



## ARTICLE OF THE MONTH

### The Durability of Endovascular Coiling Versus Neurosurgical Clipping of Ruptured Cerebral Aneurysms: 18 Year Follow-up of the UK Cohort of the International Subarachnoid Aneurysm Trial (ISAT)

Molyneux AJ, Birks J, Clarke A, Sneade M, Kerr RS  
*Lancet*. 2015 Feb 21;385(9969):691-7. doi: 10.1016/S0140-6736(14)60975-2. Epub 2014 Oct 28.  
Erratum in: *Lancet*. 2015 Mar 14;385(9972):946. PMID: 25465111

Welcome to another installment of the SNACC Article of the Month. The April edition is dedicated to a study that is looking at the long-term outcomes of patients enrolled in the original ISAT trial. Mainly a neurosurgical and neurointerventional endeavor, ISAT is a trial that changed the clinical practice regarding cerebral aneurysm treatment worldwide. The follow-up study presented here essentially confirms the durability of the endovascular treatment at ten years and that the clinical advantages of coiling demonstrated at one year persist at ten years. The risk of death and rebleeding from the treated aneurysm is very small and similar to the risk of hemorrhage from another aneurysm. In view of these findings and also considering the evidence suggesting that the rate of complications following endovascular treatments has reduced significantly in the years following the ISAT enrollment period, the authors, not unreasonably, question the benefit of the long-term surveillance of treated aneurysms. This month, we have Dr. Steven Hetts kindly sharing his thoughts on the data presented in the study. Dr. Steven Hetts is Chief of Interventional Neuroradiology at the UCSF Mission Bay Hospitals, where he provides endovascular therapy for children and adults with cerebrovascular disease and tumors. He founded the Interventional Neuroradiology services at San Francisco General Hospital and the San Francisco Veteran's Administration Hospital. Dr. Hetts is also the founding Co-director of the UCSF Hereditary Hemorrhagic Telangiectasia Center of Excellence and Co-director of the Interventional Radiology Research Laboratory. We hope you will enjoy this Article of the Month offering and ask you to let your thoughts be known on [SNACC LinkedIn feed](#) the [Twitter feed](#), or the [Facebook page](#).

~ Oana Maties, MD and John F. Bebawy, MD

### Commentary

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There are few clinical trials that have done more to change practice in cerebrovascular disease than ISAT. Since its first publication in 2002,<sup>1</sup> ISAT has had an outsized influence on the choice of treatment of ruptured brain

aneurysms. In the United States, for example, before 2002 less than 10% of ruptured brain aneurysms were treated using endovascular techniques; between 2002 and 2011, over 40% of ruptured brain aneurysms were treated with endovascular techniques.<sup>2</sup> Extension of these results to non-ruptured aneurysms has been even more pronounced: before 2002 20% of brain aneurysms were treated endovascularly and after 2002 more than 60% have been. With the development of new endovascular technologies, endovascular treatment of aneurysms has become increasingly comprehensive. Despite the shift of aneurysm care to be predominantly endovascular in many hospitals, there have been questions about the durability of endovascular treatments as compared to surgical treatments since the advent of endovascular techniques in the 1990s. The recent articles by Molyneux et al<sup>3,4</sup> have addressed the durability of endovascular and surgical treatments in the ISAT cohort out to 14 and 18 years, respectively.

ISAT was designed as a straightforward randomized controlled trial comparing endovascular coiling to open surgical clipping of ruptured brain aneurysms. Designed in the early 1990s and enrolling patients between 1994 and 2002, ISAT only permitted treatment of aneurysmal subarachnoid hemorrhage patients using the first generation of endovascular technologies (detachable coils) or surgical clips. Only relatively simple aneurysm geometries were enrolled, thus excluding challenging morphologies such as fusiform dissecting aneurysms. At an average of one year of follow-up, 24% of coiled patients and 31% of clipped patients were dependent or dead, leading to early stoppage of enrollment in ISAT based on nonequivalence of disability-free survival. This early stoppage led to significant questions about the durability of aneurysm treatment, which has been addressed by long term follow up publications.

In the most recent update on ISAT results in those patients treated in the United Kingdom, Molyneux et al<sup>4</sup> report 10 to 18.5 year outcomes. At 10 years, 674/809 (83%) of coiled patients and 657/835 (79%) of clipped patients were alive (OR 1.35, 95% CI 1.06-1.73). Although coiled patients were more likely to be alive than clipped patients at 10 years, they were similarly likely to be independent (82% versus 79%, OR 1.25, 95% CI 0.92 to 1.71). Of 33 patients who had recurrent subarachnoid hemorrhage more than one year after initial aneurysm treatment, half (17) were from the original target aneurysm and half (16) were from another aneurysm. Of the rebleeds from the target aneurysm, 13 were in the coiling group and three were in the clipping group (p=0.06). The lessons drawn from ISAT include: (1) there is a low rebleeding rate from coiled and clipped aneurysms, but that long-term surveillance is warranted to prevent rebleeding from treated and untreated aneurysms; (2) when anatomically possible, endovascular treatments of ruptured aneurysms have a lower long-term mortality rate than surgical treatments but about the same rate of long-term disability; and (3) by about 16 years after aneurysm treatment, the mortalities of the surgical and endovascular groups converge due to deaths from other causes such as cardiovascular disease and cancer, underscoring the importance of general health maintenance programs for subarachnoid hemorrhage survivors.

#### **References:**

1. *Lancet* 360: 1267-1274, 2002
2. Lin et al, *JNIS* 4:182-189, 2012
3. *Lancet Neurol* 8:427-433, 2009
4. *Lancet* 385: 691-697, 2015