DISCLOSURES

• Successful completion: Participants must attend the entire program, including any resulting Q & A, and submit required documentation.

• Conflict of interest: Planners disclose no conflict of interest; the speaker, as an employee of the commercial support entity, discloses a conflict of interest.

• Commercial company support: Fees are underwritten by education funding from GI Supply.

• Non-commercial company support: None.

• Alternative or Complementary therapy: None.

"Keep Calm and Get the GI Tract Tattooed: Proper Techniques and the Costs of not Tattooing."

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Goals of program

1) Describe approved methods of endoscopic marking of lesions of GI tract
2) Identify risks and benefits of endoscopic marking lesions of GI tract
3) Describe indications for endoscopic marking in five areas of GI tract
4) Discuss the impact of endoscopic marking on wrong site surgery reduction

Why is endoscopic marking important?

• Issue of wrong site surgery is relevant to GI lesions
• Endoscopic marking improves multi-disciplinary communication; serves as a mechanism between teams
• Marking ensure accuracy and precision of lesion location
• Enhances continuity of care
• Marking can successfully impact the incidence as well as death rates associated with colorectal cancer worldwide.

What is my role in all this?

• We must be educated on how and why we are doing this procedure
• Endoscopy teams have been or will be asked to assist in endoscopic marking

Endoscopic marking

Approved methods:

• Endoclips
• Technetium-99m-labelled antimony colloid
Endoscopic marking
Chemical Marking Agents

Preparation of the marking agent:
- The Endoscopy nurse plays a vital role in preparation and delivery of marking agent
- Proper dye preparation is critical
- Shake/agitate the marking agent
- Length of time the marking lasts is related to proper preparation and delivery of agent

Marking Procedure:
- Equipment
  - Marking agent
  - Syringe
  - Endoscopic injection needle: 23-25 gauge, 3-5mm tip

Marking agents

<table>
<thead>
<tr>
<th>AGENT/MANUFACTURER</th>
<th>FDA CLEARED FOR ENDOCscopic MARKING</th>
<th>FEATURES AND PREPARATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>India Ink (Endomark) PMT/Permark, Inc.</td>
<td>YES</td>
<td>Store with normal saline, sterile and filter. Shake to mix. May have ingredients that cause inflammation.</td>
</tr>
<tr>
<td>Indocyanine green (Cardiogreen) Sigma-Aldrich, Inc.</td>
<td>NO</td>
<td>Powder only soluble in water, must be used within 6 hours. Shake to mix. Little use in GI. Contraindicated in patients with allergy.</td>
</tr>
<tr>
<td>Methylene blue 1% American Reagent Akron, Inc.</td>
<td>NO</td>
<td>Single-use vial, may be diluted, not for use in patients on MAO or with kidney disease. Disperses quickly.</td>
</tr>
<tr>
<td>Purified carbon suspension (Spot) GI Supply, Inc.</td>
<td>YES</td>
<td>Sterile, ready-to-use off the shelf, prespackaged syringe. Shake to disperse particles before use. Two year shelf life.</td>
</tr>
</tbody>
</table>

Tattooing of Broad-Based Polyps & LSTs
- inject 2-3 ml at a time, not more since injecting too much will spread throughout the peritoneum confusing the surgeon if requires surgery
- can also use Me Blue if more than one polyp to mark for the surgeon
Marking Technique

**Procedure**

1. Prime needle with saline
2. Advance needle through operating channel of endoscope
3. MD will insert needle at an oblique angle to bowel - tenting the tissue is helpful to verify submucosa depth
4. Inject marking agent using 0.5 – 1.0ml per injection site*
5. Four quadrant circumferential marking is recommended best practice

*A two-step approach may be used - injecting saline to create a bleb then using same needle to inject ink

Injection technique

- Tent the tissue with the needle before injection
- The needle shape visible through the mucosa verifies submucosal placement

Injection technique

- Colon
- Lateral spreading tumour
- Spot® injection site
- Tattoo placement relative to a lateral spreading tumor being marked for later endoscopic resection

Lasting effects of marking

- **Methylene Blue**
  - Few hours to days

- **ICG**
  - Few hours to weeks

- **SPOT, India Ink**
  - Seen years after injection
  - Darkest and longest lasting marking agents

Risks & benefits of endoscopic marking

- **Risks of Endoscopic Marking**
  - Inflammatory reactions
  - Microabscess formation within gut wall
  - Abdominal pain
  - Idiopathic inflammatory bowel disease
  - Peritoneal staining

*Risk of not marking may be greater than risks of marking!"
Risks of NOT Tattooing

- 113% Longer surgery
- 90% Remove more bowel than needed
- 68% Remove wrong section of colon
- 60% Remove less bowel than needed
- 50% Pt. needs additional surgery


Benefits of endoscopic marking

- Provides precise localization of gastrointestinal lesions
- Recommended as a "standard of care"
- Top priority for all members of the care team
  - Endoscopist and the endoscopy team in the procedure room
  - Surgeon and the surgical team in the OR
  
  Team partnership = Quality care

Benefits of endoscopic marking

- Improved localization of lesion site decreases uncertainty and thus reduces length of surgery
  - Less risks associated with surgery, anesthesia/sedation
  - Increases access to valuable operating/procedural rooms
  - Frees up physician and team to care for other patients

What are our colleagues saying?

