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Natural history of unruptured intracranial aneurysms: probability of and risk factors for aneurysm rupture

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Object. The authors conducted a study to investigate the long-term natural history of unruptured intracranial aneurysms and the predictive risk factors determining subsequent rupture in a patient population in which surgical selection of cases was not performed.

Methods. One hundred forty-two patients with 181 unruptured aneurysms were followed from the 1950s until death or the occurrence of subarachnoid hemorrhage or until the years 1997 to 1998. The annual and cumulative incidence of aneurysm rupture as well as several potential risk factors predictive of rupture were studied using life-table analyses and Cox's proportional hazards regression models including time-dependent covariates.

The median follow-up time was 19.7 years (range 0.8–38.9 years). During 2575 person-years of follow up, there were 33 first-time episodes of hemorrhage from previously unruptured aneurysms, for an average annual incidence of 1.3%. In 17 patients, hemorrhage led to death. The cumulative rate of bleeding was 10.5% at 10 years, 23% at 20 years, and 30.3% at 30 years after diagnosis. The diameter of the unruptured aneurysm (relative risk [RR] 1.11 per mm in diameter, 95% confidence interval [CI] 1–1.23, $p = 0.05$) and patient age at diagnosis inversely (RR 0.97 per year, 95% CI 0.93–1, $p = 0.05$) were significant independent predictors for a subsequent aneurysm rupture after adjustment for sex, hypertension, and aneurysm group. Active smoking status at the time of diagnosis was a significant risk factor for aneurysm rupture (RR 1.46, 95% CI 1.04–2.06, $p = 0.033$) after adjustment for size of the aneurysm, patient age, sex, presence of hypertension, and aneurysm group. Active smoking status as a time-dependent covariate was an even more significant risk factor for aneurysm rupture (adjusted RR 3.04, 95% CI 1.21–7.66, $p = 0.02$).

Conclusions. Cigarette smoking, size of the unruptured intracranial aneurysm, and age, inversely, are important factors determining risk for subsequent aneurysm rupture. The authors conclude that such unruptured aneurysms should be surgically treated regardless of their size and of a patient's smoking status, especially in young and middle-aged adults, if this is technically possible and if the patient's concurrent diseases are not contraindications. Cessation of smoking may also be a good alternative to surgery in older patients with small-sized aneurysms.

KEY WORDS • subarachnoid hemorrhage • unruptured intracranial aneurysm • cigarette smoking