Anesthetic Implications for Endosonography and Complex Endoscopic Procedures

Jo Ann Platko  PhD, CRNA, BC
OBJECTIVES

• Describe and implement anesthesia modalities for endoscopic diagnostic and curative modalities, including Endoscopic Ultrasound (EUS), Endoscopic Mucosal Resection (EMR), Endoscopic Submucosal Dissection (ESD), and Endoscopic Retrograde Cholangiopancreatography (ERCP)
OBJECTIVES

• Recognize and implement best practice anesthetic management for patients during advanced endoscopic procedures
• Discuss pharmacology of current anesthetic drugs utilized in endoscopic procedures
• Discuss implications for the Certified Registered Nurse Anesthetist (CRNA) in providing anesthesia for Complex Endoscopic Procedures outside of the Operating Room
• Briefly discuss new Endoscopic procedures
Non OR Anesthesia (NORA)

- The number of cases performed outside of the OR are increasing (CT scan, MRI, Interventional Radiology, Endoscopy, EP lab etc.)
- Cases range from minor cases to more complex cases (More monitoring, more IV drips)
- Higher acuity patients
Non OR Anesthesia (NORA)

- Procedures are performed for diagnosis, intervention and treatment
- Anesthetic technique ranges from local to GA
- Anesthesia is often performed in small, unfamiliar spaces
- Nurse anesthetists are often working with personnel unknown to them (skill sets and level)
- Risks - high radiation exposure, magnetic fields
Non OR Anesthesia (NORA)

• The responsibility to adhere to anesthetic standards fall on to the anesthesia care provider administering the anesthesia

• Do you know what the standards are for NORA?
NORA Standards

• Standards for Non Operating Room Anesthesia

• Are Identical to Operating Room Standards for Anesthesia
Workspace Issues

- Is there room for an anesthesia machine?
- Are there connections for $O_2$, $N_2O$, Air pipelines? (E cylinders for backup)
- Is there appropriate ventilation/scavenger system?
- Is there an anesthesia cart?
- Is there a code cart, ped cart, MH cart?
- Is there a Pyxis machine?
Workspace Issues

• Is the equipment outdated?
• Are there adequate methods to communicate with colleagues or other departments?
• Are the physical facilities adequate for patient care? (Temperature, lighting, space)
• Are the facilities adequate for processing the specimen? Making slides, microscope, pathologist
Workspace Issues

• Are the electrical outlets adequate in number and condition?
• Is there an emergency power supply and back up lighting?
• Is there room and personnel for patient post anesthesia recovery?
Anesthesia in the GI Suite

- Patients may be extremely dehydrated
- May have some form of GERDs or impaired gastric motility
- May have derangements in electrolytes
- Are often elderly with comorbidities
- If younger, may have Crohn’s or IBS
- May be there for pre-bariatric surgery exam
What is Endosonography?

- Endosonography is an endoscopy with the addition of an ultrasonic probe producing an image by means of high frequency sound waves.
Esophagogastroduodenoscopy (EGD)

- Test using a small lighted scope to visually examine the esophagus, stomach and first part of the small intestine
Endoscopic UltraSound (EUS)

• “An examination with a special endoscope fitted with a small ultrasound device on the end, used to look inside the layers of the wall of the gastrointestinal tract and visualize the surrounding organs including the pancreas, liver, gallbladder, spleen and adrenal glands.”  
  ASGE
Reasons for EGD with EUS

- Pancreatic lesions
- Pancreatic cysts
- Acute Pancreatitis
- Chronic Pancreatitis
- Autoimmune Pancreatitis
- Hereditary/Familial Pancreas Carcinoma (Surveillance)

- Dilated CBD & PD
- Swollen/inflamed pancreas
- Suspected stones in the pancreas duct or CBD
- Suspected blockage of the pancreas or CBD
- Hx of recurrent acute pancreatitis
Endoscopic UltraSound (EUS) Injection Therapy

