

Therapeutic Endoscopy

Fantastic Voyage Now a Reality

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Gastroenterology



History of Endoscopy

- Two major obstacles:
 - The gut is not straight
 - It's dark in there!
- Dr. Kussmaul 1868 first gastroscopy
- Thomas Edison 1878: first practical/commercial incandescent light bulb
- Hoffmann 1911: first proposed flexible endoscope
- Hopkins 1954: First model of a flexible fiber imaging device

History of Therapeutic Endoscopy

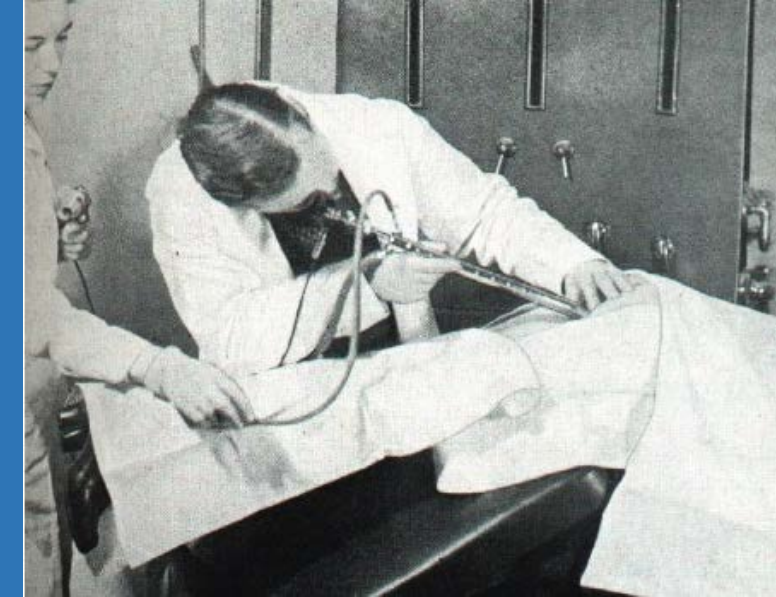
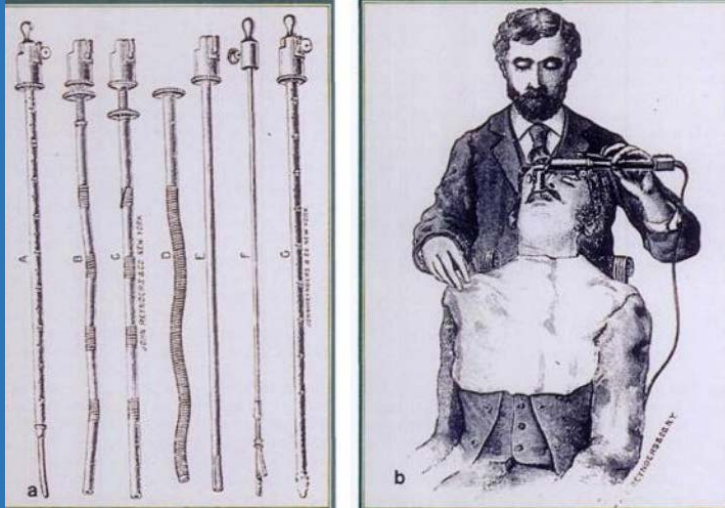
Table 1 Highlights from the “golden era” (1968–1990) of gastrointestinal endoscopy

- 1968 Endoscopic retrograde pancreatography
 - 1969 Colonoscopic polypectomy
 - 1970 Endoscopic retrograde cholangiography
 - 1974 Endoscopic sphincterotomy (w/bile duct stone extraction)
 - 1979 Percutaneous endoscopic gastrostomy
 - 1980 Endoscopic injection sclerotherapy (reinvented)
 - 1980 Endoscopic ultrasonography
 - 1983 Electronic (charge coupled device) endoscope
 - 1985 Endoscopic control of upper gastrointestinal bleeding
 - 1990 Endoscopic variceal ligation
-

