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ScienceDirect
Surgical Neurology 72 (2009) S1:23 – S1:28
SURGICAL NEUROLOGY
www.surgicalneurology-online.com

Technique

Unilateral approach to clip bilateral multiple intracranial aneurysms

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Received 14 September 2007; accepted 26 December 2007

Abstract

Background: In patients harboring bilateral supratentorial aneurysms, the operation has traditionally been accomplished via sequential craniotomies, starting with the side of the ruptured aneurysm. Ideally, if the contralateral aneurysms can be exposed adequately and safely, surgical clipping of all aneurysms via a single, unilateral craniotomy would simplify treatment because the patient could avoid a second craniotomy and anesthesia. We present our technique of the unilateral approach to bilateral multiple intracranial aneurysms.

Methods: From September 2005 to December 2006, 8 cases of 12 patients with bilateral multiple intracranial aneurysms were unilaterally approached. All patients selected were under grade 3 according to Hunt-Hess classification. Bilateral posterior communicating aneurysms were the common type in our group. Unilateral pterional approach was adopted. After routinely clipping the ipsilateral aneurysm, dissection to opposite spaces was continued until the exposure of the neck of contralateral aneurysm and proximal and distal contralateral carotid artery, for vascular control.

Results: Total 19 aneurysms of 8 patients were successfully clipped. The patent of all parents' arteries were preserved, particularly the fetal posterior communicating arteries. There was no death associated with this approach in our group.

Conclusions: The advantage of the technique is obvious—the ability to spare the patient the risk and inconvenience associated with a separate craniotomy at the same or different stage. The disadvantage of the technique is that the space of manipulation is deep and narrow. Therefore, it is an alternative approach only for experienced neurosurgeons.

Keywords: Bilateral; Multiple intracranial aneurysms; Unilateral approach

1. Introduction

Multiple intracranial aneurysms are present in 7% to 34% of patients with intracranial aneurysms at presentation, and in 20% to 40% of these patients, the aneurysms are bilateral [5,10]. The bilateral MIA is commonly located in the symmetrical place of the bilateral internal carotid system, such as ICA and MCA. There are several therapeutic options that can be used for patients with bilateral MIA. The bilateral craniotomies are traditionally used to clip the aneurysms at one stage or by stages in each patient. The ability to treat these patients through a unilateral craniotomy offers the obvious advantage of avoiding a second craniotomy. We present here our experience with the technique of the unilateral approach to bilateral MIA.

2. Clinical material and methods

Between September 2005 and December 2006, 165 consecutive patients were admitted to the neurosurgery department of the affiliated hospital of Nanchang University (Jiangxi, China) with the diagnosis of angiographically confirmed cerebral aneurysms. In this series, 12 patients were found to have bilateral supratentorial aneurysms. A

Abbreviations: ACA, anterior cerebral artery; ACoA, anterior communicating artery; CT, computerized tomography; DSA, digital subtraction angiography; ICA, internal carotid artery; MCA, middle cerebral artery; MIA, multiple intracranial aneurysms; OA, ophthalmic artery; PCoA, posterior communicating artery; SAH, subarachnoid hemorrhage; 3D-CT, 3-dimensional computerized tomography.

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0090-3019/$ – see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.surneu.2007.12.031

unilateral approach was attempted in 8 of the 12 patients. There were 3 males and 5 females. Age was from 38 to 56 years with mean age of 43.7 years. They were all admitted to our hospital with SAH; 3 of them had oculomotor paralysis. Patients were graded according to Hunt and Hess Scale as follows: grade 1 in 3 patients, grade 2 in 3 patients, and grade 3 in 2 patients.

All patients had CT scanning and conventional angiography, 5 of them also underwent 3D-CT angiography for the detection of intracranial aneurysms. A total of 19 aneurysms were found located at bilateral internal carotid arteries. Six cases had bilateral PCoA aneurysms, among them 2 cases had additional ACoA aneurysms and one had ipsilateral MCA aneurysm as well. One case had MCA aneurysm and contralateral PCoA aneurysm. One case had PCoA aneurysm and contralateral OA aneurysm. The sizes of aneurysms were smaller than 5 mm in 8 aneurysms, 5 to 25 mm in 10, and larger than 25 mm in 1.

