Hypervolemia in Aneurysmal Subarachnoid Hemorrhage

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Background
Secondary ischemia is a frequent complication after aneurysmal subarachnoid hemorrhage (SAH) and is responsible for a substantial proportion of patients with poor outcome after SAH. The cause of secondary ischemia is unknown, but hypovolemia and fluid restriction are important risk factors. Therefore, hypervolemia (volume expansion therapy) is frequently used in patients with SAH to prevent or treat secondary ischemia.

Objective
Our goal was to determine the effectiveness of hypervolemia for improving outcome in patients with aneurysmal SAH.

Methods
Search Strategy
We searched the Cochrane Stroke Group Trials Register (last searched September 2003). In addition, we searched MEDLINE (1966 to January 2004) and EMBASE (1980 to January 2004) and contacted trialists to identify further published and unpublished studies.

Selection Criteria
Selection criteria included all randomized controlled trials of volume expansion therapy in patients with aneurysmal SAH. Because we assumed that we would not find many randomized clinical trials, we also sought controlled trials on the basis of consecutive groups of patients quasi-randomly allocated to treatment or control group and included these in the analysis if the 2 groups were well comparable with regard to major prognostic factors.

Data Collection and Analysis
Two reviewers independently extracted the data and assessed trial quality. The primary analyses were based on the intention-to-treat results (if available) of the individual trials for “poor outcome” (death or dependence), case fatality, the occurrence of secondary ischemia and rebleeding, and for the occurrence of complications of the treatment (such as pulmonary edema and cardiac failure).

Results
We identified 3 trials. One truly randomized trial (82 postoperative patients) and 1 quasi-randomized trial (32 postoperative patients) with comparable baseline characteristics for both groups were included in the analyses. Hypervolemia (consisting of 3000 mL 5% albumin solution in 1 trial and of 2000 mL 5% dextrose plus 2000 mL 0.9% saline plus 1500 mL colloids in the other trial) did not improve outcome (relative risk [RR] of poor outcome, 1.0; 95% CI, 0.5 to 2.2) nor the occurrence of secondary ischemia (RR, 1.1; 95% CI, 0.5 to 2.2) but tended to increase the rate of complications (RR, 1.8; 95% CI, 0.9 to 3.7). In the third trial (30 quasi-randomized preoperative patients), outcome assessment was done only at the day of operation (7 to 10 days after SAH). In the period before operation, treatment resulted in a reduction of secondary ischemia (RR, 0.3; 95% CI, 0.1 to 1.0) and case fatality (RR, 0.2; 95% CI, 0.1 to 1.2).
Reviewers’ Conclusions

At present, there are insufficient data to support hypervolemia in patients with aneurysmal SAH. In 2 trials on postoperative hypervolemia, no beneficial effect was found, but complications occurred more often with the intervention strategy. Because volume expansion is often used in the treatment of patients with aneurysmal SAH, randomized trials are urgently needed. These trials should have a well-defined method of volume expansion, a well-defined study population, and a well-defined objective (such as, for example, whether the treatment is given to all patients or only to those who have clinical features of delayed cerebral ischemia).

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