The Golden Era of Endoscopy

- Major advancements in flexibility and imaging in the GI tract
- Reduction in size of endoscopic instruments
- Disinfection of instruments
- Disposable equipment
- Development of Endoscopic Ultrasound (EUS) and Endoscopic Retrograde Cholangiopancreatography (ERCP)
- Management of clinical issues steered away from surgical approaches
- Surgical discipline free to advance techniques in more complicated clinical issues

Times Have Changed



Rigid Sigmoidoscopy

Times Have Changed



Optical Endoscope



Modern Day HD Endoscope



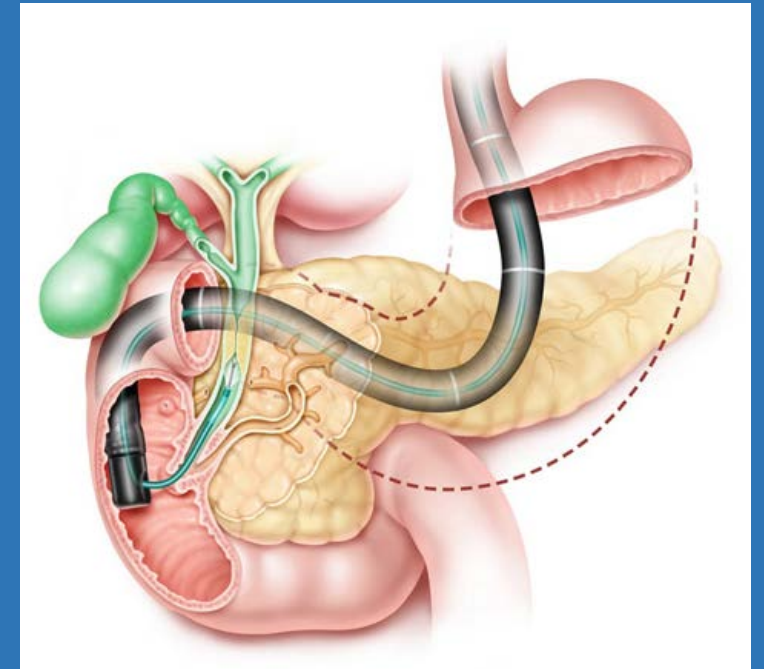
Capsule Endoscope

Cholangioscopy

Advancements and Impacts in Biliary
Endoscopy

Applications and Indications for Biliary Endoscopy

- Indications include:
 - Bile duct stones
 - Gallbladder stones
 - Biliary obstruction
 - Malignancy of the pancreas and biliary tree
- Scope and Scale:
 - 20+ million with gallbladder/bile duct disease
 - ~37,000 cases of pancreatic cancer
 - ~10,000 cases of gallbladder/bile duct cancer
 - 10-15% of those undergoing cholecystectomy have bile duct stones



Google image

Applications and Indications for Biliary Endoscopy

- Clinical manifestations can include:
 - Jaundice, abdominal pain, itching
 - Elevated liver enzymes, weight loss, nausea/vomiting
- Intervention for gallstones described since at least the 1800's, with the first laparoscopic cholecystectomy in 1985



Applications and Indications for Biliary Endoscopy

- Intervention for gallstones in the bile duct remained problematic for years, often requiring surgical exploration of the bile duct
- Surgical exploration carries risk:
 - Bile leak up to 6%, retained stones 3-6%, abscess/infection 1%
- Need for less invasive means of exploring bile duct

