



**ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY**

**AUTONOMOUS INSTITUTION**

Approved by AICTE & Affiliated to Anna University

NBA Accredited for BE (ECE, EEE, MECH) | Accredited by NAAC with A+ Grade

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## DEPARTMENT OF BIOMEDICAL ENGINEERING

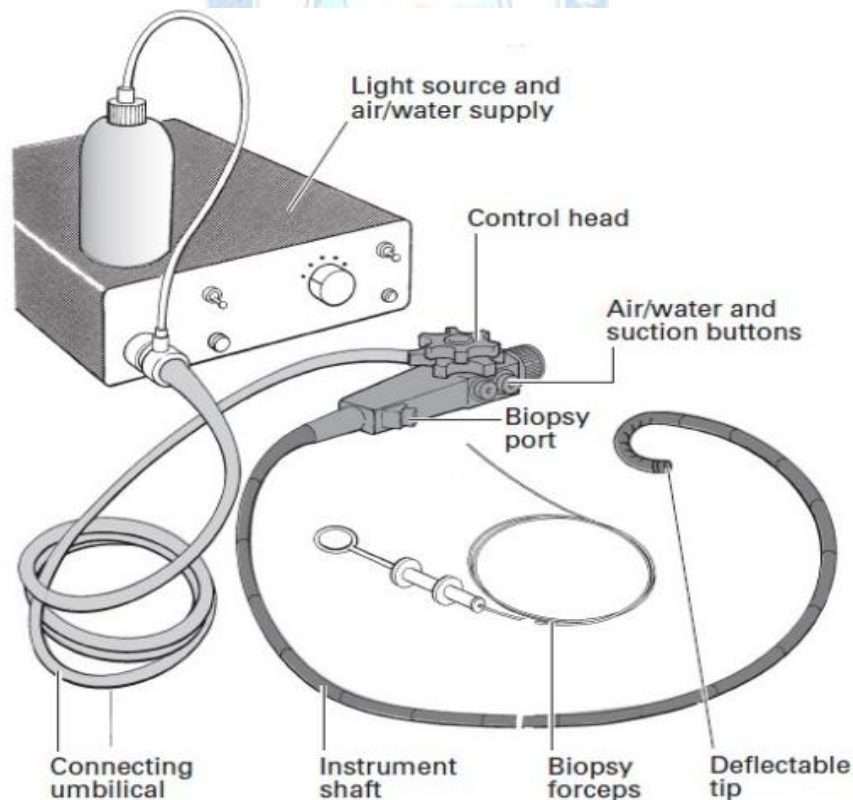
### VII Semester

#### OBT357 BIOTECHNOLOGY IN HEALTH CARE

#### UNIT- 5 BASICS OF IMAGING MODALITIES

##### 5.5 Endoscopy

Endoscopy is a medical procedure that allows doctors to visualize the inside of the body using an endoscope, a thin, flexible tube with a light and a camera. The endoscope is inserted through a natural body opening or a small incision to examine hollow organs or cavities, helping to diagnose conditions like ulcers or cancer, collect tissue samples (biopsies), and even perform some surgical treatments.



##### Endoscopic ultrasonography (EUS)

The diagram depicts a diagram of an endoscope, a medical device commonly used in procedures like ultrasonography or endoscopy. Here's a breakdown of its components based on the labeled parts:

- ❖ **Light source and air/water supply:** Connected via a tube (e.g., from a bottle), this provides illumination and air or water to clear the viewing field during the procedure.
- ❖ **Control head:** The main handle where the operator manipulates the device, featuring knobs and buttons.
- ❖ **Air/water and suction buttons:** Located on the control head, these allow the operator to control air, water, or suction to manage the endoscopic view or remove fluids.
- ❖ **Biopsy port:** An opening on the control head used to insert instruments like forceps for taking tissue samples.
- ❖ **Connecting umbilical:** The flexible tube connecting the control head to the light source and supply system.
- ❖ **Instrument shaft:** The long, flexible tube inserted into the body, housing the optical system and working channel.
- ❖ **Biopsy forceps:** A tool inserted through the biopsy port to collect tissue samples.
- ❖ **Deflectable tip:** The adjustable end of the shaft, allowing the operator to navigate and direct the scope within the body.

### **Working Principle:**

EUS operates by integrating a high-frequency ultrasound transducer into the tip of an endoscope, which is inserted into the body (typically through the mouth or rectum).:

- ❖ The flexible endoscope, with a deflectable tip, is guided through the digestive tract using the control head for navigation and suction/cleaning. A transducer at its tip emits high-frequency ultrasound waves (5–20 MHz) that penetrate beyond the GI wall to image nearby organs like the pancreas, vessels, or lymph nodes. Reflected echoes are detected by the transducer and processed into detailed, real-time cross-sectional images, with higher resolution due to the

probe's proximity. Doppler EUS evaluates blood flow, while biopsy tools can be passed through the scope for tissue sampling under direct ultrasound guidance.

### **Types of Endoscopes:**

1. **Gastroscope:** Examines the upper digestive tract (esophagus, stomach, duodenum).
2. **Colonoscope:** Inspects the large intestine (colon and rectum).
3. **Bronchoscope:** Visualizes the airways (trachea and bronchi).
4. **Laryngoscope:** Examines the larynx (voice box) and upper throat.
5. **Cystoscope:** Inspects the bladder and urethra.
6. **Endoscopic Ultrasound (EUS) Scope:** Combines endoscopy with ultrasound to image digestive tract walls and adjacent organs (e.g., pancreas, liver).
7. **Enteroscope:** Examines the small intestine.
8. **Hysteroscopy:** Visualizes the inside of the uterus.

### **Advantages**

- ❖ Non-invasive and painless.
- ❖ No ionizing radiation (safe in pregnancy).
- ❖ Real-time imaging (useful for moving structures like the heart).
- ❖ Portable and relatively low cost.
- ❖ Can guide interventional procedures.

### **Disadvantages**

- ❖ Limited penetration in obese patients or through bone/air (e.g., lungs, skull).
- ❖ Operator-dependent (image quality depends on skill).
- ❖ Lower resolution compared to CT or MRI for some organs.
- ❖ Cannot provide detailed images of air-filled structures (like intestines) or dense bone.

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