

New Assessment Of Cerebral AVMs Yet Unruptured (NASSAU) Analysis: Are The Results From The ARUBA Trial Also Applicable To Unruptured AVMs Deemed Suitable For Gamma Knife Radiosurgery?

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Objective:

The management of unruptured AVMs is controversial after publication of the ARUBA trial. The aim of the study was to compare outcomes in AVM patients initially managed with gamma knife radiosurgery with those in the untreated arm of the ARUBA trial. We are calling this study the NASSAU analysis (New ASSessment of cerebral AVMs yet Unruptured).

Methods:

Data was collected from 1341 patients treated with gamma knife radiosurgery for earlier unruptured and untreated AVMs in whom follow up data was available (total of 8709 years; median 4.9 years, mean 6.5 years).

Results:

The cumulative 2 year AVM hemorrhagic rate was 5.8%. Nine percent of patients suffered from at least one hemorrhage. The first hemorrhage was fatal or left the patient in a vegetative condition in 23%. Forty four per cent developed permanent sequelae following the hemorrhage. Only 33% recovered completely from the hemorrhage. Symptomatic complications developed in 8%, of which 54% resulted in a permanent deficit. The results of no treatment of the AVM was better than treatment with gamma knife radiosurgery for only the first 5 years. Thereafter, after more than 5 years, the gamma knife treated patients benefitted more from radiosurgery compared to the untreated arm, and the longer the follow up the better the outcome was in the gamma knife treated group.

The mortality rate was the same with or without gamma knife treatment in the first 2 years. Thereafter the mortality rate was higher without treatment.

The mortality and morbidity rate following gamma knife radiosurgery was also compared to no treatment (assuming a 0.9%, 2.2% or 4.5% annual risk for hemorrhage). In addition, the 68% likelihood for a hemorrhage and the 54% likelihood for a complication causing mortality and morbidity was included in the analysis. For small AVMs less than 5cc it took one year before the patient benefited from gamma knife, while in large AVMs more than 5cc it took 4 years before the patient benefited from gamma knife radiosurgery.

Conclusions

The mortality rate is lower following gamma knife radiosurgery in the NASSAU study as compared to the no treatment arm in the ARUBA study. The time it takes before patients benefit from gamma knife radiosurgery depends on the AVM volume and the risk of hemorrhage in patent AVMs. The annual risk of hemorrhage was 2.9% in the first 2 years following gamma knife radiosurgery in our patient population, which translates to a latency time of one year for patients with smaller AVMs and 5 years for patients with larger AVMs to benefit from gamma knife radiosurgery. Based on the evidence provided in the above gamma knife treatment data, the results of gamma knife radiosurgery for unruptured AVMs is superior in the long term to that of untreated AVMs in the ARUBA study. Thus the recommendations in the ARUBA study that unruptured AVMs should managed conservatively is convincingly refuted in the data from our NASSAU study.