Defying Diagnosis: Nonspecific Abdominal Pain

Robert J. Vissers, MD FACEP FRCPC
Medical Director, Emergency Medicine
Associate Chief Medical Officer
Legacy Emanuel Hospital
Adjunct Associate Professor, OHSU
Portland, OR

Or: Remember that guy with abdominal pain you sent home…?

Case 1

His final diagnosis will most likely be:

A) Nonspecific abdominal pain
B) Appendicitis
C) Cholecystitis
D) Ectopic pregnancy

The Challenge of Appendicitis (Abdominal Pain)

- Common complaint
- Huge spectrum of disease and acuity
- Common source of misdiagnosis
- Risk management issues
- Don’t follow the rules
- Consumes resources and time
Epidemiology (The Challenge)
- 5-10% of all visits
- 18-42% admitted, 63% in elderly
- 40 to 50% remain undiagnosed at D/C
- Initial impression only 50% - 65% correct

Evolution of Abdominal Pain Management
- An ED diagnosis
- More management options
- More specific diagnosis
- Imaging will continue be the greatest area of advance and change

Diagnosis of appendicitis: Risk based approach?
- 4th highest percentage of closed claims
- 15% of total dollars paid
- Majority are missed appendicitis
- Acute gastroenteritis most common misdiagnosis
Case 1 continued

- 36 hrs AP
- + N&V, mild anorexia, loose stools
- T 36º, P 112
- Tender RLQ
- BS normal, Rectal normal
- No peritoneal signs

You would:
A) Call surgery to evaluate for probable appendicitis
B) Order a renal protocol CT
C) Order a CT with contrast to rule out appendicitis
D) Admit for observation

Case 1 continued

Admitted for observation
Exam is unchanged
Low grade temp overnight
An appendiceal CT is performed….

CT with contrast
Final Diagnosis:
Appendicitis
(We knew it all along)
Unruptured at OR
(Thank god)

CT : Normal Appendix

CT renal protocol

Appendicitis
What are the odds?

Epi:
- Prevalence of acute appendicitis is 12% to 28% in acute abdominal pain
- Up to 32% if less than 50 years of age

Legal:
- Abdo pain 4th highest closed claim dollars
- Majority are missed appendicitis
Appendicitis: Can we improve the odds?

- Lab tests? *Probably not.*
- Imaging? *Yes.*

Is it Appendicitis?

<table>
<thead>
<tr>
<th>Historical feature</th>
<th>Sens</th>
<th>Spec</th>
<th>LR+</th>
<th>LR-</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLQ pain</td>
<td>0.81</td>
<td>0.53</td>
<td>7.31</td>
<td>0.28</td>
</tr>
<tr>
<td>Migration</td>
<td>0.64</td>
<td>0.82</td>
<td>3.18</td>
<td>0.50</td>
</tr>
<tr>
<td>No past similar pain</td>
<td>0.81</td>
<td>0.41</td>
<td>1.50</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Hx

History: No single historical feature can exclude appendicitis.
Palpation
- Location is unreliable and non-specific
- Rebound tenderness 81% sensitive and 50% specific for peritonitis
- Rebound is 63% to 76% sensitive and 56% to 69% specific in appendicitis
- Rebound has a 25% false positive rate

Is it Appendicitis?

<table>
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<tr>
<th>Physical finding</th>
<th>Sens</th>
<th>Spec</th>
<th>LR+</th>
<th>LR-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebound tenderness</td>
<td>0.63</td>
<td>0.69</td>
<td>3.70</td>
<td>0.43</td>
</tr>
<tr>
<td>Guarding</td>
<td>0.74</td>
<td>0.57</td>
<td>1.72</td>
<td>0.27</td>
</tr>
<tr>
<td>Rectal tenderness</td>
<td>0.41</td>
<td>0.77</td>
<td>3.10</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Guaic testing remains the most compelling reason to perform a rectal
Appendicitis: Lab
Which is true?
A) Pyuria or hematuria is often present if symptoms for > 3 days.
B) Repeated WBC at 6 hours may be helpful.
C) WBC is very sensitive for appendicitis.
D) C-reactive protein can rule out appendicitis.

