Clinical and Radiological Features of Posterior Communicating Artery Aneurysms

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Key words: posterior communicating artery, brain aneurysms, SAH

Summary

Treatment of unruptured intracranial aneurysms based on critical size and predictive risk factors is generally accepted, but several factors contribute to the clinical outcome in a patient with subarachnoid hemorrhage (SAH) secondary to a ruptured aneurysm. We decided to evaluate other parameters that might contribute to the clinical outcome of patients with a ruptured posterior communicating artery aneurysm. A retrospective review of the medical records of patients diagnosed and/or treated of cerebral aneurysms at our institution was carried out. We selected patients with Pcom aneurysms that presented with SAH and reviewed conventional and tridimensional angiographic images to determine its anatomical orientation and correlated the data with amount of SAH and clinical presentation and outcome. A total of 112 Pcom aneurysms presented with SAH and were included in this study. 92 patients were women and 20 were men, with a mean age of 57 years (range 25-81). According to anatomical orientation, 43 were inferolateral, 30 lateral, 13 superolateral, three inferomedial, two in medial location, two superomedial, 11 inferoposterior, five posterior and three superoposterior. Aneurysms in superolateral location are to be watched carefully, it is likely that this location joins several conditions for these aneurysms to grow faster or have a higher hemodynamic stress which makes them more at risk of rupture and contribute to a worse clinical outcome.

Introduction

Subarachnoid hemorrhage (SAH) from a ruptured aneurysm conveys a mortality of approximately 50%; one third of the patients who survive remain dependant¹. Treatment of unruptured intracranial aneurysms based on critical size and predictive risk factors is generally accepted²⁻⁶. However, many factors contribute to clinical outcome in a patient with SAH including patient age, density of SAH, clinical condition before treatment, choice of treatment (surgical or endovascular), aneurysm size among others^{3,4,7-9}. Given these wide variety of factors we decided to investigate if other parameters had an impact on clinical evolution of ruptured intracranial aneurysms.

Our study is based in the anatomical features of posterior communicating artery (Pcom) aneurysms. We investigated the data from patients with ruptured Pcom aneurysms treated at our institution and correlated the clinical evolution with the anatomical orientation of the aneurysm.

Methods

We reviewed retrospectively all medical records of aneurysms diagnosed and/or treated at our institution between 1994 and 2005. We selected patients with Pcom aneurysms that presented with SAH and reviewed conventional and tridimensional angiographic images to determine its anatomical orientation in the an-

Figure 1 A,B) 3-D DSA used to group the aneurysms according to their anatomical orientation. A) AP view showing the localization of the aneurysm in relation to the posterior communicating artery with its corresponding examples in conventional DSA. B) Lateral view showing the localization of the aneurysm in relation to the posterior communicating artery with its corresponding examples in conventional DSA.

teroposterior (AP) and lateral plane and the clinical presentation of the patients, measuring the Hunt and Hess (HH) scale at presentation and the Glasgow Outcome Scale (GOS) for

follow-up. Additionally, with this information we correlated the location of the Pcom aneurysms with the Fisher scale (FS) at presentation and GOS at follow-up after endovascular treatment. In addition, a correlation of clinical presentation with sex and size was performed.

Tridimensional images of the aneurysms were used as reference for anatomical orientation with six groups in the AP view (Figure 1A) (inferolateral (IL), lateral (L), superolateral (SL), inferomedial (IM), medial (M) and superomedial (SM)) and three groups in the lateral view (Figure 1B) (inferoposterior (IP), posterior (P) and superoposterior (SP)). The aneurysms were measured and categorized as small (<5 mm), medium (5-10 mm), large (10-25 mm) and giant (>25 mm).

Table 1 Correlation between clinical presentation and gender.

HUNT and HESS	Female	Male	TOTAL
I	26	6	32 (28.57%)
II	35	8	43 (38.39%)
III	15	3	18 (16.07%)
IV	12	1	13 (11.60%)
V	4	2	6 (5.35%)

Results

A total of 780 aneurysms were diagnosed and/or treated at our institution, 125 (16%) were Pcom aneurysms; a total of 112 presented with SAH and were included in this study. 92 (82.14%) patients were women and 20 (17.85%) were men, with a mean age of 57 years (range 25-81).

The distribution between sex and clinical presentation at admission is presented in Table 1. Correlation between sex and outcome is presented in Table 2. The relation between the amount of SAH seen at CT (Fisher Scale) and the outcome after treatment is seen in Table 3.

Anatomical orientation according to tridimensional images showed that of the 112 aneurysms that bled, 43 were inferolateral, 30

lateral, 13 superolateral, three inferomedial, two in medial location, two superomedial, 11 inferoposterior, five posterior, and three superoposterior. The clinical radiological correlation between anatomical orientation with Fisher scale and GOS is shown in Table 4.

Table 2 Correlation between clinical status at follow-up and sex.

GOS	Female	Male	TOTAL
5	63	18	81 (72.32%)
4	17	2	19 (16.96%)
≤3	10	2	12 (10.71%)
GOS: Glasgow Outcome Scale			

Table 3 Correlation between the amount of subarachnoid hemorrhage at presentation and the patients' clinical status at follow-up.

