Ultrasound Of The Acute Abdomen – a survival guide

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Definition

- Rapid onset of severe abdominal pain usually requiring admission to hospital
Speed of diagnosis

• Stability of patient, site and severity of pain
• Trauma, non-traumatic
• Large proportion of patients will not have a diagnosis for their pain when they are discharged
• Ultrasound v CT v laparotomy
Patient Care

• Avoid delay.
• Assess patient condition, take a good history and above all LISTEN to what is not being said!!
• Use all information – biochemical and previous imaging
• Reassurance
• Ensure report delivered efficiently to appropriate point of referral for early patient management
History taking

- Demographic details, occupation, recent travel, history of recent abdominal trauma.
- Pain:
  - Onset (including whether new pain or previously experienced).
  - Site (ask the patient to point), localised or diffuse.
  - Nature (constant/intermittent/colicky).
  - Radiation.
  - Severity.
  - Relieving/aggravating factors (e.g., if worsened by movement/coughing, suspect active peritonitis; pancreatitis is relieved by sitting forward).
Associated symptoms

- Vomiting and the nature of vomitus (undigested food or bile suggests upper GI pathology or obstruction; faeculent vomiting suggests lower GI obstruction).
- Haematemesis or melaena.
- Stool/urine colour.
- New lumps in the abdominal region/groins.
- Eating and drinking - including when the patient's last meal occurred.
- Bowels - including presence of diarrhoea, constipation and ability to pass flatus.
- Fainting, dizziness or palpitations.
- Fever/rigors.
- Rash or itching.
- Urinary symptoms.
- Recent weight loss.
Trauma to the abdomen
Who provides the service?

Core and out of hours

- Paramedic
- Emergency medicine physician
- Sonographer
- Radiologist
- Trauma radiographer
Principles of Ultrasound in Emergency Medicine

• Limited examination
• Focused
• Specific question
• ‘Rule in’
• Record images
• c.f. radiology departmental examination
Free fluid: Fast (Focused Assessment with Sonography for Trauma)

- Employed to answer a single rule-in question rather than specifically evaluate a system.
- Takes less than 5 minutes
- Can be performed during resuscitation
- Has replaced diagnostic peritoneal lavage (DPL) as the primary assessment of blunt abdominal trauma.
FAST

• Employs a limited 4-6 view of the abdomen to rule in free fluid.
  – Hepatorenal space (Morrison’s pouch)
  – pericardial space
  – perisplenic space
  – suprapubic region
  – bilateral paracolic views

• 250ml of fluid
Liver Trauma
Renal trauma
Splenic collection
Non-traumatic pain

Types of Abdominal Pain

For Information, Visit: www.epainassist.com

<table>
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<tr>
<th>Right</th>
<th>Center</th>
<th>Left</th>
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</thead>
<tbody>
<tr>
<td>Gallstones</td>
<td>Hiatal Hernia</td>
<td>Pancreatitis</td>
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<tr>
<td>Stomach Ulcer</td>
<td>Heartburn</td>
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<td>Hepatitis</td>
<td>Hepatitis</td>
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<td>Duodenal Ulcer</td>
<td>Duodenal Ulcer</td>
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<td>Cholecystitis</td>
<td>Stomach Ulcer</td>
<td>Gastritis</td>
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<tr>
<td>Constipation</td>
<td>Bowel Disease</td>
<td>Constipation</td>
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<tr>
<td>Kidney Stones</td>
<td>Stomach Ulcer</td>
<td>Kidney Infection</td>
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<td>Pancreatitis</td>
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<td>Kidney Infection</td>
<td>Inflammatory</td>
<td>Bowel Disease</td>
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<td>Inflammatory</td>
<td>Umbilical Pain</td>
<td>Inflammatory</td>
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<td></td>
<td>Early Appendicitis</td>
<td>Pelvic Pain</td>
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<td>Pelvic Pain</td>
<td>Diverticulitis</td>
<td>Constipation</td>
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<td>Constipation</td>
<td>Inguinal Hernia</td>
<td>Irritable Bowel</td>
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<td>Appendicitis</td>
<td>Inflammatory</td>
<td>Syndrome</td>
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<td>Disease</td>
<td>Inguinal Hernia</td>
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<tr>
<td>Disease</td>
<td>Pelvic Pain</td>
<td>inflammatory</td>
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<td></td>
<td>Bladder Infection</td>
<td>Bowel Disease</td>
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<td>Prostatitis</td>
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Ultrasound Of The Acute Abdomen

