KALS Kandy Academy of Laparoscopic Surgery

Laparoscopic Instruments

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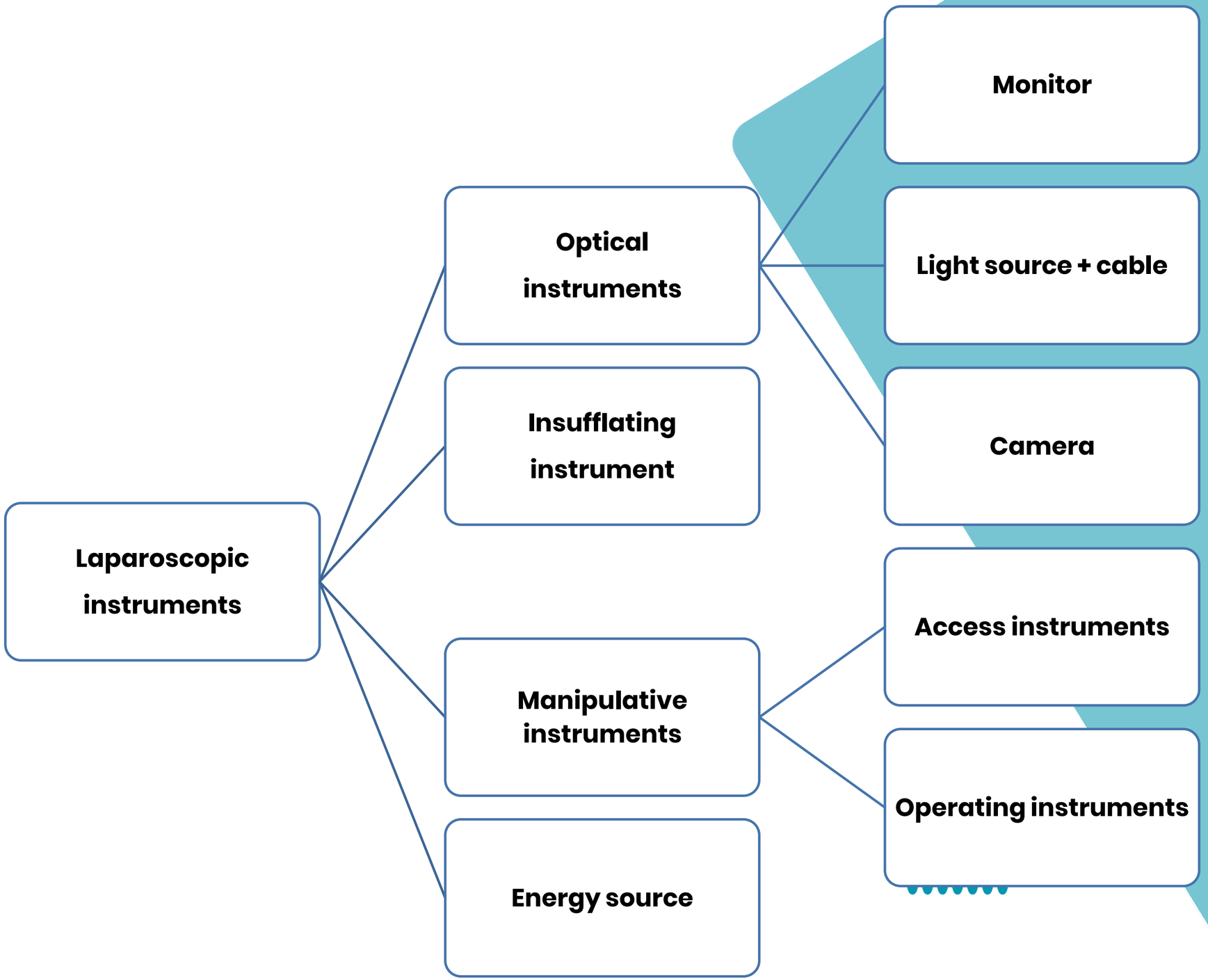
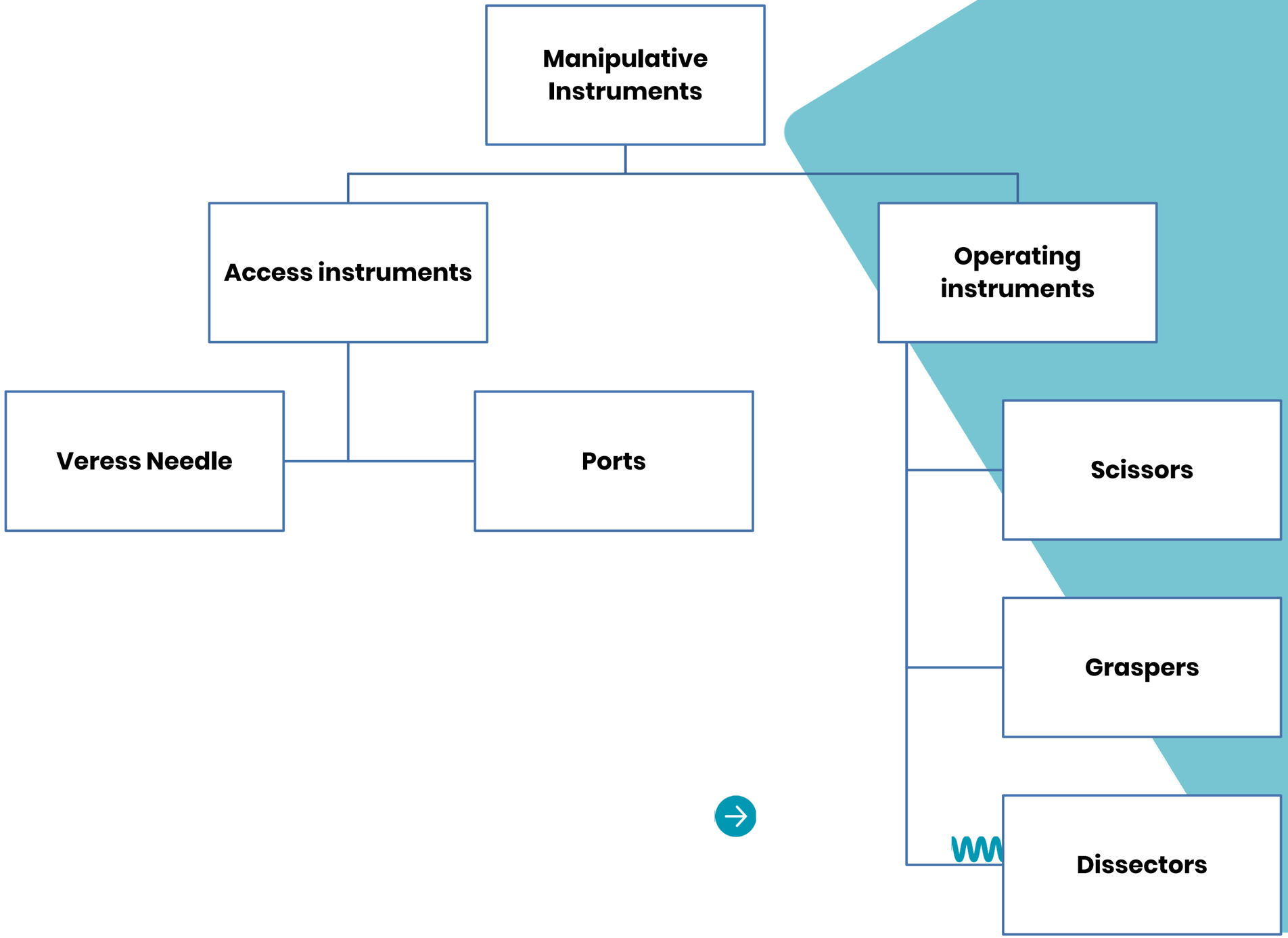
Becoming a good laparoscopic surgeon

