Small asymptomatic aneurysms do rupture. Relationship of growth to aneurysm rupture in asymptomatic aneurysms <=7mm: A Systematic Analysis of the Literature.

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Introduction

The rupture rates of asymptomatic unruptured aneurysms has been subjected to intense investigation and have been found to vary noticeably according to study design and study population. The management of unruptured cerebral aneurysms remains controversial because of the uncertainty of the natural history. ISUIA intensified the natural history debate regarding small unruptured asymptomatic aneurysms particularly those less than or equal to 7mm in diameter. This has likely increased the number of such aneurysms, which are observed conservatively. The apparent paradox of natural history data suggesting low rupture risk of small asymptomatic aneurysms and the median size of aneurysm rupture, however, remains unexplained. A limitation of natural history studies is that aneurysm growth rates and their potential relationship to rupture have not been well examined. Aneurysm growth is likely associated with rupture and the relationship has not well been identified. Moreover, it remains controversial whether follow-up imaging is indicated in patients selected for conservative management. We aimed to examine the literature regarding the relationship between aneurysm growth and rupture. We specifically examined the questions of whether small asymptomatic aneurysms less than or equal to 7mm in diameter, which are followed over time, rupture; and whether aneurysm growth is associated with rupture.

Methods

We reviewed all publications on unruptured aneurysms published from 1966-2009. We then selected all aneurysms less than or equal to 7mm in diameter for which measurements were reported for at least two time points, duration of follow-up was clear, and for which initial asymptomatic status and ultimate outcome were reported.
We excluded cases of (1) mycotic aneurysms, (2) traumatic aneurysms, (3) aneurysmal growth or rupture following carotid endarterectomy as it is not clear whether the change in aneurysmal behavior is a result of alteration in cerebral hemodynamics following surgical intervention, (4) Aneurysms for which above information was not available. Using Mann-Whitney U test, we compared percent yearly increase, and absolute diameter growth for aneurysms which met selection criteria and stratified the data for ultimate aneurysm status (ruptured vs unruptured).

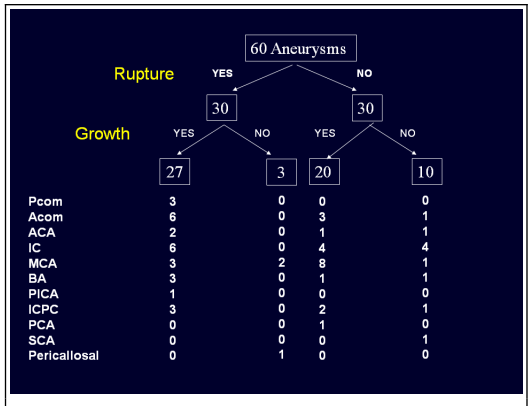

Fig-1.

Results

Our search identified 49 patients aged 38 to 81 (59.96+/-11.76) harboring a total of 60 asymptomatic aneurysms less than or equal to 7 mm in diameter. 30/60 aneurysms had subsequent rupture. The aneurysms were localized as depicted in Fig-1.
52 aneurysms were < to 5 mm. The follow-up period ranged between 6 months and 20 years. Among the aneurysms that ruptured, 3 had no growth and 27 grew prior to rupture. Among the aneurysms without subsequent rupture, on the other hand, 20/30 enlarged during follow-up. There was a trend toward larger absolute diameter growth for ruptured aneurysms vs. unruptured aneurysms (4.17 mm+/-2.62) vs (1.65mm+/-0.97) respectively. This trend was statistically significant (P<0.0001) Fig-2. The percent yearly increase in both groups suggests that rate of growth of aneurysms is highly variable, and unpredictable. Annual growth rate (% yearly increase) for aneurysms with growth and subsequent rupture was not statistically different (42.20+/-73.80 Vs 33.85+/-31.27;P =0.75).

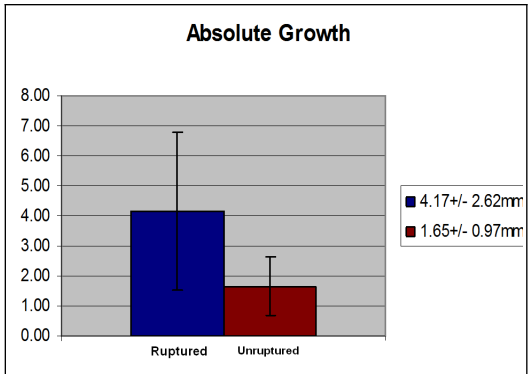

Fig-2.