WBC:
May be the most non-predictive, misleading study we obtain.

CT vs U/S
- 1994 large prospective trial directly compared CT with US:
  - Higher sensitivity (96% vs 76%)
  - Higher NPV (95% vs 76%)
  - Normal appendix seen (43% vs 4%)
  - Other diagnosis (48% vs 33%)
  - Overall accuracy (94% vs 83%)
53 y.o., RLQ pain
- appendicolith with peri-appendiceal fat stranding

60 y.o., periumbilical pain
- distended retrocecal appendix with enhancing wall

CT of the appendix
- IV + Oral + Rectal?
- Oral and Rectal?
- Rectal only?
- IV only?
- No contrast?

No oral contrast?
- Thin cut, helical CT in 300 consecutive patients – no oral contrast!
- Sens 96%, Spec 99%, Accuracy 97%
- Similar to other techniques
- (5 false negatives: 3 misreads early in study, other 2 were thin women)

CT false negative:
Thin patients, young women.

A systematic review of whether oral contrast is necessary for the computed tomography diagnosis of appendicitis in adults
Anderson BA, et al.
American Journal of Surgery
190 (September, 2005) 474–478

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Average performance of CT scanning protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>Reid et al 2004</td>
<td>95% (95%CI)</td>
</tr>
<tr>
<td>Rivals et al. 2001</td>
<td>95% (95%CI)</td>
</tr>
<tr>
<td>Bart et al. 2000</td>
<td>96% (95%CI)</td>
</tr>
<tr>
<td>Rivals et al. 1999</td>
<td>99% (95%CI)</td>
</tr>
<tr>
<td>Total</td>
<td>96% (95%CI)</td>
</tr>
</tbody>
</table>

Non-contrast CTs are at least as accurate as contrasted CTs in appendicitis!
Cost effective?

- 100 consecutive patients, all with focused CT + contrast
- 98% accurate for 53 patients with appendicitis
- Reduced negative lap rate and admissions outweighed cost of CTs ($500/patient)
  

Other diagnoses

- Non-focused scan, using 5mm cuts in area of appendix, 7-10mm elsewhere
- 552 patients, 97.6% accuracy for appy
- In negative patients, found alternative cause in 66.2%
  
  *Raman. AJR Am J Roent, 2002*

CT Radiation risk

- CT abdomen about 10 mSv
- 10 mSv = 1/2000 cancer risk
- Natural incidence of fatal cancer 1/5
- Risk varies considerably with study

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Effective dose (mSv)</th>
<th>Equivalent dose background radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CXR</td>
<td>0.02</td>
<td>2.4 days</td>
</tr>
<tr>
<td>L-Spines</td>
<td>1.3</td>
<td>158 days</td>
</tr>
<tr>
<td>CT Head</td>
<td>2.0</td>
<td>243 days</td>
</tr>
<tr>
<td>CT Abdomen</td>
<td>10.0</td>
<td>1190 days</td>
</tr>
</tbody>
</table>
Better outcomes with increased CT scans in suspected Appy?

- 2714 appendectomies, 1998-2004 reviewed
- CT use went from 12.3% to 84.4%
- Delay in treatment dropped (7.8% to 3%)
- Complications decreased (33% to 21%)
- No significant change in negative lap rate


Abdominal CT who?
- Equivocal H&P
- Women
- Elderly
- Inconclusive U/S

U/S in appy
- Can’t rule out appy
- Operator dependent

Paulson. NEJM, 2003
Case 2: Are we there yet?

