Complications of pediatric endoscopy and colonoscopy

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I have no financial relationships with any commercial entity to disclose

Learning objectives

• To identify immediate and delayed complications of endoscopy/colonoscopy
• To review the current literature and the estimated rates of complications
• To discuss several representative clinical case scenarios

Informed consent

• A process with the key element: Disclosure
  – Nature of the procedure
  – Benefits
  – Risks
  – Alternatives
  – Limitations
• Full disclosure strengthens physician-patient relationship

Complications (adults)

• Most common cardiopulmonary events
  – Aspiration
• Perforation (0.01-6%)
• Major hemorrhage
• Infection
• Pancreatitis (1.5-11%)
• Mortality (<0.1%)

Complication types

• Pre-procedure (preparation)
• Intra-procedure (sedation/anesthesia vs. procedural)
• Post-procedure

ASGE: Complications of upper GI endoscopy, 2002

Pre-procedure complications

- Likely rare, but incidence not known
- More likely associated with colonoscopy and with young age
- Dehydration, electrolyte abnormalities, and hypoglycemia

Inadequate cleansing

- Hinders polyp detection
- Procedure may be repeated
- Increases procedure/anesthesia time
- May increase risk/severity of complications

Pre-procedure preparations

- ASA status assessment
- Chronic conditions (IDDM, renal disease, heart disease requiring abx prophylaxis, patients on anti-coagulation Rx)
- Use of medications that can affect anesthesia or bleeding time including alternative/complimentary therapies

Antibiotic prophylaxis - Cardiac

- Bacteremia → routine daily activity
  - Brushing/flossing 20-68%
  - Toothpick use 20-40%
  - Chewing food 7-51%
- Bacteremia → endoscopic procedures
  - EGD 0-8%
  - Sigmoidoscopy 0-1%
  - Colonoscopy 0-15%

Antibiotic prophylaxis

- Approximately 30 million endoscopic procedures/year in US
- Only 15 cases of infectious endocarditis
- Not recommended - all cardiac conditions with routine endoscopic procedures
- Recommended - PEG placement, some ERCP and EUS/FNA, cirrhosis with acute GI bleeding

Instrument reprocessing

- Manual cleaning is essential
- ASGE standards
  - High level disinfection of endoscopes
  - Sterilization of reusable accessories
- 1 in 1.8 million risk of infection when proper protocol followed
Anti-platelet medication and anticoagulants

- No data supporting discontinuation of aspirin or NSAIDs prior to endoscopic procedures

“Low risk procedures”
- Diagnostic EGD, colonoscopy +/- biopsy
- ERCP without sphincterotomy
- EUS without FNA
- Enteroscopy

ASGE Recommendations

- **Low risk procedure**
  No adjustment for warfarin, LMWH or anti-platelet medications

- **High risk procedure and low risk condition**
  Stop anticoagulation 3-5 d, LMWH 8h, and anti-platelet medications (except aspirin, NSAIDs) 5-7 d before procedure

- **High risk procedure and high risk condition**
  Bridge with heparin or LMWH


Intra-procedure complications

- **Cardiopulmonary**
  - Hypoxia, arrhythmia, hyper/hypotension, respiratory distress, brady/tachycardia, wheezing, aspiration, laryngeal spasm

- **Gastrointestinal**
  - Bleeding, distention, abdominal pain, nausea, vomiting, perforation

- **Drug reaction and others**
  - Rash/hives, paradoxical reaction, frozen chest, fever

Intra-procedure complications (EGD)

- Study of 13 Pediatric Endoscopy Database System Clinical Outcomes Research Initiative (PEDS-CORI) sites of 10,236 procedures in 9,234 patients
- Immediate complications reported in 239 procedures (2.3%, 95% CI 2.0%-2.6%)
- The most common were hypoxia in 157 (1.5%) and bleeding in 28 (0.3%)
- Complication rates significantly higher in the youngest age group, highest ASA class, females, IV sedation, and in the presence of a fellow

Thakkar et al, GIE, 2007

Intra-procedure complications (EGD)

<table>
<thead>
<tr>
<th>Investigator, y</th>
<th>Country</th>
<th>No. of procedures</th>
<th>Complication rate (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoat, 1981</td>
<td>USA</td>
<td>3044</td>
<td>1.7</td>
<td>1.1-2.3</td>
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<tr>
<td>Balch et al, 1997</td>
<td>USA</td>
<td>1633</td>
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<tr>
<td>Tari and Sany 1989</td>
<td>China</td>
<td>558</td>
<td>0.9</td>
<td>0.5-1.7</td>
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<tr>
<td>Zafar et al, 1991</td>
<td>India</td>
<td>189</td>
<td>0.9</td>
<td>0.5-1.5</td>
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<tr>
<td>Amin and Chilukuri 1997</td>
<td>USA</td>
<td>142</td>
<td>2.9</td>
<td>0.4-6.0</td>
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<tr>
<td>Balslev et al, 1996</td>
<td>UK</td>
<td>99</td>
<td>0.7</td>
<td>0.2-2.5</td>
</tr>
<tr>
<td>Gandhi et al, 1991</td>
<td>USA</td>
<td>98</td>
<td>0.5</td>
<td>0.3-1.3</td>
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<tr>
<td>Rajh and Tuck 1991</td>
<td>USA</td>
<td>65</td>
<td>0.9</td>
<td>0.5-1.5</td>
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<tr>
<td>Edwards, et al 1997</td>
<td>USA</td>
<td>50</td>
<td>0.9</td>
<td>0.6-1.2</td>
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<td>Graham et al 1998</td>
<td>USA</td>
<td>57</td>
<td>4.5</td>
<td>0.4-13.7</td>
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<tr>
<td>Kangser et al, 1994</td>
<td>USA</td>
<td>49</td>
<td>2.0</td>
<td>0.5-10.8</td>
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<tr>
<td>Pelle et al, 1993</td>
<td>Brazil</td>
<td>67</td>
<td>0.3</td>
<td>0-1.0</td>
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<td>Ghezzi et al, 1994</td>
<td>USA</td>
<td>27</td>
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<td>0-1.3</td>
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<td>Alvarado et al, 1997</td>
<td>USA</td>
<td>20</td>
<td>0.0</td>
<td>0-1.3</td>
</tr>
</tbody>
</table>