- Ethanol and bupivicaine injection for Celiac Neurolysis
Endoscopic UltraSound (EUS) Drainage Therapy

- Drainage of Pseudocysts
Endoscopic UltraSound (EUS) Drainage Therapy

• Drainage of Phlegmons
Endoscopic UltraSound (EUS) Drainage Therapy

• Drainage of Abscess
Endoscopic Mucosal Resection (EMR)
Indications for Endoscopic Mucosal Resection (EMR)

• Staging and treatment of superficial mucosal lesions of the esophagus, stomach and colon
• Duodenal lesions, including ampullary lesions requiring ERCP-assisted ampullectomy
• Gastrointestinal Stromal Tumors (GISTs)
• Adenomatous colon and rectal lesions
• Rectal carcinoid tumors/ Sessile neoplasms
Hallmarks of Endoscopic Mucosal Resection (EMR)

- Identification and demarcation of the lesion
- Submucosal injection to lift the lesion
- Endoscopic removal of lesion (usually with a snare)
Endoscopic Mucosal Resection (EMR)
Complications of Endoscopic Mucosal Resection (EMR)

• Bleeding is the most frequent reported complication
• Treated by applying endoscopic clips, hot biopsy forceps or bipolar coag
• Patients anticoagulation should be withheld if at all possible
Complications of Endoscopic Mucosal Resection (EMR)

- Perforation occurs in 0.3-0.5% of all cases
- Usually reparable with endoscopy clips or suture
- Rarely requires surgical intervention but if so must be done quickly and will require IV antibiotics
Endoscopic Submucosal Dissection (ESD)

- Originally developed to produce an en bloc removal of larger polyps or tumor in mucosa and submucosa of esophagus, stomach or colon
- Requires use of an electrocautery knife
- Provides a low, local recurrence rate
- More technical skill required by endoscopist
Endoscopic Submucosal Dissection (ESD)
INDICATIONS FOR Endoscopic Submucosal Dissection (ESD)

• Lesions in Submucosal layer of the esophagus, stomach and colon
• Usually lesions are greater than 2 cm.
• Curative removal of superficial neoplasms
• Most important factors involve knowing the depth of the lesion and the status of lymph nodes
Complications of Endoscopic Submucosal Dissection (ESD)

- Longer procedure time compared to EMR
- Requires GI endoscopist’s proficiency
- Slightly higher risk of complications compared to EMR
- Most common side effects are perforation and bleeding
ENDOSCOPIC SUBMUCOSAL DISSECTION (ESD)
Endoscopic Retrograde Cholangiopancreatography ERCP

- A procedure using a lighted scope and x ray to evaluate and diagnose diseases of the liver, bile ducts and pancreas.
Endoscopic Retrograde Cholangiopancreatography (ERCP)
Approximations of Pancreatic Duct and Common Bile Duct
Post ERCP Pancreatitis

- Acute pancreatitis is the most common and most serious complication related to ERCPs.
- Reason most malpractice lawsuits post ERCPs.
- Most commonly occurs from mechanical manipulation and contrast injections.
- S & S include pain, nausea, vomiting, fever, hyperamylasemia.
Post ERCP Pancreatitis Treatment

- CT Scan
- Serum Amylase level
- Fluids
- Narcotics
- NG tube
- Measure urinary output
ARGON PLASMA COAGULATION (APC)

- Ionized argon gas is delivered through an endoscope’s catheter to deliver an electrical current to GI lesions
- Used to treat:
  - Arteriovenous Malformations (AVMs)
  - Hemostasis
  - GI tumors in poor surgical candidates
  - Gastric Antral Vascular Ectasia (GAVE)
Gastric Antral Vascular Ectasia (GAVE)

- AKA Watermelon Stomach
- Treated with Argon Plasma Coagulation
Per Oral Endoscopic Myomotomy (POEM)