Conclusions

Our study suggests that small asymptomatic aneurysms less than or equal to 7mm can grow and rupture. Aneurysm rupture is much more likely to occur in aneurysms with larger absolute diameter growth, but rupture can also occur in the absence of growth.
Our knowledge regarding aneurysm growth rate is far from complete. It is clearly misleading to rely on percent yearly increase (annual growth rate) for stratification of risk of rupture. In both groups, rate of growth of aneurysms is highly variable, episodic and unpredictable. Thus, based on the available data it is not possible to determine the appropriate time interval between diagnostic follow-up studies in patients with unruptured aneurysms. While variable growth rates of cerebral aneurysms would suggest more frequent screening, scheduled surveillance becomes less effective since aneurysmal growth is erratic. Aneurysm growth when identified is a potential predictor of subsequent aneurysm rupture. Lack of growth is not a guarantee of benign aneurysm behavior. Unfortunately despite decades of research aneurysm behavior remains predictably unpredictable even in small asymptomatic aneurysms.

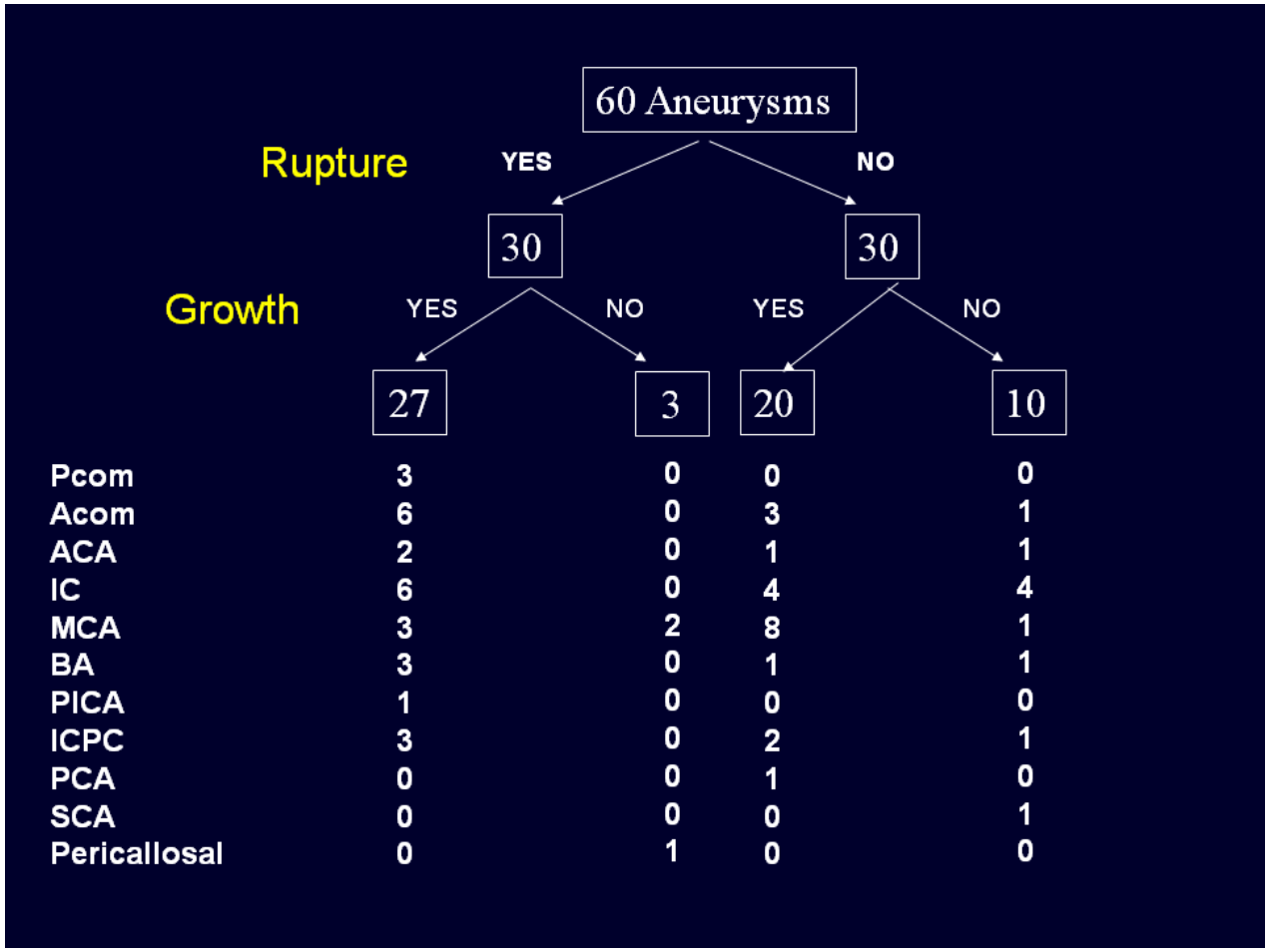
60 Aneurysms
Rupture
YES
NO
30
30
Growth
YES
NO
YES
NO
27
3
20
10
Pcom 3 0 0 0
Acom 6 0 3 1
ACA 2 0 1 1
IC 6 0 4 4
MCA 3 2 8 1
BA 3 0 1 1
PICA 1 0 0 0
ICPC 3 0 2 1
PCA 0 0 1 0
SCA 0 0 0 1
Pericallosal 0 1 0 0

Fig-1.

