How to evaluate the appendix with borderline diameter on CT: Reconsideration of the established CT criteria and proposal of a solution derived from ultrasonography

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Purpose

The aim of this study is to evaluate the limitations of established CT criteria for acute appendicitis and to propose a feasible CT criterion, diameter with compression (DWC) drew from ultrasonographic criteria especially for the appendix with borderline diameter.

Methods and Materials

We retrospectively reviewed medical records of 460 adult patients who underwent CT for suspected appendicitis between July and October 2009. In total, 216 patients (99 males, 117 females) with visible appendices were enrolled after pathologic or clinical confirmation. A 5-year-experienced abdominal radiologist analyzed CT findings of appendix: maximal outer diameter (MOD), mural thickness and enhancement, intraluminal content, periappendiceal infiltration, appendicolith and DWC which is expected diameter after deduction of intraluminal compressive contents such as air or feces. A comparison between appendicitis group and non-appendicitis group was performed using Chi-square test for mural enhancement, periappendiceal infiltration and appendicolith. For MOD, mural thickness, and DWC, receiver operating characteristic (ROC) curves were constructed.

Results
<table>
<thead>
<tr>
<th>Intraluminal content</th>
<th>MOD</th>
<th>DWC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collapsed</td>
<td>Already collapsed</td>
<td>DWC = MOD</td>
</tr>
<tr>
<td>Completely air-filled</td>
<td>Completely compressive</td>
<td>DWC = MOD – inner diameter</td>
</tr>
<tr>
<td>Face-filled</td>
<td>Completely compressive</td>
<td>DWC = MOD – inner diameter</td>
</tr>
<tr>
<td>Completely fluid-filled</td>
<td>Not compressive</td>
<td>DWC = MOD</td>
</tr>
<tr>
<td>Filled with air &amp; fluid</td>
<td>Partially compressive</td>
<td>DWC = MOD – depth of intraluminal gas</td>
</tr>
</tbody>
</table>

**Fig.**: Definition of diameter with compression (DWC) comparing to maximal outer diameter (MOD).
References: M. Y. Kim; Radiology, Hanyang University Medical College, Guri-si, KOREA, Republic of
MOD was ranged from 5.7mm to 26.3mm in 80 appendicitis patients and from 3.1mm to 9.8mm in 136 non-appendicitis patients.

The area under the ROC curve (AUC) of MOD, DWC and mural thickness was 0.967, 0.973 and 0.670. The optimal cutoff value was greater than 8.2mm of MOD and greater than 6.4mm of DWC.

MOD between 5.7mm and 9.8mm was the overlapping range in which 25 out of 80 appendicitis patients (31.2%) and 62 with 18 periappendiceal inflammation out of 136 non-appendicitis patients (45.6%) were included. In the overlapping range, AUC of MOD sharply declined to 0.767 but AUC of DWC remained 0.923. Use of a criterion of DWC yielded a sensitivity of 91.7%, a specificity of 83.3% and an accuracy of 86.2%, whereas using a criterion of MOD theses values were 66.7%, 83.3% and 74.4%, respectively. Sensitivity and accuracy of MOD were lower than the values obtained using a criterion of DWC.

Conclusion

CONCLUSION: Appendices with borderline diameter on CT are still difficult to interpret by established criteria due to enlargement by normal air-filling or periappendiceal inflammation. However, the new criterion of DWC more than 6.4mm can improve diagnostic performance.

CLINICAL RELEVANCE/APPLICATION: DWC is affected not by normal distension or periappendiceal inflammation but by true appendicitis. Therefore DWC is a consistent CT criterion to evaluate appendicitis regardless of MOD.

References


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