# Evaluation of the Acute Abdomen

**Melissa Whitmill, M.D.**
Assistant Professor of Clinical Surgery
The Ohio State University

---

## Acute Abdomen

- 10% of emergency room visits
- 40% d/c with diagnoses: unknown etiology
- 60% d/c with wrong diagnoses
- Acute vs. chronic pathology
- Atypical presentations most difficult

---

## The Acute Abdomen

- Any Abrupt Onset of significant abdominal pain
- Requires urgent decision, diagnoses, and treatment
- Treatment is often surgical
- Diagnoses often unclear, but treatment must be appropriate

---

## Pathophysiology of Pain

- **Somatic Pain**
  - Segmental spinal nerves
  - Pressure, inflammation, distention
- **Visceral pain**
  - Sympathetic, parasympathetic or somatic
- **Referred Pain**
  - IE Kehr's sign
**Patient Evaluation**

- History of Present Illness
- Pain description, Assoc sx, gyn/gu hx
- PMHx, Fam hx, Soc Hx
- PE
- Special Abdominal Focus
- Work up: Basic then Advanced
- “When you hear hooves its horses!”

**Associated Symptoms**

- Nausea, vomiting
- Fever, chills
- Anorexia, Weight loss
- Food intolerance
- Constitutional symptoms
- Change in Bowel habits
- GU symptoms

**Description of Pain**

- Onset and duration
- Character and severity
- Location and radiation
- What makes it better/What makes it worse
- Progression of Pain
- Associated Symptoms

**Gynecological / GU Symptoms**

- Last Menses
- Sexual History/Contraception
- Obstetric History
- Vaginal Discharge/pain
- Dysuria, frequency
- Pneumaturia, hematuria
<table>
<thead>
<tr>
<th>Past Medical History</th>
<th>Physical Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Previous GI disease or treatment</td>
<td>• General Appearance</td>
</tr>
<tr>
<td>• Cardiac or Pulmonary Disease</td>
<td>• Vital Signs</td>
</tr>
<tr>
<td>• Medications</td>
<td>• HEENT</td>
</tr>
<tr>
<td>• Other Systemic Illnesses</td>
<td>• Chest/CV</td>
</tr>
<tr>
<td>• Recent Unassociated Illnesses</td>
<td>• Abdomen (Look, Listen, Feel)</td>
</tr>
<tr>
<td>• Trauma</td>
<td>• Gyn / rectal / GU</td>
</tr>
<tr>
<td></td>
<td>• Extremities / neuro/psych</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abdominal exam: LOOK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Distention</td>
</tr>
<tr>
<td>• Breathing, splinting</td>
</tr>
<tr>
<td>• Discoloration</td>
</tr>
<tr>
<td>• Scars</td>
</tr>
<tr>
<td>• Hernias</td>
</tr>
</tbody>
</table>
Abdominal exam: 
LISTEN

- Percussion
- Auscultation
- Bowel Sounds
  - Presence
  - Character
  - Frequency

Abdominal exam: 
FEEL

- Localized tenderness
- Abdominal vs. flank or CVA
- Masses
- Hernia
- Ascites
- Peritoneal Signs
  - Guarding, rebound, referred rebound

Work up: Basics

- CBC, Lytes, UA
- Abd Xrays (KUB, CXR, upright)
- other labs: Amylase, LFT’s, HCG
- EKG

Workup: Advanced

- Ultrasound: Pelvis/RUQ
- Computerized Tomography
- NG tube (also may be treatment)
- Endoscopy, UGI, contrast enema
- Laparoscopy and laparotomy
### Etiology

- Appendicitis
- Cholecystitis
- Diverticulitis
- Perforated ulcer
- Pancreatitis
- Perforated bowel
- Bowel obstruction
- Mesenteric ischemia
- IBD
- Ectopic pregnancy
- PID
- Gastroenteritis
- Nephrolithiasis

### Appendicitis

- History: periumbilical pain migrates to RLQ, anorexia, short time course
- Exam: tenderness in RLQ, pelvic, Rovsing’s sign, Psoas, obturator, referred rebound
- CT or US may be helpful

### Other Causes

- Volvulus
- Cholangitis
- Pneumonia
- MI
- Ovarian pathology
- Hepatitis
- Sickle cell disease
- DM ketoacidosis
- Uremia
- Hypercalcemia
- Porphyria
- Intussusception
- Lupus
- HIV
- Others
### Small Bowel Obstruction

