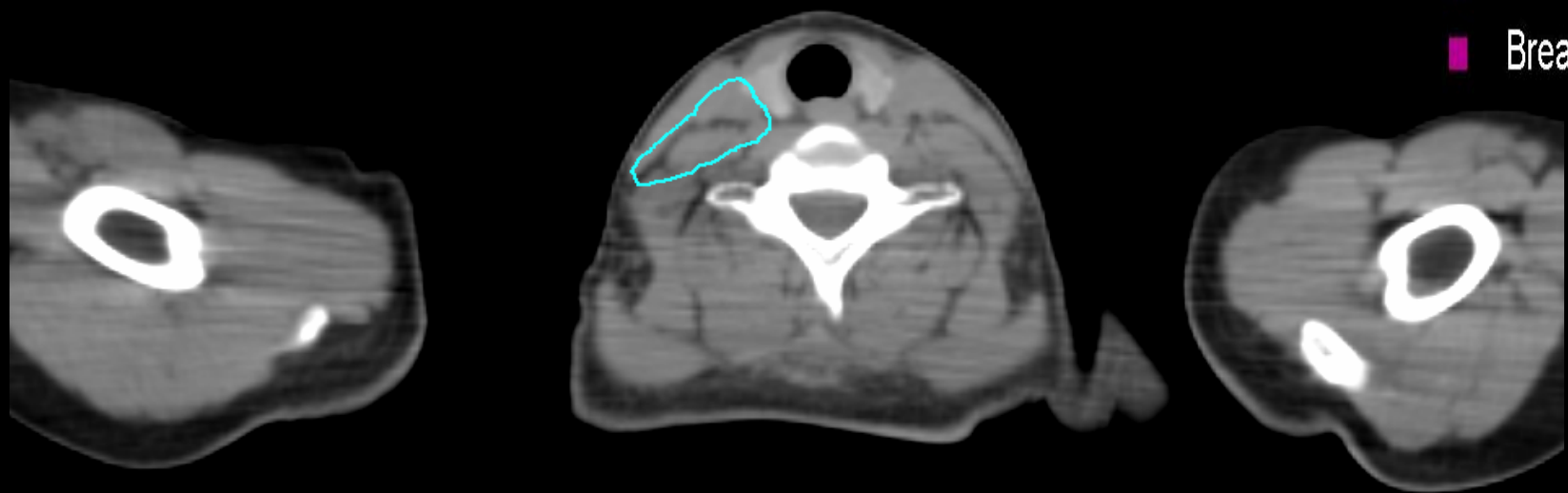
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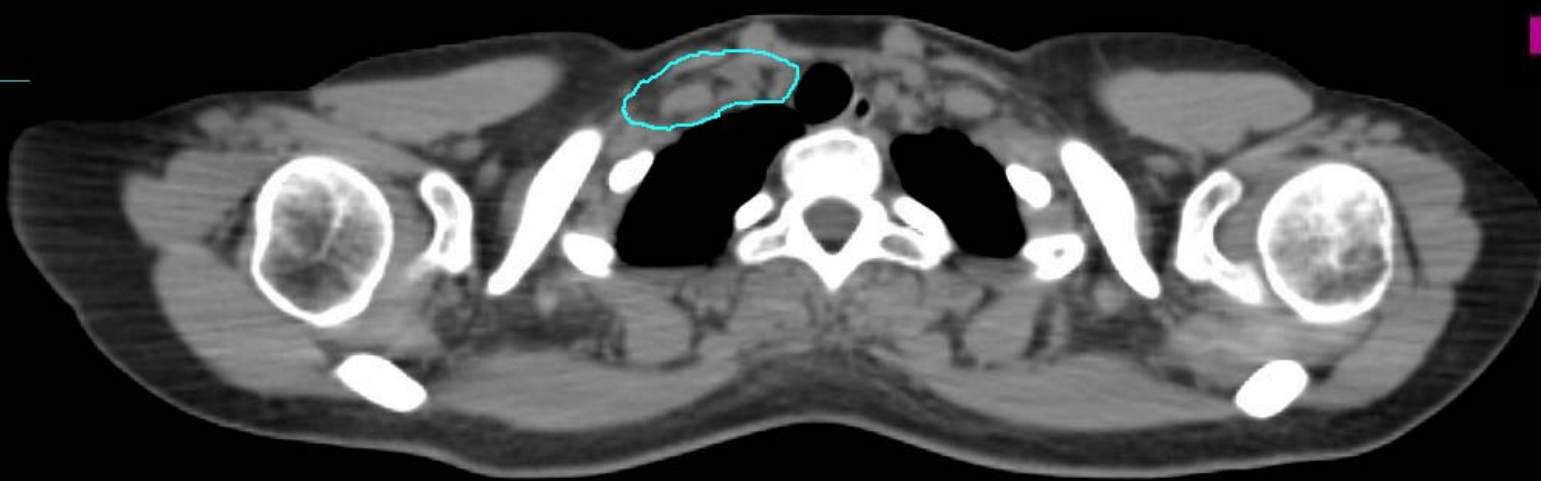
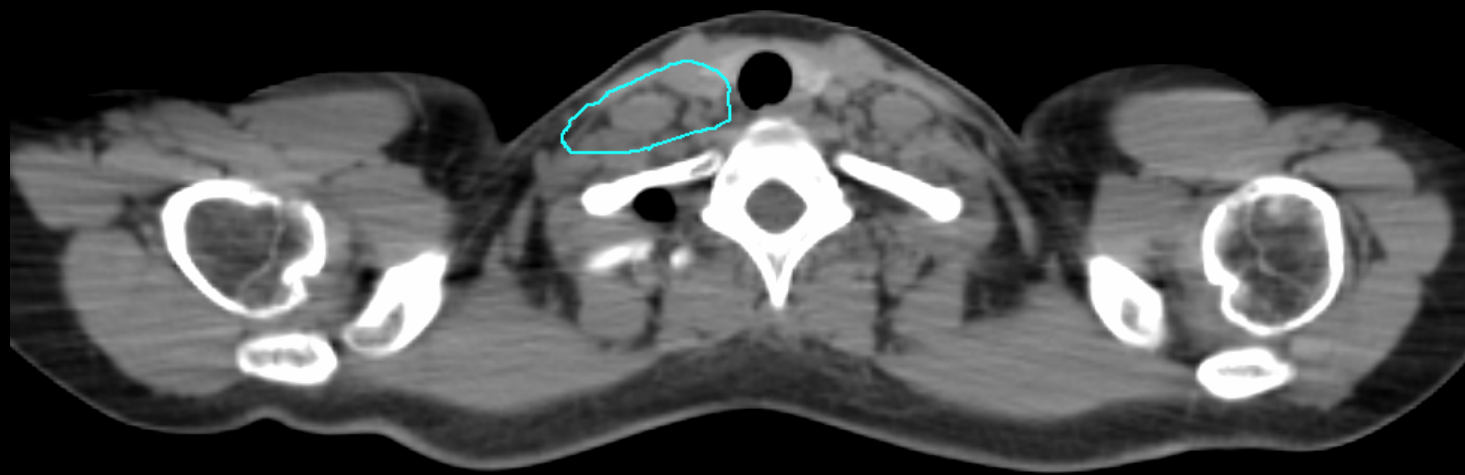
Case C: Stage III- Intact breast post lumpectomy

- Stage IIIA (T-2, N-2, M-0) right breast cancer, tumor size 3 cm, 4/18 nodes positive
- Surgery: Lumpectomy and axillary node dissection
- Radiation: Breast, chestwall \pm regional lymph nodes
- External wires present on CT:
 - Wire on lumpectomy scar
 - BB on AP set-point at clinically estimated level of the match for the supraclavicular \pm axilla with the chestwall \pm IMC fields
 - Wire extending from 9-3 o'clock around the infra-mammary fold
 - Wires at lateral and inferior clinically estimated extent of the chestwall

