Early Exposure to Clinical Imaging in First Year Medical Student Anatomy Curriculum: A Pilot of Radiology-Anatomy Laboratories using dynamic image review on a PACS teaching environment
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Disclosures

The authors have no pertinent disclosures
Purpose:

- To assess if early exposure to clinical radiologic imaging helps to reinforce traditional methods of teaching anatomy and can act as a bridge to early introduction of pathologic processes to first year medical students.
Materials/Methods:

- As part of a preclinical curriculum redesign increased instruction time was allotted for development of radiology curriculum during the first-year gross anatomy course.

- 3 radiology-anatomy laboratory exercises (Cardiothoracic, Abdominal and Pelvic) were developed with participation from a multispecialty curriculum committee to coincide with the relevant first-year anatomy dissection curriculum at NYU SOM.

- In each 90-minute lab, students (117 total) worked in small groups (of 2-3) reviewing selected anonymized clinical imaging (including CT and MR imaging) using teaching-environment PACS server accessible either on in-class desktops or personal laptop computers to identify the anatomic structures and relationships emphasized in anatomy class. (Figure 1)
Materials/Methods:

Figure 1: NYU SOM first year anatomy students working through CT cases during the Cardiothoracic Radiology anatomy laboratory, November 2017.
Materials/Methods:

- The students navigated through the cases with the help of laboratory manuals comprised of a series of clinical vignettes and detailed instructions to allow the students to find pertinent imaging anatomy independently. Radiology faculty, fellows and residents were available on site for further assistance. (Figure 2)

- Anonymous 14-question online survey consisting of Likert-scale type questions was distributed after completion of all three laboratory exercises to assess student-perceived attitudes and possible future applications of the experience.

- Image-rich radiology content from the lab exercises was incorporated into the Final anatomy examination (comprising approximately 36% of the multiple choice portion of the exam).
Materials/Methods:

Figure 2a: Select representation of the content within the Pelvic Imaging Laboratory Manual (pages 1-4)

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Item Description</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelv_001, Pelv_001</td>
<td>CASE 1: ANONPT #1</td>
<td>CT NORMAL female</td>
</tr>
<tr>
<td>Pelv_002, Pelv_002</td>
<td>CASE 2: ANONPT #2</td>
<td>MR Normal Female</td>
</tr>
<tr>
<td>Pelv_003, Pelv_003</td>
<td>CASE 3: ANONPT #3</td>
<td>MR Normal Male</td>
</tr>
<tr>
<td>Pelv_004, Pelv_004</td>
<td>CASE 4: ANONPT #4</td>
<td>MR female perineum unknown</td>
</tr>
<tr>
<td>Pelv_005, Pelv_005</td>
<td>CASE 5: ANONPT #5</td>
<td>CT female pelvic unknown</td>
</tr>
<tr>
<td>Pelv_006, Pelv_006</td>
<td>CASE 6: ANONPT #6</td>
<td>US scrotum</td>
</tr>
</tbody>
</table>

Figure 2b: Image of anonymized clinical cases available on PACS “educational server” used for the Pelvic Imaging Laboratory
Results:

- All first-year students (n= 117) participated in small group hands-on radiology-anatomy laboratories.
- 79 students (68%) completed the post-lab survey.

<table>
<thead>
<tr>
<th>Question</th>
<th>(n= 79/117, 68%)</th>
<th>Strongly Agree (%)</th>
<th>Agree (%)</th>
<th>Neutral (%)</th>
<th>Disagree (%)</th>
<th>Strongly Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labs helped me understand spatial relationships between anatomic structures</td>
<td>76.9</td>
<td>18.0</td>
<td>3.9</td>
<td>0.0</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Labs helped me understand clinical significance of anatomic relationships and how that may influence disease presentation</td>
<td>67.1</td>
<td>27.9</td>
<td>0.0</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Labs are a good complement to our cadaver dissection</td>
<td>74.7</td>
<td>20.3</td>
<td>1.3</td>
<td>1.3</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>I feel comfortable using PACS: finding, viewing, and manipulating images</td>
<td>51.9</td>
<td>38.0</td>
<td>5.1</td>
<td>5.1</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>I liked the image quality of the PACS studies</td>
<td>81.0</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>There was appropriate time to complete the lab</td>
<td>33.3</td>
<td>16.7</td>
<td>12.8</td>
<td>18.0</td>
<td>19.2</td>
<td></td>
</tr>
<tr>
<td>The experience was fun</td>
<td>53.2</td>
<td>30.4</td>
<td>7.6</td>
<td>7.6</td>
<td>1.3</td>
<td></td>
</tr>
</tbody>
</table>
Results:

- In summary, the lab experience was positively received by the participating students. Majority of students agreed that:
  - Labs were a good complement to cadaveric dissection
  - Labs helped students understand spatial relationships and clinical implications
  - The experience was enjoyable.

- Areas for improvement:
  - Many students reported insufficient time to complete the activity during the assigned supervised classroom hours.
  - Re-evaluation of the quantity of material will certainly have to be assessed for future exercises of this kind, or alternatively increased radiology instruction time will be required.
Conclusions:

- Integration of real clinical radiologic imaging in an anonymized educational-server PACS environment proved to be a highly effective way to reinforce the material taught in traditional cadaveric dissection.

- Students perceived these exercises as valuable in understanding the clinical significance of anatomic relationships.

- This innovative approach demonstrates that radiology can play a pivotal role in early medical student education.

- To our knowledge, our experience is the first of its kind to provide an in-class real clinical multimodality radiologic imaging opportunity with individual hands-on navigation capability in an anonymized educational-server PACS environment for the purpose of enhancing anatomy education.
Future Directions:

- We are currently working on creating radiology-anatomy laboratories for head and neck and upper and lower extremities imaging to coincide with the anatomy curriculum taught to second year medical students, in early fall of 2018.

- We will continue to innovate and modify the existing laboratory exercises to meet the unique needs of first year medical students.

- Growing significance of early medical student exposure to radiology cannot be understated, and this hands-on model may serve as a template for adoption by other institutions.
Thank you!

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