- History of surgery—adhesions
- Crampy pain, vomiting, obstipation
- Xrays often diagnostic
- Causes:
  - Adhesions
  - Hernia
  - Neoplasm
  - Intussusception

### Perforated Ulcer

- History: PUD, NSAID’s, other illness
- Free air on Abd Xray
- Generalized Peritonitis
- Most patients have no previous ulcer history

### Small Bowel Obstruction

![Image of small bowel obstruction x-ray]

### Free Air

![Image of free air x-ray]
### Diverticulitis

- **History:** Constipation, LLQ pain, fever, diarrhea prev hx of diverticulitis.
- **Exam:** LLQ tenderness, +/-
- **CT is diagnostic**
- **Mostly non operative Rx,**
- **Surgery for perf, free fluid, antibiotic failure**
- **Abscesses need drained (by CT)**

### Pancreatitis

- **History:** gallstones, ETOH, pain radiating to back
- **Exam:** Generalized tenderness, ?peritonitis
- **Amylase elevated (>200-5000)**
- **False elevations in SBO, perforation, ectopic, parotitis,**
- **US for stones, CT to evaluate panc**
### Cholecystitis

- **History**: post prandial RUQ pain, recurrent episodes, ~30% present with acute attack
- **Exam**: RUQ tenderness, +/- jaundice, fever, Murphy's sign
- **Labs**: amylase, LFT’s, WBC, lytes
- **US**: stones, thickened GB wall, Fluid
- **RX**: cholecystectomy, antibiotics

### Gastroenteritis

- **History**: Widely varied, diarrhea, vomiting, crampy pain, not localized, household contacts, previous history
- **Exam**: +/- fevers, diffuse tenderness, tender but not peritonitis,
- **RX**: IVF, bowel rest, observation

### Pelvic Inflammatory Disease

- **History**: sexually active women, previous STD, vag discharge, dysuria
- **Exam**: Cervical motion tenderness, vag discharge, +/- adnexal mass (R\O TOA)
- **Labs**: WBC, UA, HCG
- **US**: may be helpful
- **IV antibiotics, observation**
### Mesenteric Ischemia

- History: chronic intestinal ischemia, cardiac arrhythmias, ASCVD, smoking, low flow, hypercoagulable state.
- Exam: Pain out of proportion to exam.
- Labs: WBC, amylase, lactate
- Abd x-rays: “thumb printing”

### Ectopic Pregnancy

- History: Pregnant, menstrual irregularity, complete sexual history
- Exam: Shock, Adnexal mass, LQ tenderness
- Labs: Pos. HCG
- US may be diagnostic, fast, available
- RX: Operative

### Ureterolithiasis

- History: flank pain, hematuria, radiation to groin, previous hx.
- Exam: restless, significant pain, no abd tenderness.
- Labs: UA, crystals, RBC. Normal WBC
- IVP, CT
- Hydration, pain control
Ureterolithiasis

The Acute Abdomen: A pediatric surgeon’s view

Jonathan I. Groner MD
Professor of Clinical Surgery
The Ohio State University

Pitfalls

- Old age, young age
- Immunocompromised pt
  - HIV, steroids, ? Diabetes
- Compromised exam
  - Spinal cord injury, mental status

Definition of Acute Abdomen

- Development of an acute abdominal condition requiring urgent therapy (generally surgical)
- Pain of more than 6 hours duration is often surgical in nature (Cope’s textbook)
- Pediatric population generally defined as age<18
### Etiology of Acute Abdomen in Children

- Acute appendicitis
- Meckel’s diverticulum
- Intussusception
- Necrotizing enterocolitis
- Small bowel obstruction
- Blunt abdominal trauma
- Child Abuse (special topic)

### Appendicitis

- Most common surgical emergency for pediatric surgeons
- Possibly more common in western societies
- Peak incidence in 2nd decade of life (age 11 through 20)
- “The great imitator” can be confused with other diseases

### Diagnosis of Acute Abdomen

- Worsening or diffuse abdominal pain
- Abdominal distention
- Signs of shock/dehydration (late)
- “Backwards” syndrome of infants with peritonitis:
  - Hypothermia instead of fever
  - Apnea instead of tachypnea
  - Low WBC instead of high WBC