- Child, sent in from pediatrician to “rule out appendicitis”
- Scenario 1:
  8 yo girl, (your colleague’s daughter), with intermittent abdominal pain for 2 days, no fever, no other sx, tender RLQ

The equivocal case?
Repeat after me “I don’t know”
Recheck in 24 hours

US in Pediatric Appendicitis

- Still operator dependent
- Getting better
- Sensitivity 80% to 95%
- Specificity 89% to 100%
- Color doppler may increase accuracy

Case 2: Are we there yet?

- Child, sent in from pediatrician to “rule out appendicitis”
- Scenario 2:
  2 yo boy, with intermittent fussiness, abdominal pain since am, no fever, no other sx, abd benign
**Intussusception: Imaging**

- Traditional Barium enema – being replaced with air or water contrast
- US 98-100% sensitive, suggested as first line modality
- Enema possibly reserved for therapy
- US guided enemas being used

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**Case 2: Are we there yet?**

- Child, sent in from pediatrician to “rule out appendicitis”
- Scenario 3:
  - 12 yo boy, abdominal pain for 2 days, decreased appetite, low grade fever, pain and tenderness RLQ, worse with walking

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Scoring Appendicitis

- “Alvarado” and “Samuel” scoring systems to predict Appendicitis
- Prospectively studied in 588 kids
- + LR 3.8 and 2.4 respectively
- - LR 0.4 and 0.3 respectively
- Cannot be the sole criteria used


Case 2: Are we there yet?

- Child, sent in from pediatrician to “rule out appendicitis”
- Scenario 4:
  - 15 yo girl, worsening abdominal pain for 5 days, looks unwell, low grade fever, diffuse pain and tenderness, worse RLQ - recently treated for “UTI”

Case 3

- 71 yo male
- Diffuse abdo pain X 2 days
- Constipation
- No fever, no N/V, no UTI sx
- On beta-blocker for HTN

- VSS, afebrile, uncomfortable
- Lower abdominal tenderness, R>L
- No peritoneal signs, no CVAT
- U/A - 6 WBCs / hpf
- Serum WBC 9.2
- Abdominal films - FOS
Case 3

His probable diagnosis is:
A) UTI
B) Constipation
C) Appendicitis
D) I don’t know but it’s probably badness

Case 3

- Vomiting, abdominal pain, confusion
- BP 92/60, P 72, T 38.6
- Tender lower abdomen, right > left
- U/A 12 WBCs and 4 RBCs
- Serum WBCs are 8.4 with 15% bands
- Antibiotics, fluid resuscitation, CT…

Case 3

- Gangrenous, perforated appendix
- Sepsis
- Multi-system organ failure

Appendicitis: Elderly

- 5-15% of abdo emergencies in elderly
- 50% of deaths in elderly
- More likely atypical or afebrile
- Perforation rates of 57% to 74%
Abdominal pain in older patients

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>&lt;50</th>
<th>&gt; 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biliary tract disease</td>
<td>6%</td>
<td>21%</td>
</tr>
<tr>
<td>Nonspecific pain</td>
<td>40%</td>
<td>16%</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>32%</td>
<td>15%</td>
</tr>
<tr>
<td>Bowel obstruction</td>
<td>2%</td>
<td>12%</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>2%</td>
<td>7%</td>
</tr>
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Beware the temptation of: the U/A and FOS

Abdominal pain in the elderly
About 40% of patients >65 ultimately require surgery

Summary: Pitfalls
- Gastroenteritis
- Constipation
- Urinalysis
- CBC
- Elderly
Summary: Pearls

- Re-evaluation
- CT strengths
- CT limitations
- Gut feeling
- I don’t know

Imaging in Suspected Intussusception*

Concern for intussusception

- YES, high suspicion
  - CONTRAST ENEMA (air or water soluble)
  - ULTRASOUND
  - Admit/Observe
  - Surgery
  - Dispo

- YES, moderate suspicion
  - ULTRASOUND

- NO, broader DDX
  - Consider CT

Adapted from Northwest Acute Care Specialists, Pediatric guidelines, 2005

Thank You