

Prevalence of thunderclap headache in patients with ruptured intracranial aneurysms: series of 60 cases

Prevalência de cefaleia thunderclap em pacientes com aneurisma intracraniano roto: série de 60

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ABSTRACT

Thunderclap headache (TCH) is a head pain that begins suddenly and is severe at onset. TCH might be the first sign of subarachnoid hemorrhage. This study was conducted to evaluate the presence of thunderclap headache (TCH) in patients with ruptured intracranial aneurysm (RIA) and endovascular treatment (EVT). We evaluated the pattern of headache in 60 patients who suffered a RIA and EVT at time of admission and prospectively evaluated the characteristics of previous headache within one year before the rupture. Thirty-one patients (51,7 %) had TCH related to the rupture. Aneurysm size does not affect the occurrence of thunderclap headache ($p=0,08$). The vascular aneurysm territory is not related to presence of TCH ($p=0,527$). The prevalence of TCH in this cohort was similar to previous studies. All patients with acute thunderclap headache should be evaluated for subarachnoid hemorrhage.

Keywords: Ruptured Aneurysm; Subarachnoid Hemorrhage; Vascular Headache.

RESUMO

Cefaleia thunderclap (CT) é uma dor de cabeça de início súbito e muito intensa. Pode ser o primeiro sinal de uma hemorragia subaracnoídea (HAS). Este estudo foi realizado para avaliar a prevalência de cefaleia thunderclap em pacientes que sofreram ruptura de aneurisma intracraniano (RIA) e submetidos a tratamento endovascular.(TEV) Foram avaliados 60 participantes com quadro de RIA e TEV no momento da admissão hospitalar, e foi questionado sobre as características da dor de cabeça prévia por um ano antes da ruptura. Trinta e um (51,7%) dos participantes relataram CT no momento da ruptura. O tamanho do aneurisma não teve relação com a ocorrência da CT ($p=0,08$). O território vascular também não teve relação com a presença de CT ($p=0,527$). A prevalência de CT neste estudo foi semelhante ao relatado em estudos prévios. Todos os pacientes com CT devem ser investigados para hemorragia subaracnoídea.

Descritores: Aneurisma Roto. Cefaleias Vasculares. Hemorragia Subaracnoídea.

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INTRODUCTION

One of the main symptoms in patients with an intracranial aneurysm is headache, which is observed in all stages of the disease, i.e., prior to, during and after rupture of the aneurysm. Headache may be the only presenting symptom in up to 40% of patients¹. Multicenter studies have shown that in the period before rupture headache is present in up to 36% of cases². The character of the headache is not very specific, and there is no single pain characteristic that allows a diagnosis of aneurysm³ to be suspected other than the presence of thunderclap headache (TCH), which requires investigation for subarachnoid hemorrhage⁴.

Subarachnoid hemorrhage is most commonly due to rupture of an intracranial aneurysm. Ruptured aneurysms account for 85% of cases, non-aneurysmal perimesencephalic hemorrhage (with excellent prognosis) account for 10%, and various rare disorders (transmural arterial dissection, cerebral arteriovenous malformation, dural arteriovenous fistula, mycotic aneurysm, and cocaine abuse) account for the rest⁵.

“Thunderclap headache” refers to a headache that is very severe and has abrupt onset, reaching maximum intensity in less than 1 minute. A thunderclap headache is typically described by patients as an apoplectic event, one that clearly stands out from other types of headaches they may have previously experienced. Patients with thunderclap headache often liken the sensation to an explosion in their head or being struck in the head⁶. Primary TCH is diagnosed when all other potential underlying causes have been eliminated by diagnostic. Secondary TCH have multiple causes (Table 1)⁵, and Subarachnoid Hemorrhage is the most common cause.⁷ It is important to recall that the headache, although almost always present, is sometimes overshadowed by other symptoms and this results in misdiagnosis. Prior migraine, may lead to migraine as an incorrect diagnosis and not working up patients because their headache has responded to various analgesics, including triptans, is another reason for misdiagnosis.⁸

METHODS

We performed a prospective cohort study of consecutive patients with subarachnoid hemorrhage secondary to rupture of an aneurysm who had received EVT. The study was approved by the Hospital de Clínicas Committee for Ethics in Human Research, and all participants signed a voluntary informed-consent form. The exclusion criteria were patients over 18 years of age with the signs and symptoms of subarachnoid hemorrhage secondary to rupture of an aneurysm who had received EVT between June 1st, 2013, and June 1st 2014. The exclusion criteria were patients in coma, confused or unable to complete the questionnaire properly because of neurological disabilities, submitted to neurosurgery, presence of non-saccular aneurysms and loss of follow-up.

