

**Endoscopic Therapy  
For GI Bleeding in Children**

**Douglas S. Fishman, MD**  
 Director, Therapeutic Endoscopy  
 Assistant Professor of Pediatrics  
 Baylor College of Medicine  
 Texas Children's Hospital  
 Houston, TX




---

---

---

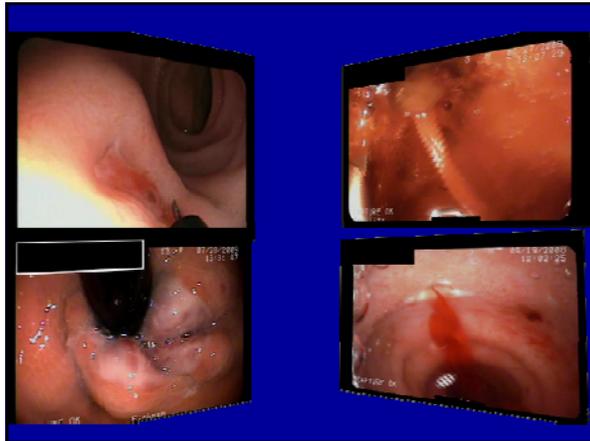
---

---

---

---

---




---

---

---

---

---

---

---

---

**Goals**

- Discuss the role of endoscopy in the management of variceal and non-variceal UGI bleeding
- Review the role of combined therapeutic modalities and demonstrate practical uses of endoscopic techniques
- Define potential limitations and complications of therapeutic endoscopy

---

---

---

---

---

---

---

---

## Patient Assessment

- High risk stable vs. High risk unstable
- Hemodynamics, measures of hemostasis
- Where to do your endoscopy? (ED, **ICU**, **OR**, GI Procedure Unit)
- When?
- Co-morbidity (Cardiac, BMT)
- Antibiotics

---

---

---

---

---

---

---

---

## The Team

- Technicians
- Nursing
  - Endoscopy Unit
  - OR
- Pediatric Endoscopists
  - Fellows
  - Attendings
  - Endoscopy “Back-up”
- Surgical Staff
- Adult Endoscopists

---

---

---

---

---

---

---

---

## Equipment

- Bleeding kit (“tackle-box”)
  - VBL kit, sclerotherapy needles, multiple clips
  - Injectables (epi, sodium morrhuate)
- Irrigation
- Suction
- Endoscopes
  - Scope size
  - Channel size
  - Duodenoscope

---

---

---

---

---

---

---

---

## The techniques

- Injection therapy
- Thermal coagulation
  - MPEC
  - Argon Plasma
- Clip application
- Variceal band ligation

---

---

---

---

---

---

---

---

## Endoscopic Criteria

- **Acute hemorrhage**
  - Forrest I a (Spurting hemorrhage)
  - Forrest I b (Oozing hemorrhage)
- **Signs of recent hemorrhage**
  - Forrest II a (Visible vessel)
  - Forrest II b (Adherent clot)
  - Forrest II c (Hematin on ulcer base)
- **No signs of recent hemorrhage**
  - Forrest III

---

---

---

---

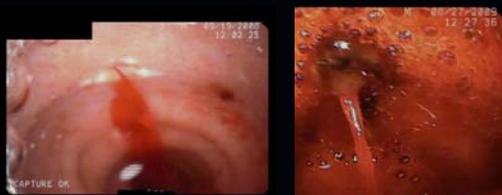
---

---

---

---

## Forrest 1a-"spurters"



---

---

---

---

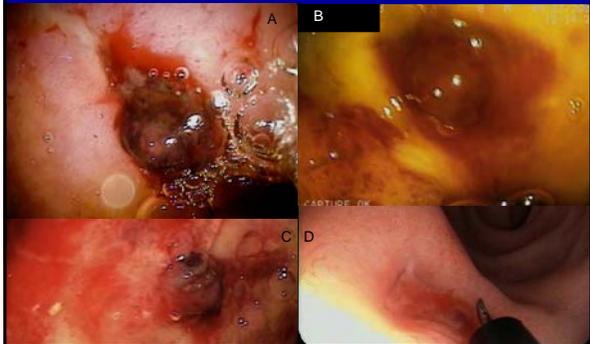
---

---

---

---

Visible Vessel or Adherent Clot ?



