• History.
• What is endoscopy?
• Rigid endoscope construction and applications.
• Flexible endoscope construction and applications.
• Endoscope rigid/flexible processing.
• Endoscope rigid/flexible care and maintenance.
• Endoscope rigid/flexible inspection.
• Troubleshooting.
• How to avoid repair.
Brief History of Endoscopy

• In the early 1900s, the first attempts to view inside the body with lighted telescopes were made. These initial devices were often fully rigid. In the 1930s, semi-flexible endoscopes called gastrosopes were developed to view inside of the stomach. Fiber-optic endoscopy was pioneered by South African-born physician Basil Hirschowitz at the University of Michigan in 1957. Widespread use of fiber optic endoscopes began in the 1960s.

• A fiber optic cable is simply a bundle of microscopic glass or plastic fibers that literally allows light and images to be transmitted through curved structures.
What is Endoscopy?

- **Endoscopy** is the examination and inspection of the interior of body organs, joints or cavities through an endoscope to allow physicians to peer through the body's passageways.

- An **Endoscope** is a device using fiber optics and powerful lens systems to provide lighting and visualization of the interior of a joint. The portion of the endoscope inserted into the body may be rigid or flexible, depending upon the medical procedure.
ENDOSCOPY

FLEXIBLE ENDOSCOPY

SURGICAL ENDOSCOPY
ENDOSCOPY

Encephaloscopy

Rhinoscopy

Thoracoscopy - Mediastinoscopy

Gastroscopy - Duodenoscopy

Colonoscopy

Amnioscopy

Cystoscopy

Arthrosopy

Arthrosopy

Laryngoscopy

Bronchoscopy

Esophagoscopy

Laparoscopy

Nephroscopy

Hysteroscopy

Proctoscopy
RIGID ENDOSCOPY
RIGID ENDOSCOPY
SURGICAL ENDOSCOPY
(RIGID ENDOSCOPY)

- Laparoscopy.
- Arthroscopy.
- Endo-Urology.
- Gynecology.
- E.N.T-applications.
- Proctoscopy.
- . . . .And many other surgical applications
  (gastrectomy, neurosurgery,...etc) .
ARTHROSCOPY             LAPAROSCOPY
RIGID ENDOSCOPE

Diagram of a rigid endoscope showing:
- Objective Head
- Spacer
- Distal Window
- Rod Lens
- Light Guide Attachment
- Eyepiece
CARE OF RIGID ENDOSCOPE

• Rigid endoscopes must be handled with care, they are very delicate and can be damaged easily if dropped or hit against hard objects.

• Can be disinfected via gas sterilization or autoclaved if specified by manufacturer or soaked in 2-3% gluteraldehyde sol’n mostly used safe disinfection technique.
FLEXIBLE ENDOSCOPY
The Digestive System

- The digestive tract consists of the followings:
  - Mouth
  - Throat
  - Esophagus
  - Stomach
  - Duodenum
  - Small bowel
  - Colon
  - Rectum
  - Anus
  - And other GI organs.
FLEXIBLE ENDOSCOPY

UPPER GI ENDOSCOPY

LOWER GI ENDOSCOPY

RESPIRATORY ENDOSCOPY
UPPER GI ENDOSCOPY

Gastroscopy

Duodenoscopy
(ERCP)

Enteroscopy
GASTROSCOPY

• Upper endoscopy (gastroscopy) enables the physician to look inside the esophagus, stomach, and duodenum and the first part of the small intestine. The procedure might be used to discover the reason for swallowing difficulties, reflux, bleeding, indigestion, abdominal pain, or chest pain.

• For the procedure you will swallow a thin, flexible, lighted tube called an endoscope. Right before the procedure the physician will spray your throat with a numbing agent that may help prevent gagging. You may also receive pain medicine and a sedative to help you relax during the exam. The endoscope transmits an image of the inside of the esophagus, stomach, and duodenum, so the physician can carefully examine the lining of these organs. The scope also blows air into the stomach; this expands the folds of tissue and makes it easier for the physician to examine the stomach.

