The Dissecting Microscope for Intracranial Vascular Surgery

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In the past year we have used 1-3 a Zeiss dissecting microscope (Fig. 1) during surgery in 17 cases: 13 intracranial aneurysms, 3 arteriovenous malformations and for studies of vasospasm during one hemispherectomy. We believe it is helpful in the following ways.

1. An aneurysmal neck and its junction with the parent vessel can be seen more clearly than with the naked eye (Fig. 2). The surgeon can therefore apply an aneurysm clip more accurately and with less chance of traumatizing or compromising the lumen of the parent vessel (Fig. 3). The microscope has proved especially useful for aneurysms of the anterior communicating and middle cerebral artery.

2. The small but vital perforating vessels that arise from major arteries of the circle of Willis can be clearly identified with the aid of the microscope. Injury to these vessels can therefore be avoided during dissection or during the application of temporary clips. For example, branches from the proximal or A-1 portion of the anterior cerebral artery, which are distributed to the anterior hypothalamus, septal region, and adjacent structures of the brain can be visualized so well that injury to them can be avoided during the surgical treatment of anterior communicating artery aneurysms (Fig. 4).

3. Changes in the circulation of small partly transparent vessels can be observed during some procedures. We have occasionally noted, for example, circulatory slowing with clumping of red cells within some of the small semi-transparent arteries of the optic chiasm while they were being exposed.

4. The laminar flow in arterialized veins of intracranial arteriovenous malformations can also be plainly seen and studied. Changes in these vessels can therefore be effectively appraised after feeding vessels are tested by temporary occlusion.

5. Vasospasm induced by mechanical stimuli of cortical as well as larger cerebral arteries can be studied and the results of topical application of 8% Papaverine documented.

6. The bright, well-focussed light from the microscope lamp affords superb illumination of the surgical field.

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† Obtainable from Storz and Co., St. Louis, Missouri (Model No. M8020).
FIG. 2. Internal carotid artery (C) with aneurysm (A) extending below the tentorial edge (T). Enlargement of microscopic magnification X5.

FIG. 3. Carotid artery aneurysm after suboptimal placement of a Mayfield-Kees clip (C) that partly indented the wall of the internal carotid artery (IC). T = tentorium. Enlargement of microscopic magnification X6.
the lens assembly to the surgical field can be adjusted as desired. We have found a 200 mm. lens to be the most useful although 300 mm. and a 500 mm. objectives are also available. The 200 mm. lens also seems to be the most satisfactory for use with the House-Urban motion picture camera described below.

Two eyepieces are available: a 12.5 and a 20 power. We prefer the 12.5 power eyepieces. By using these and the 200 mm. objective magnifications from 4 to 40 times can be obtained by manipulating the field lens built into the instrument. For intracranial vascular surgery of the type discussed here, a magnification of 6 has proven to be the most satisfactory. A side-arm eyepiece for an assistant surgeon is an extremely useful addition.

Sterilization

Although the instrument itself cannot be sterilized it can be completely enclosed in a transparent, gas-autoclavable, plastic bag. The surgeon can then focus, change magnification or change the field of the instrument without compromising the sterility of the surgical field, because he can see and easily adjust the necessary knobs on the apparatus owing to the protective plastic covering.

Photographic Equipment

Our instrument is equipped with a House-Urban motion picture camera which uses 16 mm. color motion picture film.† We have used Ektachrome Commercial film because it provides excellent copies. However, other brands of film may be used. A Nikon F. camera can be fitted to the microscope with a special adaptor for still photography.

The motion picture camera is operated by the surgeon with a foot switch that simultaneously turns on a much brighter light during photography.

† Obtainable from Urban Corp., Los Angeles, California.
Surgical Instruments

We have been using a set of miniature instruments designed for use in middle ear surgery. These include forceps, scissors, suction tip, probes and hooks. The aneurysm clips and clip holders are of standard size.

Bleeding

Bleeding from small vessels often appears through the microscope to be of much greater magnitude than it actually is. Much of this bleeding is easily controlled by the use of miniature suction apparatus. In the face of more severe bleeding, as from an aneurysm that ruptures during dissection, an additional large-size suction apparatus may be brought into use by the assistant while the surgeon continues to view the field through the microscope.

Summary

We have found the Zeiss dissecting microscope useful during the surgery of intracranial aneurysms and arteriovenous malformations, and have discussed the technical details involved. Since the technique has been so widely adopted, we think it historically appropriate to mention that we believe we were the first to use the microscope for intracranial aneurysmal surgery.

References