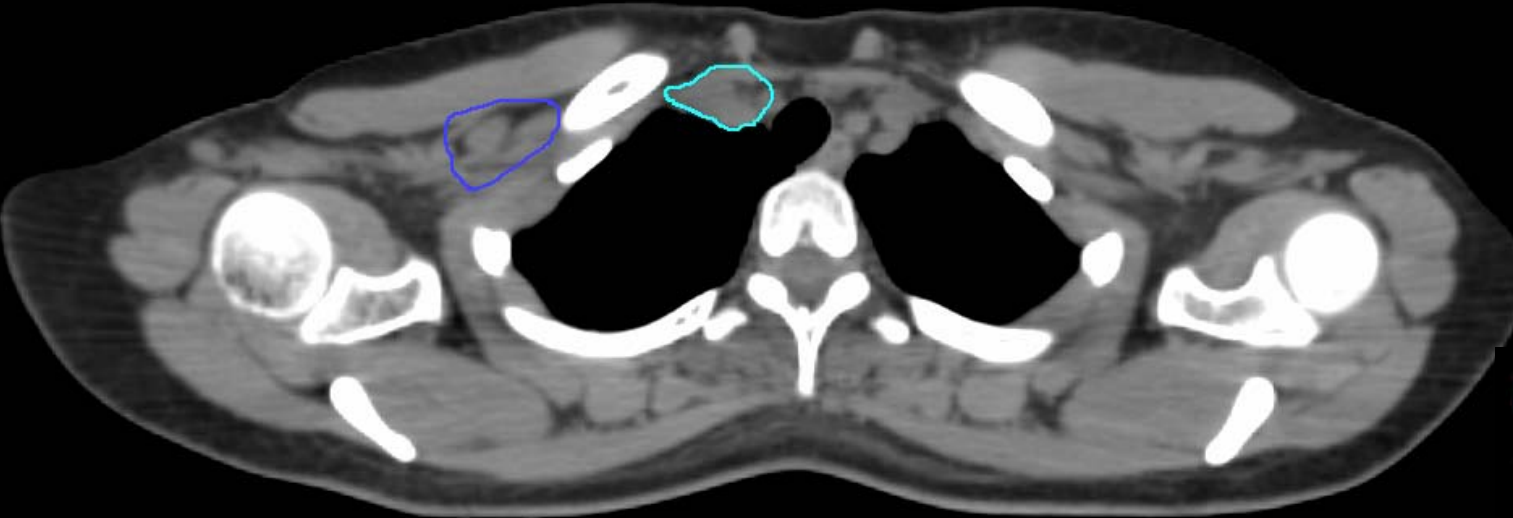


- Supraclavicular
- Axilla level 3
- Internal mammary
- Lumpectomy
- Breast/Chestwall

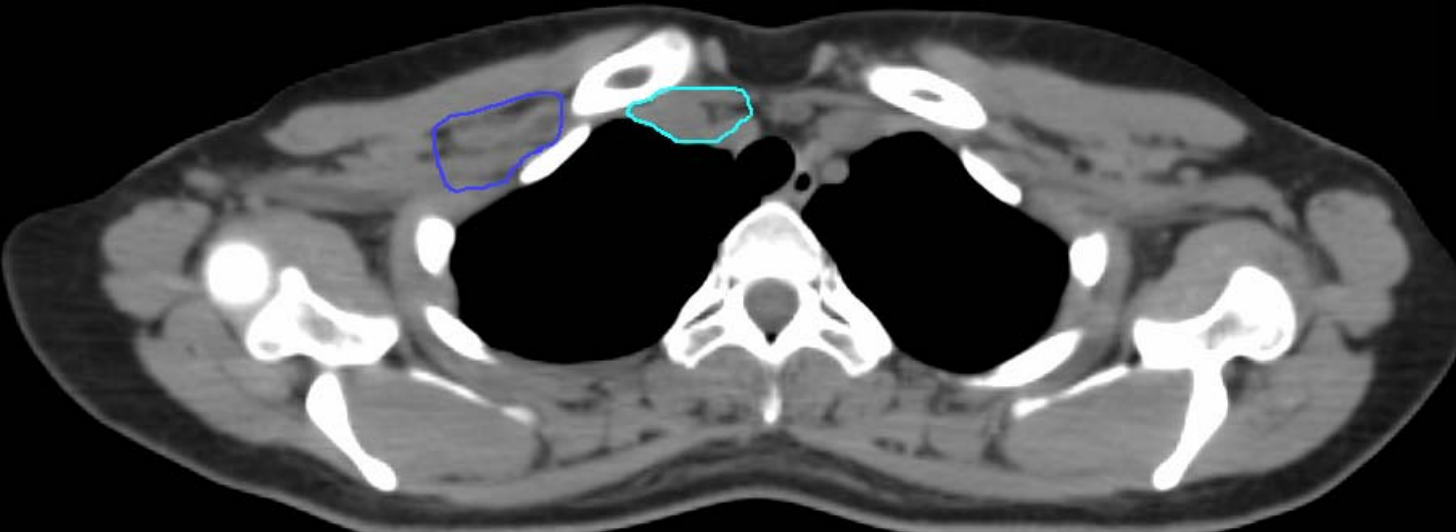


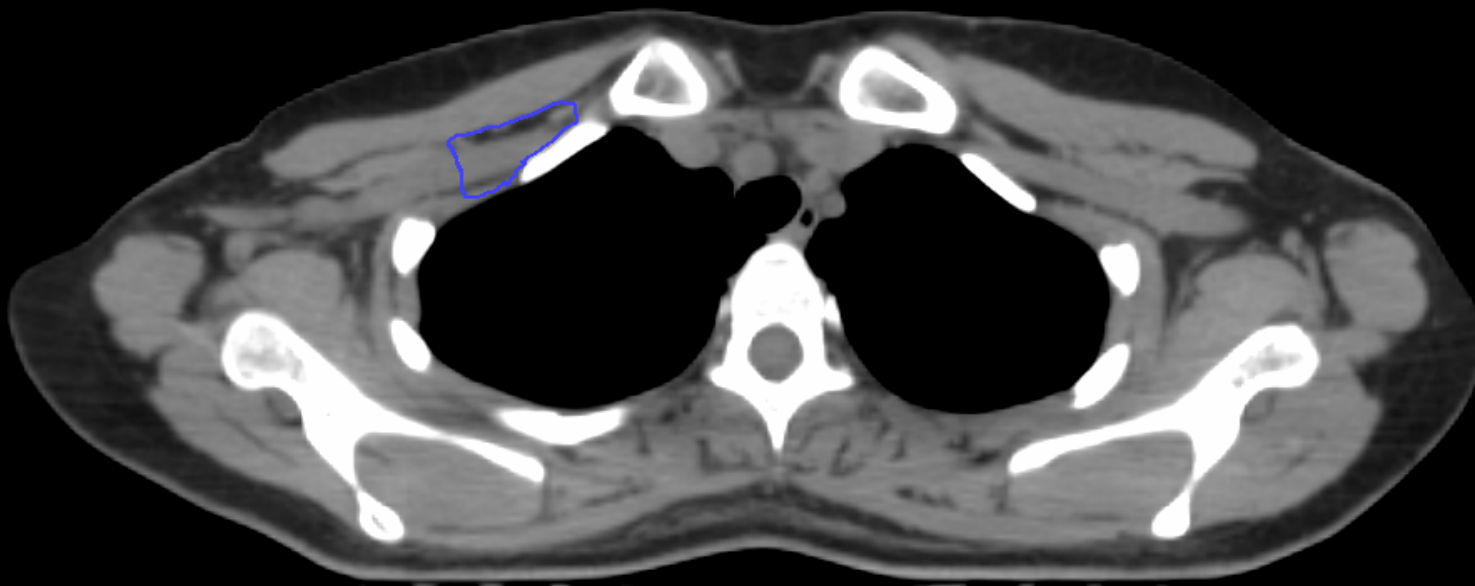


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- Axilla level 3
- Internal mammary
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- Breast/Chestwall

