Rectal MRI: Optimising Imaging for Patient Benefit

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No conflict of interest to disclose
The Problem

• Rectal cancer accounts for 8% of annual cancer diagnoses in the USA¹.

• MRI is the investigation of choice for local staging².

• Poor quality MRI limits confidence in staging and decision-making for treatment in MDT meetings, impacting patient outcomes³-⁴.

• **Subjectively:** In our hospital, the rectal cancer protocol was limited by issues with bowel wall motion, poor resolution and scanning technique.

Results – Audit 1

Overview of rectal MRI adherence to RCR guidelines

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Description</th>
<th>Audit 1 (Sept-20) n = 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>% using anterior saturation band</td>
<td></td>
</tr>
<tr>
<td>69 (9/13)</td>
<td>% appropriate coil position</td>
<td></td>
</tr>
<tr>
<td>69 (9/13)</td>
<td>% adequate tumour coverage</td>
<td></td>
</tr>
<tr>
<td>38 (5/13)</td>
<td>% mesorectum imaged to L5-S1 on SFOV</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>% buscopan given</td>
<td></td>
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</tbody>
</table>
## Intervention 1: Protocol Development

### Old protocol

<table>
<thead>
<tr>
<th>Scan</th>
<th>Voxel Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2 Propeller Sag LFOV</td>
<td>2.5 mm³</td>
</tr>
<tr>
<td>T2 Ax LFOV</td>
<td>4.7 mm³</td>
</tr>
<tr>
<td>T2 Ax Oblique SFOV</td>
<td>1.6 mm³</td>
</tr>
<tr>
<td>T2 Cor Oblique SFOV</td>
<td>1.4 mm³</td>
</tr>
<tr>
<td><strong>Total Protocol Time</strong></td>
<td>~21 mins</td>
</tr>
</tbody>
</table>

### New protocol

<table>
<thead>
<tr>
<th>Scan</th>
<th>Voxel Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2 Sag LFOV</td>
<td>1.25 mm³</td>
</tr>
<tr>
<td><strong>T2 Ax LFOV</strong></td>
<td>3.95 mm³</td>
</tr>
<tr>
<td>T2 Ax Oblique SFOV</td>
<td>1.2 mm³</td>
</tr>
<tr>
<td>T2 Cor Oblique SFOV</td>
<td>1.2 mm³</td>
</tr>
<tr>
<td><strong>Total Protocol Time</strong></td>
<td>~27 mins</td>
</tr>
</tbody>
</table>
Intervention 2: Radiology Personnel Training

Ideally how should small field of view imaging be angled?

- 2020 pre-training answers (n = 11):
  - 36%: Option a)
  - 55%: Option b)
  - 9%: Option c)

- 2021 post-training answers (n = 20):
  - 75%: Option a)
  - 15%: Option b)
  - 10%: Option c)

How high should the small field of view imaging go?

- 2020 pre-training answers (n = 11):
  - 45%: Option a) To L4/L5
  - 46%: Option b) To L5/S1
  - 9%: Option c) To S1/2

- 2021 post-training answers (n = 20):
  - 95%: Option a) To L4/L5
  - 5%: Option b) To L5/S1

Options:

- a) Axial and coronal oblique imaging angled perpendicular to the entire rectum
- b) Axial and coronal oblique imaging angled perpendicular and parallel to the rectal tumour which may require multiple stacks.
- c) Axial and coronal oblique imaging angled perpendicular to the anus.
Case review

LFOV Sag

SFOV Ax (inf slice)

SFOV Cor
Results – Audit 2

Overview of rectal MRI adherence to RCR guidelines

- % using anterior saturation band
  - Audit 1: 100 (12/12)
  - Audit 2: 69 (9/13)

- % appropriate coil position
  - Audit 1: 92 (11/12)
  - Audit 2: 69 (9/13)

- % adequate tumour coverage
  - Audit 1: 83 (10/12)
  - Audit 2: 38 (5/13)

- % mesorectum imaged to L5-S1 on SFOV
  - Audit 2: 50 (6/12)

- % buscopan given
  - Audit 2: 0

Audit 1 (Sept-20) n = 13
Audit 2 (Sept-21) n = 12
Intervention 3: Use of antispasmodics

SFOV, no buscopan, 24/09/2021

SFOV, repeat with buscopan, 01/10/2021
Results – Audit 3

Overview of rectal MRI adherence to RCR guidelines

- % using anterior saturation band
- % appropriate coil position
- % adequate tumour coverage
- % mesorectum imaged to L5-S1 on SFOV
- % buscopan given

Audit 1 (Sept-20) n = 13
Audit 2 (Sept-21) n = 12
Audit 3 (Feb-22) n = 9
Conclusion

• Following our interventions there has been significant improvements to the quality of our rectal MRI scans and our team’s technical performance.

• It has optimised the staging of rectal cancer in our department, and led to increased confidence in multidisciplinary decision making.

• Since this project IM training for radiographers and initial sequence optimisation on new MRI scanners has been completed.

• Future directions include radiographers to attend lower GI MDTs.