- To become a good laparoscopic surgeon, it is essential to have a thorough understanding of:
  - Laparoscopic instruments,
  - The engineering aspect of laparoscopic instruments,
  - Ergonomics

- In addition, sound knowledge of the human anatomy, good hand-eye coordination, refined technical skills, and proper instrument handling are crucial, with the ultimate goal of ensuring patient safety and avoiding harm.

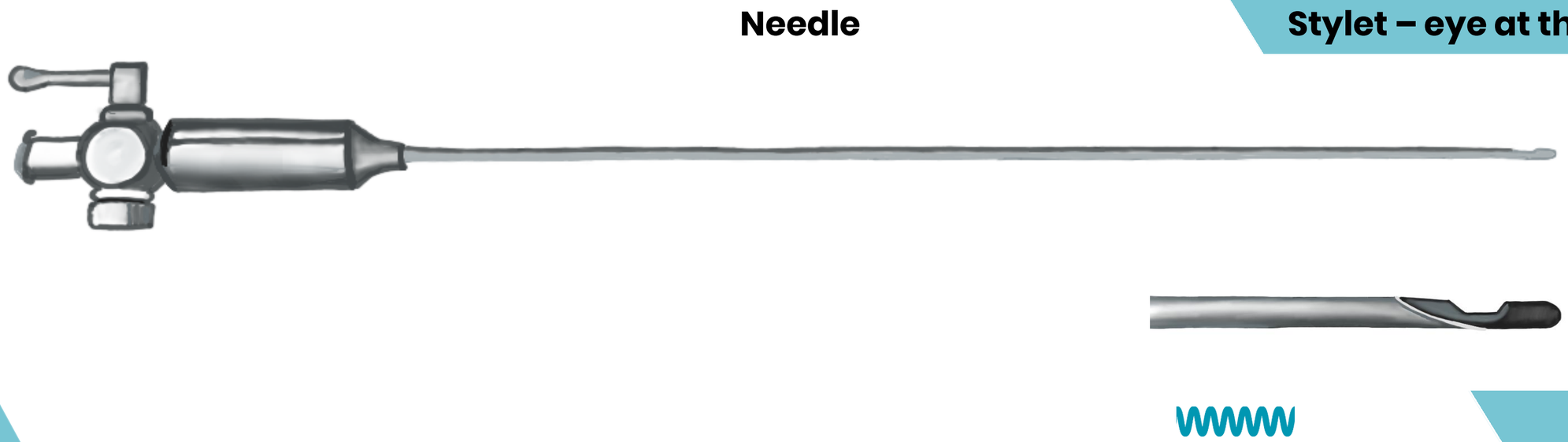

Laparoscopic instruments
Optical instruments
Insufflating instrument
Manipulative instruments
Energy source
Monitor
Light source + cable
Camera
Access instruments
Operating instruments


Manipulative Instruments
Access instruments
Operating instruments
Veress Needle
Ports
Scissors
Graspers
Dissectors

Access Instruments

- These devices are used to safely enter the abdominal cavity and create a working channel for laparoscopic surgery