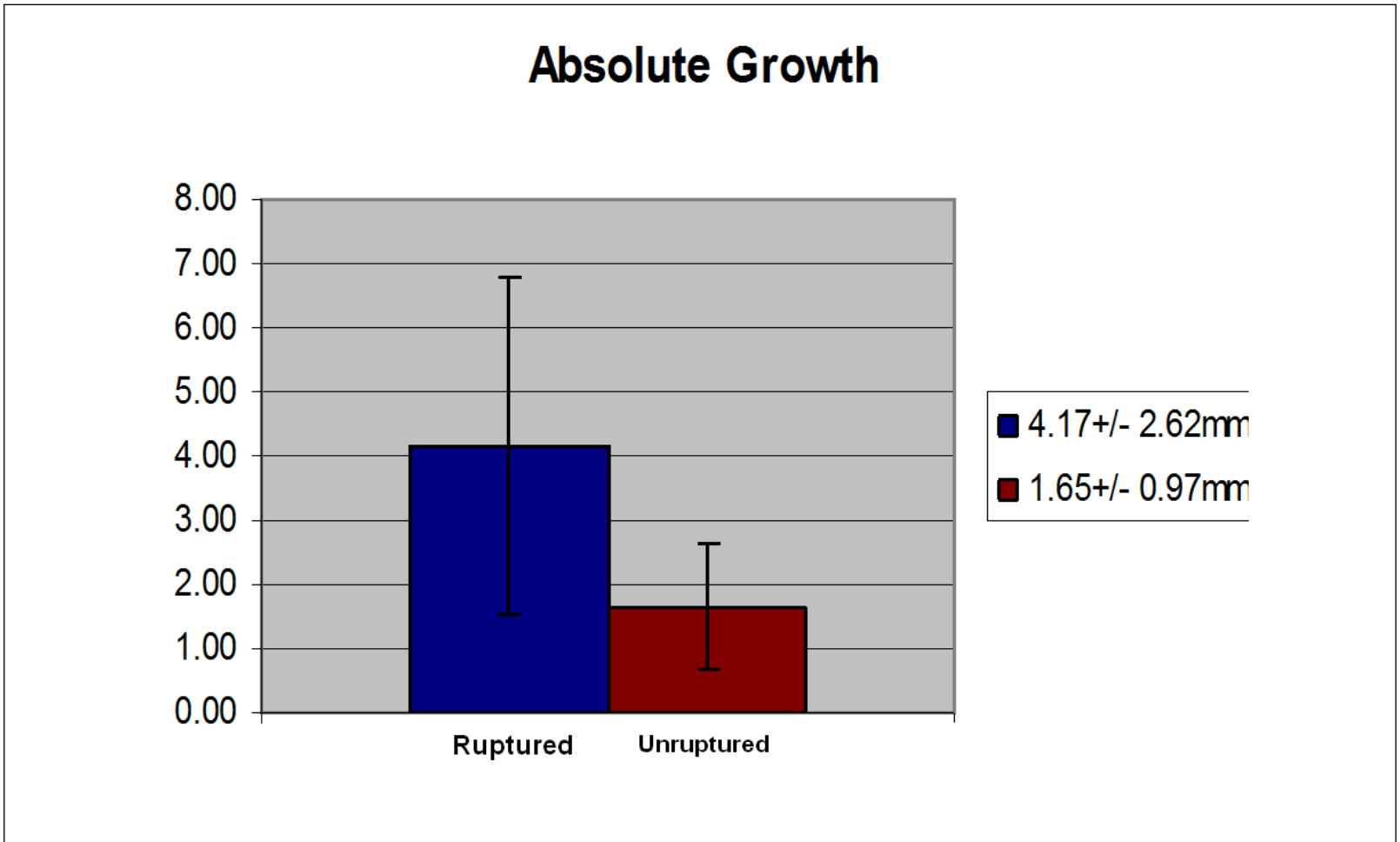
Absolute Growth
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Ruptured
Unruptured
4.17+/- 2.62mm
1.65+/- 0.97mm

Fig-2.