---

---

---

---

---

---

---

---

Forrest Iic vs. Forrest III



---

---

---

---

---

---

---

---

Forrest III



---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---

### Variceal Grading

- I, II, III (IV)
  - Small, medium, large
  - % obstruction of lumen
- Additional signs:
  - cherry red spots (petechiae of 1-2 mm on the variceal surface)
  - red wale marks (fine capillaries on the variceal surface, resembling whipping marks)
- Gastroesophageal and Gastric Varices
  - Sarin Classification

---

---

---

---

---

---

---

---

### Sarin Classification of Gastric Varices

Sarin et al. Hepatology. 1992

The diagram illustrates four types of gastric varices based on their location relative to the gastroesophageal junction (GEJ) and the greater curvature of the stomach:

- GOV1:** Gastric varices located along the lesser curvature of the stomach, proximal to the GEJ.
- GOV2:** Gastric varices located along the lesser curvature of the stomach, distal to the GEJ.
- GIV1:** Gastric varices located along the greater curvature of the stomach, proximal to the GEJ.
- GIV2:** Gastric varices located along the greater curvature of the stomach, distal to the GEJ.

---

---

---

---

---

---

---

---

## Benefits of Endoscopic Therapy

- Endoscopic therapy better than no therapy for risk of rebleeding and need for surgery :
  - ACTIVE BLEEDING
  - Non-bleeding visible vessels
- Epinephrine compared to other monotherapies or epinephrine + monotherapies: epinephrine alone was less effective (NNT=9, NNT=5)
  - Rebleeding or need for surgery

Laine and McQuaid, Clin Gastroenterol Hepatol 2009; 7: 33-49

---

---

---

---

---

---

---

---

## Endoscopy Consensus Statement

- A finding of high-risk endoscopic stigmata (active bleeding or a visible vessel in an ulcer bed) is an indication for immediate endoscopic hemostatic therapy
- Monotherapy, with injection or thermal coagulation, is an effective endoscopic hemostatic technique for high-risk stigmata; however, the combination is superior to either treatment alone.

Barkun et al. Annals of Internal Medicine 2003

---

---

---

---

---

---

---

---

## Endoscopy Consensus Statement

- A finding of low-risk endoscopic stigmata (a clean-based ulcer or a nonprotuberant pigmented dot in an ulcer bed) is not an indication for endoscopic hemostatic therapy
- A finding of a clot in an ulcer bed warrants targeted irrigation in an attempt at dislodgment, with appropriate treatment of the underlying lesion

Barkun et al. Annals of Internal Medicine 2003

---

---

---

---

---

---

---

---

## Injection Therapies

- Epinephrine (vasoactive)
  - (1:10,000) 9 mL NS with 1 mL 1:1000
  - Best in combination with thermal or mechanical coagulation
- Sclerotherapy (lead to thrombosis)
  - Sodium morrhuate (2.5-5%)
  - Sodium tetradecyl sulfate
  - Absolute alcohol
- Polymers
  - Cyanoacrylate
    - » N-butyl-2 (Histoacryl and Lipiodol) or 2-octyl (Dermabond)
  - Fibrin glue (fibrinogen and thrombin)

---

---

---

---

---

---

---

---

## Mechanical, Thermal and Biothermal

- Elastic band ligation
  - Esophageal Varices
  - Dieulafoy lesions
  - Polyps
- Endoclips
  - Single Clip (Resolution, QuikClip2, TriClip)
  - Multi Clip (InScope)
- Thermal coagulation
  - Heater Probe
  - Multi-polar Coagulation (MPEC)
  - Argon Plasma Coagulation (APC)

---

---

---

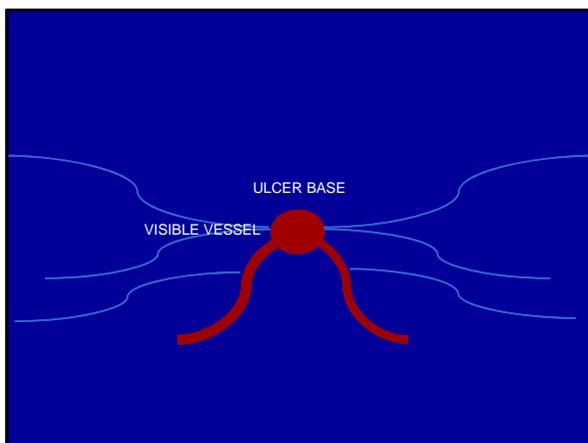
---

---

---

---

---



---

---

---

---

---

---

---

---

- Prime needle outside
- Identify lesion
- Insert catheter
- Leave space between lesion and scope to extend needle