- ASGE Technology Committee: "Estimation of tumor site can be imprecise"
- SAGES Guidelines for Laparoscopic Resection Colon and Rectal Cancer: "Every effort should be made to localize the tumor preoperatively"
- *92% surgeons surveyed believe marking/tattooing should be a "Practice Guideline or Standard of Care"

Indications for endoscopic marking
Colonic marking
- Facilitates endoscopic and surgical localization of small lesions or polyp sites in colon
- Laparoscopic resection — readily identifies areas surgeon cannot palpate
- Open surgical procedures — decreases time required to locate “run the bowel” and aids pathologist in lesion identification

Esophageal marking
- Indications:
  - Suspicious lesions for surveillance
  - Barrett’s esophagus
  - Mapping mediastinal nodes

Case study – Barrett’s esophagitis
- 55 year old man - Barrett’s esophagitis
- EGD performed - marking at proximal and distal extent of diseased areas
- Intermittent surveillance done via EGD
- Marking still present at 36 months
- Endoscopist was able to determine progression of the disease
- Patient had no complications from marking


Gastric marking
Indication:
- Endoscopic surveillance of premalignant lesions in the stomach using mucosa marking targeting biopsy

Small bowel marking
Indications:
- Used during enteroscopy to mark extent of small bowel visualized
- To localize suspected small bowel malignancies or abnormal findings
Pancreatic marking
- Indications:
  - Used to localize lesions in the pancreas prior to surgical resection
  - Used in conjunction with curved linear array EUS guidance
  - EUS – Fine Needle Tattooing (FNT) described to aid in pancreatectomy

Colon marking
Colon polyps
- Most useful in highlighting flat, broad or occult serrated polyps
- Also useful in removing broad based sessile polyps
- Upon removal, SPOT for easy distinguishability of the muscular mucosa layer to ensure safety of polypectomy
- To ensure complete polyp resection of follow-up colonoscopy
- To determine if a broad based polyp has a non-lifting sign indicative of a malignant polyp
Removal of Lateral Spreading Tumors (LST): Key Concepts for Safe Removal

• Tattoo polyp (1-3 cc minimize ink)
• Cushion with normal saline (NS) injection
• Be generous with NS injection 10-30 cc
• Use different snares
• Flat polyps (suction technique, then use mini or spiral or needle tip snares)
• Use APC (ERBE) to touch up the edges to prevent recurrence of the polyp

Characteristics of Flat Broad Based Polyps

• typically located in the right colon
• the cecum is the most common location
• often not easily seen
• its obscurity leads to development of colon cancer
• when cancer develops, often asymptomatic and presents with iron deficiency anemia

Removal of Very Large Lateral Spreading Polyp by Piecemeal Technique

Removal of Very Large LST (APC)

Very Large LST 6 Months Later

Marking of colon polyp drip technique followed by polypectomy
Colon polyp tattooed, lifted submucosally, removed by snare polypectomy followed by Argon Plasma Coagulation of the edges of the polyp to ensure complete removal.

Colon Marking
Role in Colorectal Cancer
- to mark the proximal and distal margin of the colon mass
- especially useful with rectal cancers in determining if a patient is a candidate for a colostomy if ≤5 cm below the anal verge

Colon Marking
Role in other colon lesions
- aids in localizing HPV in the anorectal region
- mark a bleeding diverticulum
Serrated Adenomatous Polyp

Serrated Polyps: WE MISS THEM!
Tadepalli et al. GIE 2011; 74: 1360-1368

<table>
<thead>
<tr>
<th>Characteristics of Serrated Polyps (N=158)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucus Cap</td>
<td>69.9%</td>
</tr>
<tr>
<td>Rim of debris or bubbles</td>
<td>51.9%</td>
</tr>
<tr>
<td>Alteration in contour of fold</td>
<td>37.3%</td>
</tr>
<tr>
<td>Interruption of mucosal vascular pattern</td>
<td>32.3%</td>
</tr>
</tbody>
</table>

Impact of endoscopic marking on reducing wrong site surgery

Characteristics of Serrated Polyps: Mucus Cap, Rim of debris or bubbles, Alteration in contour of fold, Interruption of mucosal vascular pattern.
Regulatory Agencies

- Joint Commission National Patient Safety Goals
  - UP.01.02.01 “Mark the procedure site”
- World Health Organization (WHO)
  - High 5s Project: Global collaboration to enhance patient safety

Endoscopic marking’s role in prevention of wrong site surgery

- Defined by The Joint Commission as the 3rd highest ranking sentinel event
- Especially relevant in GI as many lesions noted during endoscopy go onto to surgical resection
- Use of GI tract landmarks for lesion location is often unreliable

We all play a role in the patient’s care

- GI Associate/Technician:
  - Prepares room
  - Gathers equipment
  - Assists team
- Nurse:
  - Verifies patient
  - Prepares agent
  - Checks equipment prior to use
  - Documents care
    - Agent used, site, volume administered, expiration date
- Physician:
  - Performs marking and leads team

What is my role in all this?

- Communication
  - Patient safety relies on the team!
- Marking is a permanent communication tool
- Advocacy for patient
  - Appropriate escalation of concern
  - Speak up in a culture of safety

Ensuring Patient Safety

Moving the needle to improve patient outcomes!
- Standardization
- Education
- Policies
- Promote marking as Standard of Care

Endoscopic Marking: Questions?