

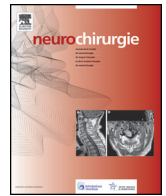


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Original article

Headache changes prior to aneurysmal rupture: A symptom of unruptured aneurysm?

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ABSTRACT

Background and objectives. – The symptomatic status of unruptured aneurysms has to be looked for. The objective of this retrospective case-control study was to identify the headache semiologic characteristics of symptomatic aneurysms during the 3 months prior to patient admission.

Patients and methods. – The case cohort was composed of 40 consecutive patients admitted for the treatment of a ruptured intracranial aneurysm (IA) and able to answer a standardized questionnaire by the same neurologist. This cohort was matched with a control cohort of 40 patients operated on for a degenerative lumbar pathology. This questionnaire, using the criteria for headache characteristics according to the International Headache Society (IHS) enabled us to classify headaches during the previous 3 months prior to the rupture (study period) and during the year prior to the period studied (reference period) in both cohorts. Headache status was considered as unstable if there were modifications of semiologic headache characteristics, thunderclap headaches or de novo headaches, or on the contrary stable.

Results. – During the status period, chronic headaches were reported by 31 patients (77.5%) in the studied cohort and 35 (87.5%) in the control cohort. During the study period, the cephalalgia status was stable in 19 patients (47.5%) versus 35 patients (87.5%) in the control cohort ($P < 0.001$). Modifications of chronic headaches were present in 11 patients (35.5%) in the studied cohort versus 4 patients (11.4%) in the control cohort ($P = 0.04$). Thunderclap headaches were present in 7 patients (17.5%) in the studied cohort but none in the control cohort ($P = 0.006$).

Discussion. – Modifications of headaches semiologic characteristics during the 3 previous months were significantly more frequent in the studied cohort. This modification could be a sign of IA instability.

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1. Introduction

Headache is a frequent symptom of intracranial aneurysm (IA) natural history, which can lead to diagnosis in the current context of effective noninvasive imaging. If sudden headache can be a sign of subarachnoid hemorrhage (SAH) [1], acute or chronic headaches can lead to the diagnosis of unruptured aneurysm from 18% to 36% of IA [2–4]. The headache occurrence could be a symptom of the unruptured aneurysm. This notion is important because symptomatic aneurysms have an increased risk of bleeding [5,6] and

need to be treated within a short period of time [7]. Acute symptoms such as “thunderclap headache” (TCH) are easily linked to the aneurysm [8,9] while chronic headaches are generally considered as associated headaches. Nevertheless, the possible resolution of chronic headache described in 59% to 89% of cases [10,11] suggested the close relationship between the symptom and the presence of IA. The aim of this study was to identify the semiologic characteristics of headache in a cohort of patients with ruptured IA compared to a cohort of patients with isolated headaches suggesting the symptomatic nature of an unruptured aneurysm.

2. Patients and methods

2.1. Population

The population was retrospectively included into this case-control study based on an “a posteriori” evaluation of headaches.

Abbreviations: IA, intracranial aneurysm; TCH, thunderclap headache; HAS, Haute Autorité de santé; SAH, subarachnoid hemorrhage; IHS, International Headache Society; mRS, modified Rankin Scale; CT, computerized tomography; WFNS, World Federation of Neurosurgical Societies.

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Table 1
Demographic cohort characteristics.

| | Case cohort n (%) | Reference cohort n (%) |
|-----------------------------|----------------------|---------------------------|
| Mean age of patient (years) | 62.5 ± 5.8 | 64.3 ± 6.2 |
| Sex ratio (M/F) | 0.74 | 0.80 |
| Cardiovascular risk factor | | |
| High blood pressure | 9 (22.5) | 12 (30) |
| Obesity | 6 (15) | 8 (20) |
| Smoker | 20 (50) | 9 (22.5) |
| Diabetes | 8 (20) | 9 (22.5) |
| Cholesterol | 10 (25) | 12 (30) |

M: male; F: female.

The population was composed of 40 consecutive patients hospitalized for ruptured IA at Rouen University Hospital between August 2006 and June 2007. Inclusion criteria were:

- SAH diagnosed on CT scan;
- an IA diagnosed on Willis CT scan and/or angiography;
- the possibility to answer the questionnaire.

