

Multiple intracranial aneurysms: incidence and outcome in a series of 357 patients

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Abstract

Patients with multiple intracranial aneurysms carry an additional risk of poor outcome due to presence of other aneurysms and the complexity of treatment. Patient's age is crucial in decision making because of its major effect on outcome and mortality.

Objectives: The purpose of this study was to assess incidence and outcome in multiple aneurysmal SAH in a series of 357 consecutive patients.

Material and method: We retrospectively analyzed a series of 366 patients with ruptured aneurysms treated between Jan 2006 and Dec 2009 in our department. We study the incidence, localization, surgical outcome and treatment method for individualized patients. We analyzed short-term outcome of multiple aneurysm in comparison to the single in accordance to Glasgow Outcome Scale at discharge. Data of all patients with aneurysmal SAH treated between 2006 and 2009 in our department were collected from their chart; operative notes and used to evaluate the incidence and outcome for three patient's age category.

Results: For both single and multiple aneurysms the incidence was significantly higher in women than in men.

Outcome differ statistically between patients with multiple and single aneurysms in age groups 40-69 and 70-89 years.

Conclusions: The incidence of multiple intracranial aneurysms is higher in women than in men, the site of rupture are different between the two groups in male the site of rupture is dominated by the anterior communicating artery aneurysms while in women it is represented by the internal carotid artery aneurysms.

Patients with multiple intracranial aneurysms had a higher mortality than patients harboring single intracranial aneurysms.

Keywords: aneurysm, multiple aneurysms, subarachnoid hemorrhage

Introduction

The prognosis for aneurysmal SAH has remained unaffected despite improvement in neurosurgical treatment and 10% to 20% of patients will remain severely disabled, and only approximately 40% will recover to an independent state after SAH (3, 16, 17, 20).

Intracranial multiple aneurysms are found in 15 to 35% patients with SAH (5, 13). Patients harboring multiple intracranial aneurysms are at higher risk of poor outcome because of the complex treatment management and complications from hemorrhage. Region Moldova, located in the east part of Romania, has a population of \approx 4, 7 million in an area of 45000 Km², that is served by 6 neurosurgical centers. With only few exceptions, patients with SAH are committed to our institution for investigation and treatment. The purpose of this study was to review our patients' population to determine the incidence of multiple aneurysms and to find the prognosis of patient with multiple aneurysms among SAH patients treated in our department between 2006 and 2009.

Subjects and methods

Our series comprised 366 patients with SAH secondary to aneurysm rupture admitted at "Prof. Dr. N. Oblu" Clinical Emergency Hospital, in Iasi between 2006 and 2009. Our center serves as a care center for patients with SAH in Moldova region.

The patients neurological status on admission was graded according to Hunt and Hess scale. In order to assess neurological outcome at discharge we used the Glasgow Outcome Scale.

On admission all patients was investigated with CT scan, as first imagistic tool. The presence of SAH on CT was confirmed in all patients and was graded according to Fisher scale. Of 366 patients, 47 (12.5%) had grade 1 SAH, 82 (27.2%) grade 2, 108 patients (28.7%) grade 3 and 111 patients (29.5%) grade 4. In our institution as a second imagistic tool we use angio-CT with reconstruction of vascular architecture to identify the source of SAH.

Of 376 patients, 292 (77.6%) patients was investigated using only angio-CT, and 59 (15.7%) was investigated supplementary with angiography because of poor quality images on angio-CT or unidentifiable source of SAH. 24 patients (6.4%) were investigated with angiography from the beginning because of suspicion on CT of SAH from aneurysms rupture in posterior circulation or aneurysm location in contact with bone structures (12). A number of 33 (8, 77%) patients wasn't explored with angio-CT or angiography because of poor condition on admission or because of necessity of emergency operation, due to presence on CT scan of intracerebral hematomas.

Multiple aneurysms were identified in 64 (17.02%) patients of whom 52 (81.2%) had 2 aneurysms, 9 (14.1%) had 3 (4.7%) aneurysms and 3 patients had 4 aneurysms. Overall incidence of multiple aneurysms in women was 19.38% and in men was 14.2%.