Stone video 04067826 stones frog



59440095 impacted stone video



Impacted stone fall out video



Applications and Indications for Biliary Endoscopy

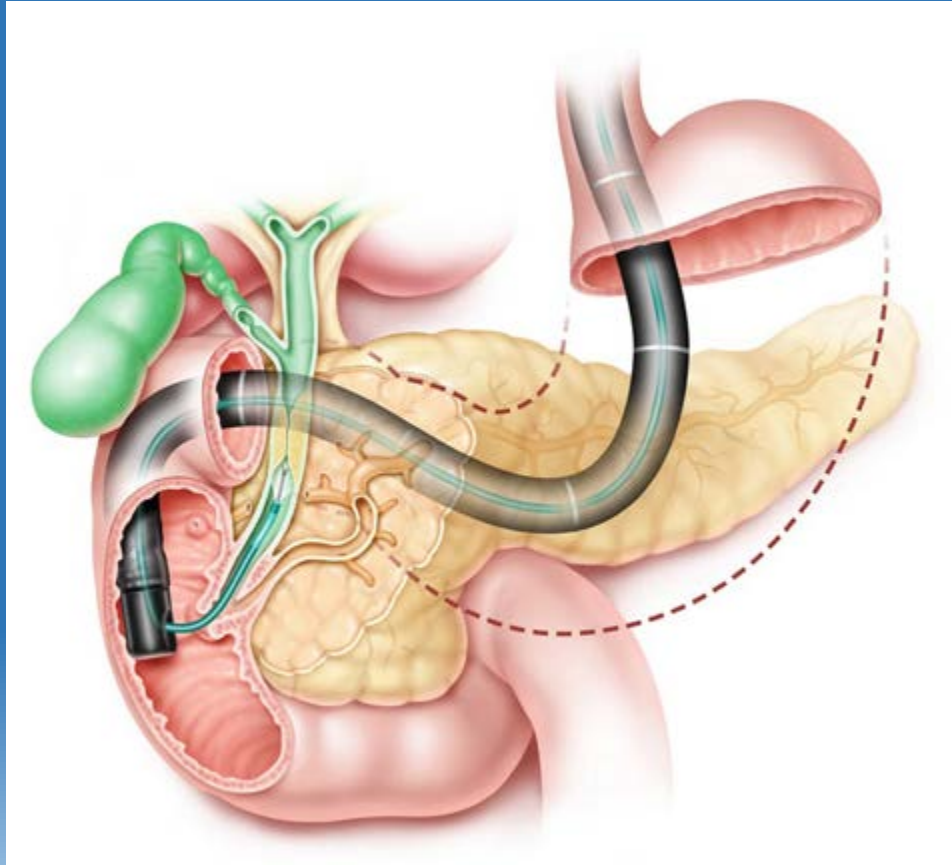
- ERCP (Endoscopic Retrograde Cholangiopancreatography) first described in 1968
- First development of direct cholangioscopy was in 1976
 - “Mother-Daughter” scope- required 2 operators, limited flexibility
 - Cumbersome
 - Low image quality
 - Very time consuming
- Advancements in fiber optic technology has revolutionized our ability to diagnose and treat endoscopically what formerly required a surgical approach

Applications and Indications for Biliary Endoscopy

- 2007: first fiber optic-based imaging system for direct biliary examination
- 2015: newest generation of digital cholangioscopy came to market
- Henry Ford one of the first in the region to offer this to our patients

Cholangioscopy

Cholangioscopy



Google images

Why Cholangioscopy?

- Direct visualization of the pancreas and biliary tree
- Improve yield of sampling and biopsy
- Intervene on impacted or large stones in the bile duct
- Characterization of strictures/obstructions of the biliary tree
- Historically biliary exploration and visualization was percutaneous or intraoperative

Why Cholangioscopy?

- EHL: Electrohydraulic Lithotripsy
- Electrical spark between two electrodes at catheter tip
- Creates high energy to fragment stones
- Overall complication rate (bile duct perforation) <1%
- Site-directed biopsy
 - Improves sampling yield
 - Visual inspection/examination of the lesion of interest

