

Trends in Aneurysm Treatment Over a 13-year Period: A Population-Based Study in the State of Washington

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Introduction

-The treatment of intracranial aneurysms has evolved significantly over the last 15 years.
-The ISAT trial was published in 2002 [1] and the ISUIA II study was published in 2003 [2].
-Despite their criticisms, these studies began shifting the landscape of intracranial aneurysm treatment.
-The Washington State Department of Health maintains the Comprehensive Hospital Abstract Reporting System (CHARS) that captures all inpatient discharge information including:

- Demographics
- ICD diagnosis/procedure codes
- Hospital billing charges

Hypothesis

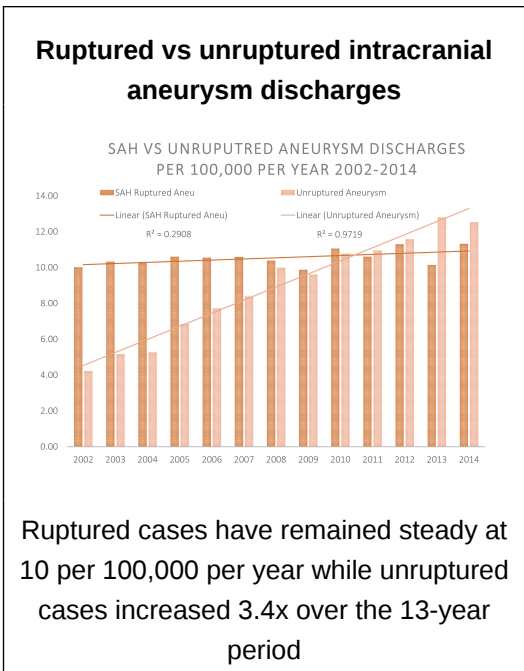
-The wide adoption of endovascular techniques will have a differential impact on the treatment of ruptured vs unruptured intracranial aneurysms with a bias towards more unruptured aneurysms been treated

Methods

-The CHARS data was queried from 2002-2014.
-Patients with ICD-9 codes matching aneurysmal subarachnoid hemorrhage (430) and unruptured intracranial aneurysms (473.3) were selected for inclusion in the analysis.
-The number of ruptured vs unruptured aneurysms discharges were compared for each calendar year as well as the associated hospital charges and length of stay.
-Pair t-test and regression analyses were performed with p-value cutoff set at 0.05

Results - Number of Hospitalizations

-The number hospitalizations for intracranial aneurysms grew at 5.3% per year, outpacing population growth at 1.2% per year ($p < 0.05$).



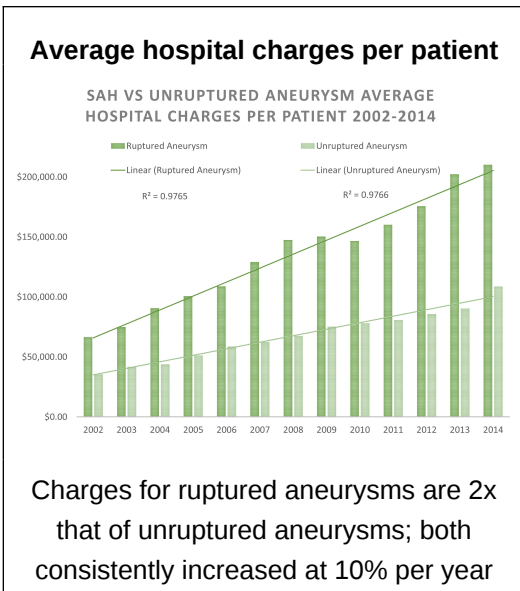
Ruptured cases have remained steady at 10 per 100,000 per year while unruptured cases increased 3.4x over the 13-year period

-This is primarily driven by unruptured aneurysms which grew at 11.2% per year ($p < 0.05$).
-Annual increase of ruptured aneurysms kept pace with population growth (2.4% vs 1.2%, $p = 0.53$).
-The number of hospitalizations for unruptured intracranial aneurysms increased 3.4x between 2002 and 2014.

Results - Hospital Charges

-The average charge per hospitalization for both ruptured and unruptured aneurysms increased at approximately 10% per year (no sig. difference between the two).

-This significantly outpaced inflation at 2.2% per year (Seattle area CPI, $p < 0.05$).
-The average hospital charges for ruptured aneurysms is 2x that of unruptured aneurysm and remained consistent for the 13-year period.

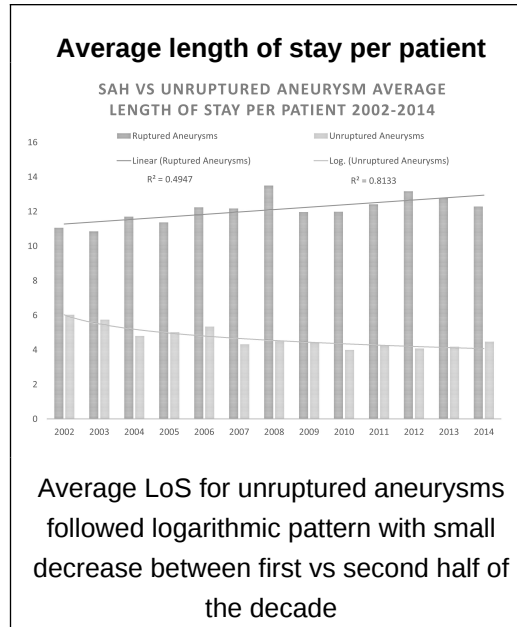


Charges for ruptured aneurysms are 2x that of unruptured aneurysms; both consistently increased at 10% per year

Results - Length of Stay

-The average length of stay (LoS) for ruptured intracranial aneurysms is significantly higher than for unruptured aneurysms (12.2 days vs 4.6 days, $p < 0.05$).
-The average LoS for unruptured intracranial aneurysms exhibited a small decreaseing trend (log-fit).
-Comparing the first half vs the second half of the 13-year period, the average LoD decreased for unruptured aneurysms (5.1 days vs 4.2 days, $p = 0.01$).
-This did not hold true for ruptured

aneurysms (11.8 days vs 12.4 days, $p = 0.16$).



Average LoS for unruptured aneurysms followed logarithmic pattern with small decrease between first vs second half of the decade

Conclusions

-Between 2002-2014 an increasing number of patients with unruptured intracranial aneurysm were hospitalized in WA state.
-The average hospital chages per patient increased steadily at 10% per year while the average LoS per patient decreased by approx. 1 day for unruptured cases.
-The real impact of this shift is unclear and long-term observation is needed.

References:

- 1 Molyneux A. International Subarachnoid Aneurysm Trial (ISAT) of neurosurgical clipping versus endovascular coiling in 2143 patients with ruptured intracranial aneurysms: a randomised trial. The Lancet 2002;360:1267-74 doi:10.1016/S0140-6736(02)11314-6.
- 2 Wiebers DO. Unruptured intracranial aneurysms: natural history, clinical outcome, and risks of surgical and endovascular treatment. The Lancet 2003;362:103-10 doi:10.1016/S0140-6736(03)13860-3.