Monitoring and preventing blood flow insufficiency due to clip rotation after the treatment of internal carotid artery aneurysms

Technical note

JUN SAKUMA, M.D., KYOICHI SUZUKI, M.D., TATSUYA SASAKI, M.D., MASATO MATSUMOTO, M.D., MASAKI ONUMA, M.D., MASAHISA KAWAKAMI, M.D., TAKEHISI ITAKURA, B.S., AND NAMIO KODAMA, M.D.

Department of Neurosurgery, Fukushima Medical University, Fukushima, Japan

RECENTLY we reported that intraoperative monitoring of the MEPs can detect blood flow insufficiency in the AChA during aneurysm surgery. We treated a patient in whom intraoperative MEP monitoring detected blood flow insufficiency in the AChA due to aneurysm clip rotation that was caused by repositioning of the frontal lobe after the brain retractor was released in preparation for dural closure. Ischemia was successfully avoided in this patient by keeping the position of the clips stable after release of the frontal lobe.

Case Report

History and Examination. This 39-year-old woman was found to have an incidental aneurysm in the right ICA at the bifurcation of the AChA. Three-dimensional computerized tomography angiography revealed an 8-mm ICA–AChA aneurysm protruding posterolaterally. Anesthesia administration and intraoperative MEP monitoring were performed as reported previously. Prior informed consent was obtained from the patient.

Operation. Clip occlusion of the aneurysm neck was performed through a standard frontotemporal craniotomy. Intraoperative MEP changes in Fig. 2. After exposing the ICA–AChA aneurysm (Fig. 1a), occlusion of its neck was performed using two Yasargil straight clips (Fig. 1b). Doppler ultrasonography data confirmed blood flow in the ICA and AChA, and MEP amplitude remained at the control level. No finding of AChA blood flow insufficiency was recognized. After release of the brain retractor, the frontal lobe began to reposition and contacted the clips. Oxycellulose cotton (Surgicel) was inserted between the clip heads and the surface of the brain (Fig. 1c) to avoid injury to the frontal lobe. Nevertheless, MEP amplitude subsequently fell to 50% of the control level. We noticed that the clips were pushed by the repositioning frontal lobe after release of the brain retractor and placement of the Surgicel; consequently the clips had rotated toward the frontal base. On reorienting the clips toward the frontal lobe, the AChA stenosis was released and MEP amplitude recovered. To prevent repeated clip rotation, a large amount of gelatin (Spongell) was inserted between the frontal base and the clip. The authors confirmed that clip rotation did not occur after repositioning of the frontal lobe. Motor evoked potential amplitude was maintained until dural closure. Postoperatively, the patient demonstrated no neurological deficit and there was no newly developed low-density area on computerized tomography scans.

KEY WORDS • clip rotation • anterior choroidal artery • motor evoked potential • intraoperative monitoring • aneurysm

Abbreviations used in this paper: AChA = anterior choroidal artery; ICA = internal carotid artery; MEP = motor evoked potential.
**Postoperative Course.** This patient did not suffer hemiparesis postoperatively and a computerized tomography scan revealed no new low-density area. She was discharged with no neurological deficits.

**Discussion**

In aneurysm surgery, even though the neurosurgeon may judge that aneurysm clip placement has been performed adequately, rotation of the clip due to brain repositioning after release of the retractor often results in stenosis or occlusion of arterial branches and perforating arteries around the aneurysm. Friedman, et al., have documented that clip rotation led to blood flow insufficiency in the AChA. In their report, one patient had a delayed deficit beginning at 36 hours and was returned to the operating room at 72 hours. In that patient the clip was found to have twisted in situ, causing occlusion of the AChA. Detection of blood flow insufficiency caused by clip rotation is, however, still difficult. In a few patients, postoperative skull x-ray films re-
Operative sequelae caused by blood flow insufficiency in the AChA, nor can it guarantee a sufficient blood flow.

In comparison with those conventional methods, the monitoring method in which MEP is used facilitates the detection of blood flow insufficiency in the AChA, which perfuses the internal capsule. It can detect ischemia in the AChA in as short a time as 5 to 40 seconds.

To prevent clip rotation, we used oxycellulose cotton and gelatin in this case. We have recently encountered another case in which the repositioning of the frontal lobe caused clip rotation. For that case we inserted a large, hard rectangular polyurethane sponge between the anterior skull base and the frontal lobe, because the repositioned frontal lobe was strongly pushing the clip head. When we anticipate that the force of clip rotation will be strong, a hard substance such as polyurethane sponge should be used as a prop.

Conclusions

We report on a case in which AChA blood flow insufficiency due to aneurysm clip rotation was detected using intraoperative MEP monitoring and in which ischemia was successfully avoided by preventing clip rotation. We emphasize that the physician should not only be careful about the clip placement itself, but should also be aware of subsequent pitfalls.

References


Manuscript received September 2, 2003.
Accepted in final form January 13, 2004.

Address reprint requests to: Jun Sakuma, M.D., Department of Neurosurgery, Fukushima Medical University, 1 Hikarigaoka, Fukushima 960-1295, Japan. email: jsakuma@fmu.ac.jp