Incorporating Cadaveric-Specific CT Images into Anatomical Education

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Introduction

- Anatomical education is widely taught through dissection of cadaveric donors. Despite textbooks showing how the "standard" individual should appear, all individuals are unique based on development, trauma, surgical intervention, etc.
- Before dissection begins, the internal anatomy is unknown beyond cause of death. Utilizing CT scans for each cadaveric donor provides the opportunity for a more comprehensive understanding of why the body might deviate from the norm in certain areas, whether it is due to pathology, past surgeries or congenital differences.
- Biomedical imaging is used within anatomical education to give students the opportunity to understand the body in a three-dimensional orientation1, which can be difficult using traditional, two-dimensional resources such as textbooks.
- Since imaging is commonly used within medical practice, exposing students to diagnostic imaging early in their education will enhance their ability to interpret radiologic studies. Utilizing scanning techniques, alongside dissection, provides an integrative way to visualize human anatomy from multiple perspectives.

Methods

- Two cadaveric donors to the NEOMED Body Donation Program were selected for a full body CT scan. Scans were conducted at University Hospital, Portage Medical Center in Ravenna using standard scanning parameters.

Sex	Male	Female
Age (years)	82	89
Cause of Death	Metastatic Lung Cancer	Unspecified Dementia

- The team viewed and interpreted the CT scans utilizing the Bee DICOM Viewer program in order to identify regions of interest.
- Based on the pathological regions of interest, we planned and conducted dissections.

Dissection Procedure

- Both lungs were removed from the male donor, and we sectioned each lung in an oblique coronal plane, allowing for a pathological vs. normal comparison.
- The brain of the male specimen was removed and was sectioned in an oblique transverse plane to view multiple lesions within the brain parenchyma.
- The heart and lungs were removed in the female donor to allow a proper depiction of the hiatal hernia (i.e., stomach protruding into the thoracic cavity).

Results

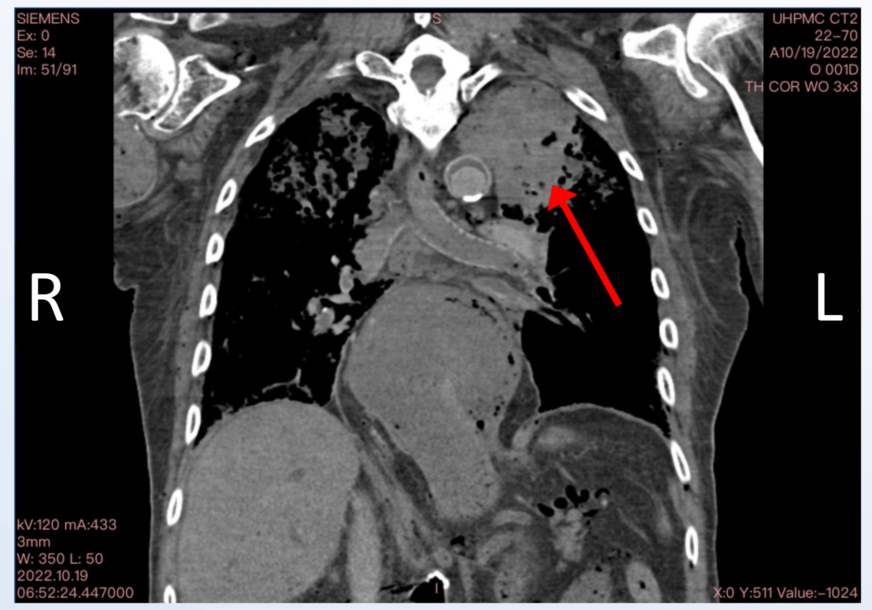

Figure 1. CT coronal view depicting tumor in apex of left lung (red arrow)

Figure 2. Cadaveric picture, coronal view depicting tumor in apex of left lung (white arrow).

Lung: Dissection of the lung required removing the chest plate. We removed the right lung followed by the left lung. After observing the tumor in the apex of the left lung, we sectioned each lung at an oblique coronal angle to observe an internal comparison between the lungs.

Figure 3. CT axial view of lesions (red arrows) in right cerebral cortex.

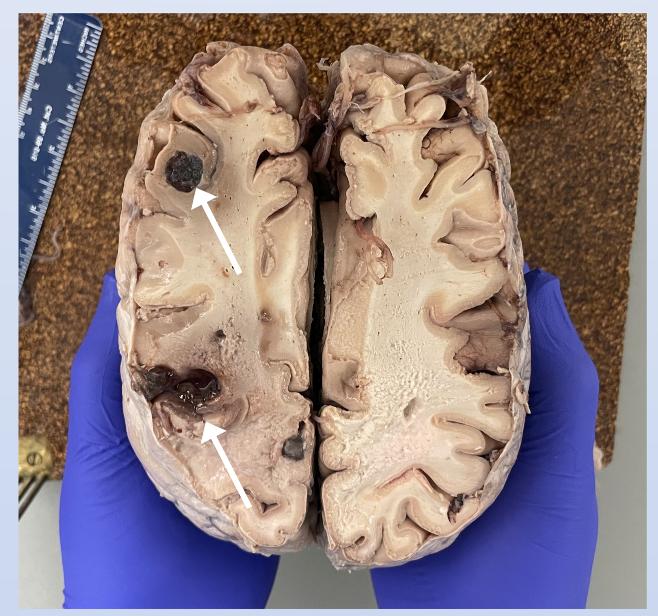

Figure 4. Cadaveric picture, axial view of lesions (white arrows) in right cerebral cortex.

