An Audit on 1,836 CT Colons in the Assessment of Diverticular Disease: A Proposal For A New Coding System As An Expansion of C-rads

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Aims and objectives

Diverticulitis is a common cause of acute surgical admissions and results in considerable morbidity. It affects 5-10% of the population over 45 years of age and 80% over 85 years of age. The C-rads coding system is a well established tool for evaluating Colorectal Cancer (CRC) with the use of CT Colonography (CTC). In terms of imaging findings, there is an overlap in the identification of CRC and diverticular disease. Our aims are to expand the established C-rads scoring system currently being used for CRC to diverticular disease. At present there are numerous classification systems to evaluate the severity of diverticular disease. These have evolved since the original Hinchey Classification in 1978 with the advent of CTC. More modern classification systems have focused on measurements of colonic wall thickness and lumen dimensions. Unfortunately, many of these scoring systems are complicated and time consuming. Furthermore, no one classification system has been agreed upon as a gold standard for the classification of diverticular disease.

What we propose is a simple, visual scoring system based on C-rads to classify the severity of diverticular disease. This we termed the D-rads scoring system, ranging from D1-D4, where D1 and D2 represents milder disease and D3 and D4 more severe disease. In addition, the C score represents Colonic disease while the denotion E indicated extra-colonic disease.
Methods and materials

Between 2012-2016, 1,836 CT Colons were reviewed both retrospectively and prospectively. The D-rads scoring system was applied. CT colons were given a code of D1-D4 depending on severity.

CT Colons were performed at Our Lady of Lourdes Hospital in Drogheda, and Our Lady’s Hospital, Navan, Ireland. Coding was performed by one of two experienced radiologists.

Patient preparation: All patients were on a fluid only diet 24 hours prior to CTC. Bowel preparation was with Sodium Picosulphate (Picolax, Ferring Pharmaceuticals, Malmo) taken the evening before the CTC. Faecal tagging was achieved with 50ml of Iodixanol (Visipaque, GE Healthcare, Oslo) taken orally the night before the CTC. A soft catheter tip was inserted into the rectum with the patient in the left decubitus position.

All patients received 20 mg of IM scopolamine-buthylbromide (Buscopan, Beehringer Ingelheim, Paris) at the time of rectal catheter placement or Glucagon if Buscopan was contraindicated and the colon was insufflated using automated CO2 distension (PROTOCO2L Colon Insufflator System, E-Z-EM) to between 3-4 litres of CO2 or as required depending on patient comfort. The adequacy of colonic distention was assessed on the scan scout view and the colon was further insufflated if necessary. The patient was scanned in either left decubitus or prone acquisition on a 16 multislice CT (Brillance, Phillips, and The Netherlands) Imaging parameters were a collimation of 16 × 0.75 mm, pitch of 1.2, slice thickness of 1.5 mm, reconstruction interval of 0.75 mm, 120 kVp, and 150-200 mAs. The mAs were reduced to 100 mAs for the non-contrast acquisition. Gantry rotation time was 0.5 sec and table speed 25mm/sec. IV contrast agent was administered in the supine or left decubitus position unless contraindicated. All patients were examined cranio-caudally, the patient was then turned into the right decubitus or supine position and a scout was taken to ensure adequate distension. They were then scanned with a 100 ml bolus of IV contrast with a scan delay of 45 seconds. All scans were carried out in a single breath hold. The obtained images were transferred to the PACS (NIMIS, McKesson, Toronto, Canada) and reported in combination of 2D and 3D using iNtuition integrated workstation (TeraRecon, Foster City, California ) by one of 2 experienced radiologists.

| D1 | Minimal or no diverticuar disease |
| D2 | Moderate diverticellar disease with circular muscle hypertrophy or diverticulae throughout colon |
| D3 | Simple diverticular stricture |
|    | Suggest MDM discussion |
D4  Complex diverticular stricture, possible malignancy or fistulating disease. Suggest MDM discussion
C  Colonic Disease
E  Extra-colonic disease (AAA, retroperitoneal disease, lung pathology)
Results

We analysed those patients who were on the severe spectrum of disease—the D3, D4, C4, E4 categories as this was the group most likely to need surgical or endoscopic evaluation or Multi-disciplinary Meeting (MDM) discussion. These categories made up a total of 205 patients out of 1,836 scans included in the study. The D3 category was made up of 34% patients, D4 12%, C4 21% and E4 33%. The mean age of patients included in the study was 54 years of age, the male to female ratio was 2:1 while 66% of cases were advised to be discussed at MDM based on the severity score. In terms of pathology within the D3 and D4 categories, 60 cases showed sigmoid diverticular disease on imaging, 10 showed sigmoid strictures, diverticular abscesses were found in 5 cases while 2 cases included Crohn's or Ulcerative colitis. Within the D3/D4 category 24% underwent further intervention either surgical (8 cases) or endoscopic (12 cases). The majority (39%) of the extra-colonic findings included a combination of gallbladder carcinoma, metastatic abdominal disease and retroperitoneal masses. Abdominal Aortic Aneurysms made up 18% of cases while 16% of lung pathology (mass/effusions) were found.

<table>
<thead>
<tr>
<th>Pathology D3/D4 Category</th>
<th>No</th>
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<tbody>
<tr>
<td>Sigmoid Diverticular Disease</td>
<td>60</td>
</tr>
<tr>
<td>Sigmoid Stricture</td>
<td>10</td>
</tr>
<tr>
<td>Diverticular Abscess</td>
<td>5</td>
</tr>
<tr>
<td>Colovesical Fistula</td>
<td>3</td>
</tr>
<tr>
<td>Crohn's Colitis</td>
<td>1</td>
</tr>
<tr>
<td>Ulcerative Colitis</td>
<td>1</td>
</tr>
</tbody>
</table>

| Further Intervention                      | 24%      |
| Surgical                                 | 8 cases  |
| Endoscopic (Colonoscopy)                 | 12 cases |
Images for this section:

Fig. 1: C1 D4 E2

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Fig. 2: C1 D4 E1-Benign Stricture in a 48 y/o male

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Fig. 3: C0 D4 E3-Malignant Stricture

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Conclusion

The purpose of this study was to portray the D-rads scoring system as a method of evaluating the severity of diverticular disease. Currently no one classification system has been agreed upon to assess this. The large number of CT Colons reported using this scoring system, shows both the reliability and reproducibility of this system in assessing diverticular disease by its severity. A clinical decision can then be made as to the most appropriate next step in management, being either clinical follow up, MDM discussion or surgical or endoscopic intervention. Furthermore, this scoring system allows clinicians to interpret the D1-D4 categories, allowing their patients to be managed in a timely manner.
Personal information

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References