---

---

---

---

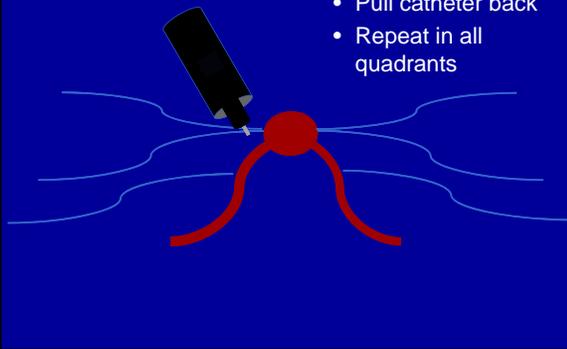
---

---

---

---

- Inject 0.5 mL until bleb formed
- Pull catheter back
- Repeat in all quadrants




---

---

---

---

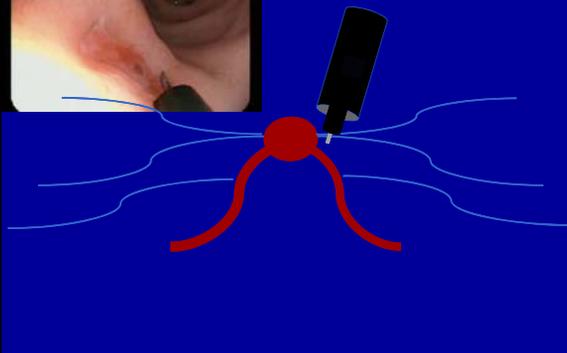
---

---

---

---

Duodenal ulcer  
1:10,000 epinephrine




---

---

---

---

---

---

---

---

## Multi-polar Electrocautery (MPEC)

- Generates heat indirectly by passage of current through tissue
- Allows for coaptation
- Leads to coagulation and vessel contraction

---

---

---

---

---

---

---

---

## When to use multipolar or heater probe

- Duodenal ulcer
- Gastric ulcer
- Mallory-Weiss Tear
- Dieulafoy lesions
- Vascular malformations (GAVE, radiation-induced)

---

---

---

---

---

---

---

---

## Multi-polar Electrocautery (MPEC)

- Use 7 or 10 French catheter
- Several available options
- No grounding necessary but requires electrosurgical unit
- Set power to 15 to 20W (less for colon)
- Apply pressure first
- Depress foot pedal 2-4 seconds
- Pull probe back gently and irrigate

---

---

---

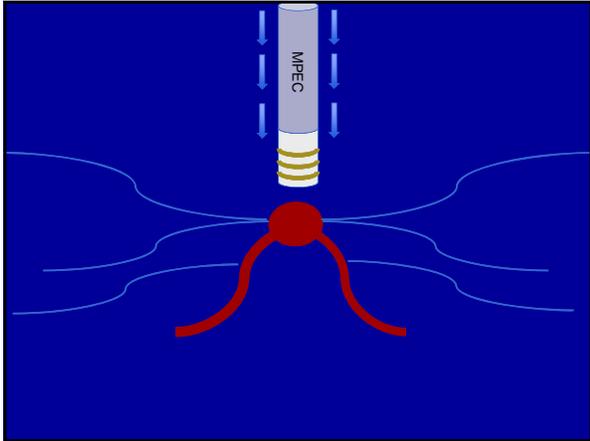
---

---

---

---

---



---

---

---

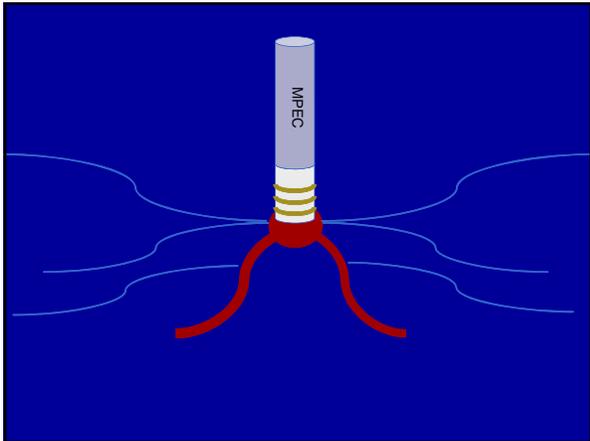
---

---

---

---

---



---

---

---

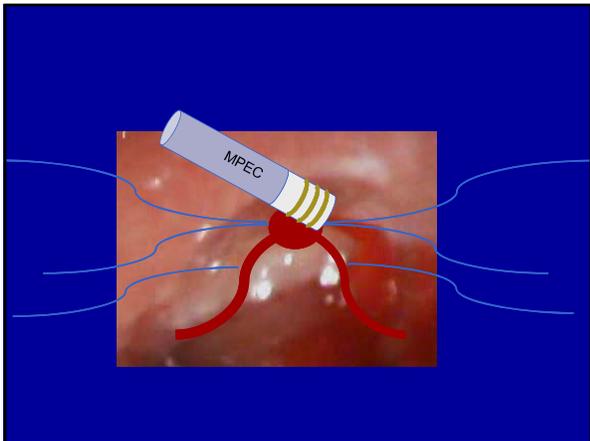
---

---

---

---

---



---

---

---

---

---

---

---

---

## MPEC Tips

- Due to various angulations, may need to bring catheter out prematurely (e.g antrum for duodenal ulcer)
- Catheters with combined sclerotherapy needle may be difficult in retroflexion
- Larger vessels require larger catheter
- Less optimal for coagulopathy

