ESOPHAGOGASTRODUODENOSCOPY (EGD)/COLONOSCOPY

Surgical Specialty:	Gastroenterology
Authors:	Maggie Coffield, DO Arkansas Children's Hospital, Little Rock, AR

Background:

- General Considerations
  - Pediatric endoscopy is done for either diagnostic or therapeutic purposes.[1] The reason for the procedure will dictate a safe anesthetic plan
    - Diagnostic indications for Esophagogastroduodenoscopy (EGD): dysphagia, chronic or resistant Gastro Esophageal Reflux Disease (GERD), vomiting, hematemesis, weight loss, failure to thrive (FTT), diarrhea, anorexia, irritability (infants)
    - Therapeutic indications for EGD: foreign-body removal, dilation, bleeding control, percutaneous endoscopic gastrostomy (PEG) placement
    - Diagnostic indications for colonoscopy: chronic diarrhea, bleeding, anemia, weight loss, failure to thrive, malignancy surveillance
    - Therapeutic indications for colonoscopy: Polypectomy, foreign body removal, dilation of strictures, bleeding control
- Patient Considerations
  - Mainly these cases are diagnostic and scheduled with patients appropriately fasted[2]
    - Patients presenting for colonoscopy frequently have undergone extensive bowel prep and may be volume-depleted
  - Occasionally these patients may need to be considered a full stomach and carry an aspiration risk such as with active bleeding, severe GERD, foreign bodies, delayed gastric emptying
    - Patients with an esophageal foreign body, severe esophageal stenosis, or achalasia present with a full esophagus situation and are at an even greater increased risk for regurgitation/aspiration
    - Rarely, these cases constitute a vital emergency such as ingestion of button batteries or magnets or uncontrolled bleeding[1]
    - Be aware of potential delayed gastric emptying with celiac disease, GLP-1 receptor agonists, diabetes, prior vagal injury, opiate use, trauma
- Associated Comorbidities/Syndromes
  - VACTERL, Alagille, Familial adenomatous polyposis (FAP), Inflammatory Bowel Disease (IBD), Eosinophilic Esophagitis (EoE), Feingold Syndrome

- FTT can be associated with other comorbidities such as cardiac disease, chronic aspiration, and metabolic diseases which all come with their own associated comorbidities

Anesthetic Planning:

- Pre-Anesthetic Evaluation
  - A detailed history with a thorough physical exam is imperative as the oropharyngeal space will be shared with the gastroenterologist
    - Ask about apneas and snoring, particularly if planning for a native airway
    - Focus on predictors of difficult airway and/or mask ventilation, piercings, loose or missing teeth, braces[2]
  - Additional labs/tests
    - Consider obtaining a hematocrit and type and screen and having blood available for patients with active bleeding
    - Routine coagulation studies have shown no predictability for the risk of bleeding in children[3]
    - Those trained should consider point of care gastric ultrasound to assess for gastric emptiness if any doubt of proper fasting (language barrier, developmental disability, obtundation)
  - Discussions to have with proceduralist/family
    - Code Status
    - Transfusion consent
    - Diagnostic and therapeutic goals of the procedure(s)
- Specific or Unique Room Set-up Requirements
  - Airway
    - Native airway with nasal cannula is common in adult GI procedures and likely familiar to most anesthesiologists
    - Supraglottic airway (SGA) allows for inhaled anesthesia and can assist in keeping small airways open that are prone to obstruction[4]
    - Endoscopy mask: either the Explorer endoscopy mask® (Intersurgical) or the Fibroscopy mask® (VBM)[5]
    - Endotracheal tube (ETT) provides a secure airway in very sick, very small, or very large patients or patients at particular risk of aspiration or potentially prolonged procedures (button battery removal) or those with difficult positioning such as Endoscopic retrograde cholangiopancreatography (ERCP)[6]
  - Drugs/Infusions
    - Certain children may need midazolam (0.5 mg/kg PO or 0.1 mg/kg IV) for anxiolysis prior to entering the procedure room
    - Depending on the patient's age, cooperation, and acuity of illness induction can be either inhaled, IV propofol (2-5 mg/kg bolus with 50-300 mcg/kg/min maintenance), or rapid sequence induction with propofol and succinylcholine (1-2 mg/kg) or rocuronium (1-1.2 mg/kg)[6]
    - Antibiotic prophylaxis is not routinely indicated in healthy children, even when biopsies are being taken; however, they should be considered in patients for PEG (risk of local infection), esophageal dilation (risk of bacteremia) and/or those with a high risk of bacterial endocarditis [1,2]
    - Ondansetron for Post Operative Nausea and Vomiting (PONV) prophylaxis (0.1 mg/kg)

        - Consider dexmedetomidine for delirium prophylaxis (0.5 mcg/kg)
    - Monitors
        - Standard ASA monitors
        - EtCO2 must be monitored when using a native airway with a spontaneously breathing patient[6]
    - Blood Availability
        - Usually not required unless indication is for bleeding
    - PICU Bed Availability
        - Usually not required unless the indication is bleeding or caustic ingestion
    - Other Indicated Resources
        - Availability of consulting surgeon in the event of fistula formation from a button battery or viscous perforation from magnets requiring urgent surgical intervention
        - These procedures are often performed as Non-Operating Room Anesthesia (NORA) and accessibility to emergency assistance for difficult airway or higher level of care warrants consideration

Intraoperative Considerations:

