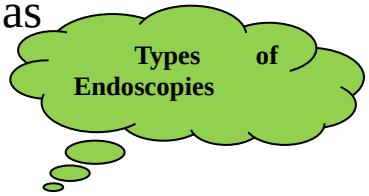
Endoscopy is the examination of internal body cavities using a specialized medical instrument called an endoscope. It is a powerful medical tool used for diagnosis and treatment of human diseases. These instruments can be inserted through natural body orifices (mouth, nose, anus, urethra) to access hollow organs, such as the, esophagus, stomach, small intestine, colon, and urinary bladder..etc. Depending on the body part, each type of endoscopy has its own special term, such as



- ✓ laparoscopy (abdomen, uterus, fallopian tube)
- ✓ laryngoscopy (vocal cords)
- ✓ bronchoscopy (lungs)
- ✓ colonoscopy (colon)
- ✓ arthroscopy (joint)
- ✓ Gastroscopy (Stomach).

The first endoscopes consisted of crude, rigid tubes that provided only a limited view of easily accessible organs.

Purpose

Definition

Application

An endoscope is a device that enables to look inside the body to examine internal organs, see Figure1. Endoscopes can examine gastrointestinal, respiratory, and urinary tracts, as well as other internal organs just through a small incision. The images of the target organ can be captured through the long tube of the endoscope. Attachments for use with endoscopes for cutting, grasping, and other functions are available that allow minimally invasive procedures, thereby improving patient care and minimizing recovery time. The endoscope can also be used for performing biopsies and retrieving foreign objects from inside the body.

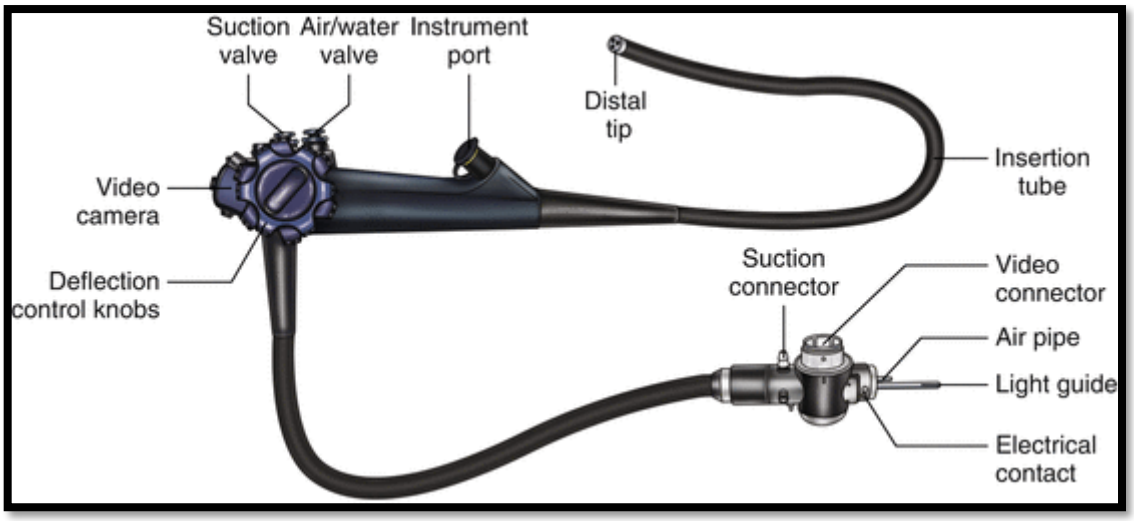


Figure1: The basic components of a conventional endoscope

Principle

Purpose

Endoscopy allows direct visualization of a diseased area inside the body by using a telescope or a tube that is passed through a [1]natural orifice or through a[2]small incision made in the skin. Endoscopes are optical instruments that may be [1]rigid employing a series of lenses, or [2]flexible employing optical fibers,

[1]to carry the illuminating light to target object and [2]to carry back the image to the eyepiece. They are often fitted with one or more extra channels through which operating instruments such as electrosurgery probes, grasping or crushing forceps can be passed. These channels may also be used for delivering fluids or gas, providing suction, or passing sampling catheters or laser light pipes. The whole endoscopy procedure can be recorded so that the images can be studied in detail or for future reference.

Types of endoscope

1-Rigid Endoscope

2-Flexible endoscope

Rigid Endoscope

Rigid endoscopes are mostly used to examine various internal organs and structures, especially joints (knee joint) and the external surfaces of organs within the abdominal cavity, such as the ovaries. A rigid endoscope is a straight, narrow metal tubular telescope with an eyepiece at one end to which a camera can be attached. With the camera system, the surgeons can view a greatly magnified image of the target area. A light source is connected to the endoscope that illuminates the structure or organ under examination. Water and air can be pumped down the tube if necessary, see Figure 2

