Computer tomography Imaging findings, clinical spectrum and follow up of patients with right colonic diverticulitis

Poster No.: C-0735
Congress: ECR 2013
Type: Educational Exhibit
Authors: D. Gutierrez, O. Chirife, M. pages, J. R. Ayuso, C. Ayuso; Barcelona/ES
Keywords: Abdomen, Colon, Gastrointestinal tract, CT, CT-High Resolution, Diagnostic procedure, Education, Diverticula
DOI: 10.1594/ecr2013/C-0735

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

Our objective is to describe the CT imaging characteristics of right colon diverticulitis, the clinical characteristics as well as evolution in a series of 6 patients.
**Background**

Right colon diverticulitis (RCD) being a fairly uncommon disease in western countries (less than 5% of the total cases of diverticulitis in published series)[1], constituted until recent ages a frequently undiagnosed entity in the non surgical scenario.

In the past, the majority of the patients with RCD faced surgical interventions under the presumptive diagnosis of acute appendicitis (RCD is commonly seen in younger patients compared with other locations of diverticular disease -37 year mean-) [2] posing unnecessary risks given that the current consensus advocate for a non surgical management of this pathology in the absence of complications (group 0 of the modified Hinchey classification of acute diverticulitis) [2].

Recent studies suggest a high possibility of correctly diagnosing this entity on the base of imaging studies including ultrasonography (US) and computed tomography (CT), differentiating it from other more common clinical entities such as acute appendicitis or colonic carcinoma in most cases [3].
Imaging findings OR Procedure details

We reviewed the radiology department records of our hospital for imaging studies of patients with a final diagnosis of right colon diverticulitis obtaining a list of six patients from 2005 to 2012, all with definite diagnosis obtained by surgery, follow-up imaging (CT, barium enema), clinical follow-up or colonoscopy. In all patients an emergency CT study was performed, additionally, an abdominal ultrasound was also performed as the initial study in four of them.

Technical parameters of the acquired studies:

- 4 of the CT studies were obtained using a 64 slice CT scanner, 1 in a 128 slice CT scanner and the remaining in a 16 slice CT equipment.
- Acquisition in a venous (60 to 80 seconds) and/or delayed (180 seconds) phase. Total administered contrast: 100 - 150 ml of with a concentration of 300 mg / mL.
- Non contrast study in 2 patients.

CLINICAL SPECTRUM

Of the total patients, 4 were women and 2 men, aged 29 to 53 years (mean 40.8 years). All patients presented to the emergency department with acute abdominal pain lasting between 12 hours and 5 days, 5 of them focusing the pain in the right lower quadrant. None of the patients had fever, being the rest of the vital signs within normal range. Table 1 depicts the clinical parameters and blood work of all the patients.

- The average leukocyte count was 12,766 per mL, with a range between 8200 per mL and 16,700 per mL, with values within the normal range in 33.3% patients.
- The CRP was elevated in 83.3% of patients, with a range between 3.46 and 15.4 mg/dL.

IMAGING FINDINGS. Table 2

1. The inflammatory changes: Mild to moderate inflammatory changes in the pericolonic fat in all patients (Fig. 1, 2).

2. The diverticula: Visualized in all studies, being located between the
ileocecal valve and the hepatic flexure of the colon.

3. The diverticular content: As reported in previous studies, the diverticula contained high-density material in most patients (83.3%) [5].

