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Technique

Minimal invasive method for intraoperative angiography using the superficial temporal artery with preservation of its trunk

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Abstract

Background: Intraoperative angiography is useful in evaluating the vascular lesion before clipping/excision, presence of any residual lesion, and excluding unintended occlusion/stenosis of the arterial branch/parent artery. The previously reported techniques using the superficial temporal artery involved either retrograde cannulation of the aortic arch or its permanent obliteration at the end of the procedure. The present report describes a simple method that enables cannulation of the artery using standard Sildenger's technique and ensures its patency at the end of the procedure for possible use in present or future procedures.

Methods: The method was applied during craniotomies performed for various intracranial vascular lesions. One division of the superficial temporal artery was subjected to catheterization. At the end of the procedure, the division of the superficial temporal artery that was punctured was hemostased, leaving the main trunk patent.

Results: Intraoperative cerebral angiography was performed by the author via catheterization of one division of the superficial temporal artery in 56 craniotomies. Intraoperative cerebral angiography showed adequate high-quality subtraction images.

Conclusion: The present report describes a simple method that enables cannulation of one division of the superficial temporal artery and preserves the main trunk at the end of the procedure.

Keywords: Cerebral angiography; Intraoperative; Aneurysm; Artereovenous malformation; Artereovenous fistula; Arterial bypass

1. Introduction

Although advances have been introduced in the field of endovascular procedures, microsurgical application, however, still plays a cornerstone rule in the management of cerebrovascular lesions. For that, the microsurgical results have been put into continuous challenge. It even becomes augmented when dealing with lesions that have not yet symptomatized, such as unruptured aneurysms [10]. This raises the potential advantage of intraoperative angiography to gain time in correcting any abnormality before wound closure [1,2,10]. Against this is the reported risk of complications related to angiography [3]. The latter has led investigators to look for less risky methods for performing adequate intraoperative angiography.

2. Materials and methods

The method was adopted by the author as a routine part of craniotomies for vascular lesions. In the initial 16 craniotomies, a radiolucent cranial head holder and a radiolucent operating table were not available. In these cases intraoperative angiography was possible by simple accurate placement of the Mayfield head frame high on the cranium and extending the patient position out of the table by adding shoulder support. In addition to the operating table and

Abbreviations: AVM, arteriovenous malformation; A2, anterior cerebral artery second segment; ECA, external carotid artery; EC-IC, external carotid to internal carotid bypass; ICA, internal carotid artery; IV, intravenous; M1, middle cerebral artery first segment; NBCA, *n*-butyl cyanoacrylate.

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different rotations of the C-arm (Siremobil 2000; Siemens, Munich, Germany), these modifications succeeded in finding a window for unobstructed cerebral angiographic views. The radiolucent cranial head holder was then used since its introduction into the department. The patient is positioned on the radiolucent operating table as appropriate for the lesion to be operated on. The patient's head is fixed in a radiolucent cranial pin head holder (Sugita radiolucent head holder; Mizuho, Mizuho Medical Inc., Japan). The pulsation of the superficial temporal artery may be felt manually as detected by the portable Doppler ultrasound. The artery main trunk and divisions are dissected for as much as it is allowed by the skin incision for the planned craniotomy. A mobile C-arm image intensifier with subtraction capability is used (Siremobil 2000). One division of the superficial temporal artery is subjected to catheterization in a retrograde fashion. The cannulation starts from as distal as allowed by the planned exposure and stays in the same division. With the use of Sildenger's technique, an intravenous catheter (Angiocath, The Desert Company, Sandy, Utah, USA), size 18 gauge (1.16 in), 3 cm long, is passed into one of the divisions of the superficial temporal artery. The size of this catheter allows for an infusion rate of 86 mL/min. Once backflow arterial bleeding is noticed, the