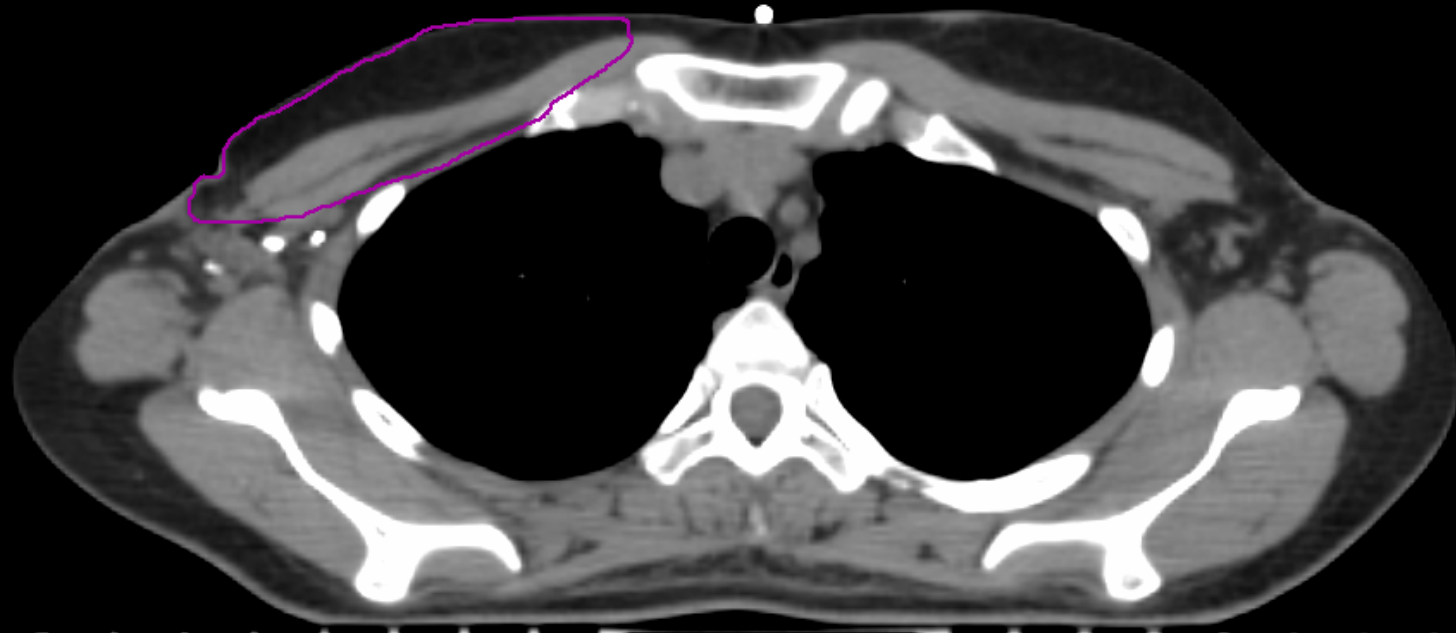


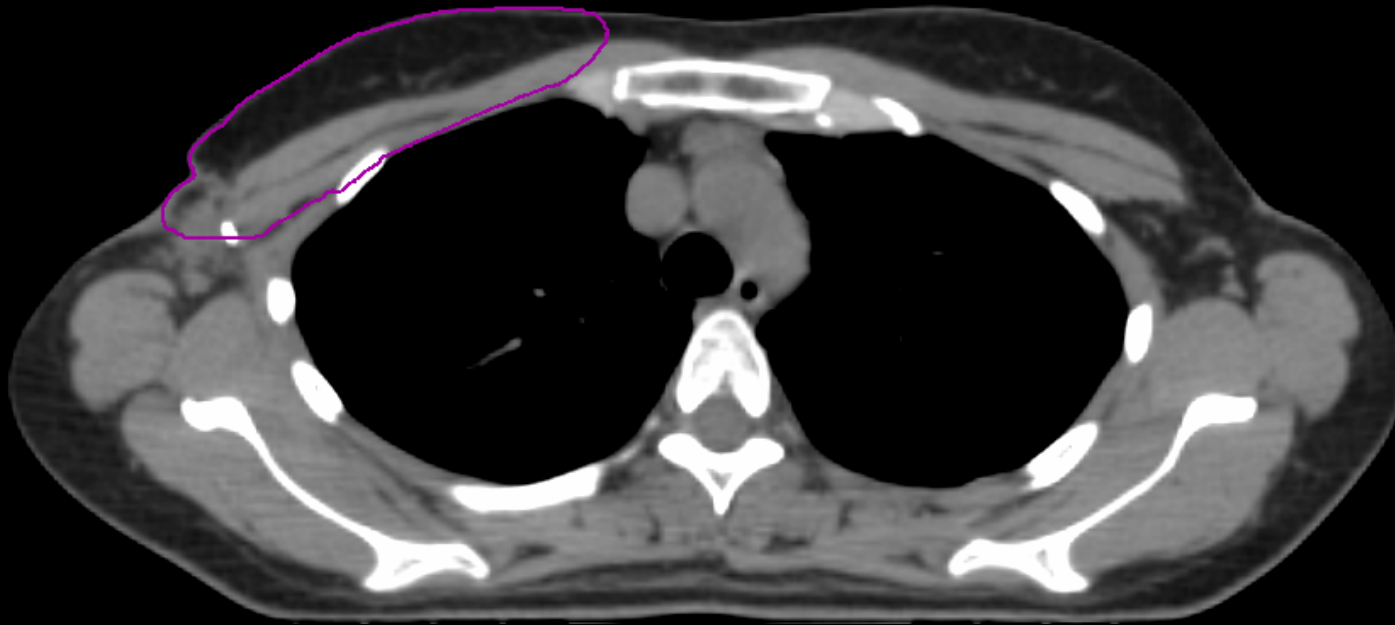
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- Axilla level 3
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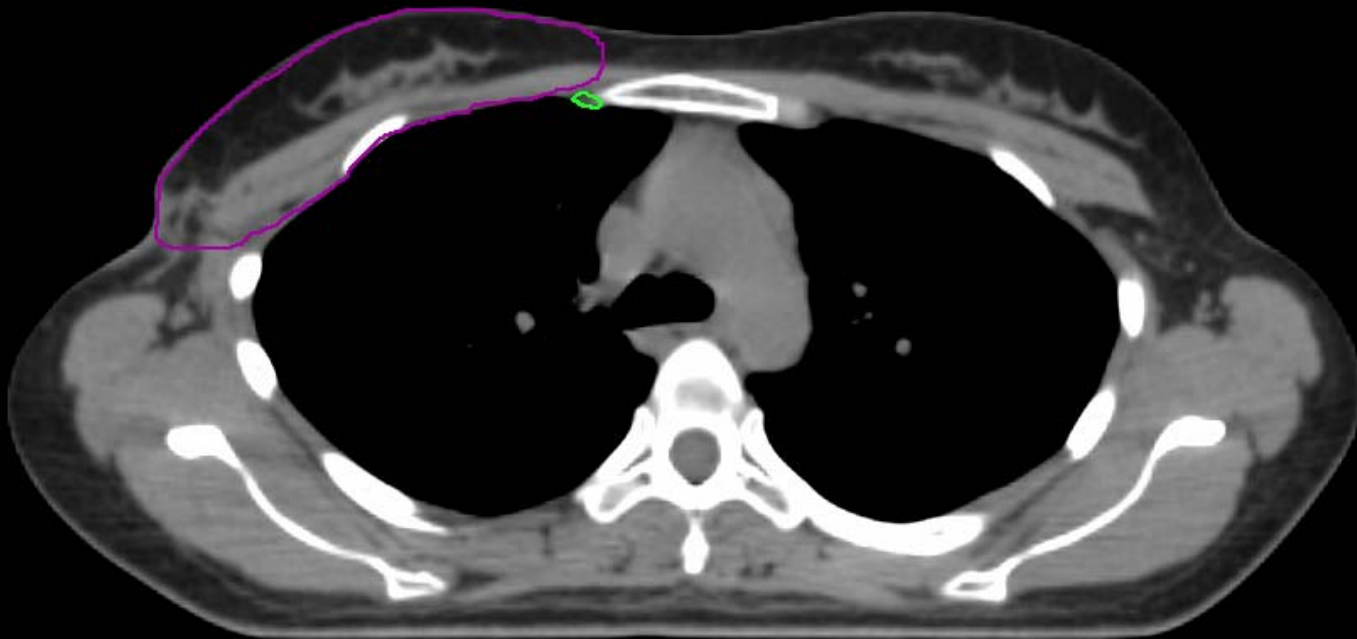