4. The location: The right colon was the only location of diverticular disease in 4 out of 6 patients.
   - Of the remaining two patients, one had additional diverticular disease in the sigmoid colon and the other to the fullest extent of the colon (Fig. 3), which may mean that some of the right colon diverticula are acquired and not congenital as has been described in the literature. [6,7]

5. The Size: The average size of the diverticulum was 18.5 mm with a range between 12 and 27 mm, similar to that reported in other series. [8]

6. The appendix: An appendix of normal characteristics was identified in 3 of the 6 patients. (Fig. 4)
   - In a fourth patient, a man aged 43, the inflamed diverticulum was erroneously assessed as an acutely inflamed appendix in the emergency CT report undergoing surgery without complications, identifying a non-inflamed appendix and a unique right colon diverticulum displaying inflammatory changes. Retrospectively, the emergency CT study was assessed by radiologists experienced in abdominal imaging, confirming the findings that suggested the right colonic diverticulitis as the most likely diagnosis. (Fig. 5)

In one of the patients, an exploratory laparoscopy was performed with the clinical diagnosis of acute abdomen prior to any imaging studies. Intraoperative findings reported an "inflammatory plastraon with some fibrin remainings in the transverse colon at the duodenal level. Normal cecal appendix, gallbladder and ovaries". In the post surgically acquired TC study, the diverticulum located in the hepatic flexure of the colon with hyperdense content and inflammatory changes in the adjacent fat was clearly visualized (Fig. 6). The appendix was not identified.
Based on the CT studies, right colonic diverticulitis was correctly diagnosed initially in 83.3% of patients. Retrospectively, all patients presented with suspicious findings of RCD on CT.

**PATIENT OUTCOME**

Both the patients who received initial conservative -4- as well as surgically intervened patients -2- had a satisfactory outcome with a hospital stay no longer than 6 days.

The final diagnosis of right colon diverticulitis was obtained by:

- Intraoperative findings in 1 patient (patient operated with the diagnosis of acute appendicitis).
- Additional follow-up studies in 4 patients: barium enema (**Fig. 7**) and colonoscopy in 2 and only colonoscopy in the fifth patient.
- Clinical follow up and initian emergency CT scan only in one of the patients.
Table 1

Clinical and blood parameters

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Clinical presentation</th>
<th>Leucocytes (x 10^3)</th>
<th>CRP (mg/dL)</th>
<th>Total hospital admission days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35</td>
<td>F</td>
<td>24 hours of RIF pain. Emesis and diarrhea</td>
<td>15300</td>
<td>7.32</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>51</td>
<td>M</td>
<td>3 days of RIF pain.</td>
<td>12000</td>
<td>9.5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>29</td>
<td>F</td>
<td>12 hours of RIF pain.</td>
<td>8200</td>
<td>3.46</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>43</td>
<td>M</td>
<td>12 hours of RIF pain.</td>
<td>15900</td>
<td>2.97</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>34</td>
<td>F</td>
<td>2 days of diffuse abdominal pain.</td>
<td>16700</td>
<td>15.4</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>53</td>
<td>F</td>
<td>3 days of RIF, RHC an 8500 hypogastrum pain. Nausea.</td>
<td>-</td>
<td>1.3</td>
<td>6</td>
</tr>
</tbody>
</table>

Median 40.83 - - 12766.67 6.66 4.33

CRP: C reactive protein; RIF: Right iliac fossa; RHC: Right hypochondrium

Table 2

CT characteristics of right colon diverticulitis

<table>
<thead>
<tr>
<th>Patients</th>
<th>Diverticulum identifications</th>
<th>Diverticulum content</th>
<th>Diverticulum diameter (mm)</th>
<th>Unique right colon diverticulum</th>
<th>Cecal appendix identification</th>
<th>Pericolonic fat stranding</th>
<th>Other localizations of diverticular disease</th>
<th>CT diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>Hyperdense</td>
<td>13</td>
<td>Yes</td>
<td>No</td>
<td>++/22 mm collection</td>
<td>No</td>
<td>RCD</td>
</tr>
<tr>
<td>2</td>
<td>yes</td>
<td>Hyperdense</td>
<td>26</td>
<td>No</td>
<td>Yes</td>
<td>++</td>
<td>Whole colon</td>
<td>RCD</td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
<td>Hyperdense</td>
<td>17</td>
<td>Yes</td>
<td>No</td>
<td>+</td>
<td>No</td>
<td>RCD</td>
</tr>
<tr>
<td>4</td>
<td>Yes</td>
<td>Hyperdense</td>
<td>16</td>
<td>Yes</td>
<td>Yes</td>
<td>+</td>
<td>No</td>
<td>Acute appendicitis</td>
</tr>
<tr>
<td>5</td>
<td>Yes</td>
<td>Hypodense</td>
<td>12</td>
<td>Yes</td>
<td>Yes</td>
<td>++</td>
<td>Sigma</td>
<td>RCD</td>
</tr>
<tr>
<td>6</td>
<td>Yes</td>
<td>Hyperdense</td>
<td>27</td>
<td>Yes</td>
<td>Yes</td>
<td>+</td>
<td>No</td>
<td>RCD</td>
</tr>
</tbody>
</table>