After embolization, these patients were interviewed about a history of headache using a purpose-built

Table 1. Causes of Thunderclap Headache *

Most Common Causes of Thunderclap Headache
Reversible cerebral vasoconstriction syndrome
Subarachnoid hemorrhage
Less Common Causes of Thunderclap Headache
Cerebral infection
Cerebral venous sinus thrombosis
Cervical artery dissection
Complicated sinusitis
Hypertensive crisis
Intracerebral hemorrhage
Ischemic stroke
Spontaneous intracranial hypotension
Subdural hematoma
Uncommon Causes of Thunderclap Headache
Aqueductal stenosis
Brain tumor
Cardiac cephalgia
Giant cell arteritis
Pituitary apoplexy
Pheochromocytoma
Retroclival hematoma
Spontaneous spinal epidural hematoma
Third ventricle colloid cyst

*Although the exact incidence of each cause of thunderclap headache is not well-defined, certain causes of thunderclap headache are more common than others based upon how often they present with thunderclap headache and the incidence of the condition itself. For example, although pituitary apoplexy might commonly present with thunderclap headache, as pituitary apoplexy is an uncommon condition, it is an unlikely cause of a patient’s thunderclap headache.

questionnaire by a neurologist. A questionnaire about the presence of headache based on the ICHD (International Classification of Headache Disorder) 3rd edition⁴ criteria in the 12 months prior to rupture was applied after EVT. Depending on the characteristics of their headache at the first assessment, patients were classified as having migraine with aura, migraine without aura or tension-type headache.⁴

The diagnosis of subarachnoid hemorrhage was based on computed axial tomography (CAT), when this failed to confirm the diagnosis, an analysis of cerebrospinal fluid following lumbar puncture was done to confirm the hemorrhage. After the diagnosis, patients underwent digital subtraction angiography (DSA) to confirm the presence of and the site of the aneurysm, allowing the EVT. Two experienced Interventional Neuroradiologists, using remodeling technique, performed the coiling. Patients were treated with Guglielmi Detachable Coils (GDC, Stryker Neurovascular, Fremont, California, USA) and Hyperform Occlusion Balloon System (Covidien, Irvine, California, USA).



Statistical Analysis

The non-parametric Mann-Whitney test was used to correlate the aneurysm size with its localization. The Fisher exact test was used to investigate the association between qualitative variables, and the Jarque-Bera test was used to test the variables for normality. P values of less than 0.05 were considered significant.

RESULTS

In total, we recruited 60 patients with RIA, 48 (80%) were women and 12 men (20%), with a mean age of 49.5 ± 12.9 years. Thirty-seven (61.7%) had a history of headache in the 12 months prior to rupture of the aneurysm and were distributed as follows: 16 (43.2%) with tension-type headache; 11 (29.7%) with migraine without aura; nine (24.3%) with migraine with aura; and one (2.7%) with non-specific characteristics. (Table 2). From 60 cases, 31 (51.7%) had TCH as clinical presentation of SAH. Arterial Hypertension and tabagism were present in 18 (58%) patients and 10 (32%) participants with TCH, respectively. In 23 (74%) participants with TCH the aneurysm size were less than 10 mm, and in 8 (26%) were larger than 10 mm. The aneurysm size was not statistically significant in occurrence of TCH (p=0.08) In 48 patients (80%) the aneurysms were localized in anterior circulation and 12 (20%) in posterior circulation, but no difference in prevalence of TCH in this 2 subsets was shown. (p=0.527)(Table 3).

DISCUSSION

Epidemiological studies in the Brazilian population have shown the prevalence of migraine and tension-type headache to be 15.2% and 13%, respectively^{9,10}. In the present study, the prevalence of both types of headache in patients with an intracranial aneurysm was twice as high: 33.4% for migraine (15% with aura and 18.4% without aura) and 26.7% for tension-type headache.

Subarachnoid haemorrhage is the most common cause of secondary TCH and should be the focus of

Table 3. Presence of TCH according vascular territory

Thunderclap Headache	Aneurysm Localization			
	Anterior Circulation		Posterior Circulation	
	n	%	n	%
No	22	45,8%	7	58,3%
Yes	26	54,2%	5	41,7%
Total	48	100,0%	12	100,0%

p= 0,527

the initial assessment given the significant associated morbidity and mortality. Initial misdiagnosis and subsequent rebleeding corresponds with a worsening prognosis. Historically, the diagnosis of SAH was missed on initial presentation in 11% to 25% of patients presenting with TCH.^{8,11,12}

A study performed in 364 patients, with intracranial aneurysms confirmed by angiography, evaluated presence of warning signs (moderate or severe headache, dizziness, nausea/vomiting, transitory sensitivity and/or motor deficit, loss of consciousness, visual or oculomotor disturbances) preceding major hemorrhage.