Answer SIX basic questions:

• Is there blood (free fluid) in the peritoneal cavity?
• Is an abdominal aortic aneurysm (AAA) present?
• Is there evidence of obstructive uropathy?
• Is there evidence of biliary disease (cholelithiasis)?
• Is there evidence of a living intrauterine pregnancy?
• Is there a pericardial effusion?

» Brenchley J. Sloan J. 2000
Aetiology

- 34% no cause for pain identified
- 28% appendicitis
- 10% acute cholecystitis
- 4% small bowel obstruction
- 4% acute gynae
- 4% acute pancreatitis
- 3% ureteric colic
- 3% perforated ulcer
- 11% others – vascular origin, aortic aneurysm, cardiac problems
AAA: Abdominal Pain And Hypotension

- Aortic dimensions can be easily measured and although leakage cannot be assessed, the presence of a dilated aorta in patients with circulatory instability significantly speeds up diagnosis of a leaking abdominal aortic aneurysm and vascular referral.

  » BALLARD et al 1998
Kidneys
Renal colic

- Ultrasound – hydronephrosis, pyelonephritis – management pathway

- CTKUB – stones (exception – females of child bearing age)
Hydronephrosis - pregnancy

Is it normal for gestation?
Hydronephrosis – chronic retention

Cortical thickness?
Renal calculi

- Is it in the collecting system?
- Is it causing obstruction?
- Is it solitary?
Renal and ureteric stones
Hydronephrosis
Hydronephrosis – pelvic mass
Rhabdomyosarcoma
Pyelonephritis

- Often unilateral
- Discrepancy in size
- Focal echogenic area
- Hypervascularity
Increased cortico-medullary differentiation
Pancreas
Acute Pancreatitis

• Oedematous inflammation of the pancreas with severe upper abdominal pain.
• Diagnosis made on clinical grounds with a serum amylase $>1000$ iu/l.
• Predisposing factors include alcoholism, gallstones and mild blunt, abdominal trauma.
Acute pancreatitis
Chronic Pancreatitis

- Chronic changes due to recurrent bouts of inflammation with resultant fibrosis, stone formation and permanent damage.
- Patient presents with a similar pain to acute pancreatitis only more persistent and not as severe.
- Frequently occurs in alcoholics following multiple episodes of acute pancreatitis.
Chronic pancreatitis
Traumatic Pancreatitis

• Severe trauma may disrupt the duct spilling pancreatic juices into the surrounding tissues resulting in the development of large pseudocysts.
• Neck of pancreas is most vulnerable, the duct rupturing when compressed between the aorta and the spine.
• Distal pancreatectomy is often necessary
Traumatic dissection pancreatic body
Biliary Tree
Abnormal LFTs

• Serum albumin and bilirubin levels used to provide a true measure of hepatic function
• Alanine aminotransferase (ALT) or asparate transaminase (AST) sensitive markers of hepatocyte injury –
  – raised in acute hepatitis but also in chronic liver disease.
  – Very high levels of ALT (> 1,000iU/l) can due to hepatic ischaemia or cholangitis due to biliary stones
• Gammo-glutamyl transpeptidase (GGT) is a marker for biliary tract disease
• GGT along with ALP used as a specific marker of alcohol misuse
• History and exam should include possible non hepatic causes of raised LFTs e.g. right sided heart failure, endocrine disorders, diabetes and thyroid dysfunction
## Abnormal LFTs

