ANATOMICAL SPATIAL REFERENCING IN MEDICAL EDUCATION

Allison K. Chatterjee, PhD

Marian University
Indiana
College of Osteopathic Medicine
Introduction

• Medical students are required to learn new language for orienting structures of the body in space while concurrently learning clinically-relevant content

• Terminologia Anatomica: International Anatomical Terminology
  • Used to describe anatomical structures, positions, & relationships
  • Common, consistent language among medical professionals
  • Specific universal international vocabulary
  • Rooted in the Latin & Greek languages
Anatomical Referencing System

Anatomical Position & Planes
- Median
- Frontal
- Transverse
- Sagittal

Anatomical Directional Terms
- Lateral
- Medial
- Superior
- Inferior
## Dissection Guide vs Anatomy Atlas

<table>
<thead>
<tr>
<th>Dissection Guide</th>
<th>Anatomy Atlas</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Step-by-step written instructions</td>
<td>• Detailed labeled images of structures</td>
</tr>
<tr>
<td>• Filled with terminology &amp; prepositions</td>
<td>• Image types</td>
</tr>
<tr>
<td>• Examples from Dissection of Infratemporal Fossa</td>
<td>• Line drawing/outline</td>
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<tr>
<td>• “Locate the lingual nerve, just medial to the inferior alveolar nerve, both lying on the superficial surface of the medial pterygoid muscle.”</td>
<td>• Full-color drawings</td>
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<tr>
<td>• “The middle meningeal artery typically passes superiorly to the foramen spinosum through a split in the auriculotemporal nerve.”</td>
<td>• Photographic</td>
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*Students may have difficulty deciphering dissection guide or anatomy atlas (or both)*
Imaging

• Imaging modalities like CT and Ultrasound show very different views of anatomical structures
  • Students have to re-orient themselves
  • Difficulty with left-right orientation
What factors determine how quickly, effectively, and efficiently students adopt anatomical terminology & incorporate them into their schemas?

• Familiarity with Latin/Greek language
  • Not yet studied
  • Cross-linguistic potential study?

• Prior coursework – medical terminology, anatomy, histology, embryology
  • Current study with survey

• Osteopathic vs Allopathic medical school
  • Current study with survey

• Spatial ability
  • My early study focused on spatial rotation
  • Current study focuses on battery of spatial tests
Early Study: Spatial Rotation & Think Aloud Questions

• Administered Purdue Visualization of Rotations Test
• Divided students into 3 groups based on score on spatial test
• Think Aloud Protocol During Interviews
Example question: A man was stabbed in the chest with a knife with a blade five centimeters long. The blade entered the right third intercostal space just lateral to the body of the sternum. What part of the heart would likely be injured?

• Assess how participants orient the heart & use of landmarks
• Assess ability to visualize without additional stimuli
Results From Think Aloud

• The level of detail describing the location of the heart improved as spatial rotation scores increased

• Low Score on Spatial Rotation Test
  • Anterior view of heart
  • “the right ventricle comprises most of the anterior surface of the heart.”

• Moderate Score on Spatial Rotation Test
  • Heart in relation to sternum, length of knife
  • “I remembered the relationship of where it is to the sternum”
  • “first I see five centimeters and I think in my head approximately how long that would be”

• High Score on Spatial Rotation Test
  • More detail, borders of heart
  • “third intercostal I would believe would be further up on the heart; I think it goes back to four or five, but that might be ribs not intercostals”
Difference in Language Use

• Low Score on Spatial Rotation Test
  • Used anatomical terms infrequently: “superior,” “posterior,” “medial,” & “deep”
  • Used lay term: “around”

• Moderate Score on Spatial Rotation Test
  • Used anatomical terms infrequently: “superior,” “dorsal,” “medial,” & “deep”
  • Used lay terms: “around” & “top”

• High Score on Spatial Rotation Test
  • Used anatomical terms most frequently: “superior,” “anterior,” “dorsal,” “medial,” & “posterior”
References

• Chatterjee, A. K. (2011). *The Importance Of Spatial Ability And Mental Models In Learning Anatomy.* (PhD), Purdue University, West Lafayette.

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