Direct surgical treatment was conducted in 223 of the 312 patients (71, 47%) with single aneurysms and in 54 of 64 patients (84.36%) with multiple aneurysms. In patients with multiple aneurysms the site of rupture was determined by the size and shape of the aneurysms on the angiogram and by the thickness of the SAH on the CT scan.

The outcome of patients with multiple aneurysms was compared with the outcome of patients with single aneurysm. For this comparison the patients were classified according to three age categories: 20-39, 40-69 and 70-89. (Table 1)

TABLE 1

Number of patients with SAH secondary to aneurysm rupture: age and sex distribution

Age category, years	No. of Patients with ruptured aneurysms		Frequency of Multiple aneurysms, %	
	men	women	men	women
20-39	22	17	5,12	7,69
40-69	106	171	5,05	12,99
70-89	13	36	7,14	9,52

TABLE 2

Incidence of ruptured aneurysms in different age groups and SAH grade

Grade of SAH	Age distribution of patients with single ruptured aneurysms			Age distribution of patients with multiple ruptured aneurysms		
	20-39	40-69	70-89	20-39	40-69	70-89
1,2	14 (4,6%)	65 (21,4%)	7 (2,3%)	1 (1,6%)	14 (21,9%)	2 (3,1%)
3	12 (3,9%)	111 (36,5%)	19 (6,25%)	4 (6,25%)	26 (40,6%)	4 (6,25%)
4-5	8 (2,6%)	51 (16,7%)	9 (2,9%)	0	11 (17,2%)	1 (1,6%)

Results

From patients with SAH and multiple aneurysms, 52 patients were operated with a total number of 67 surgically secured aneurysms at the first surgical intervention.

The percent of patients with single ruptured aneurysms and with low-grade SAH (H&H 1,2) was 28.8%, grade 3 SAH was found in 48.3% of patients and high-grade SAH (H&H 4,5) in 22.8% of patients. In comparison, low-grade SAH in patients with multiple aneurysms was found in 25%, Fischer grade 3 SAH in 53.1% and high-grade SAH in 21.8%. For patients in age category 20-39 the incidence of multiple aneurysms was 12.8% which increase to 17.9% in age category 40-69 and to 18% in age category 70-89. Between patients with multiple aneurysms, in age category 20-39, 60 % were women, in age category 40-69, 68% were women but decrease to 55.5% women in 70-89 age group. In our series the incidence of ruptured aneurysms in accordance with age groups and grade of SAH did not differ statistically. (Table 2)

The most common site of aneurysms location in male patients with single aneurysms was represented by the anterior communicating artery (61.2%) while in women it was represented by the internal carotid artery (34.4%). In female patients with multiple aneurysms the most common site of aneurysms which ruptured was the ICA 17 (38.6%) with net preponderance of posterior communicating artery aneurysms (14), but in male patients the most frequent site of ruptured aneurysms was the anterior communicating artery 10 (50%). Figure 1

The site of ruptured aneurysm was confirmed during the surgery in all surgical treated patients. In patients treated conservatively the site of rupture was found by evaluation of distribution of the SAH on CT scan (19).

The overall mortality in our series was 14.1% (52 patients), 37 (10%) patients remained severely disabled after SAH and 58.5% good and excellent outcome on discharge. 17 out of 52 died patients wasn't operated because of very poor condition on admission, 23 patients had underwent

aneurysms clipping and 8 patients was operated for intracerebral hematomas. Among 52 patients who died, 11 patients had multiple aneurysms. The mortality rate between patients with multiple aneurysms was 17.2% but in patients with single aneurysms the mortality rate was 13.5%. In the age group 20-39, 3 (7.7%) patients had unfavorable outcome (GOS 1) and died, and 31 patients (76.9%) had good outcome (GOS 4 to 5). In 40-69 age category, 13.3% patients had GOS grade 1, and 69.4% had good outcome. Among patients in 70-89

age groups poor outcome was significantly higher (31.6%) and good outcome was achieved in 36.8%. (Figure 2)