<table>
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<tr>
<th>Liver Enzymes</th>
<th>Normal</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST</td>
<td>under 40 IU/l</td>
<td>40-200</td>
<td>Over 200</td>
</tr>
<tr>
<td>ALP</td>
<td>under 40 IU/l</td>
<td>40-200</td>
<td>Over 200</td>
</tr>
<tr>
<td>GGT</td>
<td>under 60 IU/l</td>
<td>60-200</td>
<td>Over 200</td>
</tr>
<tr>
<td>Alk Phos</td>
<td>under 112 IU/l</td>
<td>112-300</td>
<td>Over 300</td>
</tr>
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<tr>
<td>Bilirubin</td>
<td>under 1.2 mg/dl</td>
<td>1.2- 2.5</td>
<td>Over 2.5</td>
</tr>
<tr>
<td>Albumin</td>
<td>3.5-4.5 g/dl</td>
<td>3.0 -3.5</td>
<td>Under 3.0</td>
</tr>
<tr>
<td>Prothrombin time</td>
<td>Under 14 secs</td>
<td>14-17</td>
<td>Over 17</td>
</tr>
</tbody>
</table>
Chronic cholelithiasis
Acute cholecystitis
Acute cholecystitis
CBD dilatation
Biliary obstruction – IHD dilatation
Biliary obstruction - stones
Biliary obstruction – intra duct mass
Cholangiocarcinoma
Liver
Liver Mets- previous H/o Ca
Acute left loin pain – no prev history
Acute RUQ pain and hepatomegaly
Portal vein patency

Check for thrombus in PV, varicosities and recannulised umbilical vein
recannulised umbilical vein
Collections
Collections

RUQ pain, pyrexial, recent travel to Asia
H/o Cholecystectomy 10 years ago, RUQ pain
Biloma
Rectus sheath haematoma
Psoas muscle abscess

Psoas muscle abscess may present with fever, flank pain or abdominal pain

**Primary**: abscess occurs probably as a result of spread of an infectious process from an occult source in the body and can occur in patients with:

- diabetes mellitus
- intravenous drug abuse
- AIDS
- renal failure
- immuno suppression

**Secondary**: spread of infection from gastrointestinal disease (e.g. appendicitis, Crohn’s disease, diverticulitis)

- Renal disease is the second most common source
The rest
Acute Appendicitis

• Non-compressible sausage shaped structure, demonstrating no peristalsis.
• 75% lie behind the caecum and colon, making ultrasound access difficult.
• In cross section, it gives a target appearance >6mm in diameter, usually between 7 and 10 mm. The wall thickness can be 3mm or more.
site of purulent collection perforation appendix
Right Sided Colonic Diverticulitis

- Self limiting, benign condition
- All ages
- Congenital
- Not so rare
- Clinically appendicitis
- In 40% unnecessary hemicolecctomy performed.
Diverticulitis
Crohn’s
Lymphoma
Conclusion

- Abdominal ultrasound is first line investigation in the assessment of suspected acute biliary colic, renal colic, acute colonic diverticulitis, appendicitis and abdominal masses. Requested for acute pancreatitis with limited success.

- Patients with localised abdominal pain and tenderness are more likely to have a positive diagnosis on ultrasound.

- Raised WCC or an abnormal LFT in patients with acute abdominal pain is predictive of a higher yield of positive findings on ultrasound.

- Only one third of children with appendicitis will present with classic symptoms. Pain initially in midline and extending to RIF with guarding, favourable for appendicitis. N.B. High or ectopic appendix may be seen.
Conclusion

• Use all the clinical history to make a diagnosis
• Avoid over diagnosis, gallstones and dilated CBD may be incidental findings.
• Cholecystitis has thickened GB wall and intermittent pain whereas pancreatitis continual pain.
• Check biochemical results to aid diagnosis
• Use colour doppler to check patency and hypervascularity
• Check all previous imaging before suggesting follow up
References

• Ballard RB. 1998. THE SURGEON'S USE OF ULTRASOUND IN THE ACUTE SETTING Surgical Clinics of North America. 78 (2) 337–364


• White EK et al. 2014. Seeing past the appendix: the role of ultrasound in right iliac fossa pain Ultrasound, 22 (2): 104-112
Thank You