

Section 21

LECTURE

Diagnostic and Therapeutic Endoscopy

DIAGNOSTIC AND THERAPEUTIC ENDOSCOPY FOR THE GI TRACT
or
The endoscopic revolution in the practice of gastroenterology

A. Historical perspectives on endoscopy

1800's - Early endoscopes: Hollow tubes, magnifying lens, and proximal light

1930- Semiflexible gastroscope – Rudolph Schindler
Flexibility obtained with a series of prisms but limited view
Distal light, ability to biopsy

1959 – The **Fiberoptic revolution** – Basil Hirschowitz
complete flexibility without loss of image

Subsequent milestones in endoscopic development

1960-1970 Diagnostic gastroscopy, introduction of colonoscopy

1970-1980 Endoscopic cholangiopancreatography
Introduction of therapeutic endoscopy
Treatment of bleeding, removal of polyps, bile duct stones

1980-1990 Advent of **Video** endoscopy
Endoscopic ultrasonography
Improved treatment of strictures – Placement of feeding tubes

1990-2000 Explosion of **Laparoscopic surgery**
Small bowel endoscopy
Self expanding metal stents
Endoscopic mucosal resection

2000- Video Capsul endoscopy
Intraluminal therapy of gastroesophageal reflux
Improved Dx with oculocoherence, fluorescence, magnification

B. Impact of endoscopy on gastroenterology – predictable course

- 1. Initially only improved diagnosis – Hohum!**
- 2. Then therapeutic potential – This looks interesting!**
- 3. Eventually can replace surgery – Sign me up!!!**
- 4. Spin – off: Changed concepts of GI disease**
 - Relationship of colon polyps to cancer
 - Peptic ulcer as an infectious disease
 - Sources of GI bleeding
 - Premalignant changes in chronic GI inflammation

C. The endoscope

Color Videochip camera transmits high resolution digital image
External light transmitted through fiberoptic bundles
Ability to control direction of viewing tip through 360°
Instrument channel(s) permit sampling, therapeutic maneuvers
Ability to insufflate air, cleanse lens
Instruments of various lengths, diameter, and stiffness depending on examination
 Indication and age of patient
Side viewing instruments for work in the biliary tree and pancreas

D. Technique

Outpatient procedure using conscious sedation and topical anaesthesia
Only therapeutic interventions with high likelihood of complications need to be admitted
Patient acceptance high and comparable to Xray
 Retrograde amnesia with sedatives
Routine complete upper and lower GI visualization. Potential for visualization of much of small bowel
Contraindications: few: perforation, active ischemia
Complications
 Few for diagnostic studies. Perforation 1/3000 or less
 Significant for therapeutic procedures but generally equal to (in young) or less than comparable surgery (in old)
 Accelerated recovery

Costs: Endoscope and processors, video monitors @ 45,000
 1/10 the cost of modern fluoroscopy equipment
 Cost for procedure @ 1.5x comparable radiologic procedure due to support personnel for conscious sedation.

Order of magnitude less than comparable surgery

II. USES OF ENDOSCOPY

Upper GI endoscopy – Esophagogastroduodenoscopy

Routine visualization to third portion of the duodenum
Therapeutic applications for each diagnostic indication

A. Upper GI bleeding

Non-variceal bleeding

Early endoscopy the preferred approach
Identify, treat the high risk lesion
Permit early discharge of low risk patients
Many radiologically undetectable lesions
Mallory-Weiss tears, AV malformations

Risk stratification of bleeding lesions predicts likelihood of rebleeding and surgery

Spurting vessel – 80-90%

The **visible vessel**- Raised platelet thrombus in ulcer base: 35-50%

Adherent clot or oozing vessel 30%

All of above indications for therapy

Therapeutic devices:

Bipolar electrodes, heater probe (steam iron), vascular clips, Injection
Therapy with epinephrine, etoh.
Argon lasers, cryotherapy for vascular ectasias
Demonstrated effectiveness by metanalysis re transfusion, surgery, mortality