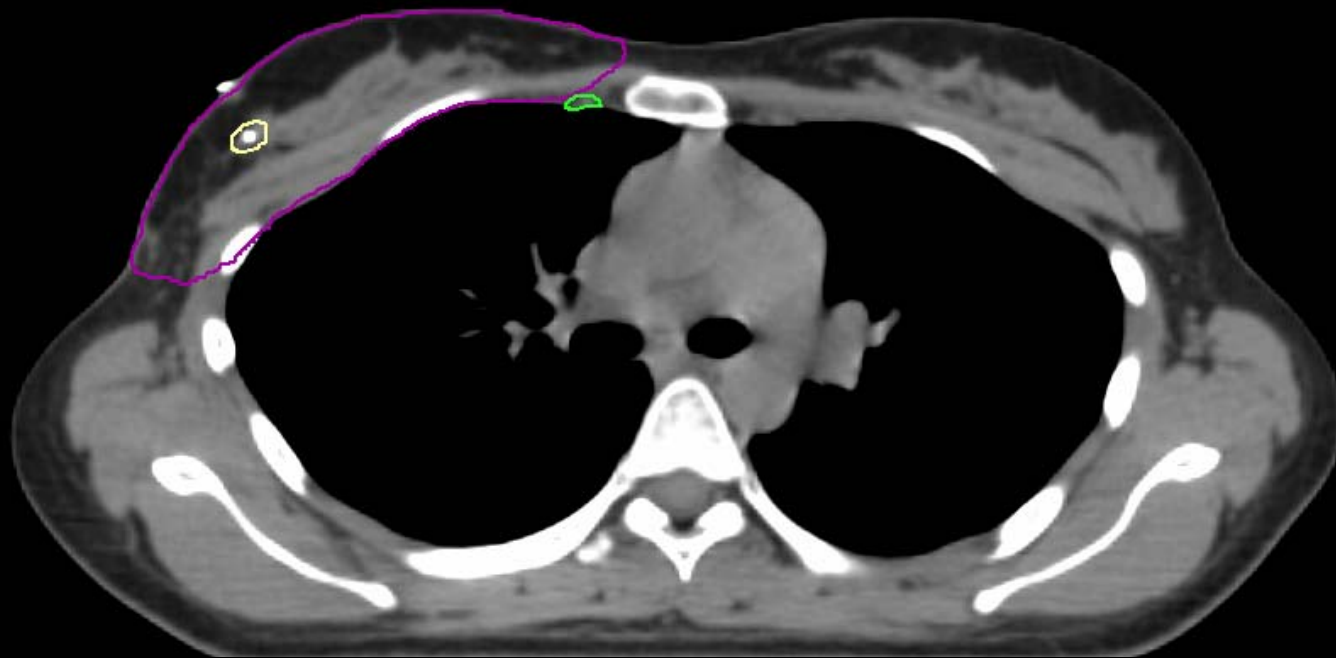
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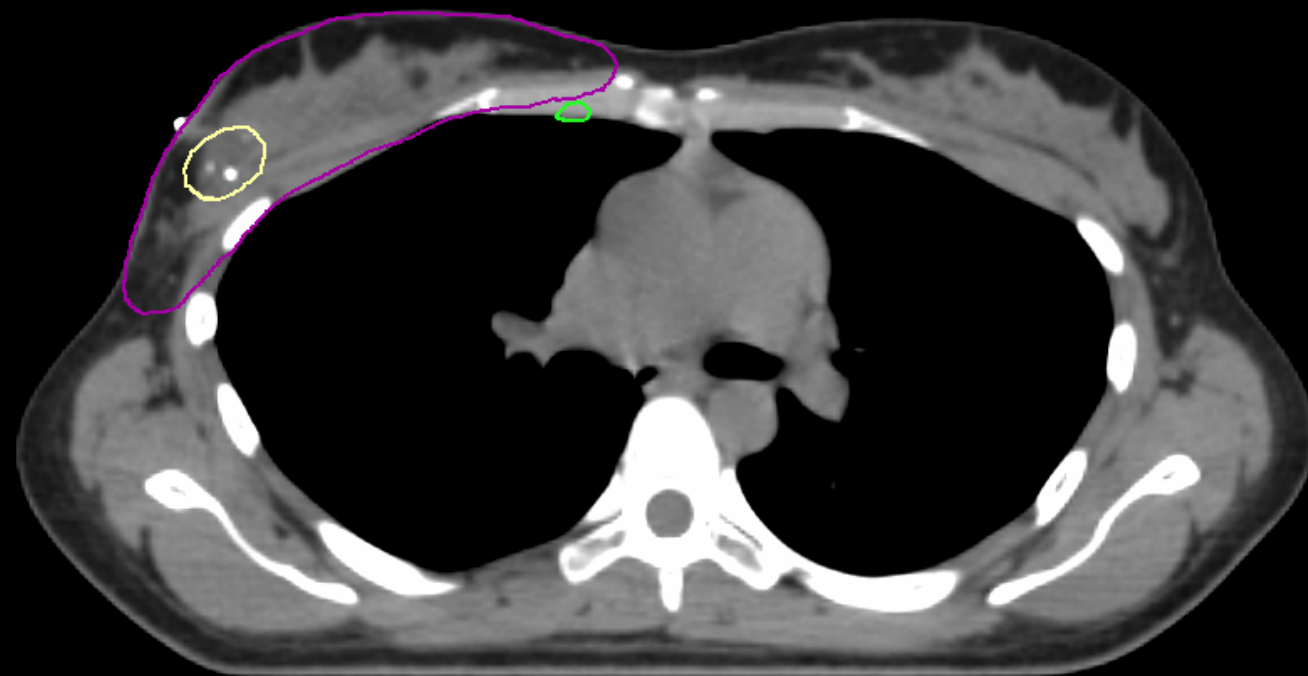


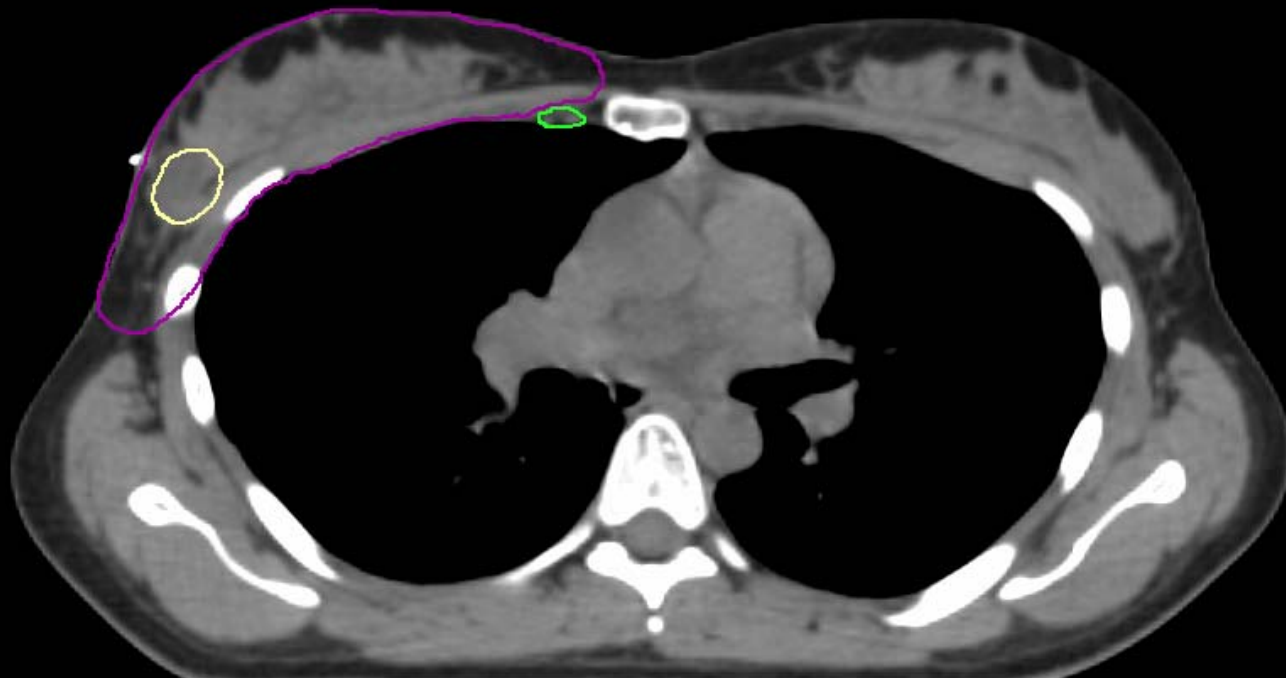
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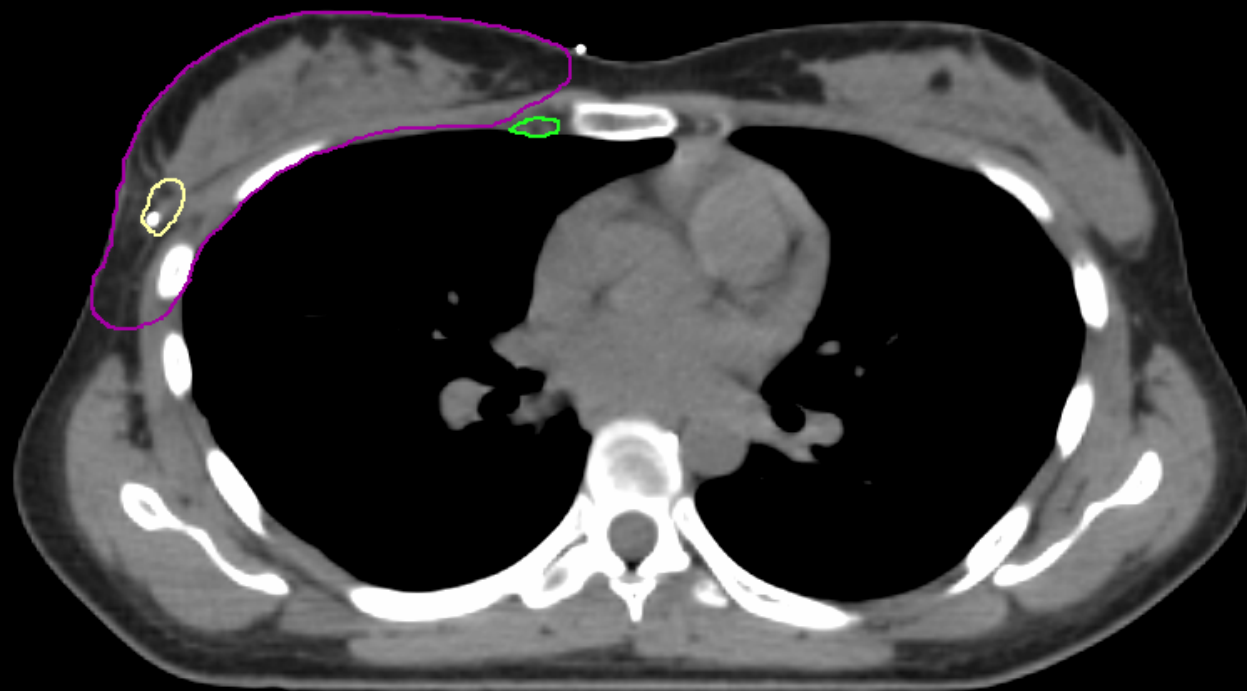