The interval between SAH and surgery was less than 7 day in 7 patients and 2 weeks in 1. All of the aneurysms were clipped through a unilateral craniotomy. The selection of operative side was based on the site of ruptured aneurysm, the type of MIA, the projection of the aneurysmal body, and 3D-CT angiography, with which the operative approach was mimicked. After routinely clipping the ipsilateral aneurysm, dissection to contralateral spaces (including the interoptic space (Fig. 1), the contralateral opticocarotid space (Fig. 2), and the contralateral carotid bifurcate space (Fig. 3) was continued until exposure of the neck of the contralateral aneurysm and its proximal and distal carotid artery—for vascular control. To mobilize the contralateral optic nerve safely, it was necessary to open the falciform fold of the contralateral optic nerve. In one case, the contralateral posterior clinoid process needed to be unroofed using a high-speed drill to facilitate exposure of the aneurysmal neck.

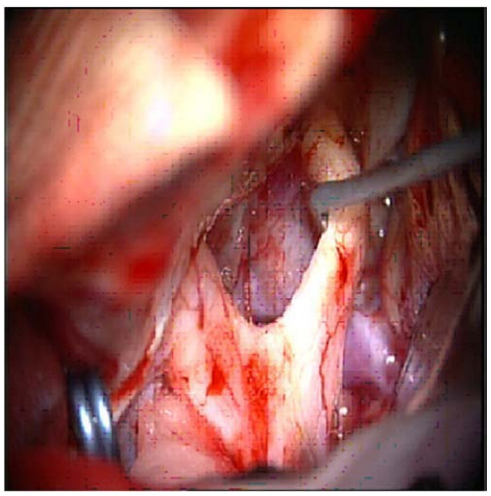

Fig. 1. The interoptic space—the triangular space bordered by the optic nerves and planum sphenoidale. Dissection in this location provides contralateral proximal artery control and the necessary exposure is obtained to access the contralateral ophthalmic, superior hypophysial, and posterior communicating arterial aneurysms. In this case, the hypophysial artery aneurysm could be exposed by lifting the contralateral optic nerve (the contralateral falciform fold has been opened).

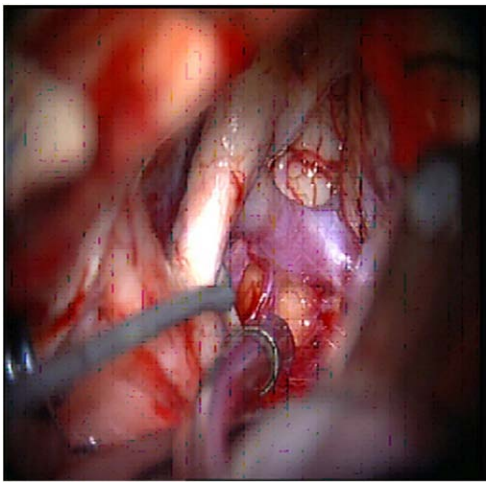

Fig. 2. The contralateral opticocarotid space—the triangle defined by the lateral border of the contralateral optic nerve (chiasm and tract), the inferior aspect of the A1 segment of the contralateral anterior cerebral artery, and the medial aspect of the distal contralateral carotid artery. This corridor affords the best opportunity to access the contralateral anterior choroidal and posterior communicating arterial aneurysms. In this case, lateral displacement of the optic nerve through this triangle allows exploration of the contralateral anterior choroidal and posterior communicating artery.

3. Results

A total of 19 aneurysms in 8 patients were successfully clipped. Favorable outcomes were obtained in 7 patients, and 1 patient had a transient disability. Postoperative DSA was performed in all cases 7 days after the operation, which showed all aneurysms were clipped and the patent of all parent arteries was preserved, particularly the fetal PCoA (Figs. 4 and 5). A CT scan was carried out 3 days and 3 months after the surgery. One patient had hydrocephalus

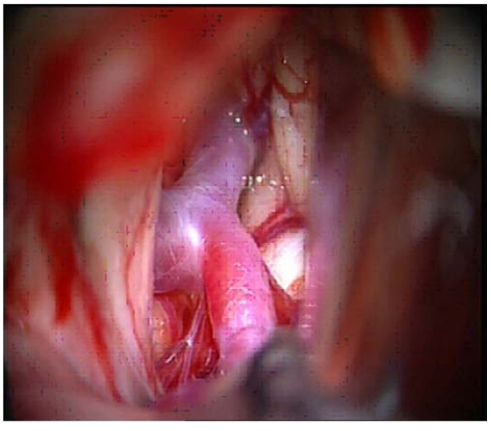

Fig. 3. The carotid bifurcate space—through this space, carotid termination aneurysms can be exposed and clipped.