Variceal Bleeding

Control with injection of sclerosants, neoprene band ligation
Retreatment till esophageal varices eliminated

B. Swallowing Disorders - Dysphagia and Odonophagia

Almost always organic, absolute indication

Rings, strictures, tumors

Therapy

Removal of foreign bodies, its amazing what some people will swallow

Dilating balloon, wire guided bougies

Value of **Self expanding metal stents** as palliation for tumors

C. Dyspepsia and Esophageal Reflux

10-30% of ulcers missed,

Identification of helicobacter and diffuse gastritis and reflux esophagitis

Barrett's esophagus

Therapy

- Endoluminal therapy of esophageal reflux
- Fundoplication with endoscopically placed sutures, staples, radiofrequency ablation
- injection of polymers
- The endoscopic sewing machine
- Photodynamic therapy of Barrett's esophagus with ablation

D. Suspected malignant and premalignant lesion

- Accurate diagnosis of ulcers, polyp, thickened folds
- Surveillance of premalignant lesions-dysplasia/carcinoma in situ
- Biopsy, flow cytometry, vital staining

Therapy

- Endoscopic mucosal resection** of superficial lesions (See EUS)
- Favorable Japanese experience with early CA of the stomach
- Polypectomy – major importance in the colon.

E. Nutrition

- Percutaneous endoscopic feeding tubes in stomach, small intestine
- Simplify care of neurologically impaired and those with aspiration

Endoscopic ultrasound

- Technique for closer imaging of upper and lower GI tract
- Small high frequency ultrasound attached to endoscope or probes
- Short penetration but high sensitivity

Uses:

- Staging of esophageal, gastric, pancreatic cancers
- Diagnose nature of submucosal lesions – Mass vs vascular
- differentiate vascular lesions
- Best visualization of small lesions of pancreas, ability to do FNA
- Aspirate and characterize cystic lesions of the pancreas
- Drainage of pancreatic pseudocysts

III. RETROGRADE CHOLANGIOPANCREATOGRAPHY - CANNULATION OF THE AMPULLA OF VATER

A. Indications

Obstructive jaundice

- Ineffectiveness of conventional radiology
- Preferred alternative to skinny needle cholangiography
- Route for nonoperative interventions (v.i.)
- Biopsy of ampullary tumors

Recurrent pancreatitis

- Predicts effectiveness of surgery
- Determines operative approach
- Definition of cysts, fistula
- Removal of stones

Unexplained pancreobiliary pain

- Suspected pancreatic CA, if imaging techniques not definitive
 - Differentiation between carcinoma and pancreatitis may be difficult
- Manometry for "papillary stenosis". Response to sphincterotomy
- Pancreatic anomalies

B. Therapy - Need for surgery of the biliary tree decreasing.**Common duct stones**

- Endoscopic papillotomy and extraction of stones
 - Procedure of choice for retained, recurrent stones
 - Complications comparable or less than surgery
 - Recovery - 2 days vs. 2 months
 - Sub-optimal risks with CDS and intact gallbladder
 - Rarely require subsequent cholecystectomy
- Still a problem with oversized stones
 - Use of crushing baskets, lasers, lithotripsy, long term stents

- Treatment of acute cholangitis and gallstone pancreatitis
 - Safe, effective, essential for severe cholangitis
 - Safe in pancreatitis - improves survival in severe disease
 - Limited population at risk

Malignant obstruction of the common duct

- Pancreatic, ampullary, or primary bile duct malignancy
 - Metastatic tumors to porta hepatis
- Insertion of indwelling stents and drains
 - For temporary drainage as preparation for surgery
 - As permanent therapy in inoperable metastatic disease
 - Prolonged patency and stent exchange PRN
- Insertion of expandable metal stents
 - Several varieties
 - Large size = longer patency but tumor ingrowth
 - Non-removable

Benign bile duct injury especially after laparoscopic cholecystectomy

- Strictures: dilation with inflatable balloon
- Fistula: stent until leak closes

Therapeutic techniques for the pancreatic duct

- Pancreatic cysts
 - drainage into stomach, duodenum
- Obstructing pancreatic stones
 - papillotomy and removal
- Stenting and ballooning of strictures, stenotic ampulla
 - Potential dangers of long term stenting
- Pancreas Divisum: Association with increased risk of pancreatitis?

