International Study of Unruptured Intracranial Aneurysms

The International Study of Unruptured Intracranial Aneurysms (ISUIA) is an epidemiologic international study of the natural history of unruptured intracranial aneurysms that enrolled 4,060 subjects.

The likelihood of rupture of unruptured intracranial aneurysms that were less than 10 mm in diameter was exceedingly low among patients in group 1 and was substantially higher among those in group 2. The risk of morbidity and mortality related to surgery greatly exceeded the 7.5-year risk of rupture among patients in group 1 with unruptured intracranial aneurysms smaller than 10 mm in diameter

The ISUIA reported overall 1-yr morbidity and mortality of 12.6% in clipping vs 9.8 for endovascular coiling [1].

A conventional biplane cerebral angiogram available for central review was required for enrollment resulting in a large database. Data on aneurysms that ruptured during follow-up of the 1,692 untreated subjects provides an opportunity to investigate the anatomic features that may be predictive of future rupture.

The objective of the study is to develop and test a method for three-dimensional (3D) shape reconstruction of aneurysms using biplane angiographic data in the ISUIA for retrospective morphometric assessment. Beginning with the two boundaries of the biplane views, curve morphing techniques were employed to estimate a number of intermediate boundaries around the aneurysm sac resulting in the creation of a 3D sac surface. The method was tested using simulated biplane “angiograms” of pre-reconstructed 3D models of patient-specific aneurysms. An algorithm to perform the image analysis was developed, and the morphometric indices of 150 intracranial aneurysms in the ISUIA database were estimated. Simultaneously, experienced neuroradiologists made manual measurements of key dimensions in the sac from the biplane angiograms for all cases. 3D reconstructions using this proposed method matched well with the original pre-reconstructed 3D geometries and were consistent with manual measurements of the neuroradiologists for the ISUIA aneurysms. A method for reconstructing the 3D geometry of the intracranial aneurysm sac from biplane angiograms in the ISUIA database with reasonable fidelity has been developed [2].

1)
Wiebers DO, Whisnant JP, Huston J, 3rd, et al. Unruptured intracranial aneurysms: natural history, clinical outcome, and risks of surgical and endovascular treatment. Lancet. 2003;362(9378):103-110.
2)
Raghavan ML, Sharda GV, Huston J 3rd, Mocco J, Capuano AW, Torner JC, Saha PK, Meissner I, Brown RD Jr; for the International Study of Unruptured Intracranial Aneurysms Investigators. Aneurysm Shape Reconstruction from Biplane Angiograms in the ISUIA Collection. Transl Stroke Res. 2014 Jan 31. [Epub ahead of print] PubMed PMID: 24477497.