Findings of a national survey of anatomy in radiology training

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Purpose

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• To evaluate the attitudes of radiologists in Scotland towards the role of anatomy in undergraduate and postgraduate medical training, in particular radiology training and examinations • The ultimate intention is to introduce change if the current system is considered suboptimal

Background:

• In 1993, the General Medical Council (GMC) in the United Kingdom (UK) published "Tomorrow’s Doctors" • This recommended changes to medical education in the UK, notably: - "Student-centred learning" rather than didactic teaching methodologies - A reduced emphasis on factual acquisition • The consequential curricular reforms led to a significant reduction in the amount of teaching in basic medical sciences such as anatomy and physiology • Changes to undergraduate curricula have been compounded by modifications to postgraduate training in the UK • 2005 saw the development of the Modernising Medical Careers initiative • New medical graduates now undertake a two-year "foundation programme" before specialist training, often replacing many years of postgraduate training • Hence, trainees entering radiology often have less experience and no postgraduate examinations (e.g. MRCS - Membership of the Royal College of Surgeons), which rely on a sound anatomy knowledge • Anatomy is integral to everyday radiological practice • Despite this, the Royal College of Radiologists (RCR) removed anatomy as a core component of the first Fellowship examination (FRCR part 1) • Registrars in Scotland undertake an unofficial "Anatomy and Techniques" examination in first year • The RCR has bowed to pressure and is reinstating anatomy as part of the FRCR part 1 from 2010 • As a result of changes to undergraduate and postgraduate training, we sought to investigate the attitudes of Scottish radiologists to the role of anatomy in radiology training and examinations

Methods and Materials

• Two anonymous parallel online questionnaires were created, one for consultants and one for registrars • The links to the questionnaires were distributed: - Initially to all members of the Scottish Radiological Society via their website - Subsequently, via heads of each of the 4 Scottish training schemes, to all consultants and registrars in each region • A total of 137 completed questionnaires were received (86 consultants, 51 registrars) • Precise numbers receiving the survey are unknown but based on available information we estimate 210 consultants and 120 registrars (approximately 40% response rate)

Questionnaires:

• Both surveys asked the following questions, graded on a five-point Likert scale (strongly agree to strongly disagree): - I support the decision to examine anatomy in
part 1 of the FRCR examination - It would be useful for radiology trainees to receive refresher courses in gross anatomy - It would be useful for radiology trainees to spend a period of time working as an anatomy demonstrator - Anatomy should be a compulsory subject at medical school - A good knowledge of anatomy is essential for a radiologist

• Both surveys also sought demographic data and enquired as to the perceived best methods of teaching at medical school Consultant Questionnaire:
  • In addition, the consultants were asked the extent to which they agreed with the following statements: - The level of anatomy taught at medical schools today is satisfactory - The level of anatomy knowledge of doctors entering radiology training is satisfactory - The MRCS and MRCP examinations test a sufficiently high level of anatomy knowledge - The FRCR examinations test a sufficiently high level of anatomy knowledge

• Consultants were also asked whether they were involved in teaching or training registrars, and which background (e.g. surgical, medical) they thought yielded the most anatomically knowledgeable registrars Registrar Questionnaire:
  • Registrars were asked about: - Pre-radiology training background - Knowledge of radiological anatomy at the start of training and at the time of filling in the survey (scale 0-10) - Postgraduate examinations they had completed (Radiology & Non Radiology) - Anatomy knowledge testing by non-radiology postgraduate examinations and FRCR - If they had received formal anatomy teaching at medical school, and if so, was it satisfactory and how was it delivered? - Anatomy demonstrator posts - What formal radiological anatomy teaching their training scheme delivered, if any

Results

Medical school:

• 100% of registrars and 99% of consultants agree that anatomy should be compulsory at medical school • 100% of registrars received formal anatomy teaching at medical school, of whom 67% felt it to be satisfactory and 20% felt it to be unsatisfactory • For the majority of registrars, anatomy teaching consisted of a combination of lectures and cadaveric learning (figure 1) • No registrar stated that they had been taught using radiological imaging as a teaching aid • Each survey enquired as to the perceived best methods of teaching anatomy (up to 3 allowed per response), results of which are shown in figure 2. Postgraduate training:
  • The primary background of registrars prior to radiology was: - Medical in 47% - Surgical in 37% - Other in 16% (with 8% having undergone foundation training) • 43/51 (84%) registrars had completed at least one part of a non-FRCR postgraduate qualification (e.g. MRCP, MRCS), of which: - 57% had gained a full qualification - 10% had completed part of a qualification - 17% did not
state number of parts completed • Figure 3 shows the proportions of consultants and registrars (possessing at least one part of a non-FRCR postgraduate qualification) who believe that these examinations test a sufficiently high level of anatomy knowledge • Consultants failed to agree with the above statement significantly more often than registrars (94% vs 65%, P for difference <0.0001, Fisher's Exact test) • Consultants believe that registrars from a surgical background possess a better knowledge of anatomy than those from a medical background (75% vs 2%); 22% believe there is no significant difference

**Radiology training:**
• The following table shows registrars' perceptions of their knowledge of radiological anatomy at the beginning of their training and at the time of survey completion (scale 0-10, where 0 = know nothing and 10 = know everything)

<table>
<thead>
<tr>
<th>Year of training</th>
<th>Number of registrars</th>
<th>Rating at start of training - median (range)</th>
<th>Rating at completion of survey - median (range)</th>
<th>Number of rating points increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>3 (1-7)</td>
<td>5 (3-8)</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>4 (1-6)</td>
<td>6.5 (4-9)</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>2.5 (1-6)</td>
<td>6 (4-8)</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>1 (1-5)</td>
<td>6 (5-7)</td>
<td>5</td>
</tr>
<tr>
<td>5+6</td>
<td>11</td>
<td>3 (1-8)</td>
<td>9 (6-10)</td>
<td>6</td>
</tr>
</tbody>
</table>