---

---

---

---

---

---

---

---

## Argon Plasma Coagulation



---

---

---

---

---

---

---

---

## Argon Plasma Coagulation

- Non-contact thermal hemostasis
- Tungsten electrode in probe ionizes argon gas
- Argon beam seeks nearest tissue
- Limited depth of coagulation (2-3 mm) with contact at surface

---

---

---

---

---

---

---

---

## APC Uses

- Vascular ectasias (GAVE and DAVE)
- Mallory-Weiss tears
- Duodenal and Gastric Ulcers
- Radiation induced injury
- Destruction of sessile polyps (duodenal adenomas in FAP)

---

---

---

---

---

---

---

---

## APC Tips

- Decompress frequently
- Use 7F or 10F catheter
- Set at 40W (15-20 in colon)
- Set flow 0.5-1L/min
- Use pulse setting and paint the area of interest
- Keep the black strip in view to avoid damage to endoscope

---

---

---

---

---

---

---

---

## Hemostatic Clips

- Mucosal/sub-mucosal defects < 3 cm
- Bleeding ulcers
- Arteries < 2-3 mm
- Polyps < 1.5 cm in diameter
- Need endoscopes with working channels equal to or greater than 2.8mm.
- Active bleeding or lesions with coagulopathy

---

---

---

---

---

---

---

---

## When to use clips for hemostasis

- Duodenal ulcer
- Gastric ulcer
- Mallory-Weiss Tear
- Early anastomotic bleeding
- Post-polypectomy
- Prophylaxis (pre-polypectomy, EMR)
- Post-variceal banding

---

---

---

---

---

---

---

---

## Hemostatic Clip Options

- Boston Scientific (Resolution Clip)
- Olympus (Quick Clip2)
- Wilson Cool (Tri-Clip)



---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---

## Clip Tips

- Practice with assistant prior to “in vivo” use
- May need to bring out in antrum and assess opening, closing and angle
- May need two hands to create POP
- To release, assistant should open their hand, endoscopist should keep catheter steady and even pull back slightly
- Have both lengths available

---

---

---

---

---

---

---

---

## Hemostatic Clip Tips

- Be familiar with clips
- Have multiple available
- Work close
- Inject with epinephrine if oozing
- Head-on or tangential, don't pinch the vessel
- Rotate clip
- Push into mucosa and suction
- Close

---

---

---

---

---

---

---

---

## Hemostatic Clip Tips: Common Errors

- Deployment of clip too far from endoscope
- Knock off clips already deployed
- Premature closure of clip
- Insufficient number of clips available
- Failure to release clip

---

---

---

---

---

---

---

---

## Variceal Band Ligation (VBL)

- Arrest bleeding and obliterate/eradicate the varix
- VBL is the use of a rubber band when placed over a varix, leads to thrombosis

---

---

---

---

---

---

---

---

## Variceal Band Ligation

Wilson Cook  
4,6, 10 Shooter®

Boston Scientific  
Super 7®

ConMed  
Auto-Band Ligator®



---

---

---

---

---

---

---

---

## VBL use in children

- In adults, compared to sclerotherapy
  - Decreased mortality (45% vs 28%)
  - Decreased complications (22% vs 2%)
  - Less recurrent hemorrhage and fewer sessions (NS)
- Majority of studies include patients with both intrahepatic and extrahepatic disease
- >90% variceal eradication in most series

Stiegmann GV et al. NEJM 1992; 326: 1527-1532  
McKiernan P et al. JPGN 2002; 34: 207-211  
Celinska-Cedro et al. J Pediatr Surg; 38: 1008-11

---

---

---

---

---

---

---

---

## VBL technique

- Identify varix of concern (map out remainder)
- Remove scope and attach ligation device
- Start low in the distal esophagus with high risk lesions first

