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, flourescence, 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 throogh 360o
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 flouroscopy 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 likelyhood 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 Odonyphagia

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

Percuraneous 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 lowerGI 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 bleeeds.

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
CO_2 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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