DIAGNOSING ACUTE APPENDICITIS ON ULTRASOUND—WHERE DO WE STAND?

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Disclosure

- No relevant financial or non-financial relationships to disclose
Outline

- Background/ Aim of study
- Standard
- Target
- Methodology
- Results
- Intervention/ Action plan
- Conclusion
Background/ Aim

- Acute appendicitis is a common acute surgical condition of the abdomen in adults
- Ultrasound can be of great value
  - Availability
  - Lack of ionizing radiation
  - Dynamic
- Aim to determine the sensitivity of ultrasound in detecting acute appendicitis in adults at two tertiary care centres (Site 1 and Site 2)
- Compare with values obtained from the literature
- Make departmental changes to try and improve our sensitivity
Standard

- Literature review
  - 2007 systematic review\(^1\) (25 studies and 9,121 patients): sensitivity of 83.7%
  - 2006 meta-analysis\(^2\) (15 studies and 1,947 patients): sensitivity of 83%


Figure 1e: Graph show sensitivity recorded in individual series of US for adults. Point estimates (□) and 95% CIs (horizontal lines) are given for each series. The meta-analytic summary estimate is represented by the vertical line. Outliers have not been excluded on these graphs.

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Computed tomography and ultrasonography in the diagnosis of equivocal acute appendicitis

A meta-analysis

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Table 3 - Summary of individual ultrasonography studies' sensitivities and specificities with their 95% confidence intervals.

<table>
<thead>
<tr>
<th>Study</th>
<th>TP</th>
<th>TN</th>
<th>FP</th>
<th>FN</th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (95% CI)</th>
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<tbody>
<tr>
<td>Schwerk et al21</td>
<td>115</td>
<td>394</td>
<td>8</td>
<td>15</td>
<td>88.46 (81.83-92.88)</td>
<td>98.01 (96.12-98.99)</td>
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<tr>
<td>Rubin and Martin et al22</td>
<td>40</td>
<td>84</td>
<td>5</td>
<td>5</td>
<td>88.89 (76.50-95.16)</td>
<td>94.38 (87.51-97.58)</td>
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<td>Skaane et al23</td>
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<td>19</td>
<td>77.91 (68.05-85.38)</td>
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<tr>
<td>Schwerk et al24</td>
<td>174</td>
<td>651</td>
<td>12</td>
<td>20</td>
<td>89.69 (84.61-93.23)</td>
<td>98.19 (96.86-98.96)</td>
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<td>Rioux25</td>
<td>42</td>
<td>118</td>
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<td>3</td>
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<td>123</td>
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<td>40</td>
<td>48.72 (37.95-59.61)</td>
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<td>Zielke et al30</td>
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<td>Pickuth et al39</td>
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<td>87.10 (78.92-94.26)</td>
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<td>550</td>
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<td>Summary</td>
<td>2294</td>
<td>6118</td>
<td>262</td>
<td>447</td>
<td>83.69 (82.26-85.03)</td>
<td>95.89 (95.38-96.35)</td>
</tr>
</tbody>
</table>

* Studies comparing the role of ultrasonography and computed tomography in the diagnosis of patients with equivocal appendicitis.
TP=true positive result, TN=true negative result, FP=false positive result, FN=false negative result.
Target

- To meet or surpass the standard
Methodology

- Surgical database from HGH and J HCC was searched and data collected over a six year time period (October 1, 2007 - September 30, 2013)
  - 664 reports, 402 of which were included in the audit
  - Inclusion criteria:
    - Histopathology-proven diagnosis of acute appendicitis and utilization of pre-operative ultrasound (alone or with CT)

- Ultrasound reports retrieved from PACS were classified as:
  - Negative: appendix normal, equivocal or not visualized
  - Positive: appendix in keeping with acute appendicitis

- Statistical analysis
  - Sensitivity
Results

- Combined average sensitivity for Site 1 and Site 2 = 0.72
- Average sensitivity for Site 1 = 0.66
- Average sensitivity for Site 2 = 0.78
- Trend over time, 2007-2013:
  - Site 1 = 0.50 to 0.65
  - Site 2 = 0.43 to 0.83
Results

Overall sensitivity compared to target sensitivity

Site 1  Site 2

Actual  Target
Results

Yearly sensitivity compared to target sensitivity

Site 1
Site 2
Target
Interventions/ action plan

- Results provided to sonographers
- Suggest departmental changes:
  - When calling for the patient from ER, ensure recent administration of analgesics
  - Begin in RLQ
    - To ensure analgesics have not worn off and graded compression can be performed
    - To ensure enough time and attention is given to searching for the appendix
  - Consider transvaginal imaging
  - If unsuccessful at finding the appendix
    - Second look ultrasound by a more experienced sonographer
    - If appendix is found, first sonographer should try to reproduce the finding for optimal learning
Action plan for the Emergency Department

- Provide results to the ER physicians
- Request their cooperation with coordinating analgesics with ultrasound appointment
Conclusion

- Below standard at Site 1 and at standard for Site 2 for the most recent year of data
- The trend is that of improved sensitivity over time
- With departmental changes, hopefully the sensitivity will continue to improve
- Re-audit to assess compliance and determine whether sensitivity has increased
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- Dr Kavita Dhamanaskar- Project supervisor, Site supervisor
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- Dr Abdullah Alabousi- Data collection
- Candice Kung- Data collection
References


