Neuroendoscope Holder and Brain Retractor

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Neuroendoscopy

What is a Neuroendoscopy?

- **Neuroendoscopy** is a minimally-invasive surgical procedure in which the neurosurgeon removes the tumor through small holes in the skull or through the mouth or nose.

Neuroendoscopy enables neurosurgeons to:

- Access areas of the brain that cannot be reached with traditional surgery
- Remove the tumor without cutting or harming other parts of the skull

Neuroendoscopy results in:

- Less pain than traditional surgery
- Faster recovery than traditional surgery
- Minimal scarring

Advantages of Neuroendoscopy

The neurosurgeon can see into the brain to an extent that was not previously possible with a microscope and can carry out more extensive surgery. Neuroendoscopy provides:

- Panoramic views
- Better observation
- Additional illumination
- Increased overview
- Higher magnification
- Can ‘look around corners’
- Extended viewing angles
- Provides a ‘second prospective’
- Excellent visual quality in deep narrow fields

Concerns while using Neuroendoscope

- Endoscopic surgery requires special training and experience.
- Bloody operative field (needs constant cleaning of lens).
- Fogging is also a problem and needs endoscope to be removed and cleaned when it occurs.
- There is risk of local injury to the surrounding structures.
- Movements of instruments are restricted due to the small diameter of the working channel.
- Limited working channels due to small diameter of the operating sheath.

What is a Endoscope holder?

- An endoscope holder is a device used to mount and fix the endoscope in a particular position.
- It acts as a third arm of the surgeon.
- Articulated arm allows movements in different directions.
- Provides some degree of freedom even if the frame is fixed.

Free hand vs. Endoscope holder

Neuroendoscopy can be done either free hand or using a rigid holder. The table lists advantages and disadvantages of both:

	Free Hand	Using Holder
Advantages	1. More freedom of movement particularly when configuration needs to be frequently changed, e.g. tumor removal	1. Surgeon can use both hands 2. Minimizes accidental movements and tremor
Disadvantages	1. More fatigue for surgeon 2. Risk of accidental movements	1. More static 2. Inconvenient when frequent repositioning is needed

Available Technologies

Mechanical Holding Arm

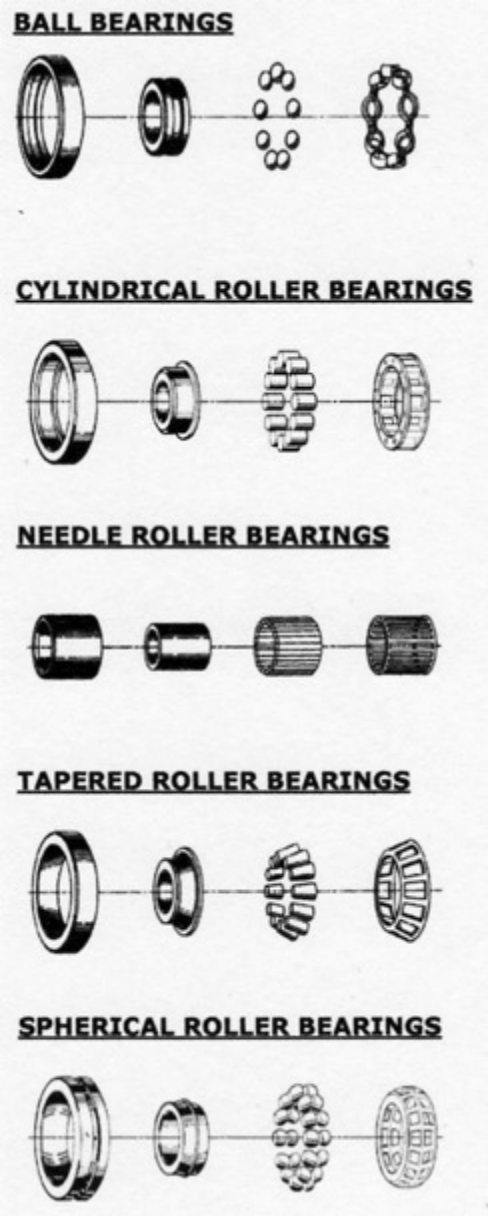
Features:
- Rotation socket to clamp to operating table
- Articulated Stand for all five joint functions
- Clamping Jaw for use with the instrument (range 4.8 to 12.5mm)