• These results demonstrate a perceived increase in anatomical knowledge commensurate with degree of experience • Of note, those in year 2 of training perceived themselves to have a greater knowledge of radiological anatomy at the start of training and at the time of the survey than those in years 3 or 4 • Consultants were significantly more likely to consider the anatomical knowledge of those entering radiology to be unsatisfactory than registrars (64% vs 31%, P for difference <0.001, Fisher's Exact test) • The vast majority of respondents believed that refresher courses in gross anatomy would be useful for radiology registrars (85% of consultants, 88% of registrars) • However, the majority of registrars (51%) receive no formal anatomy teaching • Radiologist-delivered lectures was the most common method (88% of those receiving teaching) • Respondents universally perceived a good knowledge of anatomy to be essential for a career in radiology (100% of consultants, 98% of registrars)

**FRCR:**
• The vast majority of respondents supported the decision to reinstate an anatomy component to the First FRCR (90% registrars vs 97% of consultants) • A minority of post-FRCR registrars (of which n=14) and consultants believe that the FRCR examinations test a sufficiently high level of anatomy knowledge (29% vs 43%)

**Anatomy demonstrating:** • 10% of registrars had held a post as an anatomy demonstrator • Both consultants and registrars tended to agree that a period of time spent as an anatomy demonstrator would be useful for radiology trainees - Consultants - 43% agree vs 31% disagree - Registrars - 43% agree vs 37% disagree
Fig. 1: Number of registrars being taught at medical school using each method
Fig. 2: Perceived best methods of teaching anatomy at medical school
**Fig. 3:** Number of respondents believing that non-FRCR postgraduate examinations test a sufficiently high level of anatomy knowledge
Conclusion

Key conclusions:

- All radiologists perceive the importance of anatomy to undergraduate and postgraduate training
- Greater emphasis should be placed on teaching using computers and radiological imaging at medical school
- Registrars should receive anatomy teaching as part of their training, although this tends not to be the case at present
- A significant proportion believe that radiology registrars should themselves participate in anatomy teaching to medical students
- As would be expected, registrars' knowledge of radiological anatomy increases with experience
- The current FRCR examinations are not generally felt to sufficiently test anatomical knowledge
- Radiologists of all levels welcome the inclusion of an anatomy component in the First FRCR
- The majority of registrars surveyed possessed at least part of a non-FRCR postgraduate collegiate examination, although these were not felt to sufficiently test anatomical knowledge
- Consultants consider the knowledge of those entering radiology training to be unsatisfactory

Discussion:

- The value of radiological imaging in teaching anatomy to medical students has been recognised for decades [1]
- Some believe that radiological imaging augments rather than replaces traditional cadaveric dissection [1]
- Others claim that integrated medical imaging obviates the need for cadaveric material e.g. Peninsula medical school, opened in the last decade in the UK, which focuses on radiological imaging and living anatomy [2]
- Technological advances have forged a symbiotic relationship between radiological imaging and computer-based learning
- Numerous studies have highlighted various computer/web-based learning strategies [3-9], with 3D, virtual reality and cross-sectional applications having been shown to impact positively on students' anatomy knowledge
- The need for standardisation of radiological anatomy teaching in UK medical schools has been highlighted [10], and the RCR has guidelines as to the role of radiology in the undergraduate curriculum [11]
- Clinicians in many specialties are in favour of more vertical integration of anatomy teaching in the undergraduate curriculum [12]
- Our study shows strong support for the new anatomy component in the First FRCR, which should give junior radiology trainees a headstart over previous years in terms of knowledge of radiological anatomy
- RCR guidance [13] suggests that 30 hours of dedicated, training scheme-initiated teaching of radiological anatomy should be delivered in addition to self-directed study for the examination
- This should serve to address the deficiencies in current anatomical teaching within training schemes, as highlighted by our study
- The Final FRCR Part A examination will continue to examine anatomy, although the extent is unclear following a change in format in September 2009 (previously 15-20% of the examination related to basic sciences) [14,15]
- The Radiology-Integrated Training Initiative (R-ITI) is a joint development between the RCR, Department of Health and NHS aimed at radiology registrars in the first 3 years of training [16]
- R-ITI aims to cover the syllabus for the First and Final FRCR Part A examinations, with web-based learning using a validated case archive also serving to enhance trainees' knowledge of radiological anatomy
- The value of medically-qualified...
anatomy demonstrators - including radiology trainees - is well-recognised [17], proving beneficial to both trainees (improved knowledge of anatomy and enhanced teaching, learning and communication skills) and medical students, who benefit from a more clinically-oriented approach to anatomy teaching. In Scotland, first year radiology registrars in Aberdeen spend one afternoon a week as anatomy demonstrators, with similar arrangements in place elsewhere in the UK [18] - although the majority of radiology training schemes offer no such arrangement. Even in the context of MMC/ Tomorrow's Doctors, other specialities which rely heavily on a sound knowledge of anatomy continue to value anatomy demonstrator posts. One study [19] revealed that the majority of consultant surgeons believed a dedicated anatomy demonstrating post to be preferable to the equivalent period spent in a surgical specialty.

**Summary:**
- This study has provided an insight into the attitudes of radiologists in Scotland towards radiological anatomy teaching and knowledge.
- Provision of anatomy teaching delivered to - and by - radiology trainees are two key areas which should be addressed.
- Findings will be fed back to the heads of radiology training programmes across Scotland.

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