FISHER	GOS 5	GOS 4	GOS ≤3	TOTAL
I	9 (5f; 4m)	3 (3f)	0	12 (10.72%)
II	27 (23f; 4m)	2 (2f)	0	29 (25.89%)
III	24 (19f; 5m)	2 (1f; 1m)	2 (1f; 1m)	28 (25%)
IV	21 (17f; 4m)	12 (10f; 2m)	10 (8f; 2m)	43 (38.39%)
TOTAL	81 (72.32%)	19 (16.96%)	12 (10.71%)	112

GOS: Glasgow Outcome Scale; f: female; m: male

According to size a total of 31 aneurysms were small, 53 medium, 15 large and 13 giant. The relation between size and the amount of SAH at admission (Fisher scale) is shown in Table 5.

Discussion

The management of unruptured cerebral aneurysms either by surgery or endovascular methods remains controversial. Understanding the pathophysiology of the aneurysms and the causes for its progression and rupture is important. Most of the patients with Pcom aneurysms were women which is consistent with the literature¹⁰. Our study showed that most of the rup-

tured Pcom aneurysms presented with a HH I-II (67% of the total) and with a GOS of 5 at follow-up (72% of the total) with a slightly better outcome in men (90%) than in women (68%). This difference could be due to the small proportion of male patients compared to women (18% vs. 82%). When we compared the FS with the GOS at follow-up we found that 63% of the patients with ruptured Pcom aneurysms presented a SAH grade III-IV, but despite this, the majority of them (63%) had a GOS of 5 at discharge and only 17% of these had a GOS equal or below 3. It is important to note that none of the patients with a FS I-II had a GOS equal or below 3 at follow-up. This information shows that most patients with a ruptured Pcom aneurysm have a chance of a good outcome, although it is important to note that this series does not take into account the patients that died from the initial SAH and only includes patients treated endovascularly.

According to size, 78.5% of the aneurysms were medium or large, with an even distribution according to FS, except for grades III and IV in which 50% of the patients with this grade had a medium size aneurysm and 60% of FS I

Table 4 Correlation between anatomical orientation and clinical and radiological features.

Orientation	Number	Fisher				Mean GOS
		I	II	III	IV	
Inferolateral	43	7	12	9	15	5
Lateral	30	3	11	7	9	5
Superolateral	13	1	0	1	11	3
Inferomedial	3	0	0	2	1	4
Medial	2	0	1	1	0	5
Superomedial	2	0	1	0	1	5
Inferoposterior	11	3	1	5	2	5
Posterior	5	0	3	1	1	5
Superoposterior	3	1	0	0	2	4

GOS: Glasgow Outcome Scale

Table 5 Correlation between the size of the aneurysm and the amount of subarachnoid hemorrhage at presentation.

Size	Fisher				Total
	I	II	III	IV	
Small	9	7	6	9	31
Medium	3	15	14	21	53
Large	0	6	3	6	15
Giant	3	0	4	6	13

had a small aneurysm. The importance of size has been the need for a criterion for treatment for unruptured aneurysms⁷, but it seems size is not a good predictor of rupture. Aneurysms develop and grow at different rates and the hemodynamics of their location differ depending on their orientation in the parent vessel. The latter was the main objective of this study, and when correlating the anatomical orientation with the FS at presentation and the GOS at follow-up we found the majority of the ruptured Pcom aneurysms were in the lateral groups (inferolateral, pure lateral and superolateral) with 76% of the total of Pcom aneurysms. The other important finding we observed when examining the average GOS of every group according to anatomical location was that nearly all of the locations had a mean GOS of 5, except for the aneurysms in the superolateral group which had a mean GOS of 3. In addition, 85% of this group of aneurysms had a FSC of IV which means that unlike other locations, this kind of aneurysms correlated well with the amount of blood at the initial CT scan and the clinical evolution. Although, we do not have anatomopathologic confirmation of these findings and the aneurysms in a superolateral location are a small percentage of the total we believe that the data are valid. It is possible that a more thorough search of the location of the Pcom aneurysms in patients that died from SAH might confirm this data.

This information could be used to add another criterion at the time of deciding whether or not to treat an unruptured Pcom aneurysm regardless of size. The reason for superolateral Pcom aneurysms having the worst prognosis of all it is not clear. One theory might be that the hemodynamics of its location produce more shear stress on the wall of the aneurysm making it more prone to rupture and produce a greater amount of SAH and/or that they have more space to grow quickly debilitating the aneurysm wall at a higher rate.

Conclusions

Pcom aneurysms have a clear female predominance. In general, if the patients have a good clinical presentation at the time of SAH they will have a better outcome. It is also noteworthy that small aneurysms have a small amount of blood when they bleed and therefore a good outcome. Clinical evolution is inde-

pendent from amount of SAH except for aneurysms in the superolateral location on which clinical evolution correlates well with the amount of blood on the initial CT scan. For this reason, aneurysms in a superolateral location are to be watched carefully. It is likely that this location joins several conditions for these aneurysms to grow faster or have a higher hemodynamic stress which makes them more at risk of rupture and contributes to a worse clinical outcome. Location of the aneurysm is another criterion to be taken into account when deciding whether or not to treat an aneurysm.

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