Unruptured intracranial aneurysm endovascular treatment

There is no randomized data available to compare the results of surgery versus endovascular treatment of unruptured aneurysms (UIAs) [1].

Unruptured intracranial aneurysm endovascular treatment can be performed with relative safety. The long-term follow-up results of unruptured intracranial aneurysm treatment (UIAs) by means of coil embolization remain unclear.

The efficacy of treatment as compared with observation has not been rigorously documented [2].

The use of coiling relative to surgical clipping of unruptured intracranial aneurysms is associated with decreasing periprocedural morbidity and mortality among patients treated in the United States from 2001 to 2008 [3].

Koyanagi et al., from the National Hospital Organization Himeji Medical Center, Kyoto University Graduate School of Medicine, Kobe City Medical Center General Hospital, National Cerebral and Cardiovascular Center, Suita and Kokura Memorial Hospital Japan.

retrospectively analyzed data from cases in which patients underwent coil embolization between 1995 and 2004 at 4 stroke centers. In collecting the late (≥ 1 year) follow-up data, postal questionnaires were used to assess whether patients had experienced rupture or retreatment of a coiled aneurysm or any stroke or had died.

Overall, 184 patients with 188 UIAs were included. The median follow-up period was 12 years (interquartile range 11-13 years, maximum 20 years). A total of 152 UIAs (81%) were followed for more than 10 years. The incidence of rupture was 2 in 2122 aneurysm-years (annual rupture rate 0.09%). Nine of the 188 patients with coiled UIAs (4.8%) underwent additional treatment. In 5 of these 9 cases, the first retreatment was performed more than 5 years after the initial treatment. Large aneurysms were significantly more likely to require retreatment. Nine strokes occurred over the 2122 aneurysm-years. Seventeen patients died in this cohort.

This study demonstrates a low risk of rupture of coiled UIAs with long-term follow-up periods of up to 20 years. This suggests that coiling of UIAs could prevent rupture for a long period of time. However, large aneurysms might need to be followed for a longer time [4].

Bekelis et al., investigated the association of combined open and endovascular expertise with the outcomes of unruptured cerebral aneurysm coiling.

Bekelis et al., performed a cohort study of 100% of Medicare fee-for-service claims data for elderly patients who underwent endovascular coiling for unruptured cerebral aneurysms between 2007 and 2012. To control for confounding, the authors used propensity score conditioning, with mixed effects to account for clustering at the hospital referral region level.

During the study period, there were 11,716 patients who underwent endovascular coiling for unruptured cerebral aneurysms and met the inclusion criteria. Of these, 1186 (10.1%) underwent treatment performed by hybrid neurosurgeons, and 10,530 (89.9%) by proceduralists who performed only endovascular coiling. Multivariable regression analysis with propensity score adjustment demonstrated a lack of association of combined practice with 1-year postoperative mortality (OR 0.84; 95% CI 0.58-1.23), discharge to rehabilitation (OR 1.0; 95% CI 0.66-1.51), 30-day readmission rate (OR 1.07; 95% CI 0.83-1.38), and length of stay (adjusted difference, 0.41; 95% CI -0.26 to 1.09). Higher procedural volume was independently associated with improved outcomes.

In a cohort of Medicare patients, the authors did not demonstrate a difference in mortality, discharge to rehabilitation, readmission rate, and LOS between hybrid neurosurgeons and proceduralists performing only endovascular coiling [5] .

A portfolio of 41 cases of unruptured intracranial aneurysms with angiographic images, along with a short description of the patient presentation, was sent to 28 clinicians (16 radiologists and 12 surgeons) with varying years of experience in the management of unruptured intracranial aneurysms. Five senior clinicians responded twice at least 3 months apart. Nineteen cases (46%) were selected from patients recruited in the Canadian UnRuptured Endovascular versus Surgery trial, an ongoing randomized comparison of coil embolization and clip placement. For each case, the responder was to first choose between 3 treatment options (observation, surgical clip placement, or endovascular coil embolization) and then indicate their level of certainty on a quantitative 0-10 scale. Agreement in decision making was studied using κ statistics.

Decisions to coil were more frequent (n = 612, 53%) than decisions to clip (n = 289, 25%) or to observe (n = 259, 22%). Interjudge agreement was only fair (κ = 0.31 ± 0.02) for all cases and all judges, despite substantial intrajudge agreement (range 0.44-0.83 ± 0.10), with high mean individual certainty levels for each case (range 6.5-9.4 ± 2.0 on a scale of 0-10). Agreement was no better within specialties (surgeons or radiologists), within capability groups (those able to perform endovascular coiling alone, surgical clipping alone, or both), or with more experience. There was no correlation between certainty levels and years of experience. Agreement was lower when the cases were taken from the randomized trial (κ = 0.19 ± 0.2) compared with nontrial cases (κ = 0.35 ± 0.2).

Individuals do not agree regarding the management of unruptured intracranial aneurysms, even when they share a background in the same specialty, similar capabilities in aneurysm management, or years of practice. If community equipoise is a necessary precondition for trial participation, this study has found sufficient uncertainty and disagreement among clinicians to justify randomized trials [6].

For unruptured cerebral aneurysms, an observed perioperative survival advantage for endovascular coiling relative to that for surgical clipping was lost on long-term follow-up, according to data from an administrative database of patients who were not randomly allocated to treatment type. A cost advantage of endovascular treatment was maintained even though endovascularly treated patients were more likely to undergo subsequent hospitalizations for additional aneurysm repair procedures. Rates of aneurysm rupture following treatment were similar in the two groups [7].

Diffusion-weighted MR images (DWI) obtained after endovascular treatment of cerebral aneurysms frequently show multiple high-signal intensity (HSI) dots.

Aspiration of the inner content of the microcatheter right after detachable coil delivery was helpful for the reduction of the incidence of microembolisms after endovascular coil embolization for the treatment of unruptured cerebral aneurysms [8].

Case series

Kim et al. retrospectively analyzed the data of 427 patients with UIAs who underwent endovascular treatment between July 2011 and June 2014. When clopidogrel resistance was confirmed via platelet reactivity unit (PRU) assay after dual antiplatelet therapy (aspirin plus clopidogrel) administration for 5 days, triple antiplatelet therapy with cilostazol was administered (Group I, 274 patients). The other group was placed on standard dual antiplatelet therapy (Group II, 153 patients). All patients underwent magnetic resonance diffusion-weighted imaging within 2 days after endovascular coiling.

No significant associations with the occurrence of a thromboembolic event and microembolic event were found between the groups. The occurrence of thromboembolic and microembolic events showed no statistical difference between groups I and II ($p = 0.725$ for thromboembolic events and $p = 0.109$ for microembolic events). Also, the PRU value and the occurrence of microembolic events, using a PRU cutoff value of 240, showed no statistical difference ($p = 0.114$ in group I and 0.064 in group II). There was significant increase in microembolic events after the use of a stent-assisted endovascular procedure. As the PRU value increased, there was a trend toward an increase in the mean number of microembolic lesions without statistical significance.

Even though there is a presumed anti-thromboembolic effect for clopidogrel resistance in other literature, the clinical efficacy of adjustment of additional cilostazol for endovascular coiling of unruptured aneurysms may be limited due to the unspecified cutoff value of the PRU assay for evaluating the resistance [9].

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