Cholangioscopy



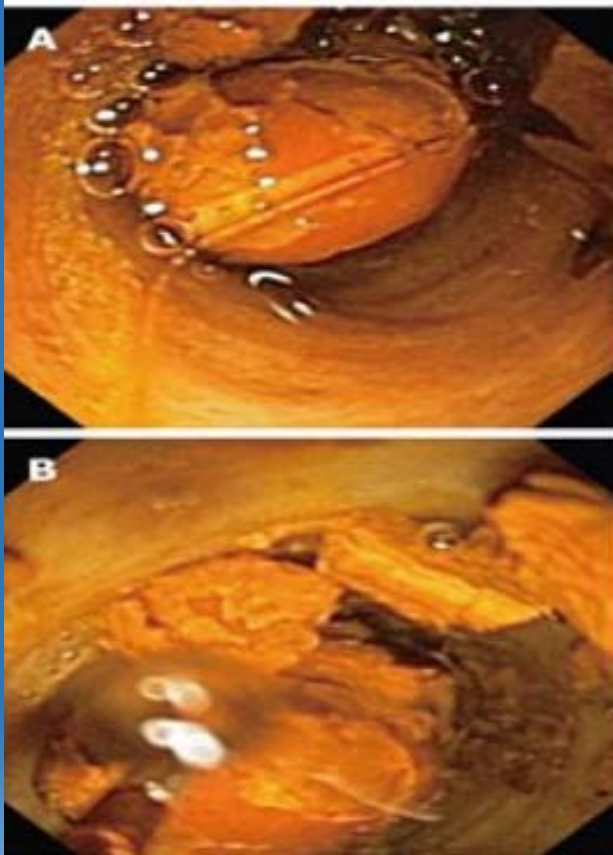
Biopsy forceps



Electrohydraulic Lithotripsy (EHL)

Google image

Cholangioscopy



Google images

Normal spy video



Spy stone video



Spy stone EHL



EHL video



Spy cholangio video



Cholangioscopy Complications

- Complications on par with standard ERCP procedure
 - 3-5% pancreatitis, 1% bleeding, 1:1000 perforation
- Typically outpatient procedure with discharge same day
- Near 100% confidence of bile duct clearance
- Significant improvement in diagnostic yield with site-directed biopsy compared with brush cytology for malignancy diagnosis

Surgical vs Endoscopic Clearance of the Bile Duct

Surgical

Endoscopic

Bile Leak	6%	<1%
Retained Stones	3-6%	<1%
Abscess/Infection	1%	<1%

Cholangioscopy

- Significantly impacted cost of management and treatment of clinical issues that once required surgical intervention
- Significantly reduced complications associated with interventions
- Interventions that once required inpatient management can now be performed as outpatient procedures
- Improved diagnostic yield of sampling
- Reduced need for repeat procedures