Veress Needle



Ports

Port

Washer

Gas input of the cannula

Shaft of the cannula

Cannula

Trocar

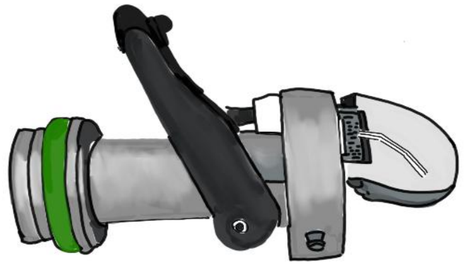
Ports

Washer with Reducer

Washer

Valves

- Metal Valve



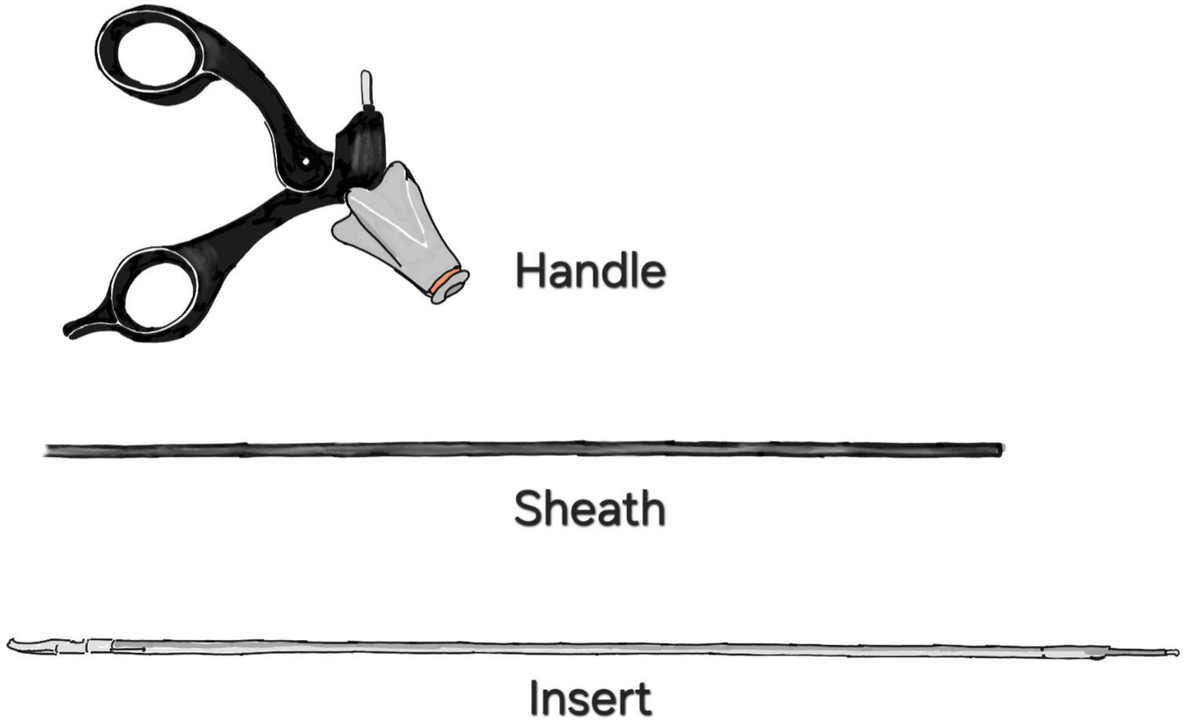
- Rubber Valves

For 10mm port

For 5mm port

Hand Instruments

- All hand instruments consist of three main parts



Handles

Lockable/ ratcheting handle

Non-lockable handle

Sheath

- Sheath is an insulating cover placed over metal laparoscopic instruments to prevent electro thermal damage during laparoscopic surgery

Insert

- The insert contains the working element and the jaws.
- Jaws work in 2 different ways.
  - Double-action jaws
  - Single-action jaw

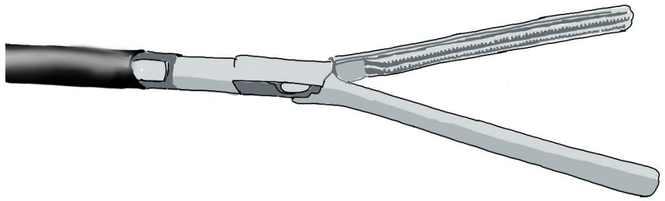
Laparoscopic Gaspers

- These are designed to hold, manipulate, and stabilize tissues during minimally invasive procedures

Atraumatic Graspers

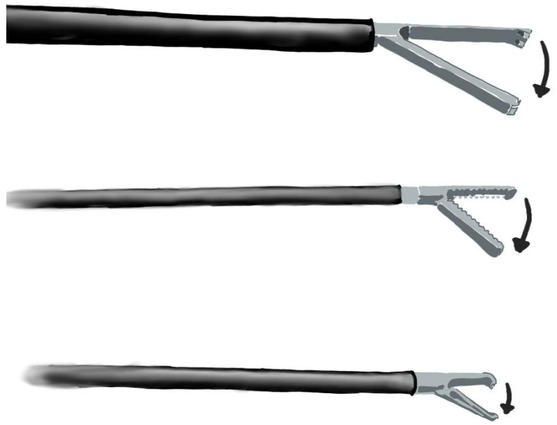
- Double-action jaws with shallow serrations
- Fenestrated
- Shallow curvature
- Longer the jaw, softer the grasp
- Good for delicate tissue handling such as bowel tissue

Automatic Graspers



Traumatic Graspers

- Deep serrations
- Usually not fenestrated
- Mostly single-action jaws
- Got teeth in jaws
- Used to handle removed specimens, as well as tissue retrieval



Laparoscopic Dissectors

- Most popular dissector is the Maryland dissector.
- Double-action jaws.
- Used for stripping.
- Hemostatic stability.
- These are helpful in suturing delicate tissues instead of helpers.
- Make an avascular window.