Two specific groups are considered: 1) 78 patients with SAH at admission (Group A). This group of patients with referral and correct diagnosis at the first episode of non-catastrophic SAH is considered a “recognized” minor leak; 2) 74 patients with SAH and history of premonitory warning signs (Group B). These patients had not identified minor leak and were referred and diagnosed only at a second episode of SAH. Headache described by the patients as sudden, severe and unusual was the main symptom in Groups A and B; in 82.5% of cases it was localized. Thunderclap headache was an isolated symptom in 14.1% of patients in Group A and in 32.4% in Group B and in respectively 37.2% and 28.4% of cases it was associated with nausea or vomiting.¹³ The present study has shown the prevalence of TCH was 51,7%. And TCH associated with nausea and vomiting was 75%.

Table 2. Clinical characteristics of patients with primary headache and intracranial aneurysms before their rupture (n=37).

Characteristics	Migraine with aura	Migraine without aura	TTH	All types*
	(n = 9)	(n = 11)	(n = 16)	(n = 37)
Mean Age (years)	47	42,4	48,3	46,3
Thunderclap headache	6 (16,2%)	4 (10,8%)	10 (27%)	21 (56,8%)
Female	9 (24,3%)	8 (21,6%)	12 (32,4%)	30 (81%)
Male	0	3 (8,1%)	4 (10,9%)	7 (19%)
Arterial Hypertension	5 (13,5%)	5 (13,5%)	7 (19%)	18 (48,7%)
Smoker	5 (13,5%)	3 (8,1%)	4 (10,9%)	13 (35,1%)
Aneurysm size				
<10 mm	5 (13,5%)	7 (19%)	14 (37,8%)	27 (73%)
10 - 24 mm	3 (8,1%)	1 (2,7%)	2 (5,4%)	8 (21,6%)
>24 mm	0	2 (5,4%)	0	2 (5,4%)

*Including nonspecific headache

In addition, a recent study identified the presence of migraine as independent risk factor for rupture of an intracranial aneurysm⁵.

The present study has limitations. Firstly, the patients may have overlooked episodes of mild headache or forgotten details of the pain in the 12 months prior to treatment. Secondly, the number of participants was small.

CONCLUSION

In summary, we conclude that nearly half of patients with ruptured intracranial aneurysms presented thunderclap headache and there is no relation with size aneurysm and vascular territory.

REFERENCES

1. Suarez JI, Tarr RW, Selman WR. Cerebral aneurysms. *N Engl J Med* 2006; 354: 387-96.
2. Wiebers DO, Whisnant JP, Forbes. Unruptured Intracranial Aneurysms - Risk of Rupture and Risks of Surgical Intervention. *N Engl J Med* 1998; 339: 1725-33.
3. Baron EP. Headache, Cerebral Aneurysms, and the Use of Triptans and Ergot Derivatives. *Headache* 2015; 55: 739-47.
4. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. (2018). *Cephalalgia* 2018; 38: 1-211.
5. Vlak MHM, Rinkel GJE, Greebe P, et al. Risk of rupture of an intracranial aneurysm based on patient characteristics: A case-control study. *Stroke* 2013; 44: 1256-1259.
6. Schwedt TJ. Thunderclap Headache. *Headache* 2015; 21: 1058-1071.
7. Schwedt TJ, Matharu MS, Dodick DW. Thunderclap headache. *Lancet Neurol* 2006; 5: 621-31.
8. Abraham MK, Chang W-TW. Subarachnoid Hemorrhage. *Emerg Med Clin N Am* 2016; 34: 901-916.
9. Queiroz LP, Peres MFP, Piovesan EJ, et al. A nationwide population-based study of migraine in Brazil. *Cephalalgia* 2009; 29: 642-649.
10. Queiroz LP, Peres MFP, Piovesan EJ, et al. A nationwide population-based study of tension-type headache in Brazil. *Headache* 2009; 49: 71-78.
11. Landtblom AM, Fridriksson S, Boivie J, et al. Sudden onset headache: A prospective study of features, incidence and causes. *Cephalalgia* 2002; 22: 354-60.
12. Linn FHH, Wijdicks EFM, Van Der Graaf Y, et al. Prospective study of sentinel headache in aneurysmal subarachnoid haemorrhage. *Lancet* 1994; 344: 590-593.
13. Bassi P, Bandera R, Loiero M, et al. Warning signs in subarachnoid hemorrhage: a cooperative study. *Acta Neurol Scand* 1991; 84: 277-281.