Perforation and Fistula Closure Over the Scope Clip Technology

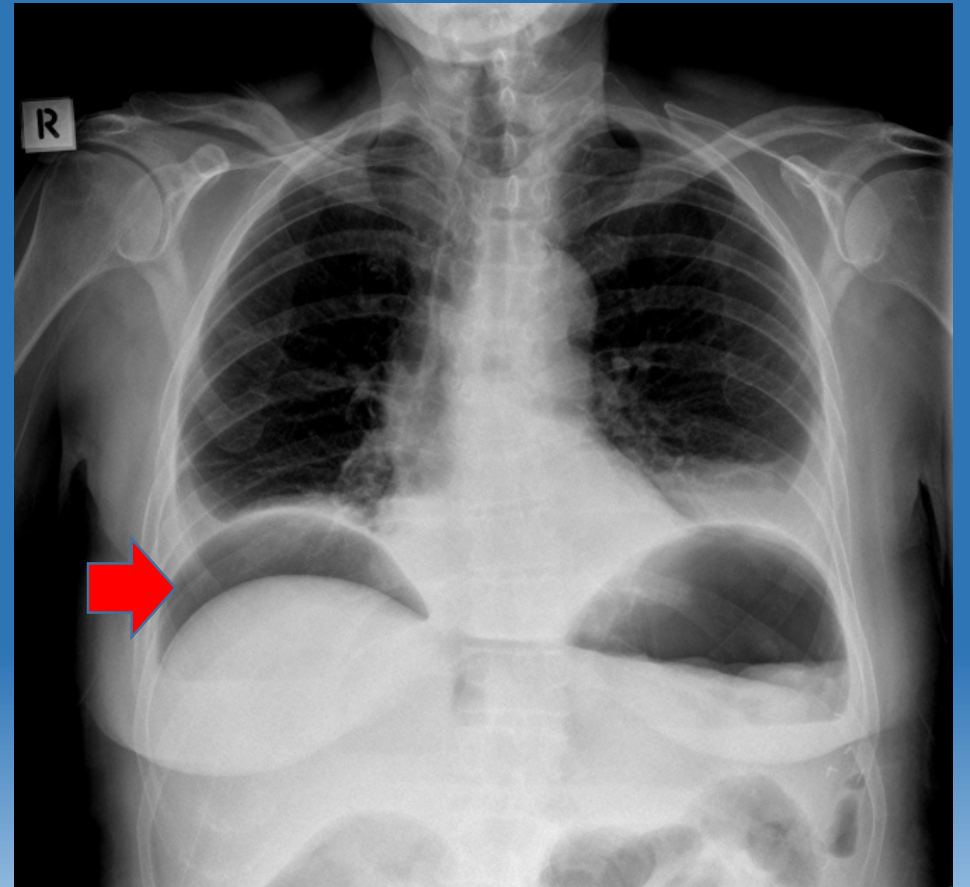
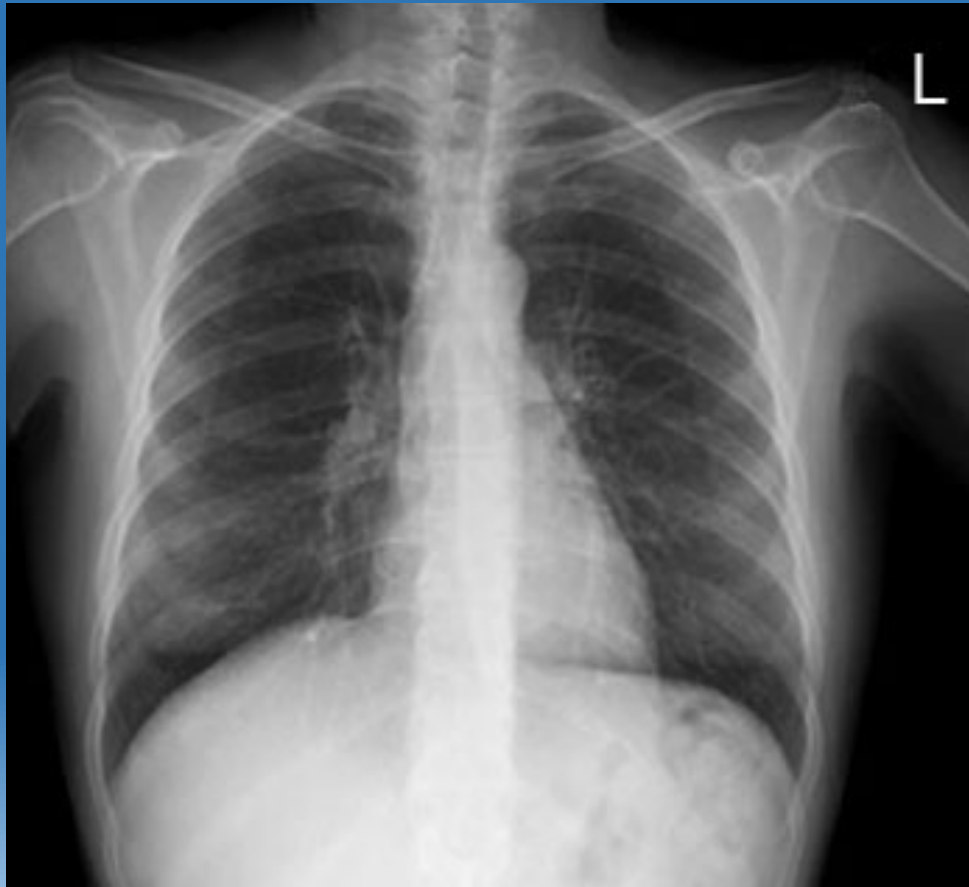
Perforation and Fistula