- General
    - Passing the EGD scope is very stimulating and will likely require either a bolus of propofol or an increased concentration of inhalational anesthetic which could lead to apnea
    - A jaw thrust can be helpful in placement of the scope but is similarly stimulating
        - This moves the epiglottis away from the posterior pharyngeal wall and makes the upper esophagus opening easier to locate and enter
    - Looping of the colonoscope and external pressure can cause visceral pain necessitating bolus dosing and risk of apnea[6]
    - The plan and urgency will vary with patient factors and proceduralist preference
    - The gas used to insufflate the digestive tract is traditionally air but to minimize post-procedural discomfort some teams use CO2. This could result in a mild hypercapnia due to systemic absorption
- Induction
    - Mask induction in appropriate patients with IV placement after onset of general anesthesia
    - IV induction in appropriate patients
    - RSI with succinylcholine or rocuronium in any patient at risk of aspiration
        - Full stomach, active upper GI bleed, delayed gastric emptying, full column GERD, achalasia, foreign body[6]
- Positioning
    - EGD and colonoscopy can both be done in the supine position, the proceduralist may prefer lateral decubitus.
    - ERCP often necessitates the prone or "swimmers position”
- Maintenance
    - Non-anesthetic procedural sedation with opioids, benzodiazepine, and native airway
    - Monitored anesthesia care (MAC) and native airway or endoscopy mask
    - General anesthesia with propofol infusion either with native airway, SGA, endoscopy mask, or ETT
    - General anesthesia with inhaled agent and SGA or ETT
- Hemodynamic/Physiologic goals

    - Avoid aspiration
- Surgical Considerations
    - There should be no surgical need for muscle relaxation
    - The proceduralist may request glucagon to be given to slow intestinal peristalsis and facilitate sphincter relaxation for entry into the biliary system during ERCP
- Emergence/Disposition
    - The proceduralist should be asked to decompress insufflated air or CO2 out of the stomach at the end of the procedure to reduce postoperative discomfort and minimize breathing difficulties in infants
    - A full stomach should be suctioned with the endoscope prior to removal and should be woken up in the OR prior to removal of ETT
    - Patients with native airway or endoscopy mask can be taken to the Post-Anesthesia Care Unit (PACU) if spontaneously breathing with no assistance
    - Similarly, patients with an SGA can have it removed and be taken to PACU to continue emergence [7]
    - Taking patients who have not fully emerged from anesthesia to the PACU requires well-trained nurses and an immediately available anesthesiologist to be undertaken safely
- Post-op Care
    - Although the placement of the scope is stimulating there is little to no anticipated post-operative pain
    - Therapeutic procedures such as PEG necessitate pain control at least with local anesthetic infiltration
    - Patients undergoing scheduled diagnostic procedures will likely go home on the same day
    - Patients with more acute complaints may already be admitted or require admission to the hospital
    - Patients with aspiration may need to remain intubated and be transferred to the Pediatric Intensive Care Unit for post-procedure ventilation

Case-Specific Complications/Pitfalls

- Airway obstruction
    - During the use of IV general anesthesia with native airway
    - With neonates undergoing dilation procedures balloon inflation can compress the small caliber airway even with an endotracheal tube in place
- Laryngospasm
    - Either with a native airway, endoscopy mask, or SGA due to a light plane of anesthesia during insertion of the scope
- Aspiration
- GI bleed
    - Either from ruptured varices or polypectomy
- Fistula formation
    - Particularly of concern with button battery ingestion
- Bowel perforation
    - Particularly of concern with multiple magnet ingestions

References

1) ASGE Standards of Practice Committee, Lightdale JR, Acosta R, et al. Modifications in endoscopic practice for pediatric patients. *Gastrointest Endosc*. 2014;79(5):699-710. PubMed Link
2) Friedt M, Welsch S. An update on pediatric endoscopy. *Eur J Med Res*. 2013;18(1):24. Published 2013 Jul 25. PubMed Link
3) Giles E, Walton-Salih E, Shah N, Hinds R. Routine coagulation screening in children undergoing gastrointestinal endoscopy does not predict those at risk of bleeding. *Endoscopy*. 2006;38(5):508-510. PubMed Link
4) Acquaviva MA, Horn ND, Gupta SK. Endotracheal intubation versus laryngeal mask airway for esophagogastroduodenoscopy in children. *J Pediatr Gastroenterol Nutr*. 2014;59(1):54-56. PubMed Link
5) Potié A, Prégardien C, Pirotte T, et al. Evaluation of the Explorer Endoscopy Mask(©) for esogastroduodenoscopy in children: a retrospective study of 173 cases. *Paediatr Anaesth*. 2016;26(6):649-654.PubMed Link
6) Chung HK, Lightdale JR. Sedation and Monitoring in the Pediatric Patient during Gastrointestinal Endoscopy. *Gastrointest Endosc Clin N Am*. 2016;26(3):507-525. PubMed Link
7) Abbasi S, Siddiqui KM, Qamar-Ul-Hoda M. Adverse Respiratory Events After Removal of Laryngeal Mask Airway in Deep Anesthesia Versus Awake State in Children: A Randomized Trial. *Cureus*. 2022;14(4):e24296. Published 2022 Apr 19. PubMed Link

Reviewed by:

Reviewer #1: Marc Parris, M.D., MPH, Children's Hospital of Philadelphia

Reviewer #2: Marc Hassid, M.D., Medical University of South Carolina

Reviewer #3: Francis Veyckemans, MD (Retired)

Created: 2/28/24; Last revised: 4/23/24