Note: CT imaging was performed with donor in supine position. Cadaveric image of the brain was flipped to mimic CT image.

Brain: Dissection of the brain required removing the skull cap. Initially, after reviewing the scans, we hypothesized that the lesions were calcified, but upon sectioning of the brain we discovered they were hemorrhagic in nature. We determined that the brain lesions were likely metastases from the primary lung neoplasia (demonstrated in **Lung** panels above).

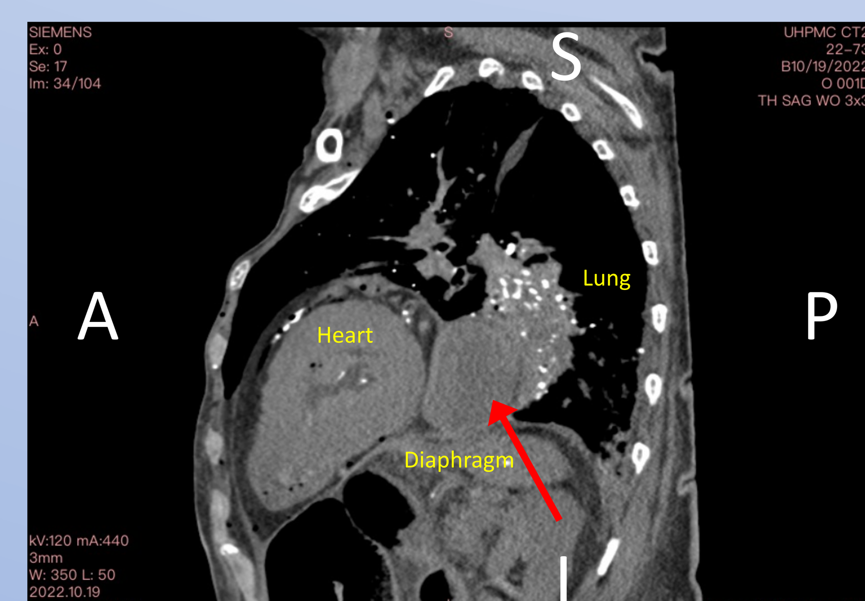

Figure 5. CT oblique sagittal view of hiatal hernia (red arrow).

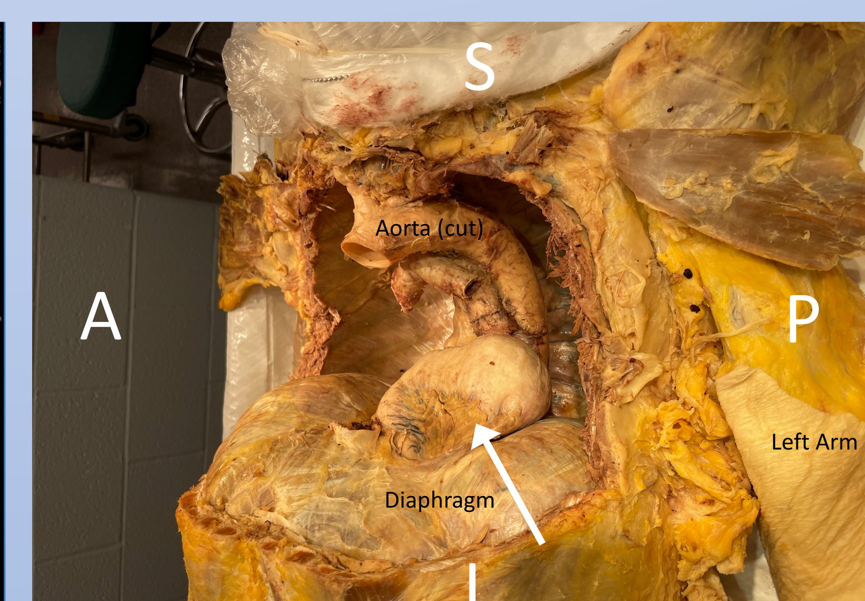

Figure 6. Cadaveric picture, oblique sagittal view of hiatal hernia (white arrow). Note: heart and lungs have been removed.

Hiatal hernia: Dissection of the hiatal hernia required removing the chest plate. Next, lungs and heart were removed to expose the hernia in situ. The hiatal hernia may have been associated with gastroesophageal reflux in life[2].

A = Anterior P = Posterior S = Superior
L = Left R = Right. I = Inferior

Discussion

- This study assessed the benefits and limitations of utilizing CT scans to perform targeted dissections.
- The CT images were beneficial in the following ways:
  - Initial planning for dissection.
  - Ongoing reference throughout the dissection process.
  - Guidance for organ sectioning.
  - Comparison with initial findings post-dissection.
- An important aspect to highlight is the usefulness of the scans throughout the dissection process.
  - When the cancerous lung was removed, it was adhered to the mediastinum. We were able to review the CT scans to determine the best plane for removing the lung (pneumonectomy).
  - When sectioning the brain, we utilized the CT scans to determine the appropriate region and angle to transect the lesions.
- Limitations of this study include:
  - Certain regions (i.e., right shoulder of male) were partially excluded from the field of view, preventing a complete visualization of the anatomy.
  - The inability to reimage, if necessary.
  - Artifacts resulting from the embalming process[3].

References

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