Duodenoscope assisted choledocho-pancreatoscopy

- Mother daughter endoscope allows direct inspection of ducts
- Visual scrutiny of possible malignant strictures, cytology
- Vehicle for delivery of laser or electrohydraulic lithotripsy

IV. COLONOSCOPY

A. Diagnostic and therapeutic indications

Colon Cancer screening

- 2nd most common cancer
- Most colon cancers arise from polyps
- Polyp to cancer sequence usually slow (10+ years)
- Cancer mortality decreased by early diagnosis
 - Removal of precursor lesions – i.e. polypectomy
 - Use of mucosal resection techniques for even very large polyps
- Screening programs for colon cancer more cost effective than mammography
- Routine screening at age 50
- Increased appreciation of genetic factors in colon cancer
 - Description of gene deletions
 - Familial polyposis, non-polyposis syndromes. @20-25% of cancers familial
 - Heightened screening with familial predisposition
- Potentially >50% Colon cancers preventable
- Once polyp or cancer found – increased risk of synchronous or metachronous lesions.

Other colon cancer screening techniques

- Chronic GI Blood loss
 - 1-5% of asymptomatic population +FOBT
 - 10% of these cancers
 - 10-15% polyps

99% of lesions in colon
But insensitive screening test
Gene mutations detected PCR amplification of fecal DNA
Virtual colonoscopy

Lower GI Hemorrhage

Occasionally useful with rapid purge
Treatment of angiodysplastic lesions with bicap, lasers
Not as effective as in upper GI bleeds.

Inflammatory bowel disease

Diagnose extent of disease
Monitor activity if rectal sparing
Screening for malignancy in ulcerative (and Crohn's) colitis
After 7-years (Crohn's 15-years)
Significance of dysplasia

Decompression of colonic distention

Ogilvie's syndrome, perhaps best left alone

Complications

Blunt and electrosurgical perforations 0.2%
Hemorrhage following polypectomy 1-2%
Fatality rare in diagnostic cases

V. SMALL BOWEL ENDOSCOPY

- A. Limited indications at present
 - Need for small bowel biopsy - i.e. sprue
- B. Unexplained GI bleeding
 - Push enteroscope - proximal jejunum
 - Sonde enteroscope
 - Tedious and incomplete examination
 - Endoscope passes by gravity
 - View on withdrawal
 - Surgical approach
 - Long scopes and open abdomen
 - Prolonged ileus post-surgery
- C. Capsule Endoscopy
 - For detection of occult GI bleeding lesions
 - Small bowel tumors

Capsule contains videocamera, strobe light and battery, transmitter
Passes through GI tract by peristalsis
2 images/second transmitted to recorder
Position roughly determined by sensor array worn by patient
6,000 images reviewed on computer (@1 hour)
As yet no therapeutic potential.

VII. FUTURE INNOVATIONS

Expanded use of endoscopic ultrasound
Spectroscopy
Fluorescence therapy

V. LAPAROSCOPY

A. Technique

Rigid instruments with video chips
Insertion just below umbilicus
CO₂ insufflation
Anesthesia not required

B. Gastroenterological indications

Evaluation of unexplained ascites
Staging of malignant disease, Hodgkins, pancreatic CA
Guided liver biopsy

C. Surgical indications

Laparoscopic cholecystectomy
Rapid patient recovery in suitable patients
Revolution in gall bladder surgery, combine with ERCP

↑ incidence of complications in learning phase
Other laparoscopic innovations
Segmental colectomy, vagotomy, hernia repair
Feasible, but is it preferable

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