---

---

---

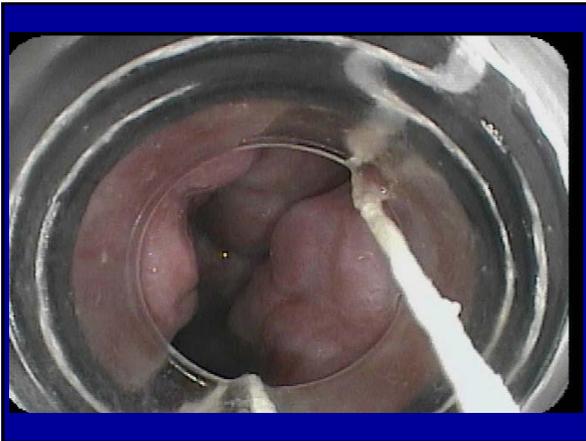
---

---

---

---

---



---

---

---

---

---

---

---

---

## VBL technique

- Angle scope so that varix can roll into banding cap. All edges of the cap should surround the varix.



---

---

---

---

---

---

---

---

## VBL technique

- Apply suction and when varix engorges  $\frac{3}{4}$  of cap obstructing endoscopic view, be ready to turn the banding device when there is a full “red out”



---

---

---

---

---

---

---

---

## VBL technique



---

---

---

---

---

---

---

---

## VBL Tips

- Re-intubation with ligation device can be difficult
- Major limitation is age (18 months)
- Minimize touching bands with endoscope after placement
- Have sclerotherapy equipment available

---

---

---

---

---

---

---

---

## Complications of VBL

- Bleeding (early and late)
- Infection
  - SBE prophylaxis not recommended
  - Antibiotics for acute bleeding only
- Perforation (rare)
- Stricture (rare)

---

---

---

---

---

---

---

---

## Training

- Text/Journals
  - Handbook of Gastroenterologic Procedures (Drossman)
  - JPGN, AJG, Gastrointestinal Endoscopy (GIE) and Endoscopy
- Video
  - DAVE project
  - ASGE Training Library
- Computer Simulation (bleeding modules)
- “Hands-On” Training
  - NASPGHAN/ASGE courses
  - ASGE Center (Chicago, IL)
- Adult GI Collaboration (observation, preceptorship)

---

---

---

---

---

---

---

---

<http://daveproject.org>

The screenshot shows the homepage of the DAVE Project website. The main heading is "The DAVE Project - Gastroenterology". Below this, there is a navigation menu with "Home", "CME", "Manual", "Contributors", "Submit", and "Search". The main content area is titled "Endoscopy Atlas" and contains several articles with video thumbnails and titles, such as "Peritoneal - Advancing the Principles of Minimally Invasive Surgical Therapy of Peritoneal Carcinomatosis" and "Intubation - Total Gastrectomy with Esophagegastrojejunostomy". On the right side, there is a "Site Sponsor" section for PENTAX and ASGE, and a "Win AMA PRA Category 1 Credit" section. The bottom of the page features a "Translate Page" button.

---

---

---

---

---

---

---

---

## Special Thanks

GI Procedure Suite Staff

Texas Children's Hospital Endoscopy Team:

- Bryan Vartabedian
- Anthony Olive
- Bruno Chumpitazi
- Kalpesh Thakkar
- Mark Gilger
- Isaac Rajjman

---

---

---

---

---

---

---

---

Thank you!!

dsfishma@bcm.edu

---

---

---

---

---

---

---

---

What should you do with a  
CLOT?



---

---

---

---

---

---

---

---

## What to do with adherent clots

- 56 patients at seven centers found to have fresh adherent clots with no active bleeding
- The clot was irrigated with 200 cc of forcibly injected water.
- Randomized into treatment with injection and heater probe or medical management
  - Those randomized to endoscopic therapy had the base of the adherent clot injected with 1/10,000 adrenaline in four quadrants with at least 1 cc in each quadrant.

---

---

---

---

---

---

---

---

## To remove or not?

- The clot was removed and heater probe (30 J) a minimum of 3 coaptive pulses.
- Rebleeding rates were 34.3% (12/35) in the medical treatment arm vs 4.8% (1/21) in endoscopic group. (**p<0.02**).
- Endoscopic treatment with injection of the base of the clot, removal, and heater probe coagulation significantly reduces rebleeding rates.

---

---

---

---

---

---

---

---

## Endoscopic Therapy vs. No Endoscopy for Treatment of Clots

- No significant benefit in further bleeding, surgery or mortality
- 2/5 favored endoscopy, 1/5 had n=5 patients
- Did not include rebleeding

Laine and McQuaid, Clin Gastroenterol Hepatol 2009; 7: 33-49

---

---

---

---

---

---

---

---

## How to remove the clot

- Snare removal (like polyp)
- Probe with biopsy forceps
- Manipulate with endoscope
- Suction

---

---

---

---

---

---

---

---