Magnetic Resonance Enterography (MRE) – A Single Institution Audit of Referral Compliance with Appropriateness Criteria

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Magnetic Resonance Enterography (MRE)

Safe, non-invasive technique for the diagnosis of small bowel disorders

- Barium small-bowel follow through
- Capsule endoscopy
- MR/CT Enterography

Coronal HASTE image of a normal MRE
(Source: Radiopedia)
# MR vs CT Enterography

<table>
<thead>
<tr>
<th>MR Enterography</th>
<th>CT Enterography</th>
</tr>
</thead>
<tbody>
<tr>
<td>No radiation</td>
<td>Cheaper</td>
</tr>
<tr>
<td>Better contrast resolution</td>
<td>More accessible</td>
</tr>
<tr>
<td>Diffusion-weighted imaging</td>
<td>Faster</td>
</tr>
<tr>
<td>Evaluation of bowel-peristalsis</td>
<td>Higher Spatial Resolution</td>
</tr>
<tr>
<td>Long scan times</td>
<td>Radiation</td>
</tr>
<tr>
<td>Limited access</td>
<td></td>
</tr>
<tr>
<td>Claustrophobia</td>
<td></td>
</tr>
</tbody>
</table>

Background

- MRE started being offered at St. Joseph’s Hospital (SJH) in 2010
- Large catchment area extending to Mississauga and Niagara
- The volumes are increasing over time - 267 studies in 2012 to 600 in 2016
- As a result, difficult allocation of MR times to other studies (prostate, liver, spine, etc.)

Background

- Primary indication is diagnosis and follow-up of Crohn’s disease in patients younger than 50 years of age*
- Trend towards increasing age in referred patients - over 1/3rd of patients in 2017 were > 50 years
- Increasing requests for non-IBD related issues such as anemia, diarrhea, non-specific abdominal pain and subacute bowel obstructions
- Yield of MRE in older patients is limited by inability to complete the exam, resulting in breathing and motion artifacts

Objectives

- To determine the referral practices for MRE at SJH by analyzing the demographics and referral indications
- To educate the referring physicians about the appropriateness of the test
- To determine the effect of this intervention on referral practices
Methods

Pre-Intervention

- 150 consecutive MRE reports were retrospectively reviewed
- Time period: July 1, 2017 – October 10, 2017
- Study date, patient age, clinical indication and quality of the study were recorded
- Indication was categorized based on the disease in question and purpose of the study (diagnosis or monitoring)
- Study quality was categorized as poor, adequate or non-specified

Intervention

- An educational letter was sent out to top 20 referring clinicians based on results of the pre-intervention phase

Post-intervention

- Similar analysis as pre-intervention performed with 150 consecutive MREs from July 1, 2018 – November 19, 2018
MRE Technique

- NPO for 4 hours
- IV access
- Oral contrast administration
  - If cannot tolerate, NG tube placement
  - 1.5 L of Lactulose
- IV Buscopan (Butylscopolamine) to slow down bowel peristalsis and reduce motion artifact
  - Contraindications: Cardiac arrhythmia, Glaucoma
- IV Gadolinium-based contrast
Results - Age

35% of patients were >50 years of age \([n=52]\)

21% of patients were >50 years of age \([n=32]\)

Statistically significant decrease in mean patient age post-intervention - Two-tail T-test \(p=0.047\) (<0.05)
### Results - Indication

#### Pre-Intervention

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflammatory Bowel Disease (IBD)</td>
<td>127</td>
</tr>
<tr>
<td>Crohn’s Disease</td>
<td>107</td>
</tr>
<tr>
<td>Ulcerative Colitis</td>
<td>6</td>
</tr>
<tr>
<td>IBD - Nonspecific</td>
<td>14</td>
</tr>
<tr>
<td>Suspected Polyps</td>
<td>7</td>
</tr>
<tr>
<td>Small Bowel Obstruction</td>
<td>6</td>
</tr>
<tr>
<td>Rule out Malignancy</td>
<td>1</td>
</tr>
<tr>
<td>Carcinoid</td>
<td>1</td>
</tr>
<tr>
<td>Primary Sclerosing Cholangitis</td>
<td>1</td>
</tr>
<tr>
<td>Anal Cancer</td>
<td>1</td>
</tr>
<tr>
<td>Esophageal Cancer</td>
<td>1</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
</tbody>
</table>

**19% of studies included non-Crohn’s related indications [n=29]**

#### Post-intervention

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBD</td>
<td>118</td>
</tr>
<tr>
<td>Crohn’s Disease</td>
<td>107</td>
</tr>
<tr>
<td>IBD – Nonspecific</td>
<td>11</td>
</tr>
<tr>
<td>Suspected Polyps (Familial Adenomatous Polyposis, Peutz Jeghers)</td>
<td>2</td>
</tr>
<tr>
<td>Small Bowel Obstruction</td>
<td>4</td>
</tr>
<tr>
<td>Rule out Malignancy</td>
<td>1</td>
</tr>
<tr>
<td>Carcinoid</td>
<td>1</td>
</tr>
<tr>
<td>Colorectal Cancer</td>
<td>1</td>
</tr>
<tr>
<td>Abdominal Pain, Diarrhea, Dysphagia, Bloating</td>
<td>16</td>
</tr>
<tr>
<td>Mesenteric Ischemia</td>
<td>1</td>
</tr>
<tr>
<td>GI Bleeding</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
</tbody>
</table>

**21% of studies included non-IBD related indications [n=32]**

*No statistically significant change post-intervention - Two-tail T-test p>0.05*
Results – Study Quality

100% of the studies were completed [number of minor assessments not calculated]. 1 patient did not receive Buscopan.

99.3% of the studies were completed [number of minor assessments not calculated]. 1 study was not completed for unknown reasons.
Conclusion

**Pre-intervention**

- Up to 35% of patients were >50 years of age.
- While majority of indications were appropriately related to IBD, up to 19% were for non-specific indications such as malignancy and small bowel obstruction.
- The split between diagnosis and monitoring studies for IBD is approximately 50-50.

**Post-intervention**

- There was a statistically significant reduction in the mean age (40.8 years vs 44.1 years).
- Only 21% of patients were >50 years of age.
- The proportion of non-IBD indications did not significantly change (21%).
- There was an increase in the studies for monitoring vs diagnosis for IBD (78/22 vs 50/50).
Proposed Algorithm

Considering MRE?

- Age < 50 years
  - New diagnosis of Crohn's
  - Known Crohn's (+/- on treatment)
  - Contraindication to CTE (ex. contrast allergy)

  Proceed with MRE

- Age > 50 years
  - Suspected bowel malignancy/polyp
  - Recurrent bowel obstruction
  - Anemia NYD
  - Abdominal pain, constipation, bloating, diarrhea
  - Acute setting (ex. leukocytosis, fever)

  Consider alternative test such as CTE
THANK YOU

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