Outflow IA in a context of arteriovenous malformations (AVM) was excluded. We collected demographic data (Table 1) such as age, sex; cardiovascular risks factors, SAH gravity according to the World Federation of Neurological Surgeons (WFNS) [12], and the Fisher classification [13], functional outcomes at 3 months with the modified Rankin scale (mRS) [14]. The outcome was favorable with a mRS from 0 to 2 and unfavorable with a mRS > 2. Case-controls were matched according to sex and age. Inclusion criteria for case-control were:

- current hospitalization in neurosurgery ward;
- surgical treatment of degenerative lumbar disc pathology.

2.2. Headache evaluation questionnaire

A standardized questionnaire of the International Headache Society (IHS) [15] was used to analyse the headaches prior to the hospitalization during an interview by the same neurologist. This interview was applied during 2 periods: a study period, the trimester previous to the rupture; and a reference period, the 9 months prior to the modification period. This enabled to detect a modification of headache characteristics during the 3 months prior to the hospitalization.

Any headaches occurring during the reference period were classified according to the IHS criteria. The different types of headaches were:

- migraine with or without aura;
- tension headache;
- trigeminal vascular headache;
- medication overuse headache;
- neurologic pain of the head;
- unclassified headache;
- combination of headaches.

We looked for previous medical history, which could lead to secondary headache etiologies: allergy profile, sinuses status, use of toxics, medication overuse, head trauma, infections, ophthalmologic or otologic pathologies.

2.3. Headache status during modification period

Modifications of headache status during the studied period were analysed with the semiologic characteristics are detailed in Table 3. These modifications were classified into 4 groups:

- thunderclap headache (TCH) defined by a sudden severe headache installed in less than a minute and lasting from 1 hour to 10 days (group A);
- de novo headaches occurring for the first time (group B);
- modifications of usual headache (group C);
- non-modified headaches (group D).

For each patient, the time interval between headache modifications and aneurysm rupture were recorded.

2.4. Statistical analysis

Data analysis was carried-out using statistical software (StatView®; SAS Institute, Cary, NC). Continuous variable were expressed using mean value and standard derivation. Discrete variables were expressed using frequencies or median and interquartile range. Differences between means were assessed by the Student's *t*-test. Differences in frequencies using Fisher's exact test. Value of $P < 0.05$ was considered as significant.

3. Results

3.1. Population

The cohort was composed of 40 patients (17 men; 23 women) and was compared with a control cohort of 40 patients with patients operated on lumbar disc degenerative pathologies. Cohorts were similar for sex, cardiovascular risk factors except for tobacco abuse, which was more significant in patients with IA ($n = 20$; 50% vs. $n = 9$; 22.5%; $P = 0.01$). In the present study, gravity of SAH was classified into WFNS I–II for 26 patients (65%), WFNS III for 7 (17.5%), and WFNS IV for 7 (17.5%). The gravity of the SAH on the CT scan was grade 2 Fisher scale for 10 patients (25%), grade 3 for 21 (52.5%) and grade 4 for 9 (22.5%). A favourable outcome at 3 months was achieved for 39 patients (97.5%) and unfavourable outcome for 1 patient mRS 3. The control cohort was composed of 33 patients operated on for a herniated disc and 7 patients operated on for lumbar stenosis.

3.2. Outcomes

During the reference period, a chronic headache was observed for 31 patients (77.5%) for the case cohort versus 35 (87.5%) of the control cohort (Table 2). Migraines and tension headache were predominant in both cohorts in the same proportion. For the case cohort, headaches were bilateral in 26 cases and unilateral in 5 cases.

Table 2
Type of headache according to the International Headache Society classification during the status period.

| Types of headache | Case cohort n = 40 (%) | Control cohort n = 40 (%) |
|--------------------------------------|---------------------------|------------------------------|
| Migraine | | |
| Migraine without aura | 12 | 13 |
| Probable migraine without aura | 1 | 1 |
| Typical aura with migraine headache | 5 | 5 |
| Probable migraine with aura | 1 | 0 |
| Chronic migraine | 1 | 1 |
| Total | 20 (50) | 20 (50) |
| Tension-type headache | | |
| Infrequent episodic | 6 | 12 |
| Frequent episodic | 1 | 2 |
| Probable infrequent episodic | 1 | 0 |
| Total | 8 (20) | 14 (35) |
| Probable medication overuse headache | 1 (2.5) | 0 |
| Unspecified headache | 2 (5) | 1 (2.5) |
| Total | 31 (77.5) | 35 (87.5) |

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