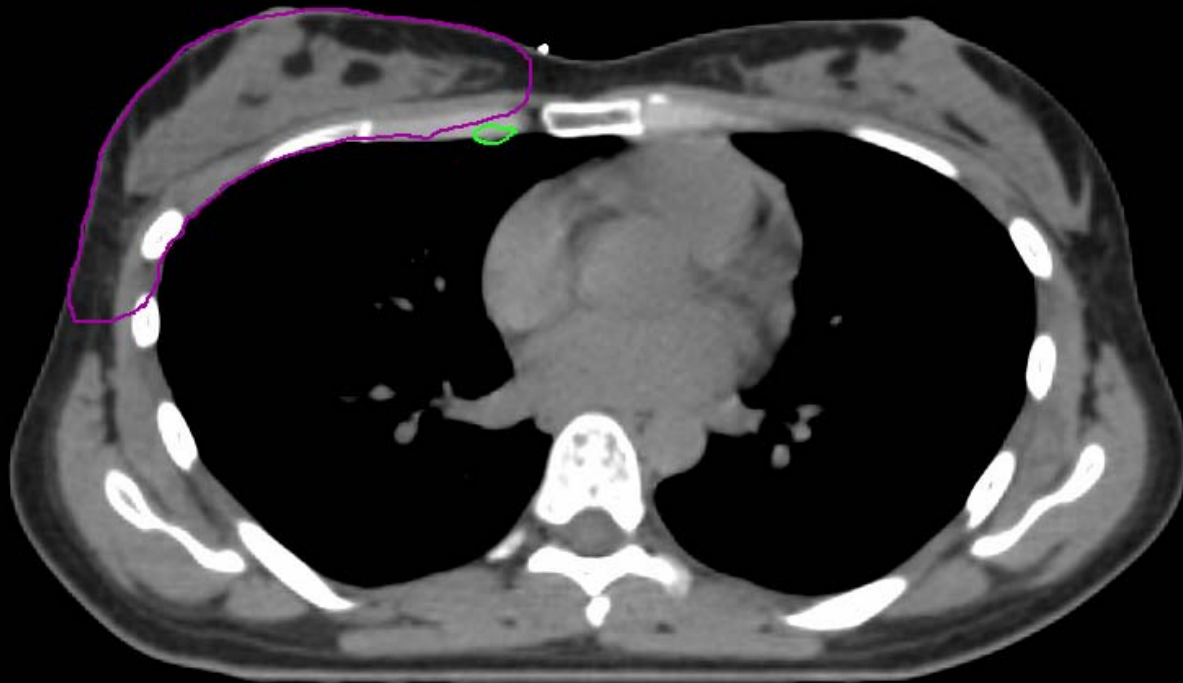
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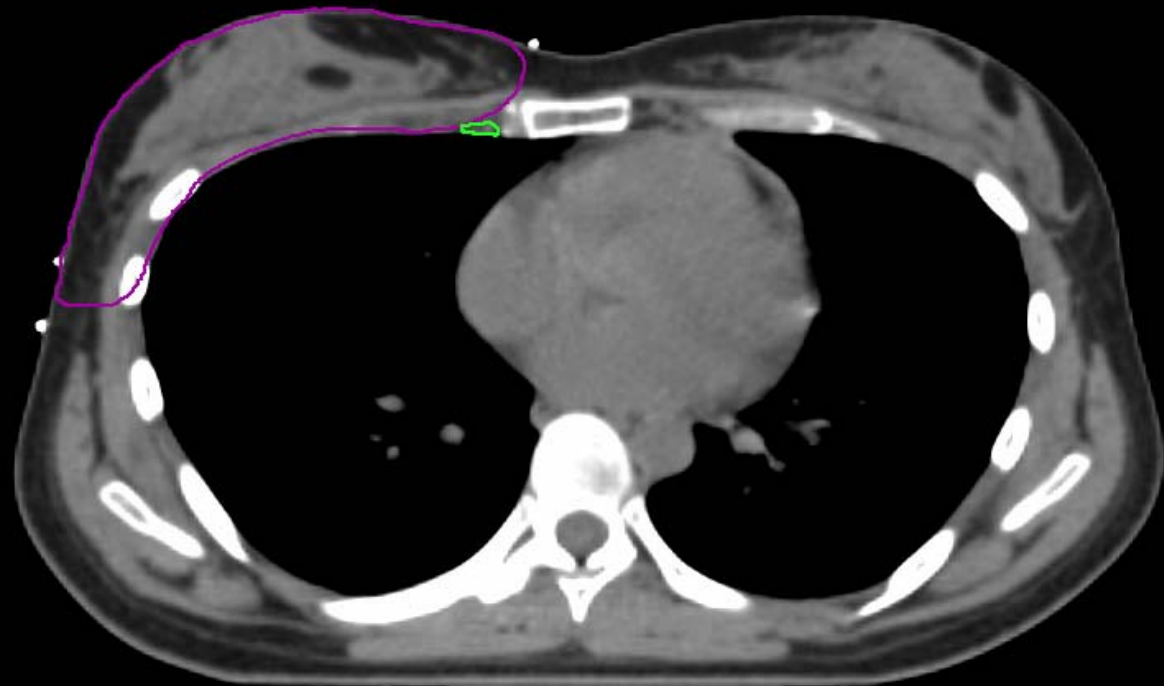