• Gastroscopy takes around 10 minutes.
ERCP

- Scope
- Esophagus
- Stomach
- Gallbladder
- Pancreas
- Duodenum
- Viewing major papilla
ERCP combines the use of x rays and an endoscope, which is a long, flexible, lighted tube. Through it, the physician can see the inside of the stomach and duodenum, and inject dyes into the ducts in the biliary tree and pancreas so they can be seen on x ray.
Endoscopic retrograde cholangiopancreatography (ERCP) enables the physician to diagnose problems in the liver, gallbladder, bile ducts, and pancreas. The liver is a large organ that, among other things, makes a liquid called bile that helps with digestion. The gallbladder is a small, pear-shaped organ that stores bile until it is needed for digestion. The bile ducts are tubes that carry bile from the liver to the gallbladder and small intestine. These ducts are sometimes called the biliary tree. ERCP is used primarily to diagnose and treat conditions of the bile ducts including gallstones, inflammatory strictures (scars), leaks (from trauma and surgery), and cancer.
LOWER GI ENDOSCOPY

Colonoscopy

Sigmoidoscopy
Colonoscopy lets the physician look inside the entire large intestine, from the lowest part, the rectum, all the way up through the colon to the lower end of the small intestine. The procedure is used to look for early signs of cancer in the colon and rectum. Colonoscopy enables the physician to see inflamed tissue, abnormal growths, ulcers, and bleeding.

If anything abnormal is seen in the colon, like a polyp or inflamed tissue, the physician can remove all or part of it using tiny instruments passed through the scope. That tissue (biopsy) is then sent to a lab for testing. If there is bleeding in the colon, the physician can pass a laser, heater probe, or electrical probe, or inject special medicines through the scope and use it to stop the bleeding.

Colonoscopy takes 30 to 60 minutes.
Flexible sigmoidoscopy enables the physician to look at the inside of the large intestine from the rectum through the last part of the colon, called the sigmoid or descending colon. Physicians may use the procedure to find the cause of diarrhea, abdominal pain, or constipation. They also use it to look for early signs of cancer in the descending colon and rectum. With flexible sigmoidoscopy, the physician can see bleeding, inflammation, abnormal growths, and ulcers in the descending colon and rectum. Flexible sigmoidoscopy is not sufficient to detect polyps or cancer in the ascending or transverse colon two-thirds of the colon.
RESPIRATORY ENDOSCOPY

Bronchoscopy

Laryngoscopy
A bronchoscope is a tube with a tiny camera on the end which is inserted through the nose (or mouth) into the lungs. During a bronchoscopy procedure, a scope will be inserted through the nostril until it passes through the throat into the trachea and bronchi. A bronchoscope is used to provide a view of the airways of the lung. The scope also allows the doctor to collect lung secretions and lung tissue for biopsy for tissue specimens.
Cystoscopy is a procedure that uses a flexible fiber optic scope inserted through the urethra into the urinary bladder. The physician fills the bladder with water and inspects the interior of the bladder. The image seen through the cystoscope may also be viewed on a color monitor and recorded on videotape for later evaluation.
Endoscopy System

- Camera processor
- Monitor
- Light source
- Video recorder
- Video printer
- Suction system
- E.S.U
- Trolley with hanger
- Endoscope
- Endo-accessories
The **flexible endoscope** is a remarkable piece of equipment that can be directed and moved around the many bends in the gastrointestinal tract. Endoscopes now come in two types: The original pure **fiberoptic** instrument has a flexible bundle of glass fibers that collect the lighted image at one end and transfer the image to the eye piece. The newer **video** endoscopes have a tiny, optically sensitive computer chip at the end. Electronic signals are then transmitted up the scope to computer then displays the image on a large video screen. An open channel in these scopes allows other instruments to be passed through in order to take tissue samples, remove polyps and perform other exams.
Construction of Flexible Endoscope

- Control Body
- Insertion Tube
- Light Guide Tube
Control Body

- Houses the following:
  - Angulation mechanism (drives)
  - Air/water and suction valves
  - Eye-piece (fiberscopes) or remote function buttons (videoscopes).
Insertion Tube

- Made of a complex plastic.
- Contains the following:
  - LG fiber
  - A/W channel
  - Biopsy channel
  - Angulation wires
  - IG fiber or CCD
ENDOSCOPE CROSS SECTION
Light Guide Tube