Thakkar et al, GIE, 2007

Tips for procedural sedation

- Assess patient before procedure
  - Assess airway (Mallampati score)
  - Decrease dose (renal disease or cirrhosis)
- Careful monitoring during the procedure
Intra-procedure complications (Colonoscopy)

- Study of 12 PEDS-CORI sites evaluated 7,792 colonoscopies during a 6-year period
- 88 procedures (1.1%, 95% CI 0.9-1.3) with at least one complication (57% gastrointestinal, 35% respiratory, and 10% miscellaneous)
- Most common GI bleeding (39%), hypoxia (25%)
- Younger patients and IV sedation risk factors


Intra-procedure complications (Colonoscopy)

Post-procedure complications

- Single center study of 4,102 procedures over 24 months (3,028 EGD's, 824 colons, 162 sigmoidoscopies, 44 ERCP's and 35 enteroscopies)
- 99 complications (2.41%) of which 69 (1.68%) were moderate or severe requiring ED evaluation ($3,500), hospital admission, transfusion, or surgery

Kramer et al., NASPGHAN, Salt Lake City, 2012

Predictable Areas of Loop Formation

Perforation

- Study of 10,236 EGDs over 4-year period found no incidence of perforation or death (Thakkar et al., GIE, 2007)
- 12-year single center experience in 2,711 cases (EGD/Colon) revealed 0.04% rate of perforation- one gastric perforation that occurred after therapeutic dilation (Balsells, GIE, 1995)
Perforation

- 16-year single-center review of 3,269 colonoscopies and 9,408 EGDs revealed 0.09% rate of perforation during COL and 0.02% rate of perforation during EGD.

(Nothl, J Pediatr Surg, 2008)

- Study of 7,792 colonoscopies over a 6-year period found one perforation (0.01%).

(Thakkar et al. Clinical Gastro Hepatol, 2008)

Perforation rates

- Perforation rates with EGD 0.05% (diagnostic) and 2.6% (therapeutic).

- Adult studies describe perforation rates in colonoscopy ranging from 0.016% to 0.12%.

Perforation rates

<table>
<thead>
<tr>
<th></th>
<th>EGD PED</th>
<th>ADULT PED</th>
<th>COL ADULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0.04</td>
<td>0.05-2.6</td>
<td>0.01-0.09</td>
<td>0.02-0.12</td>
</tr>
</tbody>
</table>

CHOP experience


- 30,177 endoscopic procedures performed: 21,345 EGD, 7,126 COL, and 1,706 flexible sigmoidoscopies (SIG).

- 1,262 (4%) were considered therapeutic procedures.

Case 1

A four-year old boy with juvenile polyposis coli undergoes polypectomy. Seven pedunculated polyps were removed using standard cautery technique without immediate complications. Twelve hours after the procedure patient develops fever, tachycardia, abdominal tenderness, and peritoneal signs. The abdominal x-ray does not show evidence of free abdominal or retroperitoneal air. Which post polypectomy syndrome is the likely cause of this patient’s symptoms and signs?

1. Mini-perforation of the colon
2. Postpolypectomy distention syndrome
3. Perforation of the colon
4. Postpolypectomy coagulation syndrome
5. Postpolypectomy bleeding

Case 2

A 7-year old girl with eosinophilic esophagitis undergoes upper endoscopy. The procedure was performed under intravenous moderate sedation with fentanyl and midazolam. She received topical lidocaine spray prior to the procedure. There were no complications during the procedure, but you receive a call from the recovery that her pulse oximetry is 88%. Her vital signs are otherwise normal as is her exam and the equipment is functioning well. What is the likely cause of this patient's desaturation?

1. Atelectasis
2. Aspiration pneumonia
3. Sedative adverse event
4. Methemoglobinemia
Case 3
A 12-year-old otherwise healthy boy with epigastric abdominal pain unresponsive to antacid therapy undergoes outpatient EGD with standard biopsies under general anesthesia with propofol without complication. The patient is discharged, but returns to ED the same evening with a complaint of epigastric abdominal pain and vomiting. He is mildly tachycardic and anemic and his amylase/lipase are elevated. The likely cause of his pancreatitis is:

1. Anesthesia medication adverse event
2. Perforation
3. Chronic recurrent pancreatitis
4. Duodenal hematoma

Summary
• Serious complications of pediatric endoscopy and colonoscopy are rare
• Appropriate preparation for procedure is crucial in order to lower the risks
• Complications can occur at various points including pre-procedure or delayed