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Late ophthalmological manifestations in patients with subarachnoid hemorrhage and coiling of cerebral aneurysm

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ABSTRACT

Late ocular manifestations of aneurysmal subarachnoid hemorrhage (SAH) have not been previously investigated except for one study which demonstrated that one half of patients subjected to aneurysm clipping suffer from symptoms of visual pathway impairment. We assessed ophthalmological status of patients after 1–4.5 years from SAH and aneurysm embolization to identify predictors of damage to the visual pathways. Complete ophthalmological examination, static perimetry, and visual evoked potentials (VEPs) were performed in 74 patients (26 men, 48 women, aged 19–76 years), who constituted a consecutive sample of 129 patients treated with aneurysm embolization in the years 2008–2010. The following independent variables: sex, age, time from SAH to embolization, size and site of aneurysm, score in Glasgow Coma Scale, Glasgow Outcome Scale, Hunt-Hess and Fisher scales were subject to univariate and multivariate statistical analyses to study their influence on the ocular outcome. 40 patients (54%) demonstrated visual field defects appearing as multiple peripheral foci and constricted field, affecting both eyes. Among these subjects, 12 patients had severe defects in the visual field, 20 had deterioration in VEPs, and 9 had decreased visual acuity. Older age and high score in Hunt-Hess and Fisher scales were identified as predictors for visual field defects and disturbances in VEPs. More than half of the survivors of SAH and aneurysm embolization suffer from a permanent defect in visual function. Damage of visual pathway correlates with severity of SAH and older age of patients.

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1. Introduction

Both common knowledge and results of numerous well documented clinical studies show that spontaneous subarachnoid hemorrhage (SAH) from cerebral aneurysm has a disproportionally high impact on psychosocial outcome of its survivors and their health-related quality of life (HRQOL) [1–4]. The problem is of particular importance, because SAH affects much younger persons than other forms of stroke.

In spite of hitherto vast research on SAH outcome, it is still unclear which particular factors predict the loss of psychosocial performance, as such potential predictors as age, sex, bleeding severity, cognitive impairment, etc., were found to have relatively small effect on mental and physical HRQOL [1,4]. On the other hand, possible lesions at the sensory level have not been studied thus far with regards to their influence on the condition of SAH survivors. Moreover, even the mere incidence of sensory damage in this population has not been conclusively defined or studied.

Recently, we described long-term ocular manifestations of aneurysmal SAH in a series of patients in whom aneurysmal clipping was performed by one neurosurgeon [5]. This study demonstrated that as many as 50% of these patients suffer from varying degrees of visual pathway impairment, with main level of damage located at the optic nerves and/or chiasm. Importantly, most of them, including patients with severe visual field defects, were unaware of their disability.

Naturally, a question arises whether the damage to the visual pathway is an effect of SAH itself or is produced during surgical manipulation during the clipping of the aneurysm. To address this problem we extended our study into a group of patients with SAH in whom aneurysm was secured by intravascular coiling. A conventional ophthalmological examination, visual evoked potentials, and static perimetry were performed in a period of 1–4.5 years after the onset of SAH.

2. Materials and methods

Between 2012 and 2014, one hundred twenty nine patients with aneurysmal SAH underwent aneurysm embolization at our institution. Among these patients, 9 died or were in vegetative state after SAH and embolization, while another 11 were excluded from the study because they underwent combined endovascular/surgical procedures for multiple aneurysms. All the remaining 109 patients discharged within the abovementioned period as independent were invited to take part in the study; however, only 92 patients responded to the invitation. 12 patients were excluded from this primary sample because of the presence of glaucoma, cataract, macular degeneration, or diabetic retinopathy as diagnosed from data on file and based on the result of current ophthamological examination. Another 6 patients had problems with cooperating during examination of the visual field and were also excluded because their results did not fulfill the criteria of reliability.

Ultimately, the study group included 74 patients: 26 males (35%) and 48 females (65%). The median age of the patients was 52 years (range of 19–76 years, mean 49.6 ± 12.3 years).

The study was approved by the Institutional Review Board, and all patients gave written consent for the use of their clinical material in this publication.

2.1. Embolization procedure

Endovascular procedures were performed using biplane Siemens Artis angiographic unit under general anesthesia. Aneurysms were coiled with detachable Guglielmi coils (GDC, Boston Scietific, Microvention), which were platinum coils with a volume-expanding hydrogel coating (Microvention). While most aneurysms were secured with electrolytically detachable coils, some were coiled with mechanically detachable coils (MDS-Balt); detailed indication for a given technique depended on aneurysm size and shape. In a few wide neck aneurysms, balloon remodeling was used as a supporting technique (Balt).

A follow up angiography was scheduled at 6 months and 1 year after endovascular coiling. Complete or near-complete (i.e. satisfactory) occlusion was stated in 86.5% of all aneurysms (64 patients), as classified by using the modified Raymond classification scale [6]. 10 patients needed re-embolization, in 2 of them repeated more than once.

2.2. Independent factors

The analyzed factors included: age at admission, sex, clinical status at attempted obliteration of aneurysm (according to Hunt-Hess and Glasgow Coma scales), timing of aneurysm obliteration in days since the hemorrhage (the day of ictus recorded as day 0), and grading of SAH according to the Fisher scale. The size of the aneurysms was dichotomized into <10 mm and >10 mm, whereas their location was classified into four groups: (1) anterior communicating artery (ACoA), (2) internal carotid artery (ICA), (3) middle cerebral artery (MCA), and (4) basilar/vertebral artery (BVA). The outcome at discharge was categorized using Glasgow Outcome Scale. All patients were examined with MRI and/or CT to check for hydrocephalus and/or for other intracranial pathologies that might influence their ophthalmological status. The relevant results of tests performed for all patients and size/localization of the aneurysms are presented in Table 1.

2.3. Ophthalmological examination

Each patient underwent ophthalmological examination of both eyes by an experienced ophthalmologist (I.O.). The mean interval between the onset of SAH and examination was 1.8 ± 1.2 years (range 1.0–3.0 years). The comprehensive ophthalmic evaluation included: recording of visual acuity and color perception, intraocular pressure measurement, slit-lamp examination of the anterior segment, lens and vitreous, direct and indirect ophthalmoscopy, investigation of the function of cranial nerves I–VII, and visual field and visual evoked potentials testing. Cranial nerve function was determined based on the position and motility of the eyelids and eyeballs (3rd, 4th, 6th, and 7th cranial nerves), status of the pupils (3rd cranial nerve), along with corneal and skin sensitivity (5th cranial nerve).

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