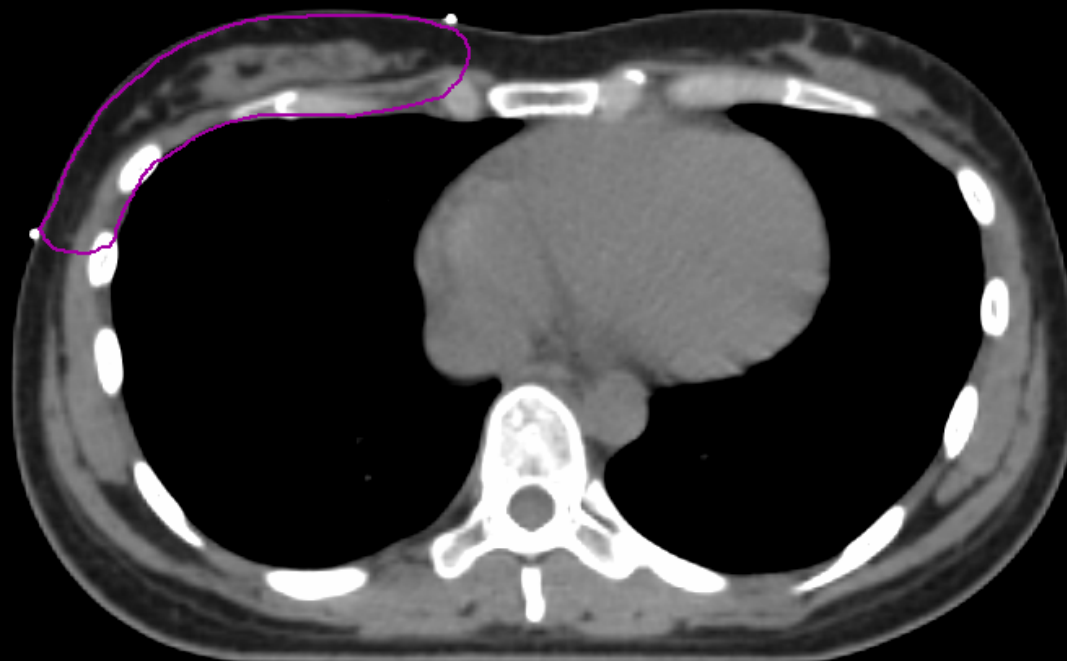
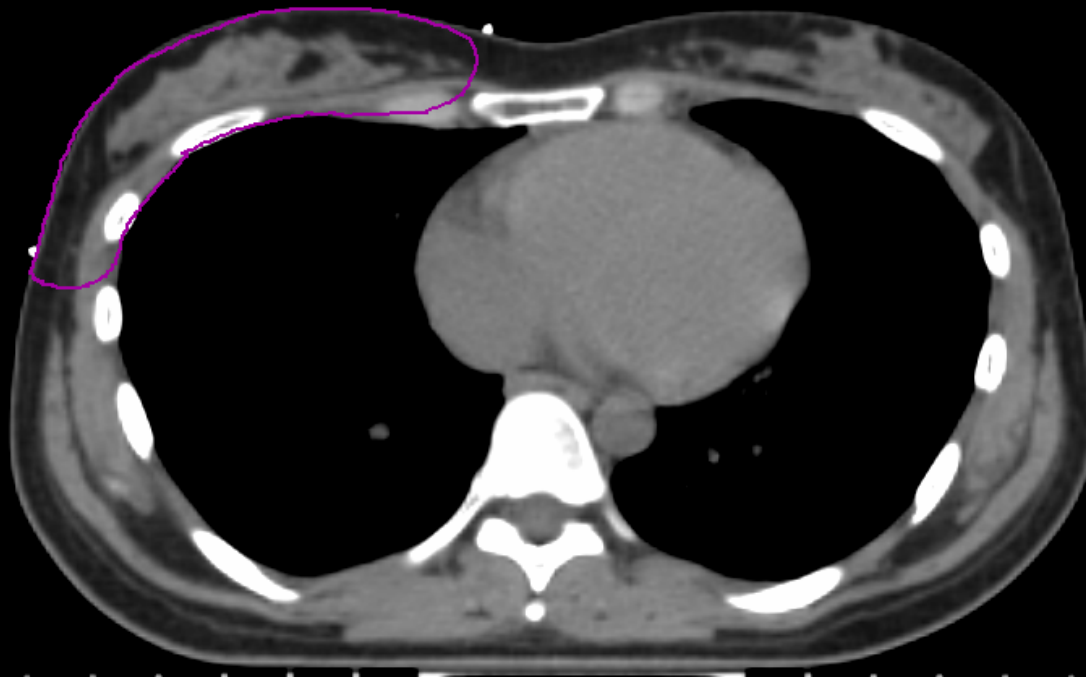
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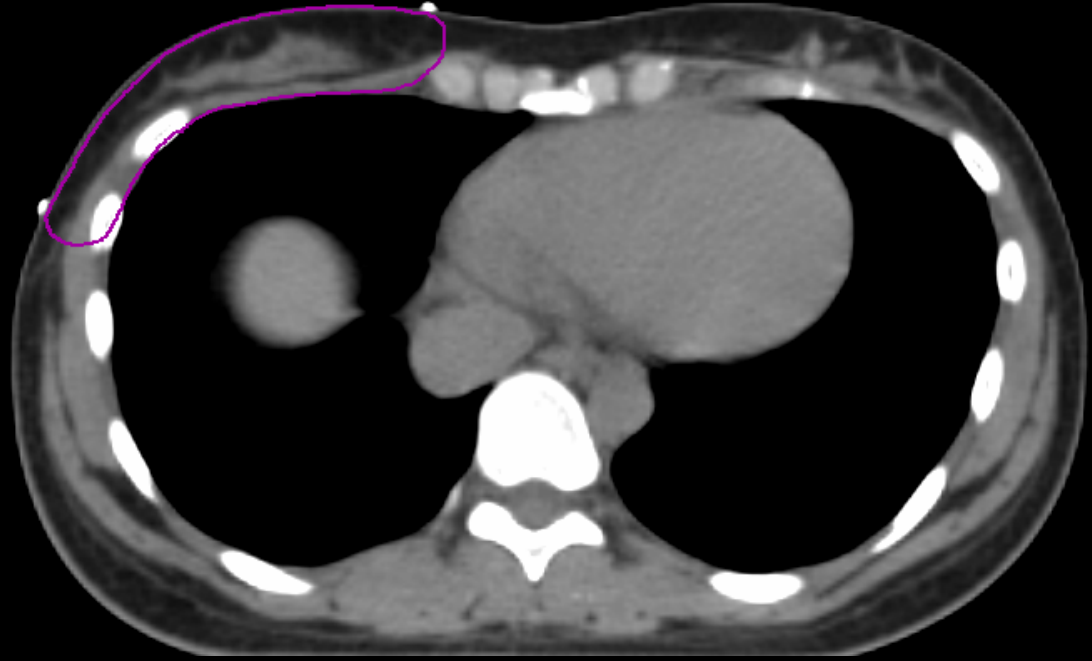


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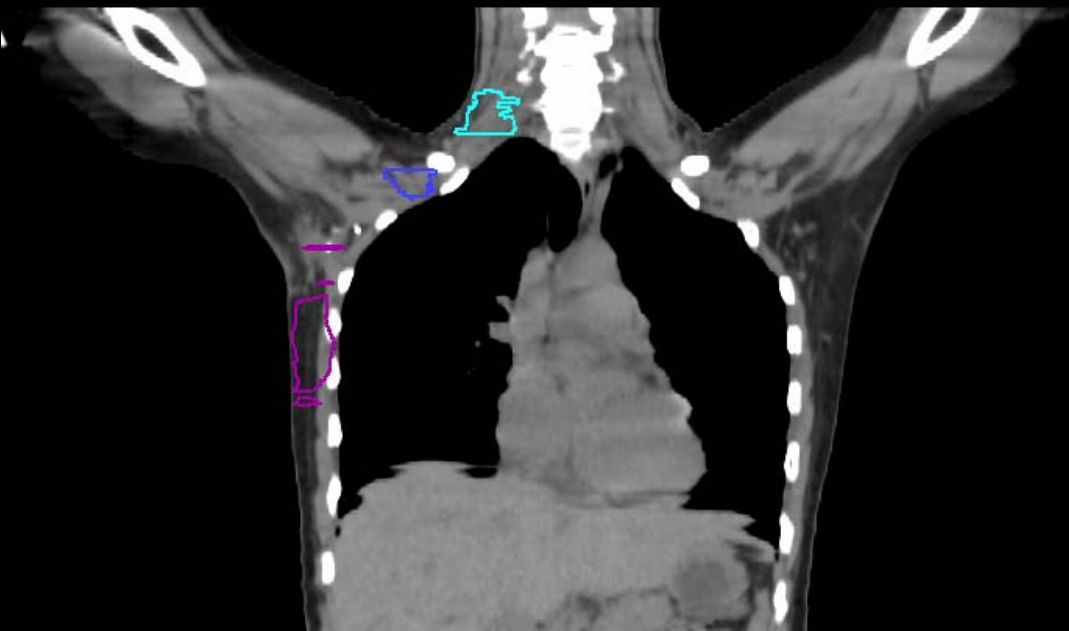




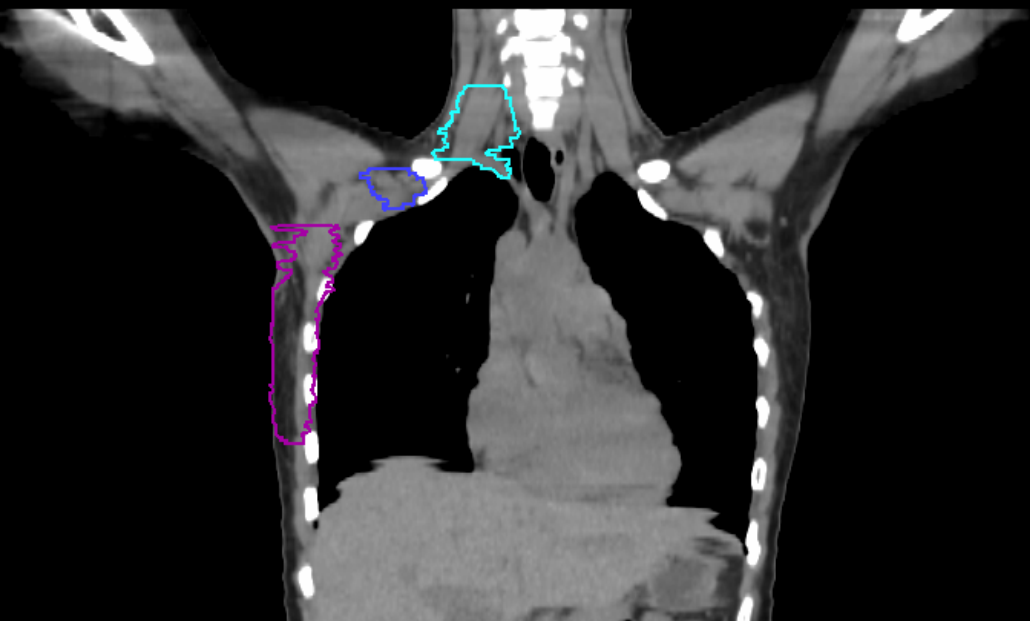
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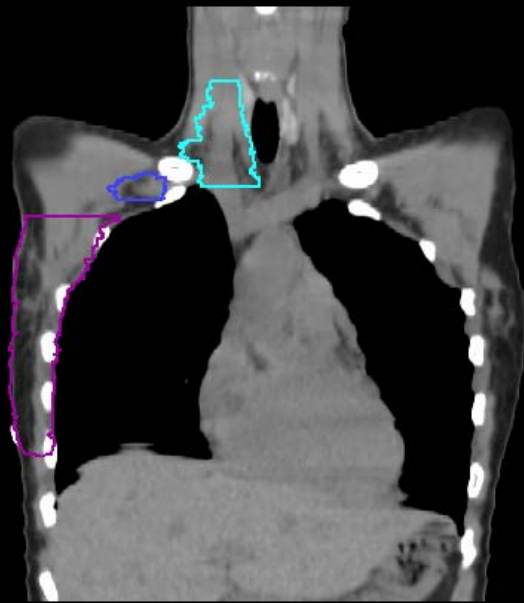