Maryland dissector has got several types.

- Typical – Monopolar
  - Bipolar

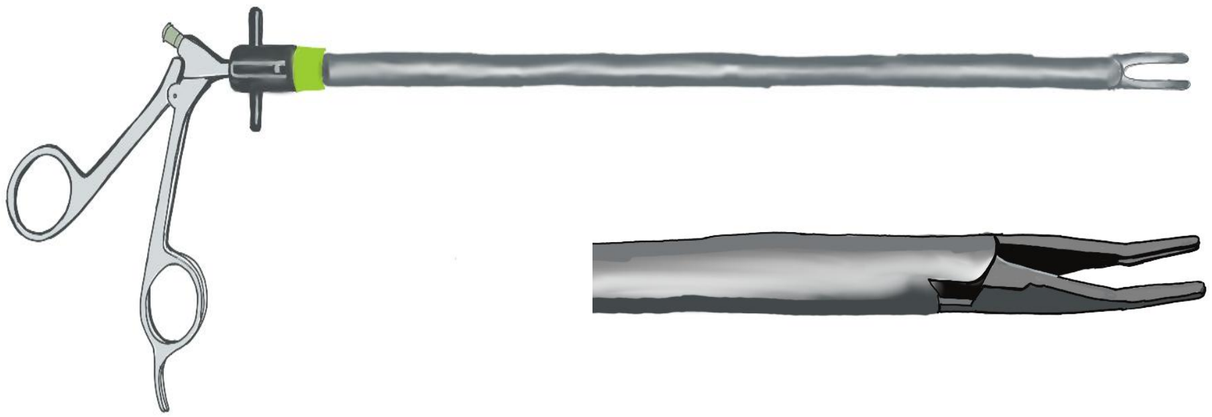
- Maryland Right angle

Scissors

- 3 main types.
  - Hook Scissors
  - Curved scissors
  - Straight scissors

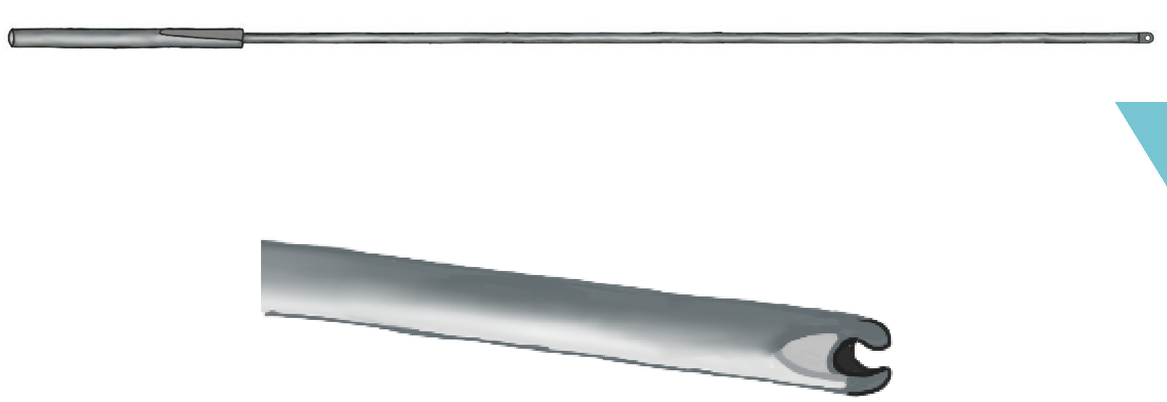
Laparoscopic Clip Applicator

- Laparoscopic clip applicators are handheld instruments used to apply metallic or polymer clips to vessels, ducts, or tubular structures during laparoscopic surgery



