Summary

Yasargil in late 1960's introduced the pterional approach for the treatment of aneurysms of the anterior circulation of the circle of Willis. As he stated, the development of this approach began with the clinical application of microsurgical techniques to basal tumors and was then applied to intracranial aneurysms (1). Since that time various modifications of the approach were reported. This technique was adopted for the treatment of aneurysms of the anterior circulation in the neurosurgical department at the university hospital of Umea from
its start in 1969 but we made a modification recently by decreasing the shape and the size of the bone flap to a minimum, the smallest 1,3 x 4,3 cm (average 1,6 x 5,6 cm).

We do not remove either the zygomatic arch or uncover the orbital roof. The exposure was however sufficient to reach any aneurysm of the anterior circulation and the tip of the basilar artery and the only limitation was still the size of the aneurysm-clip applicators.

Key words: pterional microcraniotomy, aneurysms of anterior circulation, clip applicator

Introduction

In a historical perspective, four different basic approaches have been developed for clipping aneurysms of the anterior circulation. A/ The subfrontal approach proposed by Dott 1933 (2), B/ The transcallosal approach used by Tonnis in 1936 (3), C/ The frontotemporal approach suggested by Dandy in 1942 (4) and finally D/ The interhemispheric subfrontal approach established by Pool in 1961 (5). However the approaches proposed by Dott, Tonnis and Pool were especially used for aneurysms in A1, A2 and ACoA whereas the frontotemporal approach by Dandy has been used for all aneurysms of the anterior circulation but also for aneurysms of the tip of the basilar artery as proposed by Yasargil (6). In our institution, the pterional approach according to Yasargil has been used but recently, during the year 2000, we modified it by changing the shape and decreasing the size of the bone flap. With the exception for low basilar tip aneurysms (below the posterior clinoid) or basilar trunk aneurysms, our modification seems advantageous. We hereby describe the technique in detail.
Material and methods

Between March 2000-March 2006, one hundred and fourteen (114) patients were operated using the pterional microcraniotomy. The microcraniotomy was additionally used in suprasellar hypophyseal tumors, craniopharyngiomas, optic nerve gliomas, sphenoid ridge meningiomas and other lesions adjacent to the internal carotid artery.

Operative technique

The patient under general anesthesia and additional local anesthesia (xylocain-adrenalin 1%) was placed in supine position with the head fixed and secured with the Mayfield-Kees three-point skull fixation. The head was turned approximately 30° to opposite side of the operation side and slightly extended. The skin incision extended from the middle-frontal region down to zygoma, just in front of the ear. Care was taken to avoid damage of the frontotemporal branch of the facial nerve and if possible to preserve the branches of the superficial temporal artery. Electrocautery was then used to incise the temporal muscle, fascia and periosteum.

A so called "keyhole" was drilled at the anterolateral aspect of the junction of the orbital ridge and zygomatic process and with the aid of an air-powered craniotome, a small, slightly curved bone flap was elevated. The high speed craniotome seemed to be effective in almost
all cases providing hemostasis. After the removal of the bone flap, the prominent edge of the sphenoid bone was drilled away using an air-powered diamondburr, down near to the anterior clinoid process. Any bony projections of the orbital roof were also removed for more tangential access to the skull base. Following strictly the sphenoid ridge edge, there were no occasions in which the orbital roof itself had to be removed.

Further on, when the dura was opened and the optic nerve was identified, the exposure was continued under the magnification of the microscope. When the operative procedure was carried out, the bone flap was secured back in place with usually three (3) microplates and microscrews and the muscle was sutured back.

**Results**

Out of 114 patients, 81 were primarily and solely examined with CT-angiography, 3 were examined with MR-angiography, 21 with DSA (digital subtraction angiography) and 9 patients with all three methods.

Using the pterional microcraniotomy technique described above, all patients were successfully clipped with not a single complication or postoperative deterioration.

According to Hunt & Hess, there were 81 in gr I, 22 in gr II, 8 in gr III and 3 in gr IV.
The size of the flap varied from 4,5 x 2,5 and 5,0 x 1,3 cm the smallest to 8,5 x 2 the largest. Temporary clipping was used in 63 cases while the time elapsed from skin incision to clipping varied from 64 to 236 min (average 130 min).

Discussion

Operative procedures for intracranial aneurysms can be facilitated by proper planning and exposure strategy. The pterional microcraniotomy technique requires shorter surgical time, better cosmetical result, shorter exposure of the brain and less bleeding without compromising safety. These goals were achieved judging from our results while the fear of not being able to manage a rebleed due to small exposure was not justified. A rebleed, deeply at the aneurysm site will be taken care on the spot regardless the outer opening.

Conclusion

Pterional microcraniotomy is a quick and safe approach for the clipping of aneurysms of the anterior circulation.

References


2. Dott NM. Intracranial aneurysms: cerebral arterio-radiography; surgical treatment. edingurgh med J. 48: 825-830, 1933