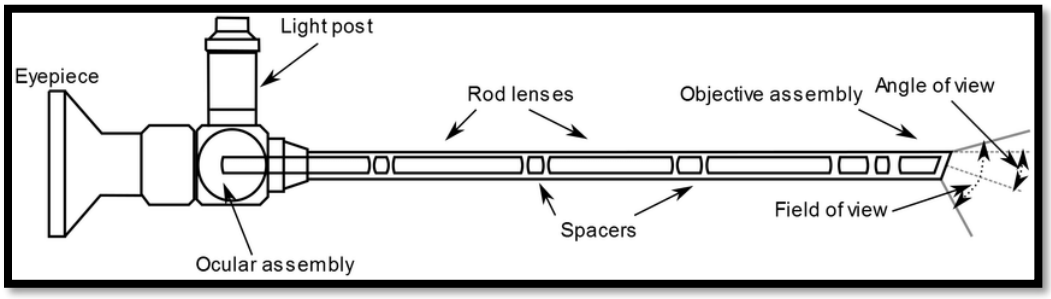


Figure 2 Constructional details of a rigid endoscope

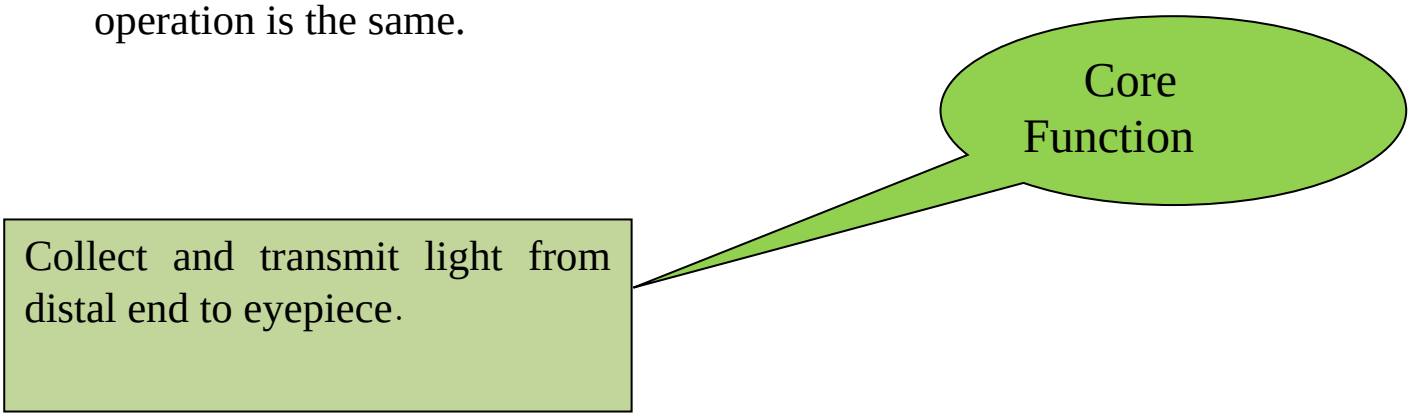
The heart of any rigid endoscope is essentially a collection of lenses that is responsible for collecting and transmitting light from the distal end of the scope to the eyepiece to produce an image. The various parts of the rigid endoscope are shown in Figure 2.

The core of a rigid endoscope consists of many different lenses and spacers arranged in a very specific order. A field lens and an objective lens assembly are mounted at the distal end of the tube. The field lens is used to determine the size of the image. The purpose of the objective lens assembly is to gather and focus light into the rest of the lens system. In endoscopes that provide an angled view, a prism is used to redirect the light gathered by the objective lenses into the lens system.

The lenses are enclosed in a tube and surrounded by a fiber optic light bundle that provides illumination of the working area during procedures. The light fibers run parallel to the inner tubing housing the optical lens assembly. At the distal end, these fibers can be bent to match the direction of view, except for zero degree endoscopes. The light bundle runs from the distal end to a fiber guide attached to the light post on the body of the tube where it can be connected to an external light source. The light from the external light source is focused into the fiber optic light bundle using a light cone, which is enclosed in the light post.

All these components are enclosed in a sheath or outer tube, which is composed of more than one layer of tubing to increase rigidity. All the lenses are held in place by a lens retainer and a tension spring placed at the proximal end. An eyepiece or ocular is placed on the proximal end of the tension spring and is used to provide centering and additional focus to the image. The ocular is enclosed by the eyepiece sleeve that contains the final lens of the scope, the eyepiece cover glass.

The eyepiece is used to view the image produced by the scope directly with the naked eye or a camera can be attached to the eyepiece to produce a video image viewable on a monitor. Although the size and arrangement of components may change between different rigid endoscope types, the basic layout and operation is the same.



Components and Functions:

1 .Core Lens System:

- Field Lens: Determines image size.
- Objective Lens Assembly: Gathers and focuses light.
- Prism (angled-view scopes): Redirects light.

2 .Illumination System:

- Fiber Optic Light Bundle:
- Surrounds inner tubing and provides illumination.
- Parallel fibers carry light to distal end.
- Bendable (except for zero-degree scopes).
- Light Post:
- Connects to external light source.
- Uses light cone to focus light into fiber bundle.

3 .Sheath (Outer Tube):

- Multi-layered tubing for rigidity.

4 .Lens Support and Focus:

- Lens Retainer and Tension Spring: Hold lenses.
- Eyepiece (Ocular):
- Provides centering and focus.
- Eyepiece Sleeve contains eyepiece cover glass.

5 .Viewing System:

- Eyepiece :
- Direct viewing of image or camera attachment for video output.

Design Variations:

- Sizes and arrangements vary, but the basic layout is consistent.