Classification of Anterior Communicating Aneurysms as a Basis for Surgical Approach

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The anterior communicating arterial complex provides one of the most common sites for the development of saccular aneurysms. Estimates of frequency of involvement of this area vary from Dandy’s early report of 18.8% (25 of 133 cases) to Riggs’s report of 60% (79 of 131 cases found in 1437 consecutive autopsies). The figure of 27.4% (485 of 1769 aneurysms) in McKissock’s series as reported by Bull is probably a representative statistic.

The development of this aneurysm when untreated is disastrous; conservative management is associated with a 40% to 70% mortality rate. For this reason various methods of surgical treatment have been advocated and instituted.

Successful treatment of aneurysms by intracranial surgery requires careful planning of the surgical approach. Berry aneurysms are most commonly saccular in configuration and most often rupture at their fundi. It is logical, therefore, that they can best be treated if the neck is isolated from the circulation without disturbing the dome. Aneurysms of the anterior communicating complex more than aneurysms of any other location can project in a myriad of directions. Since the area of the anterior communicating artery can be approached from several different directions, it is desirable to separate these aneurysms into groups appropriate to the method by which they can best be attacked.

Following this basic philosophy, anterior communicating artery aneurysms are treated by two very distinct approaches at Walter Reed General Hospital. As a result, the preoperative arteriogram has become a key to planning the operative approach. In aneurysms that project superiorly, a subfrontal approach to the anterior communicating complex is used. However, all aneurysms which point inferiorly are approached from above by making an incision through the gyrus rectus. The technique of this unique procedure has been described in Operative Neurosurgery. Figure 1 illustrates the authors’ division of aneurysms of the anterior communicating complex in which these two techniques are used.

Material

We reviewed 100 consecutive cases of aneurysms of the anterior communicating artery covering a 12-year period at Walter Reed General Hospital. Preoperative and postoperative arteriograms were most signifi-
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Results and Conclusions

Direction of Projection. In 98 of 100 cases, a valid decision could be made as to which of the eight categories of projection applied. Significantly, 70.5% of these aneurysms projected in a direction within the arc of the circle shown in Fig. 1 for which the gyrus rectus approach is used.

Size. Assuming these aneurysms to be sphere-shaped, we found the average volume to be 947 cu mm, which represents the volume of an aneurysm approximately 12 mm in greatest diameter. Those aneurysms projecting superiorly were significantly larger than those pointing inferiorly. In 29 superiorly projecting aneurysms, the mean volume was 1996 cu mm, whereas in the 68 inferiorly projecting aneurysms it was only 500 cu mm. However, because of a few very large aneurysms that primarily projected superiorly, perhaps the median would be a more meaningful comparison. Indeed, the median size of all the aneurysms was 268 cu mm. The median volume of superiorly projecting aneurysms was 381 cu mm as compared with 268 cu mm for those pointing inferiorly. The median diameter of all aneurysms calculated in this manner would then be 8 mm. Therefore, the only conclusion that can be drawn from comparing the relative size of the various aneurysms is that giant aneurysms (those greater than 18 mm in diameter) tend to project superiorly, an observation that might have been anticipated from the anatomical position of the anterior communicating complex.

Assuming the shape of the aneurysms to be ellipsoid rather than spherical, we found the calculated volumes to be smaller. By this method the average volume was only 432 cu mm, which represents the volume of an aneurysm approximately $8 \times 9 \times 12$ mm.

Multiplicity. Twelve patients had more than one aneurysm and two patients had more than two. These aneurysms varied so greatly in location that no statistically valid conclusion could be reached correlating the anterior communicating artery aneurysm with aneurysms at any other locus.

Origin. By reviewing oblique projections of carotid arteriograms and operative narrations, a statement could be made with regard to the origin of the base of the aneurysm in 44 of the cases, and in these the anterior portion of the circle of Willis was carefully studied. In 35, there was marked discrepancy in the size of the proximal anterior cerebral arteries on the two sides (Fig. 2). It is remarkable that in 24 of this group the aneurysm arose at the junction of the dominant anterior cerebral artery and the anterior communicating artery, while only five arose from the junction of the nondominant anterior cerebral artery and anterior communicating artery. The remaining six were broad-necked aneurysms arising from the anterior communicating artery itself. Testing the hypothesis that aneurysms should arise

Fig. 2. Three diagrams showing sites of origin of anterior communicating artery aneurysms. The number of cases in which there was a marked asymmetry in the size of the two proximal anterior cerebral arteries were (from left to right) 6, 5, and 24 cases.