• A complex endoscopic procedure to treat swallowing disorders, namely Achalasia
• And other gastric motility issues involving the lower esophageal sphincter
• Inpt. Procedure
• Usually takes 1-3 hours to complete
• Only a handful of healthcare centers perform this treatment
Per Oral Endoscopic Myomotomy (POEM)

1) Submucosal tunneling
2) Submucosal tunneling beyond GE junction
3) Dividing circular muscle bundles
4) Complete division of inner circular muscle bundles
5) Closure of mucosal entry

Endoscopy 2010; 42:265-71
ANTICOAGULATION GUIDELINES FOR COMPLEX ENDOSCOPIC PROCEDURES

• Must assess the risk of bleeding vs. a thrombotic event
• Consider the bleeding risk of the endoscopic procedure
• Assess the type of case Emergent vs. Elective
• Each case should be evaluated individually for the risk vs. benefit ratio
ANTICOAGULATION GUIDELINES FOR COMPLEX ENDOSCOPIC PROCEDURES

- **warafin** - If elective case discontinue, if able for 5 days, if not consider bridge therapy. If emergent consider Vit K and Prothrombin Complex Concentrate (PCC) or Fresh Frozen Plasma (FFP)

- **Xarelto /Elaquis** - If elective case hold, if emergent and the medication was taken within the last 2-3 hours use charcoal or activated PCC or non activated PCC
ANTICOAGULATION GUIDELINES FOR COMPLEX ENDOSCOPIC PROCEDURES

• Pradaxa - If elective case hold, if emergent and the medication was taken within the last 2-3 hours use charcoal or activated PCC or non activated PCC or Hemodialysis

• ASA - Discontinue if possible for at least 7 days for elective cases, if not able to may utilize platelets for bleeding

• NSAIDS - Discontinue if possible, if bleeding occurs utilize supportive measures including blood products
<table>
<thead>
<tr>
<th>HIGH RISK</th>
<th>LOW RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoscopic polypectomy</td>
<td>Diagnostic procedures±biopsy</td>
</tr>
<tr>
<td>ERCP + sphincterotomy</td>
<td>Biliary or pancreatic stenting</td>
</tr>
<tr>
<td>Sphincterotomy+large balloon papillary dilatation/</td>
<td>Device-assisted enteroscopy without polypectomy</td>
</tr>
<tr>
<td>Ampullectomy</td>
<td></td>
</tr>
<tr>
<td>EMR/ESD</td>
<td></td>
</tr>
<tr>
<td>Endoscopic stricture dilitations</td>
<td></td>
</tr>
<tr>
<td>Endoscopic therapy of varices</td>
<td></td>
</tr>
<tr>
<td>Percutaneous endoscopic gastrostomy</td>
<td></td>
</tr>
<tr>
<td>EUS with FNA, Esophageal, enteral, colonic stenting</td>
<td></td>
</tr>
</tbody>
</table>

*Compiled from British Endoscopy Society and the European Society of GI Endoscopy guidelines*
ANTIBIOTIC PROPHYLAXIS IS RECOMMENDED by the ASGE FOR:

- Pts. with high risk cardiac conditions with a known enterococci GI infection
- Pts. with liver transplant undergoing ERCP
- Pts. with known/suspected biliary obstruction
- Pts. undergoing drainage of mediastinal cysts
- Pts. with cirrhosis and GI bleed
- Pts. undergoing Peritoneal Dialysis having a lower GI procedure
## Medications