### Differential Diagnosis

- Gastroenteritis
- Urinary tract infection
- Mesenteric adenitis
- Pneumonia (right lower lobe)
- Meckel’s diverticulum
- Inflammatory bowel disease
<table>
<thead>
<tr>
<th>Appendicitis</th>
<th>Acute Appendicitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• “Acute:” appendix is inflamed but intact. Illness duration &lt; 1 day</td>
<td><strong>Classic symptoms:</strong></td>
</tr>
<tr>
<td>• “Gangrenous:” appendix is inflamed with necrosis of the appendiceal wall</td>
<td>• Anorexia</td>
</tr>
<tr>
<td>• “Ruptured:” appendix is inflamed with rupture of the appendiceal wall and spillage of infection into abdomen</td>
<td>• Nausea</td>
</tr>
<tr>
<td></td>
<td>• Mild abdominal pain of gradual onset</td>
</tr>
<tr>
<td></td>
<td>• Pain gradually becomes more pronounced in the right lower quadrant and persists</td>
</tr>
<tr>
<td></td>
<td>• Low grade fever</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendicitis - Diagnosis</th>
<th>Acute Appendicitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Rule: A careful history and a thorough physical examination are the keys to making the diagnosis of appendicitis</td>
<td><strong>Classic physical examination findings:</strong></td>
</tr>
<tr>
<td>• Rule: You can't CT scan every child who walks into the emergency department with abdominal pain</td>
<td>• Right lower quadrant abdominal tenderness</td>
</tr>
<tr>
<td></td>
<td>• Referred tenderness</td>
</tr>
<tr>
<td></td>
<td>• Easily reproducible examination</td>
</tr>
<tr>
<td></td>
<td>• Mild tachycardia</td>
</tr>
<tr>
<td></td>
<td>• Low grade fever – patient often looks flushed</td>
</tr>
</tbody>
</table>
### Acute Appendicitis

- Usually ill > 48 hours
- Usually fever > 101.5
- Frequent vomiting, generalized abdominal pain
- Generalized abdominal tenderness
- May appear dehydrated

### Appendicitis – Gangrenous

**Symptoms**

- Usually ill > 48 hours
- Usually fever > 101.5
- Frequent vomiting, generalized abdominal pain
- Generalized abdominal tenderness
- May appear dehydrated

### Appendicitis – Perforated

**Physical examination**

- Patient appears ill and dehydrated
- Vomiting, “diarrhea”
- Generalized abdominal tenderness
- May have signs of shock – can require significant fluid resuscitation
- May have bowel obstruction at presentation
Ruptured appendix with multiple abscesses

Appendicitis - Ruptured

- IV fluids: 20 ml/kg normal saline bolus (may repeat)
- Antibiotics: gentamicin and clindamycin
- Foley catheter
- NG tube (if signs of bowel obstruction)
- Variety of operative approaches

Appendicitis - Treatment

- NPO
- IV fluids
- IV antibiotics
- Acute: appendectomy (laparoscopic vs. open)
- Gangrenous: appendectomy (laparoscopic vs. open)

Gastroenteritis

- Generalized abdominal pain - crampy
- Non-tender abdomen
- Either vomiting or diarrhea must be present
- Exposure to infectious source (ill sibling, contaminated food exposure, camping trip, foreign travel)
### Diarrhea

- Diarrhea refers to frequent *high volume* watery stool output
- Some patients with ruptured appendicitis will complain of diarrhea
- Many of these patients are having rectal irritation from peritonitis or pelvic abscess leading to rectal spasms and frequent *low volume* bowel movements
- A careful history is important

### Meckel’s Diverticulum

- A bleeding Meckel’s diverticulum usually presents as painless lower GI hemorrhage which may be massive
- A perforated Meckel’s diverticulum may mimic advanced appendicitis
- Occasionally presents as bowel obstruction

### Meckel’s Diverticulum

- **The disease of “two’s”**
  - Lesion present in 2% of people
  - Two feet from the terminal ileum
  - Two mucosa types (gastric and intestinal)
  - Two common surgical problems
    - ✔ Perforation
    - ✔ Bleeding

### Meckel’s Diverticulum

- **Imaging**
  - Due to the presence of gastric mucosa, the lesion can be found on a nuclear medicine scan fairly easily
- **Treatment**
  - Operation involves excision with primary anastamosis
Intussusception