- Definition: full thickness injury to the bowel wall (perforation)
- Clinical symptoms and signs:
 - Pain, fever, nausea/vomiting
 - Sepsis/infection, free air on abdominal Xray
- Etiologies:
 - Complication of endoscopy procedures, surgery, foreign body in GI tract
 - Penetrating injuries, bowel obstruction, vascular disease
 - Infection, peptic ulcer disease, violent vomiting/retching

Perforation and Fistula

- Definition: abnormal inflammatory tract between two epithelialized surfaces (fistula)
- Can occur between bowel-> bowel/skin/bladder
- Complication of surgical procedure, inflammation, foreign body

Abdominal Free Air



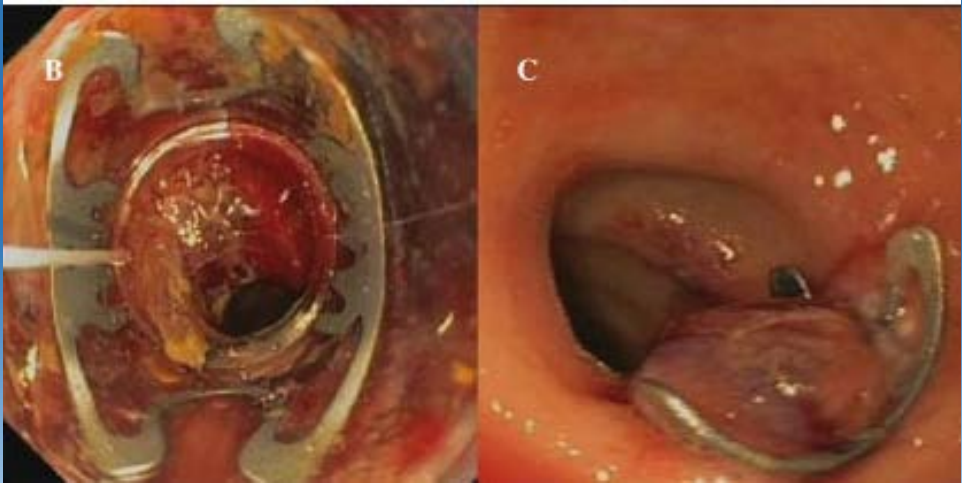
Perforation and Fistula

- Challenges in management:
 - Often required surgical repair
 - Patients often “sick” and not good surgical candidates
 - Primary closure many times difficult
 - May require bowel resection or even ostomy formation
 - Infection from bowel bacteria
 - Risk of surgery
- Need for less invasive means of management and closure

Over the Scope Clipping (OTSC)

- Plastic cap that fits over the end of the endoscope
- Spring loaded very strong metal clip
- Capture perforated/fistula area within the cap
- Deploy OTSC creating a “button”
- Allows for healing and closure of orifice

OTSC



Google image

IMG 0709 video rotate 90 degrees
clockwise



IMG 0707 video rotate 90 degrees clockwise



OTSC GJ fistula video



OTSC Perforation and Fistula Closure

- Clinical Impacts:
 - Avoidance of surgical intervention in sick patients
 - Minimally invasive
 - Very low procedure-related complication rate
 - Low infection rate

Perforation and Fistula Closure- Endoscopic Suturing



Google image

Endoscopic Suturing

- Alternate method of perforation/fistula closure
- Ability to close larger defects
- Rescue method for failed closure with OTSC
- More cumbersome
- Higher technical skill

Gastric suturing video (GG1-GG4)



Advancements in Therapeutic Endoscopic Technology

- Has allowed for minimally invasive approaches for once surgical indications
- Reduced or eliminated complications in managing complex clinical issues
- Reduced admissions and likely cost of managing complex clinical issues
- HFHS has a 100 year history of bringing these advancements to our community, and will continue to lead in the next 100 years

Thank You

- Surgical and Radiology Departments
- Gastroenterology RN staff and Leadership
- GI Division, Internal Medicine Department and HFHS Leadership for supporting our efforts to bring the latest technology and techniques to our community
- All of you, past and present!



CONGRATULATIONS HFHS!