Pneumatic Holding Arm

Features:
- Direct connection to OR compressed air supply
- Integrated safety system prevent collapsing of holding arm
- Single handed use
- Precise and fine steering

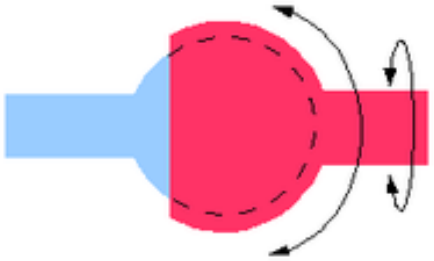
Motorized Holding Arm

Features:
- Electronically Powered
- Powerful
- Increased precision
- Direct control through foot switch
- Used in laparoscopic and thoracoscopic surgeries



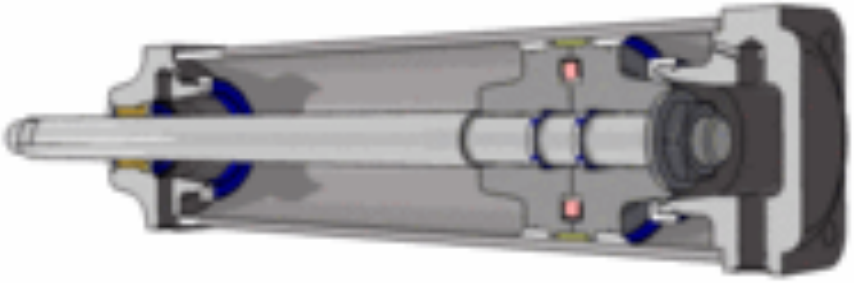
Mechanical

A typical ball joint with cutaway view



- A ball joint is used for allowing free movement in two planes at the same time, including rotating in those planes.
- Combining two such joints with control arms enables motion in all three planes.
- Ball joints allow a limited range of smooth movement in all directions

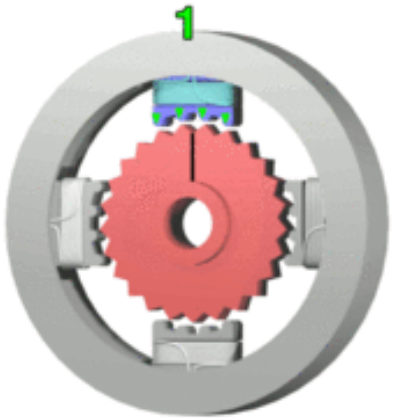
Pneumatic

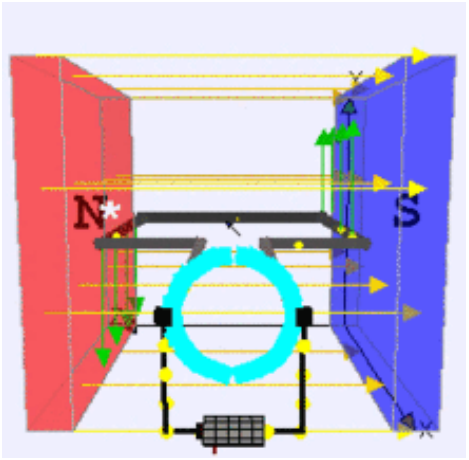


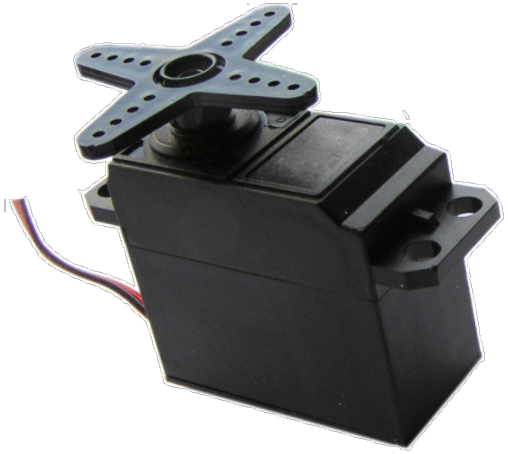
- The word "pneumatic" comes from the Greek and refers to air.
- The pneumatic retraction and holding system for open as well as for minimally-invasive surgery, neurosurgery, orthopaedics and traumatology.