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Onset/Peak/Duration</th>
<th>Dose</th>
<th>Reversal/Antagonist</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>midazolam</td>
<td>Versed</td>
<td>30-60 sec 10-15 min 1-2 hours</td>
<td>1 to 2.5 mg IV over 2 to 3 minutes before procedure</td>
<td>Flumazinil 0.2mg IV over 15 sec to 1 mg</td>
<td>Pain at injection site</td>
</tr>
<tr>
<td>fentanyl</td>
<td>Sublimaze</td>
<td>1-3 min 3-5 min 30-60 min</td>
<td>1 mcg/kg IV q 5-10 min</td>
<td>naloxone .1-.2 mg IV q 2-3 minutes</td>
<td>Respiratory depression</td>
</tr>
<tr>
<td>propofol</td>
<td>Diprivan</td>
<td>15-30 sec 3-5 min 3-10 min</td>
<td>0.1-0.15 mg/kg/min IV initially then 25-75mcg/kg/min</td>
<td>N/A</td>
<td>Pain at injection site</td>
</tr>
<tr>
<td>ketamine</td>
<td>Ketalar</td>
<td>40 sec 1 min 5-15 min</td>
<td>1-2 mg/kg</td>
<td>N/A</td>
<td>Emergence rxs, visual hallucinations</td>
</tr>
<tr>
<td>dexmedetomidine</td>
<td>Precedex</td>
<td>&lt; 5 min 15 min 2-4 hours</td>
<td>0.6 mcg/kg/hour titrated to 0.2 to 1 mcg/kg/hour</td>
<td>a2-AR antagonist atipamezole</td>
<td>Bradycardia, hypotension agitation</td>
</tr>
</tbody>
</table>
Propofol Alone

• “The use of propofol for conscious sedation during colonoscopy is associated with greater patient satisfaction and less pain when compared with midazolam/fentanyl, as perceived by the patient and endoscopist”.  Scroeder et al. (2016)
General Anesthesia

- Rong et al. . . “demonstrated that ESD under general anesthesia was associated with a shorter procedure time and a high rate of patient satisfaction with the procedures”. (2013)
Balanced Anesthesia

- Nonaka et al. “Propofol-based MAC without intubation provided a safer treatment environment by significantly reduced body movement and was very effective for difficult cases requiring longer procedure times or more powerful sedation”. (2015)
What is THIS???
$\text{CO}_2$ Insufflation Advantages

- Presumed decrease in patient pain post procedure
- Less bloating and abdominal distension
- More easily absorbed than air
- Lower risk of complications compared to air
**CO₂ Insufflation Disadvantages**

- Increased risk of complications related to a rise in systemic partial pressure of CO₂
- Maybe a slight increase in expenditure when compared to air
- Should not be utilized in COPD patients
Benefits of Endoscopic US

• Early diagnosis
• More accurate than CT scans for staging
• Minimally invasive vs. surgery
• Able to perform FNA and cyst drainage
• Healthcare dollar expenditure is less than that for surgery
• Combines the medical specialties of gastroendoscopy with surgical pathology for improved patient outcomes
Benefits of Endoscopic US

- Minimal risk of infection
- Little to no scarring
- Decreased risk of bleeding
- Decreased in pain levels
- Short hospital stay
What’s Ahead?

• **NOTES**—Natural Orifice Translumenal Endoscopic Surgery

• Endoscope in placed in mouth, urethra, anus or vagina an incision is then made in the stomach, bladder, colon or uterus to access internal organs

• >50 NOTES have been performed in the US since 2007
NOTES

• Common NOTES procedures:
  - Transvaginal cholecystectomy
  - Transvaginal appendectomy
  - Transgastric appendectomy
  - Transvaginal peritoneoscopy
  - Transgastastic peritoneoscopy
QUESTIONS
REFERENCES

• Antibiotic prophylaxis for GI endoscopy ASGE STANDARDS OF PRACTICE COMMITTEE, Volume 81, No. 1 : 2015 GASTROINTESTINAL ENDOSCOPY p. 81-89.

