Ultrafine Microneurosurgical Instruments: Technical Note

Nobuhiko Aoki, M.D., Tatsuo Sakai, M.D., Akihiro Oikawa*1, M.D., and Yoshiaki Shiokawa, M.D.*2

Department of Neurosurgery, Tokyo Metropolitan Fuchu Hospital,
*1Department of Neurosurgery, Tokyo Women's Medical College, and
*2Department of Neurosurgery, Kyorin University

Abstract

In an effort to respond to the advancement of sophisticated operating microscopes in the aspect of magnification and brightness, ultrafine microsurgical instruments are devised. Microscissors, dissecting microprobes, and tapered retractors presented here are probably finest among those being available at present. These instruments have proved useful, particularly at the critical scenes requiring maximal magnification of the operating microscope during surgery for intracranial aneurysms, arteriovenous malformations, and deep-seated brain tumors.

(Received October 19, 1992; accepted November 27, 1992)

Key words: microsurgical instrument, operating microscope, brain retractor, microscissors, dissecting microprobe

Jpn J Neurosurg (Tokyo) 2: 165-167, 1993

Introduction

With the advancement of optical instrument technology, an operating microscope with magnification up to 22 times and $16 \times 10^4$ lux of brightness is presently available (Carl Zeiss Co., Ltd., Germany). Along with the introduction of this high-quality operating microscope, there is a growing need for refinement of microsurgical techniques in operative fields under high magnification. At present, however, development of microsurgical instruments fine enough to be applicable to highly magnified operation fields is not well achieved. Based on this consideration, the authors have endeavored to devise several kinds of ultrafine microneurosurgical instruments. This report outlines the utility of the recently devised microsurgical instruments, which reduce the morbidity of surgical procedures.

Instrumentation and Technique

1. Microscissors

Compared to those currently available, the microscissors presented here are characterized by their tips being as sharp and as thin as possible. Two types of tips, straight and slightly curved, are manufactured (Fig. 1).

2. Dissecting microprobes

We designed microprobes with blunt tips, which are smaller than those conventionally used. Two types of microprobes, straight and slightly angled, are available (Fig. 2).

3. Tapered retractors

Seven sizes of tapered retractors, which were originally devised by Sugita, et al.11, are designed. They are black-coated and have a tip of 0.5 mm.
Fig. 1  Microscissors

U: ultrafine microscissors
C: conventionally used microscissors

Fig. 2  Dissecting microprobe

U: ultrafine microprobe
C: conventionally used microprobe

Fig. 3  Tapered retractors
The size (mm) indicates the width of the tip of the tapered retractor. Note the thinner part of the tip (an arrow).
1.0 mm, 2.0 mm, 3.0 mm, 4.0 mm, 5.0 mm and 6.0 mm in width (Fig. 3). The tips 15 mm in length are in particular thin (0.4 mm thickness). All of these microsurgical instruments are manufactured by Fujita Ika Corporation (Tokyo, Japan).

Since 1989, the authors have used these instruments exclusively during surgery for cerebral aneurysms, arteriovenous malformations and deep-seated brain tumors. Several characteristics of microneurosurgical techniques using these instruments are briefly outlined as follows. The assistant neurosurgeon holds two types of tapered retractors, which have suitable sizes for fissures or sulci to be dissected. Using these retractors, arachnoid membranes, the cerebral cortex, and vascular structures are mildly retracted in an intermittent fashion. Continuous retraction with a self-retaining apparatus is avoided except for an unusual setting such as rupture of cerebral aneurysms. The operating neurosurgeon identifies the structures between the tapered retractors by suctioning variable sizes of cotton patties absorbing cerebrospinal fluid and blood. Under direct visualization with a maximally magnified view, the operator dissects these structures using microprobes and microscissors. Particularly around the aneurysmal neck, direct retraction of vascular structures using 0.5 mm- and 1.0 mm-tapered retractors facilitates sharp dissection with microscissors.

**Discussion**

Microneurosurgery is a surgical procedure aiming at reducing retraction of the brain and vascular structures. This procedure is facilitated by direct visualization through a narrow operative space under high magnification and excellent lighting. Ultrafine microsurgical instruments presented here are designed to approach intra-cranial deep-seated lesions through minimal retraction of the brain without injuring even small blood vessels. The recent trends in neurosurgical techniques are characterized by intermittent, mild retraction of the brain and vascular structures, eliminating the use of self-retaining retractors except for accidental situations. As an aid for this practice, various sizes of retractors appropriate for the operative fields are needed. Tapered retractors, originally devised by Sugita, et al., are particularly useful for fine manipulation by the assistant. Our tapered retractors of 0.5 mm and 1.0 mm in width are also able to be used as dissecting instruments because of their fine tips. In our more recent experience, these tapered retractors were particularly useful for surgery of basilar artery aneurysms, which required direct retraction of the neck and main trunks of the arteries. The use of bipolar coagulator during microsurgery became less frequent after the introduction of the present microprobes and microscissors, which enabled dissection with sparing of fine vascular structures under highly magnified vision.

Along with further refinements of operating microscopes, there may be growing needs to devise finer microsurgical instruments in the future. Thus, technological advances in microsurgical instruments and operating microscopes will enable approaching the deep parts of the brain using minimal brain retraction without sacrificing fine blood vessels.

**References**