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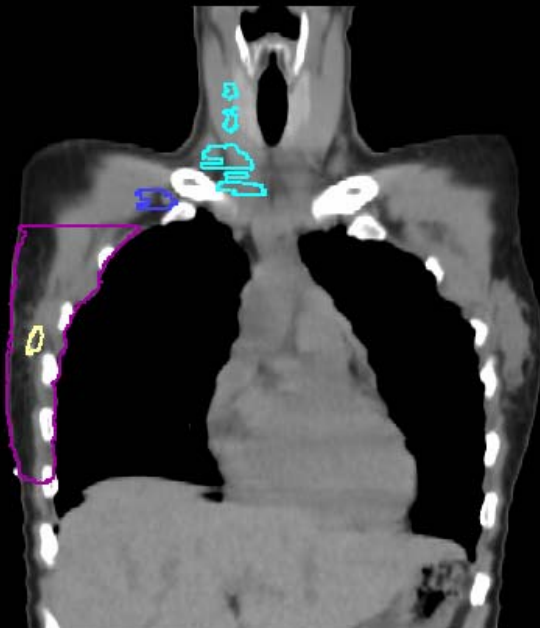


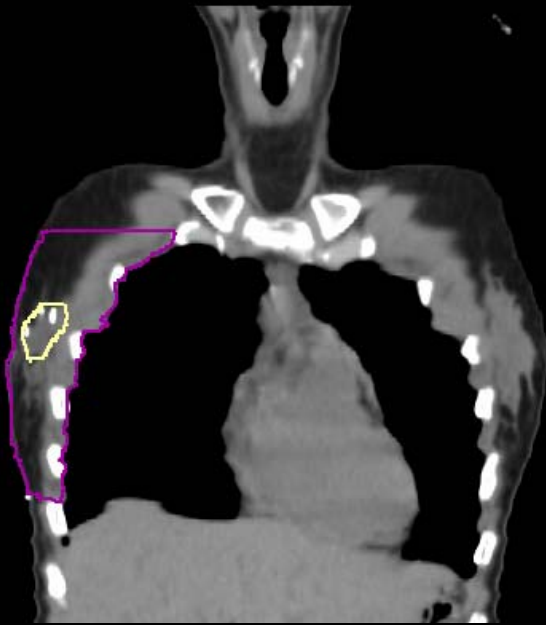
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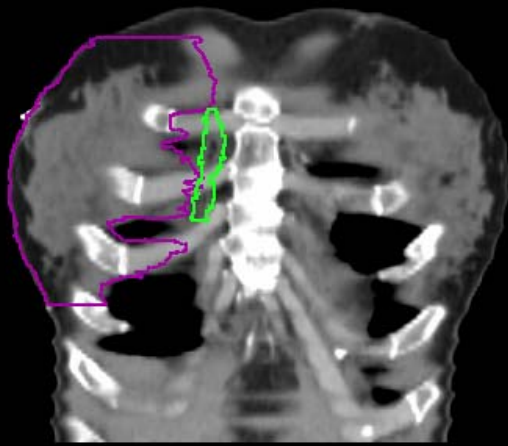
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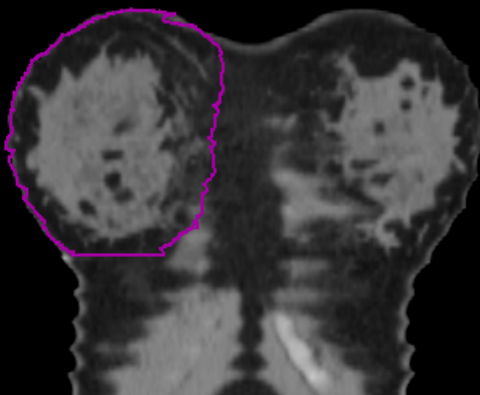


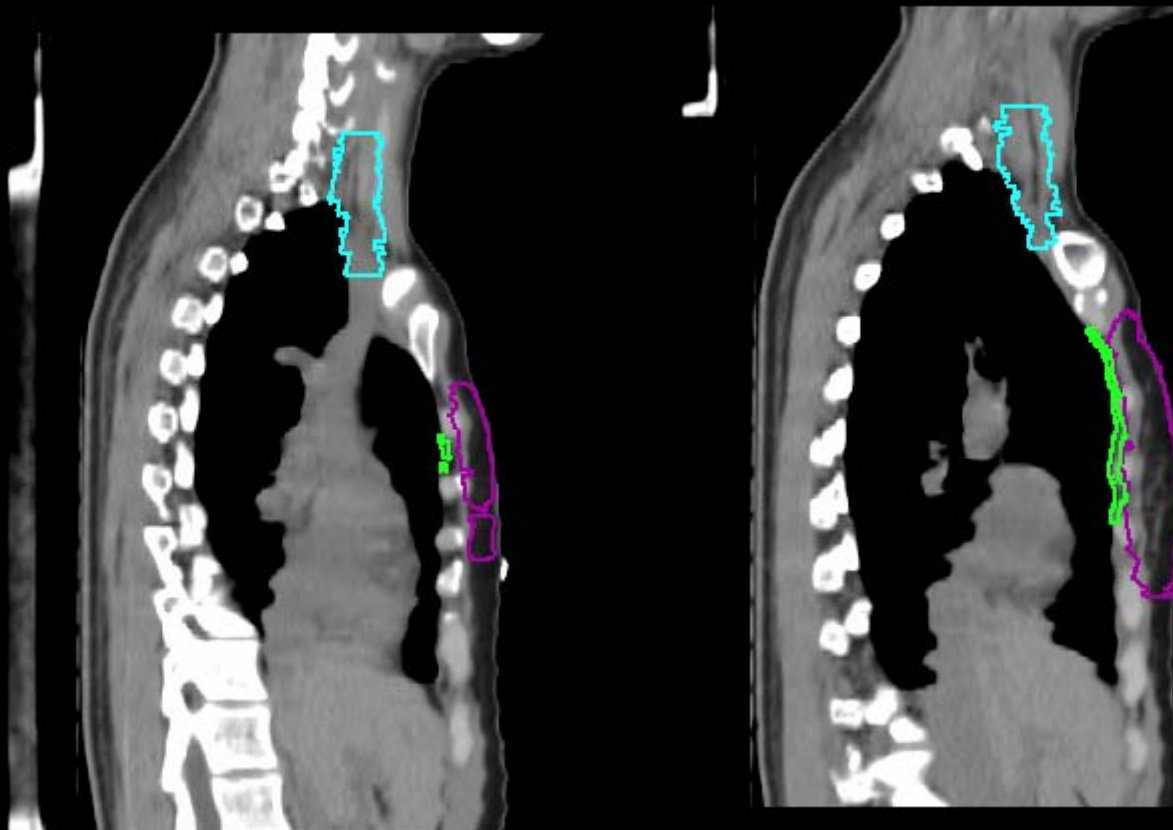
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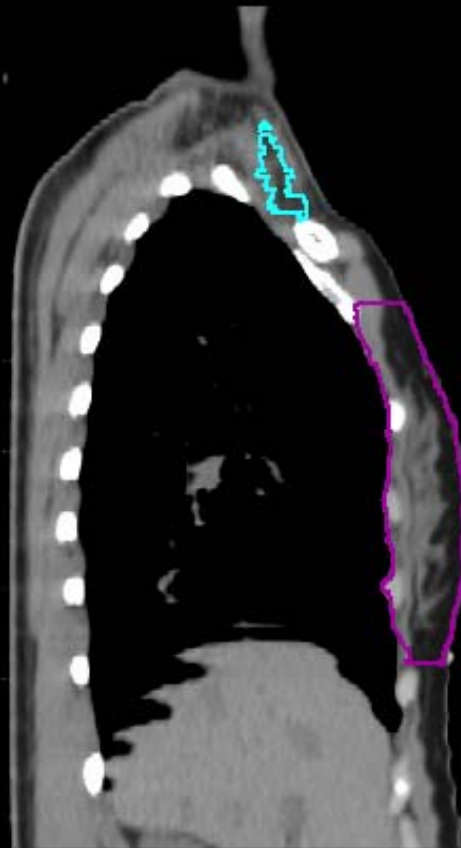
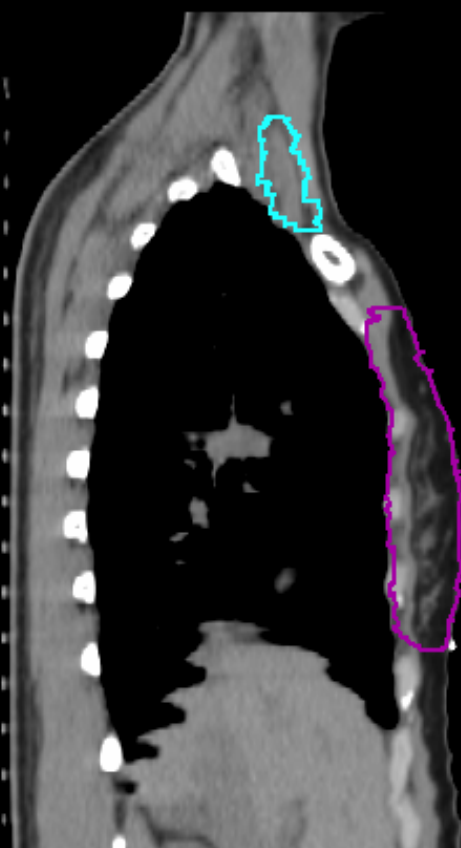