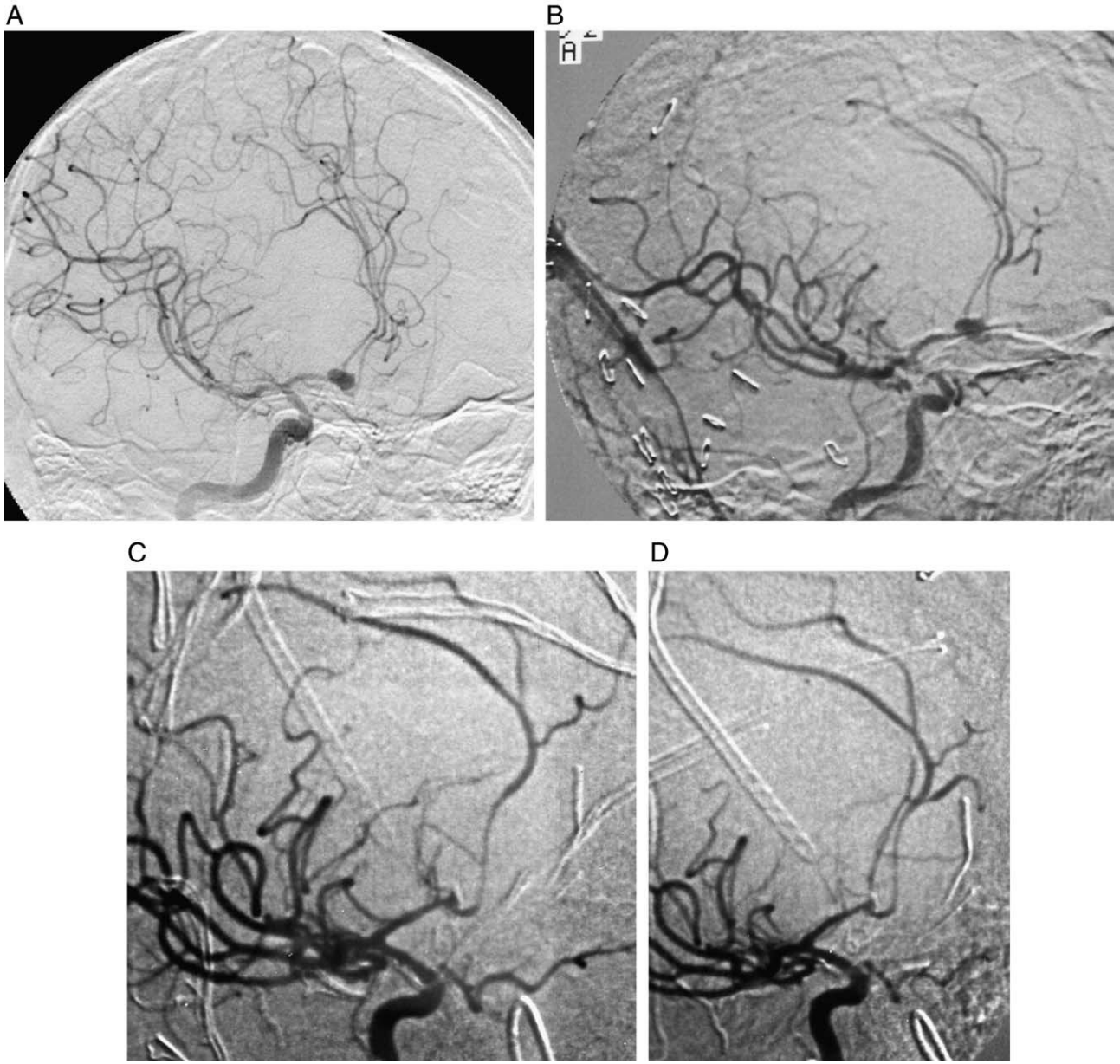

Fig. 1. (A) Preoperative right internal carotid angiography showing anterior communicating artery aneurysm. Intraoperative angiography of adequate quality, (B) before clip application, (C) after initial clipping, showing residual aneurysm neck and involvement of the left A2 origin with occlusion of the anterior cerebral artery (single arrow), (D) after immediate adjustment of the clip and return of anterior cerebral artery circulation (double arrow). Patient did not show any clinical effect.