- Contains the following:
  - LG fiber
  - Air channel
  - Water channel
  - Suction tube
  - CCD and/or control wires
  - LG plug
Anatomy of Endoscopy System
Endoscopic Accessories

- Biopsy forceps
- Graspers
- Baskets
- Injectors
- Dilators
- Knives
- HF endo-therapy accessories
- ...And too many types of accessories.
PROCESSING OF ENDOSCOPES

• Mechanical Cleaning (wiping tubes and channel brushing in a detergent sol’n)

• Disinfection

• Rinsing
Endoscope Processing Fluids

- **Detergent**: medical grade, low foaming, neutral PH or enzymatic with proper dilution and temperature.
- **Disinfectant**: 2.0-3.0% Gluteraldehyde sol’n (mostly used and safe HLD).
- **Rinsing water**: Sterile water is needed to remove detergent and disinfectant residues, all channels must be flushed properly then endoscope to be dried by wiping and then hanged in the special endoscope cabinet.
Flexible Care and Maintenance

- Endoscope must be inspected before and after use for the following:
  - Insertion and LG Tubes
  - Bending mechanism
  - Optical system
  - General inspection (appearance)
  - Endoscope to be leakage tested
Leakage Test

Endoscopes must be checked against any leak or damage before use and processing to ensure its efficiency and avoid instrument malfunction during endoscopy.

Leakage tester is an instrument which can be attached to endoscope and blows certain pressure of air-set by the manufacturer inside it then endoscope is immersed in a water basin and checked against any leak, if any leak is seen endoscope must be immediately transferred for repair and must not been used.
Why do air/water problems occur?

• The scope is not cleaned immediately following procedure.
• Nozzle is damaged, missing or misaligned.
• Severe glutaraldehyde buildup from chemical disinfectants can break away from the channel and block the air/water nozzle.
How do bending sheaths become damaged?

Any sharp objects, such as instruments, fingernails or bites can cause tears or holes in the sheath material.

- Over time, normal wear or over inflation can cause stretching or looseness of the bending rubber material.

- If the ETO cap is not in place during the ETO gas sterilization process, the scope will pressurize and the bending sheath will explode like a balloon. Follow the instructions on the white card attached to the ETO cap.
How do fluid problems occur?

- If a scope has a leak which is not detected, and the scope comes in contact with any fluid, moisture will enter the scope through the leak.
- In fiber scopes, the scope will have major fluid invasion if the scope is immersed with the ETO venting cap on. For video scopes, the water proof cap must be attached before contact with any fluid.
- If a scope has a fluid invasion and is not repaired immediately, video chip damage and image staining can result, as well as corrosion of the internal metal components.
- Remember - fluid problems are a scope's worst enemy!
Angulation problems are a result of:

- The angulation wires can stretch and break if the angulation is forced.
- Buckling of the insertion tube can stretch and break wires.
- Play in the angulation control knobs usually indicates an angulation adjustment is needed.
What causes damage to the channel?

- Kinked, damaged or open flexible biopsy forceps can cause tears in the channel material.
- Buckling of the insertion tube can cause buckles in the channel.
- Forcing instrumentation through the channel can cause wear or tears in the channel material. This frequently occurs in the bending section when resistance is met while the scope is angulated. Do not pass anything through the bending section with the tip angulated further than 110°.
How do image and light guide problems occur?

• Buckles or bites in the insertion or light guide tubes can break image and light guide fibers.
• Fluid invasion can cause staining of the fibers or video chip damage if not repaired immediately. The fluid also causes brittleness of the fiber bundles.
• Pulling on the insertion or light guide tube, as well as dropping the scope, can cause broken fibers or damage to the video chip.
HOW TO AVOID REPAIR

- Proper handling of endoscope.
- Using recommended accessories correctly.
- Proper processing and using protecting cover in case of videoscopes.
- Avoid harmful shaking, dropping or hitting against any hard object.
- Leakage test before and after use.
- Storing in clean, dry, well-ventilated and maintained at normal temperature.

FOR ANY QUERY DON'T TRY TO DISCOVER BY YOURSELF ASK ABOUT IT . . . .
THE END

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