



## Microscope and Mouthpiece

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**Figure 1: Microscope is one of the most intimate companions of the neurosurgeon in the operating room. An in-depth understanding of its use is warranted.**

The microscope is an integral facet of aneurysm surgery as it provides relatively flexible, but fully stereoscopic, magnified, and well-illuminated views of the surgical field when properly used to conduct microsurgery and not macrosurgery. Once the surgeon has had enough practice and operating time, **the microscope should be virtually like an extension of his or her face, and not an obstacle between the surgeon and the operative field.**

I studied the mechanics, optics, and fluorescent technologies of the microscope early in my training and have been actively involved in its evolution. This intimate familiarity with the scope is paramount for the eventual symbiotic relationship between the surgeon and the device. One cannot underestimate the importance of the synergetic and harmonious working relationship between the surgeon and the scope.

Aneurysm and arteriovenous malformation (AVM) surgeries test the strength of the relationship between the scope and the operator. An intraoperative rupture of either vascular lesion demands highly decisive and efficient operative maneuvers immediately. Every second counts, and there is no time to hand out the microsurgical instruments and adjust the handle and focus of the scope. In these situations, the mouthpiece is life saving and dramatically reduces operative times by advancing technical efficiency.

Functionally, the mouthpiece allows the surgeon to remain ambidextrous for the procedure while continuing to alter the focus of the microscope lens. Thus, while the mouthpiece is not a requirement for aneurysm surgery, those who master its use greatly improve their operating efficiency over those who choose to cast it aside.

The mouthpiece has made microsurgery by dynamic retraction a reality because the surgeon virtually has an extra hand while working in small, deep operative corridors as the image remains in focus at an appropriate viewing angle.

## General Principles for Using the Microscope

Please refer to the chapter on [Surgeon's Philosophy and Operating Position](#) and [Operating Room Setup and Workflow](#) for additional relevant details, including the initial steps of preparing the microscope. There are some aspects of microscope use that are specifically applicable to surgical management of aneurysms and other vascular lesions that will be reviewed here.

During operative planning, the surgeon should carefully consider the position of the microscope, the operating room table, and other devices and team members in the room. During aneurysm surgery, the optimal operative working angles toward the surgical target may change, requiring the surgeon to take alternative body positions within the 180-degree arc around the head of the table. As such, I prefer to keep my surgical assistant and surgical stands caudal to the microscope with respect to the patient.

An optimal viewing angle is also crucial for the operation's success, because the surgeon will need to perform microdissection of the subarachnoid space around the cerebral vasculature and pial surfaces without excessive retraction or mobilization of the cerebral tissue. Each patient presents with unique anatomic variants that require optimal viewing of the operative field using dynamic retraction.

To operate the mouthpiece, I first place my central incisors on the superior bar of the mouthpiece. Importantly, the

mouthpiece must be properly positioned so that I am able to rest my superior teeth on the bar without compromising my view through the binoculars.

Prior to surgery, the bar of the mouthpiece should be adjusted so it is at the appropriate distance from the microscope binoculars and does not require any change in the surgeon's posture for its use. When the surgeon bites the inferior bar of the mouthpiece using his or her lower incisors, the mouthpiece function is activated. This activation releases the microscope's vertical brakes, allowing for up-and-down movement of the scope, thus refocusing the field of view.



**Figure 2: The mouthswitch is adjusted before I begin the operation and the microscope is draped.**

Minimal arm movement should be necessary throughout the dissection process and clip application. Instead, the surgical maneuvers should be performed primarily via the fine movements of the fingers. Such ergonomic posture of the upper extremities helps alleviate the need for continuous contractile tone in the arms during the dissection. The lack of reliance on uninterrupted muscle contraction significantly reduces the incidence of tremor and fatigue.

The surgeon's posture should be in a slightly hunched forward position and comfortable for using the microscope. Before beginning surgery, the height of the surgeon's seat and armrests must be properly adjusted. Any additional major positioning during surgery should be minimal.



**Figure 3: The proper operating position: one of the most overlooked considerations in patient safety is the surgeon's comfort. Standing may lead to arm and hand fatigue, whereas a sitting position allows the use of armrests and promotes relaxed and steady hands. Comfortable positions**

also improve surgical technique by eliminating nondeliberate and unintentional dissection maneuvers. The wrists should be able to hang slightly from the armrests.

## Foot Pedals

The surgeon's other foot is dedicated to the pedals for bipolar cautery and drills. Much like the mouthpiece, the foot pedals are integral tools for aneurysm surgery because they allow the surgeon's hands to remain in the operative field while simultaneously providing complete autonomy for control of the tools handled within the operative field.

## Other Details

### Pearls and Pitfalls

- An intimate understanding of the microscope's mechanics as well as its special features including the mouthpiece can dramatically improve its efficacy.

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