Table 1

© Diego Gutierrez

Table 2

© Diego Gutierrez
Fig. 1: Patient 6. Axial CT image depicting a unique diverticulum localized on the right colon with hyperdense content associated with colonic and pericolonic inflammatory changes (arrow)

© Radiology, Hospital Clinic de Barcelona - Barcelona/ES
Fig. 2: Patient 3. Coronal multiplanar reconstruction. A. Unique diverticulum associated with inflammatory changes and hyperdense content (arrow). Cecum localized in hypogastrium (arrowhead). The cecal appendix was not identified in the CT. B. Follow up CT scan of the same patient. Complete resolution of the inflammatory changes.

© Radiology, Hospital Clinic de Barcelona - Barcelona/ES
Fig. 3: Patient 2. Axial CT image of the lower abdomen depicting right colonic inflammatory changes in the presence of multiple diverticular images (arrow). The left colon also presents multiple non complicated diverticula (arrowhead)

© Radiology, Hospital Clinic de Barcelona - Barcelona/ES
**Fig. 4:** Oblique multiplanar reconstruction centered in the right lower quadrant of patient number 6. The normal appendix is clearly identifiable (arrow)

© Radiology, Hospital Clinic de Barcelona - Barcelona/ES
**Fig. 5:** Patient 4. A. Axial CT image of the lower abdomen. Right colon diverticulum with hyperdense content localized in the antimesocolic edge associated with inflammatory changes (arrow). B. Axial CT image of the same patient caudal to the former. A normal cecal appendix is identified in the lower right quadrant (arrow). The inflammatory changes are localized in the proximity of the diverticulum with a minimum compromise of the periappendicular fat.

© Radiology, Hospital Clinic de Barcelona - Barcelona/ES

**Fig. 6:** Patient 1. Coronal and axial CT images. Hyperdense diverticulum localized in the hepatic flexure of the colon associated with inflammatory changes (arrow). Surgical drain (arrowhead).

© Radiology, Hospital Clinic de Barcelona - Barcelona/ES
Fig. 7: Differed barium enema of patient 1. A unique diverticular image is identified in the right colon, proximal to the hepatic flexure (arrow). The findings are concordant with the CT image (see Fig. 6).

© Radiology, Hospital Clinic de Barcelona - Barcelona/ES
Conclusion

Imaging studies play a key medical decision-making role in patients with abdominal pain, especially in low clinical suspicion pathologies.

RCD is a condition of low incidence, benign course and primarily conservative treatment [9]. The clinical presentation similar to more common diseases affecting a relatively young group of patients [10,11] makes the knowledge of the CT imaging findings mandatory to reach the correct radiologic diagnosis, avoiding unnecessary surgical procedures.

If a right colonic diverticulum associated with inflammatory changes is identified in conjunction with a normal cecal appendix, the CT diagnosis of RCD is very likely. Diverticulum identification is facilitated by the presence of hyperdense content, in relation with the fecalith inside, this being a key finding that increases diagnostic confidence.
References

8. Wada M, Kikuchi Y, Doy M. Uncomplicated acute diverticulitis of the cecum and ascending colon: sonographic findings in 18 patients. AJR 1990; 155:283-287