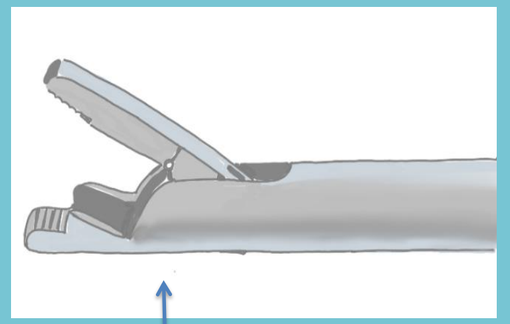
Laparoscopic Knot pusher

- A specialized instrument used to advance and secure extracorporeally formed knots into the abdominal cavity during minimally invasive surgery.



Needle Holder

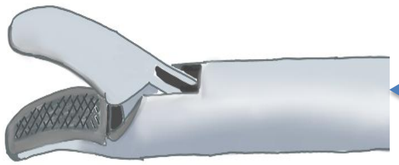
Needle holder



Straight

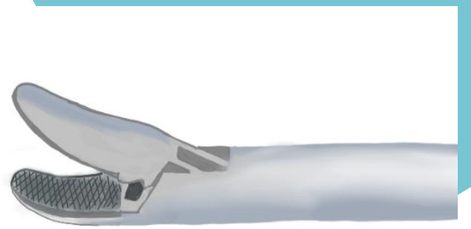
Curved

Self Riding Needle Holder



Left hand

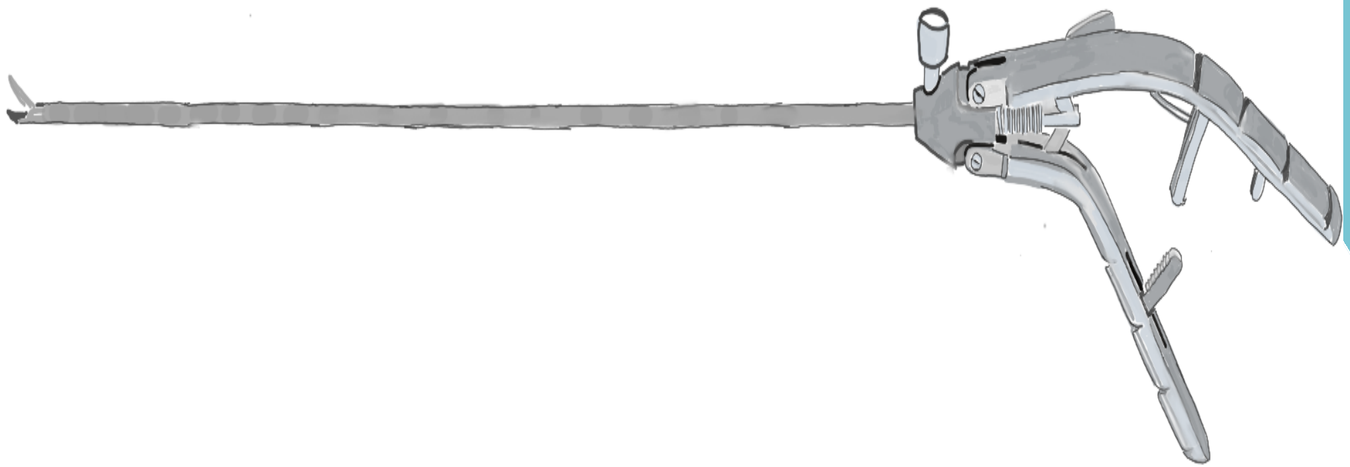
Right hand



- There are 2 types of handles for needle holders
- Axial /Straight handles
  - Ring Handle