- Telescoping of intestine onto itself causing obstruction
- Most common type is idiopathic (no known cause)
- Typical age group is 3 months to 3 years
- Episodic pain with minimal symptoms in between
- Infants may be lethargic

Diagnosis and Treatment

- Barium Enema: historical, not used anymore due to risk of perforation
- Ultrasound: “target sign”
- CT scan: multilayered mass (caution: transient, asymptomatic intussusceptions can also be seen on CT scan)
Intussussception

Air Contrast enema
- Diagnostic
- Therapeutic
- Low risk of perforation
- Standard of Care
- Generally performed by pediatric radiologists only

Small Bowel Obstruction

Etiology
- Congenital
  ✓ Malrotation
  ✓ Inguinal hernia
- Post-operative
  ✓ Any abdominal operation
  ✓ VP shunt
  ✓ Nissen – danger (difficult to diagnose)

Small bowel obstruction in an infant due to an incarcerated right inguinal hernia
Small Bowel Obstruction

- Nissen Fundoplication patients
- May have developmental delay
- Often have a gastrostomy tube
- *Usually cannot vomit!*
- SBO can be difficult to diagnose
- May have “closed loop” obstruction
- May need urgent exploration

Necrotizing Enterocolitis (NEC)

- A common cause of acute abdomen in the NICU but rare in the rest of the world
- Leading killer in NICU’s across the United States
- Primarily infectious process
- Etiology poorly understood
- Often rapidly progressive
- Rare in full term infants (but seen occasionally in infants with cardiac disease)

Necrotizing Enterocolitis (NEC)

- Most cases are diagnosed in the NICU or special care nursery
- Patients at risk are profoundly premature or have significant cardiac disease
- Not present at birth but occurs within the first few days of life

Strangulated bowel obstruction due to inguinal hernia in an infant
Abdominal wall discoloration in an infant with severe NEC

Blunt Abdominal Trauma

- Children are more susceptible to intra-abdominal injuries due to blunt trauma than adults because:
  - Thinner abdominal wall
  - Less fat around solid organs
  - More flexible rib cage
  - Higher risk behaviors?
Child fell off bicycle – note handlebar mark in right lower quadrant

Blunt injury to colon with perforation and peritonitis

“Seat belt sign”
Each of these children had major intra-abdominal injuries

Child Abuse – special topic

- #1 injury-related killer of children at NCH for the last 3 years
- A “silent epidemic” of major proportions
- Patients often have multisystem injuries
- Patients often make multiple visits to multiple EDs or clinics
- Patients may show up in your office with unrelated complaints
### Child Abuse

<table>
<thead>
<tr>
<th>Common “histories” in child abuse cases:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Injury history</strong></td>
</tr>
<tr>
<td>✓ Child fell off a couch</td>
</tr>
<tr>
<td>✓ Child fell on a toy</td>
</tr>
<tr>
<td>✓ Child injured by a very young sibling</td>
</tr>
<tr>
<td><strong>Non-specific history</strong></td>
</tr>
<tr>
<td>✓ Infant has been fussy for hours</td>
</tr>
<tr>
<td>✓ Infant refuses to eat</td>
</tr>
<tr>
<td>✓ Infant “passed out” at home</td>
</tr>
</tbody>
</table>

- **90% of children who experience physical abuse are injured by age 3**
- The vast majority of children who are intentionally injured are injured by a caregiver (mother, father, boyfriend, babysitter), NOT a stranger
- Failure to recognize abuse on an ED visit can be fatal

- **Beware of history that does not make sense or changes**
- **Beware of injuries blamed on too-young siblings**
- **Beware of young child with multiple ED visits for injuries**
- Child Abuse can happen in a family of any race, ethnicity, or socioeconomic background

### Hemoperitoneum and liver laceration due to blunt trauma (intentional injury)
Pancreatic transection in 4 year old (blunt trauma - intentional injury)

Child Abuse

- All suspected child abuse cases should be referred to a pediatric trauma center
- These children usually need skeletal survey, eye exam, social work interview, exam by child abuse specialist
- Siblings in the home should be examined as well

Conclusions

- Acute abdomen in children can be due to infectious disease or trauma
- Shock can be difficult to diagnose in children with acute abdomen
- Standard initial management includes IV hydration, antibiotics
- Many of these patients may deserve transfer to a children's hospital

Characteristic bruises in a child abuse victim
The End