In patients with multiple aneurysms favorable outcome wasn't significantly different from that of patients with single aneurysms in 20-39 category age but in the category 40-69 the difference between outcome of multiple and single aneurysms started to increase, with a less number of patients with favorable outcome in patients with multiple aneurysms. (Figure 2)

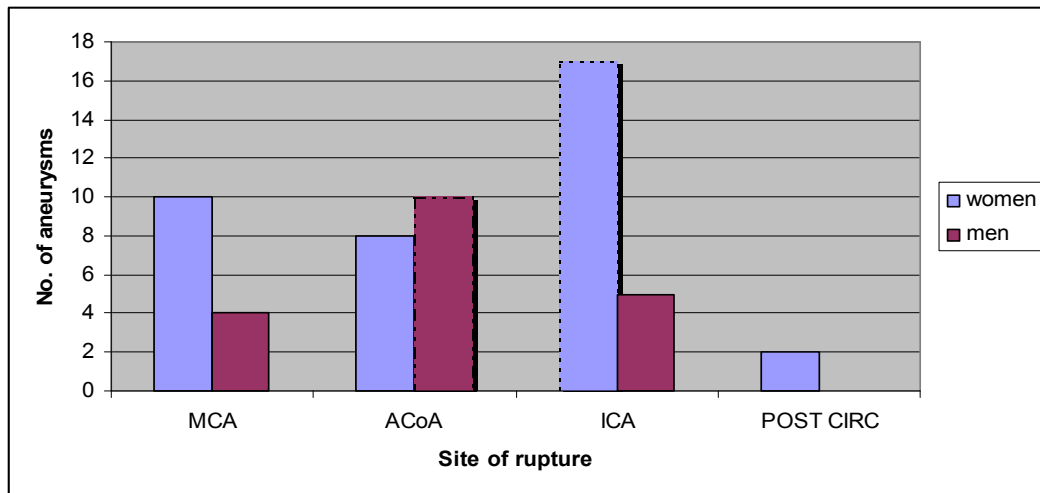


Figure 1 The most frequent sites of rupture in men and women with multiple aneurysms

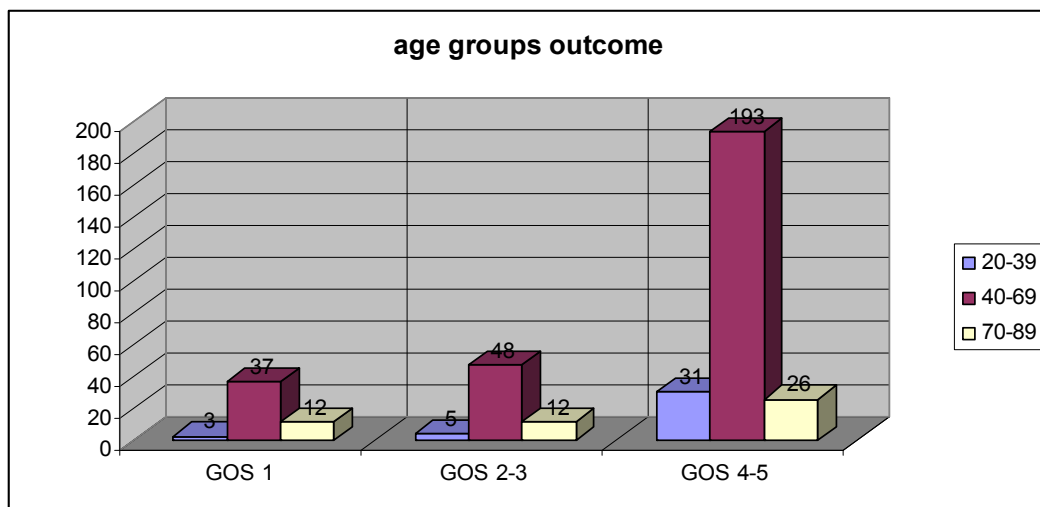


Figure 2 Number of ruptured aneurysms in each age category and outcome at discharge.