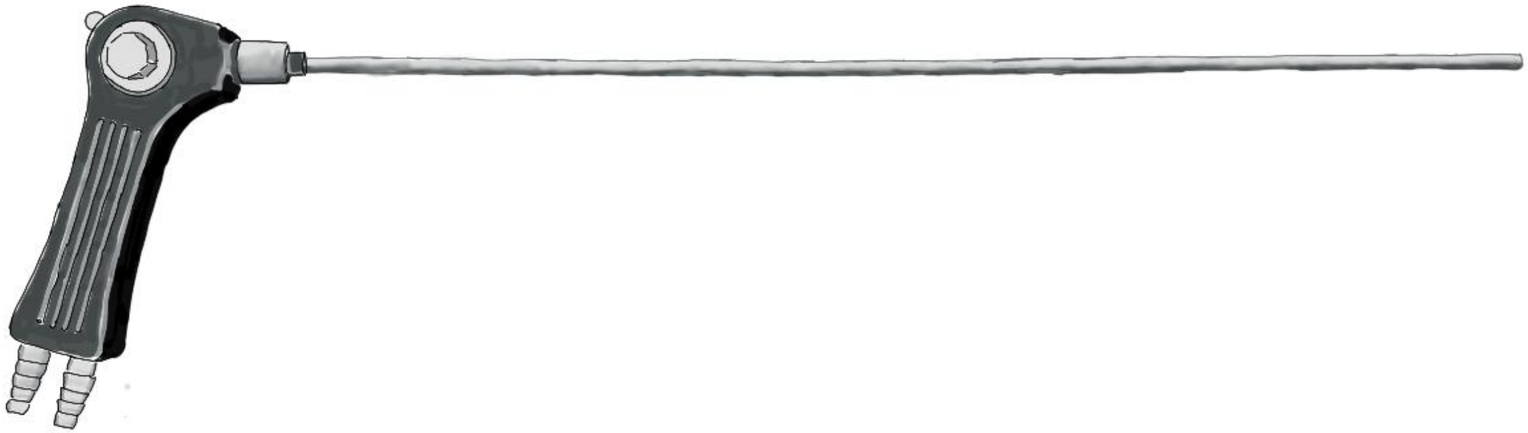
  - Palms grip

- Pistol grip handle



Suction Apparatus

- This is used to aspirate fluids such as blood, pus, bile, or irrigation solution from the operative filed.



Laparoscopic Aspiration Needle

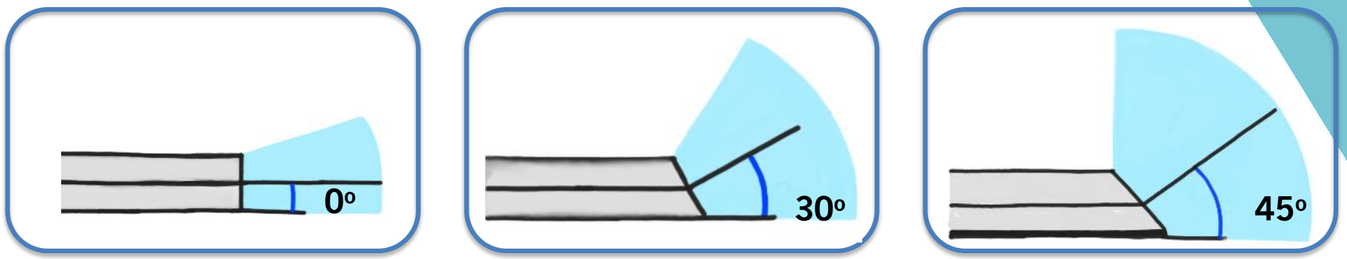
- This is used for injecting vasopressin, for aspirating cysts, and infiltration of fluids for aqua dissection.

Laparoscopic Optical Instruments

Laparoscope (Telescope)

- A rigid tube containing rod-lens optical systems
- Transmits images from the abdominal cavity to the camera
- Common diameters: 5 mm and 10 mm
- Common viewing angles:
  - 0° – straight-ahead view
  - 30° – angled view for better visualization around structures
  - 45° – used in selected procedures for wider angles

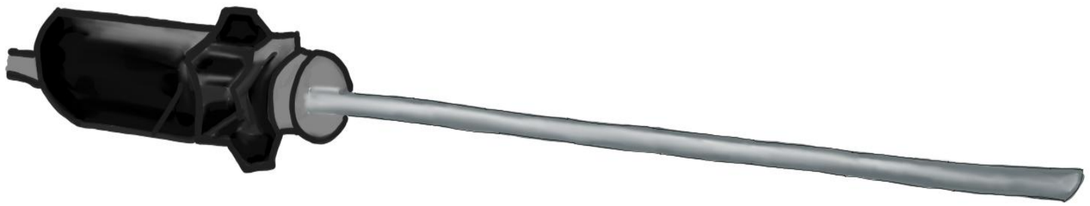
Telescope



Camera Head

- Attached to the proximal end of the telescope.
- Converts the optical image into a digital signal.

