# Simple practical new instrumentation for holding the neuro-endoscope

**Bassem Yousef Sheikh**

**Abstract**: Minimally invasive technologies are opening up new opportunities in neurosurgery, especially in the diagnosis and therapy of intracranial pathology. The aim is to deliver the highest quality and most technologically advanced neurosurgical care. Depending on the requirements of the operation, either rigid or flexible endoscopes are used in intracranial surgery. With endoscopes of differing viewing angles of 0°, 30°, 45°, 70° and 120°, the neurosurgeon can navigate into the brain to an extent that was not previously possible with a microscope and may perform more safe procedures. Minimally invasive surgery has recently become a cornerstone in biomedical engineering. The optimal achievement is to hold the endoscope in place while being able to work with both hands. Options for holding the endoscope in place comes under different categories, including: mounting to head-holder device; mounting to the operating table, or floor mounting. The present report describes a patented device that enables the neurosurgeon to operate with the endoscope directly attached to the operative site. By doing so, many drawbacks of the previous apparatuses are eliminated.

***Key words**: Endoscopy, neurosurgery, minimal invasive and neuro-endoscope. (p68-69)*

## Aim and objectives:

The use of neuro-endoscope has increased in the past two decades, with increase in number of indications for use, novel adjuncts and modifications to existing endoscopes, and auxiliary instrumentations.[2,5] The optimal achievement is to hold the endoscope in place while being able to work with both hands for accurate and safe procedures. Options for holding the endoscopy in place comes under different categories, including: 1) Mounting to head-holder device: that includes inserting at least three pins to the head for the head-holder frame.[1,3,4] This is against the philosophy of minimal invasive procedures, with potential danger of epidural haematoma. Moreover, the patient may complain postoperatively from pain at the site of the pins, 2) Mounting the holder to the operating table, and 3) Floor mounting. The potential danger of the last two methods is that if the head of the patient is accidentally moved then the brain and the endoscope will move in different angles, with the devastating risk of neurovascular injury.

Department of Surgery
Taibah University
Al-Madinah Al-Munawarah
Saudi Arabia

***Correspondence:***
Dr. Bassem Y Sheikh
NeuroEndovascular Neurosurgeon
Chairman, Surgery Department
Taibah University
PO Box 30001
Al-Madinah Al-Munawarah 30001
Saudi Arabia
Email: askdrsheikh@gmail.com

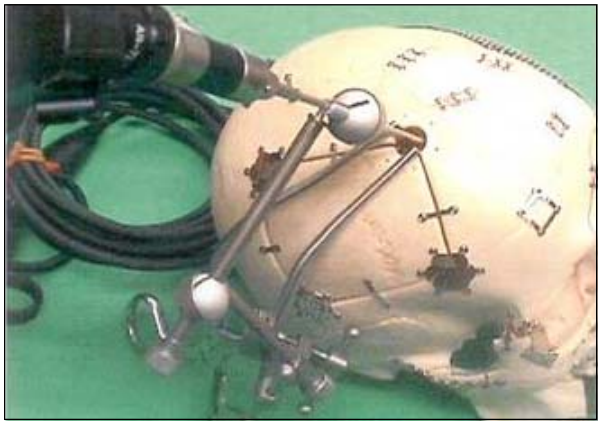
## Description

The present patented NeuroEndoscopy holder is intended to overcome risks and to allow a rapid repositioning during procedures. As the neurosurgeon requires to operate using his both hands for the delicate and safe performance of the endoscopic procedure, this endoscopic holder acts as a neurosurgeon's "third hand" in that it holds an endoscope firmly. The most significant finding of this new endoscopic holder is the increased manoeuvrability afforded to the operating neurosurgeon with the use of the endoscope holder. When the endoscope holder is used, the operating neurosurgeon does not have to hold the endoscope with one hand and thus operate with only the other hand, or have the endoscope held by an assistant. It is difficult for a neurosurgical assistant operating an endoscope to maintain a stationary position throughout the procedure, with the risk of mismatch movement and injury of vital neural structures. We believe that the endoscope holder provides for easier dissection, smoother manipulation and improved visibility.

The NeuroEndoscopy holder is formed of two main parts: self-retaining retractor to fix on either edge of the burr hole, and multi-jointed arm with tunnelled-balls for holding the endoscope. This design of the NeuroEndoscopy holder provides for an easier and safe method of fixing the endoscope in the required position. Even if the head moved

during the procedure for any reason, the NeuroEndoscopy holder will act to move the endoscope simultaneously with the head, thus preventing any possible devastating neural injury.

The multi-jointed arm is composed of three parts: a base for attachment to the self-retaining retractor, two bars, each of which is holding a full ball (Fig. 1). Each bar is formed of a hollow tube with a ring at the end that is holding the ball. The distal ball has a tunnel in the middle for passing the endoscope, and is able to move in any direction within the ring. The tunnel in the distal ball is of a different diameter that matches the desired size endoscope to be used (Fig. 2); this may hold either rigid or flexible endoscope. This multi-degree of freedom device provides the operator with the ability to accurately control the endoscopic viewing direction. The endoscope will have the ability to slide and rotate along a linear degree of freedom and a rotational degree of freedom. This is accomplished from three actuate revolute joints, with rotational degrees of freedom.



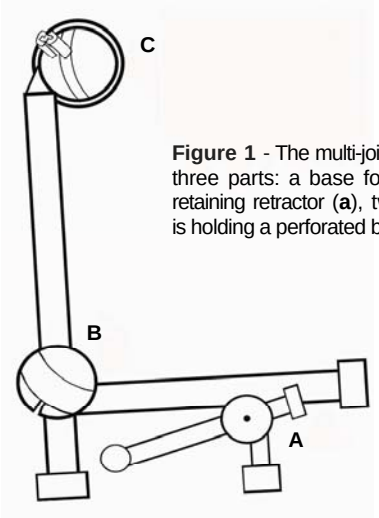



**Figure 1** - The multi-jointed arm is composed of three parts: a base for attachment to the self-retaining retractor (**a**), two bars, each of which is holding a perforated ball (**b and c**).

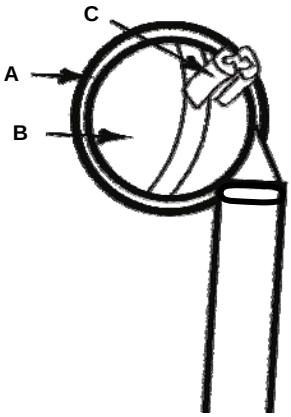



**Figure 2** - Each bar is formed of a hollow tube that ends with a ring (**a**) that holds the ball (**b**). The distal ball has a tunnel in the middle for passing the endoscope (**c**), and is able to move in any direction within the ring. The tunnel in the distal ball is of different diameter that matches the desired endoscope diameter to be used.

## Clinical application

This NeuroEndoscope holder was utilized during 23 neurosurgical procedures requiring the application of a neuroendoscope. The device has the following advantages: Simple uncomplicated mounting technique, simple locking mechanism, fast changing positioning as required, and free full manoeuvrability. In comparison with other fixation devices that have been used by the author, the present system is superior in fixation and stability to holding arms mounted to the operating table (both manual and pneumatic). Nevertheless, it is clearly inferior in fixation and stability as compared to holding arms mounted to head-holder device. Last, but not least the presented holding system has a much less manufacturing cost than other systems.

## Conclusion

Minimally invasive technologies are opening up new opportunities in neurosurgery; however, the main priority is for the procedure to be safe. This calls for the utilization of systems that guarantee a high degree of patient safety and reliability. The present patented holder represents one solution.

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