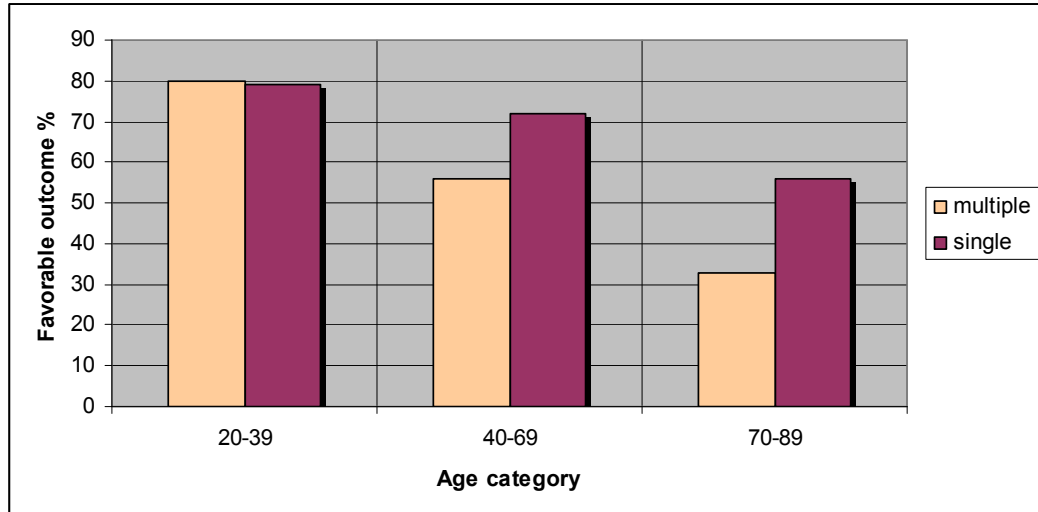


Figure 3 Frequencies of favorable outcome by age category.

The presence, on admission of intracerebral hematomas in patients with multiple aneurysms was associated with poor outcome. Twelve of 25 patients (48%) with intracerebral hematomas had unfavorable outcome (GOS 1 and 2) in comparison with only 5 of the 35 (14.3%) patients with ICH had favorable outcome.

Discussions

The frequency of multiple aneurysms varies considerably, ranging from 5 to 33.3%. Kaminogo et al. reported an overall frequency of multiple aneurysms of 20% in women and 12.4% in men in a series of 2425 patients with SAH (5). Nehls et al found 33.5% incidence of multiple aneurysms in a series of 206 patients. (2) Ellamuschi et al reported a total number of 108 (27.5%) patients with multiple aneurysms from a total number of 392 patients with aneurysm included in their study. (4)

In our report the overall incidence of multiple aneurysms was 17.4%. The incidence of multiple aneurysms in women

was 19.38% and 14.2% in male patients. Comparing with incidences reported in other studies our reported incidence of multiple aneurysms is lower than data from the literature (10, 11). We think that this is due to a small number of patients explored with 3- or 4-vessel angiography (9, 14). The incidence of multiple aneurysms increases with age in all categories. As reported in previous studies, our study also showed that in every age category the frequency of multiple aneurysms was higher in women than in men (8, 22).

The most common site of aneurysm rupture in male was represented by the ACoA aneurysms, both for patients with single and multiple aneurysms (15). In women patients the most frequent site of aneurysm rupture was the ICA (6).

Czepko et al. reported that 64 (75.3%) out of 85 patients with multiple aneurysm presented very good and good condition on discharge, 5.9% were severe disabled, and 16 (18, 8%) died. (1)

Lynch et al. reported on a series of 337 patients with aneurysms and found the

overall mortality of 6.9% and successful results were obtained in 88.8% patients. (7)

Yasargil found excellent and good results in 94.7% of his series of 1012 aneurysms patients operated. (21)

In our series the overall mortality was lower between patients with single aneurysm (13.5 %) than in patients with multiple aneurysms (17.2%). Surgical mortality in our patients was 11.7%

Conclusion

The incidence of multiple aneurysms in our series was higher in women, in all age categories.

In cases with multiple aneurysms the most common localization of ruptured aneurysms was the ICA in women and ACoA in male patients.

The mortality rate in our series was lower in patients with single aneurysms comparing with that of patients with multiple aneurysms.

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