- Integrated systems are known as Endo Eye.



Laparoscopic Optical Instruments

- **Light Source**
  - LED
  - Xenon
- **Light transmission and delivery**
  - Fiber-Optic Light Cable
  - Liquid Crystal Gel Cables
- **Monitor and Image Display System**
  - Displays real-time images of the operative field
  - Proper positioning is essential for ergonomic surgery

Energy Sources of Laparoscopic instruments

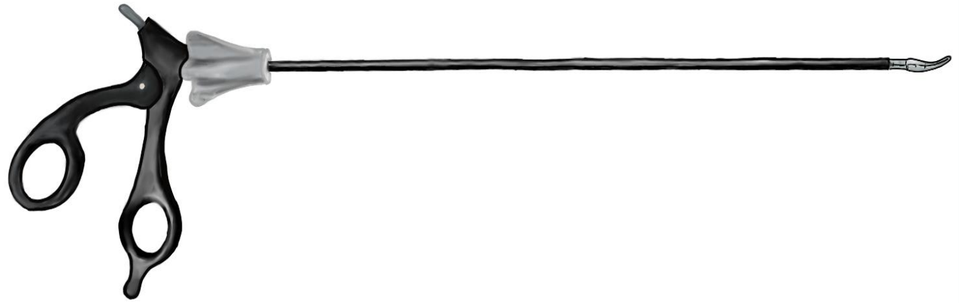
- Electro cauterization
- Ultrasonic energy devices
- Laser
- Plasma
- Ferromagnetic

Laparoscopic Insufflation Instruments

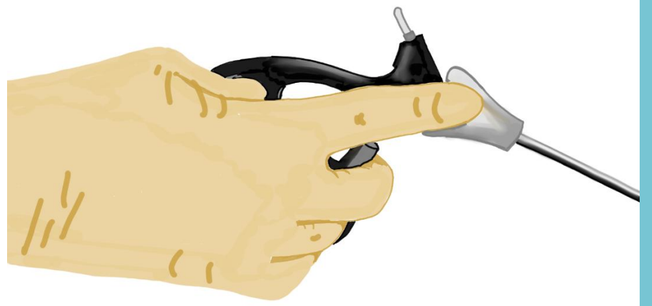
- Creates and maintains a pneumoperitoneum with a stable intra-abdominal pressure of 12–15 mmHg in adults.
- Components of the Insufflation System
  - CO_2 gas cylinder – supplies medical-grade carbon dioxide
  - Insufflator unit – regulates gas flow and pressure
  - Insufflation tubing – connects the insufflator to the access instrument
  - Access instrument (Veress needle or trocar) – delivers gas into the peritoneal cavity

- Safety Features
  - Automatic pressure cutoff systems
  - Audible and visual alarms
  - Flow limitation to prevent rapid over-distension
  - Pressure relief valves

Instrument Handling



Usual appearance of a hand instrument



Disinfection and sterilization of Laparoscopic Instruments

- Commonly used methods include:
  - Steam sterilization (Autoclaving)
  - Ethylene oxide (EO) Gas Sterilization
  - 2% Glutaraldehyde solutions
  - Peracetic acid Sterilization
  - Ultraviolet (UV) chambers
  - Formaldehyde chambers (Now largely abandoned)
  - Ethyl alcohol (95–100%)
- Although the above methods have been used routinely, there is a theoretical risk of contamination specially in use of disinfectants.
- As a result, there has been a growing shift toward single-use (disposable) laparoscopic instruments. These eliminate the need for cleaning, disinfection and sterilization.

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