- A pneumatic cylinder uses the pressure of a gas to perform work.
- It is less expensive and normal air is the most common type of gas used in pneumatic cylinders.
- Air can be easily taken in and compressed to refill pneumatic systems.

Motorized







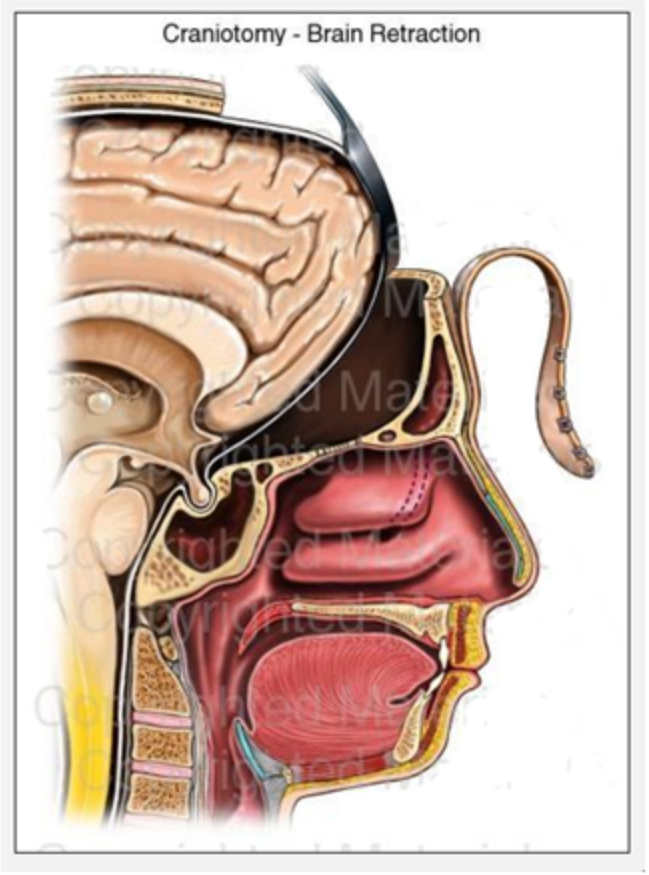
- A **stepper motor** (or **step motor**) is a electric motor that divides a full rotation into a number of equal steps.
- Available in different step angles ranging

- The **DC motor** generates torque directly from DC power supplied to the motor by using internal commutation, stationary permanent magnets.
- The commutator consists of a split ring, so that the current reverses each half turn.

- A **servomotor** is a rotary actuator that allows for precise control of angular position.
- They consist of a motor coupled to a sensor for position feedback, through a reduction gearbox.

Brain Retraction

- Brain retraction is the method to hold brain tissues at a particular position for better exposure of the operative target or site.
- It is still one of the most important techniques to lessen brain damage.
- It can be achieved by handheld (by surgical assistant) or self retaining retractors.



Self retaining retractors

Self retaining retraction system consists of certain common features:

- The rod/post- It is attached to a rigid structure. It provides the stability and fix base to the retraction system.
- Flexible arms- These form the intermediate link between the retractor blade and the fixed rod/ post. They consist of series of small metal pieces joined to each other by ball and socket joints.
- Brain Spatulas- These are flat, malleable blades of different shapes. The portion of the brain and amount of brain to be retracted would dictate the choice of a particular blade. Another characteristic of these blades is that they have non-reflective surface to minimize glare from reflective light used.

1. Brain spatula
2. Flexible arm
3. Rod/Post

Classification

The self retaining systems available can be broadly classified into four categories:

1. **Skull mounted devices**-
   These were earlier retractor systems. These were rods mounted in a drill hole in the skull with attached retractor.

2. **Soft tissue mounted devices** –
   These are secured by tension in the muscles and soft tissue but because of the relative mobility are inherently unstable.

3. **Table mounted flexible arm systems** –
   They are basically modification of flexible arm system. This system consist of angulated rod, which is fixed to the operating table.

4. **Head rest mounted systems** –
   in these systems, the base plate is attached to the skull clamp.

Thank You