• ASGE STANDARDS OF PRACTICE COMMITTEE (2016). The management of antithrombotic agents for patients undergoing GI endoscopy Prepared by: ASGE STANDARDS OF PRACTICE COMMITTEE

REFERENCES

• Chiung-Dan Hsu\textsuperscript{a}, Jui-Mei Huang, Ya-Ping Chuang\textsuperscript{b}, Hua-Yi Wei\textsuperscript{b}, Yu-Chung Su\textsuperscript{c}, Jeng-Yih Wu\textsuperscript{c}, Wen-Ming Wang\textsuperscript{c}, Hung-Te Hsu\textsuperscript{b}, Hui-Fang Huang\textsuperscript{b}, I-Cheng Lu\textsuperscript{a}, David Vi Lu\textsuperscript{a}, The Kaohsiung Journal of Medical Sciences, Volume 31, Issue 11, November 2015, Pages 580-584, Propofol target-controlled infusion for sedated gastrointestinal endoscopy: A comparison of propofol alone versus propofol-fentanyl-midazolam
REFERENCES

• http://www.stritch.luc.edu/lumen/MedEd/Radio/curriculum/Surgery/Pancreatitis.htm
• https://www2.med.psu.edu/medicalreport/gi/endoscopic-mucosal-resection-and-endoscopic-submucosal-dissection-minimally-invasive-techniques-for-resecting-gi-mucosal-tumors/
REFERENCES

• Loperfido, S. Francesco Ferrara, F., Guido Costamagna, G., Post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis. UptoDate
• Naohisa Yoshida; Yuji Naito; Yutaka Inada; Munehiro Kugai; Kazuhiro Kamada; Kazuhiro Katada; Kazuhiko Uchiyama; Takeshi Ishikawa; Tomohisa Takagi; Osamu Handa; Hideyuki Konishi; Nobuaki Yagi; Satoshi Kokura; Naoki Wakabayashi; Akio Yanagisawa; Toshikazu Yoshikawa Endoscopic Mucosal Resection With 0.13% Hyaluronic Acid Solution for Colorectal Polyps Less than 20 mm A Randomized Controlled Trial J Gastroenterol Hepatol. 2012;27(8):1377-1383.
REFERENCES

REFERENCES

• Nonaka S\textsuperscript{1}, Kawaguchi Y\textsuperscript{2}, Oda I\textsuperscript{1}, Nakamura J\textsuperscript{1}, Sato C\textsuperscript{1}, Kinjo Y\textsuperscript{1}, Abe S\textsuperscript{1}, Suzuki H\textsuperscript{1}, Yoshinaga S\textsuperscript{1}, Sato T\textsuperscript{2}, Saito Y\textsuperscript{1}. Safety and effectiveness of propofol-based monitored anesthesia care without intubation during endoscopic submucosal dissection for early gastric and esophageal cancers. \textit{Dig Endosc.} 2015 Sep; 27(6):665-73. doi: 10.1111/den.12457. Epub 2015 Mar 10


• Rong Q.-H.\textsuperscript{a} · Zhao G.-L.\textsuperscript{a} · Xie J.-P.\textsuperscript{a} (2013). Wang L.-X.\textsuperscript{b} Feasibility and Safety of Endoscopic Submucosal Dissection of Esophageal or Gastric Carcinomas under General Anesthesia. \textit{Med Princ Pract} 2013;22:280-284(DOI:10.1159/000344002) Vol. 22, No. 3, 2013
REFERENCES

- Savides, T. (). Management of Anticoagulants & Antiplatelet Agents Pre and Post Endoscopy
- Schroeder, Caleb M.D.¹; Kaoutzanis, Christodoulos M.D.¹; Tocco-Bradley, Rosalie M.D., Ph.D.¹; Obear, Janet R.N., B.S.N.¹; Welch, Kathleen B. M.S., M.P.H.²; Winter, Suzanne M.S.¹; Cleary, Robert K. M.D.¹ Patients Prefer Propofol to Midazolam Plus Fentanyl for Sedation for Colonoscopy: Results of a Single-Center Randomized Equivalence Trial. Diseases of the Colon & Rectum: January 2016 - Volume 59 - Issue 1 - p 62-69 doi: 10.1097/DCR.0000000000000051 Original Contributions: Endoscopy
REFERENCES

• http://www.achalasia-poem.net/for_medical_staff_1_gi.html