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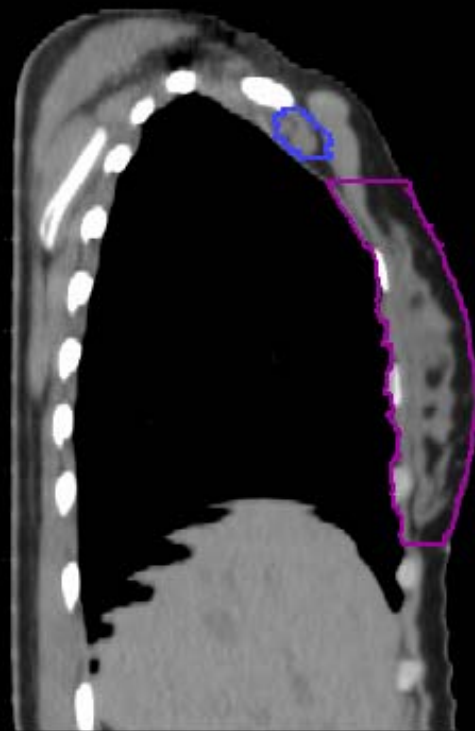
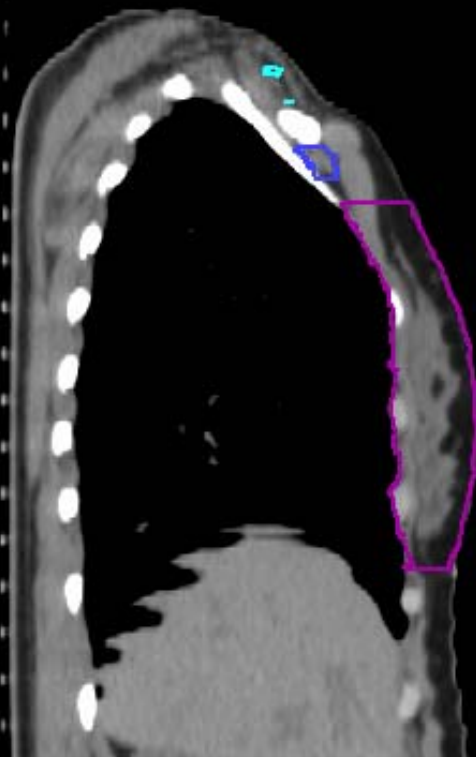




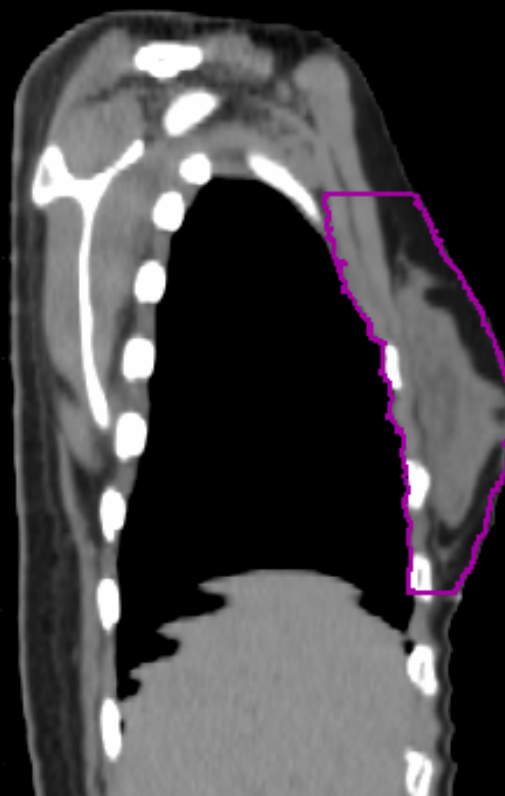
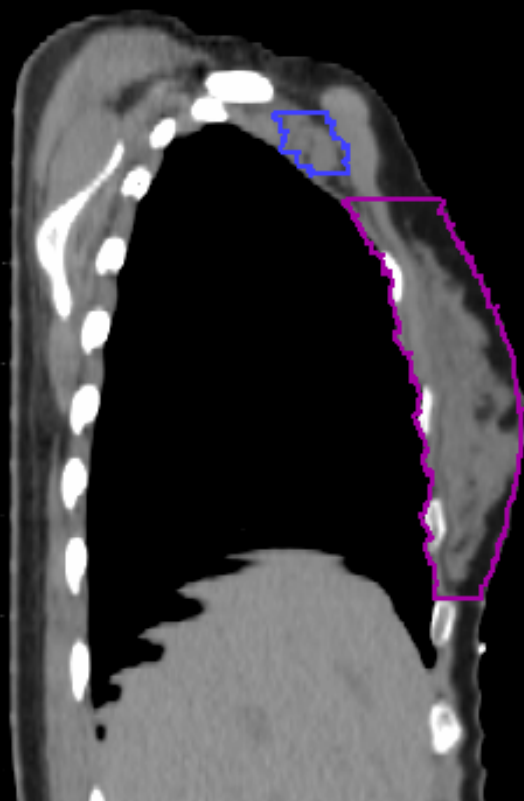
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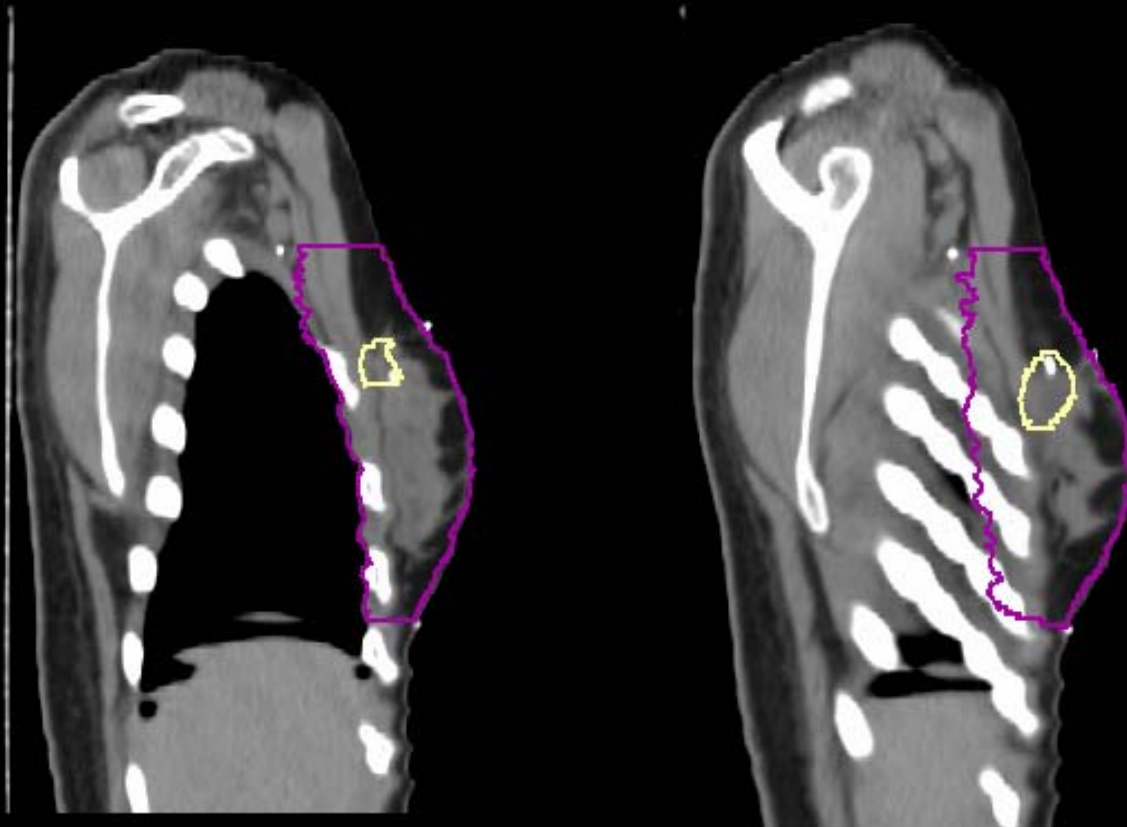
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