3D Magnetic resonance angiography

Of 78 patients referred for intracranial arteriovenous malformation from 2005 through 2013, 31 patients were operated on with microsurgical technique. 3D Magnetic resonance angiography (MRA) with neuronavigation was used for planning. Navigated 3D ultrasound angiography (USA) was used to identify and clip feeders in the initial phase of the operation.

None of the patients was embolized preoperatively as part of the surgical procedure. The niduses were extirpated based on the 3D USA. After extirpation, controls were done with 3D USA to verify that the AVMs were completely removed. The Spetzler three-tier classification of the patients was: A: 21, B: 6, C: 4.

Sixty-eight feeders were identified on preoperative MRA and DSA and 67 feeders were identified and clipped by guidance of intraoperative 3D USA. Six feeders identified preoperatively were missed by 3D USA, while five preoperatively unknown feeders were found and clipped. The overall average bleeding was 440 ml. There was a significant reduction in average bleeding in the last 15 operations compared to the first 16 (340 vs. 559 ml, $p = 0.019$).

They had no serious morbidity (GOS 3 or less). New deficits due to surgery were two patients with quadrantanopia (one class B and one class C), the latter (C) also acquired epilepsy. One patient (class A) acquired a hardly noticeable paresis in two fingers. One hundred percent angiographic cure was achieved in all patients, as evaluated by postoperative DSA.

Navigated intraoperative 3D USA is a useful tool to identify and clip AVM feeders. Microsurgical extirpation assisted by navigated 3D USA is an effective and safe method for removing AVMs [1].

1)
Unsgård G, Rao V, Solheim O, Lindseth F. Clinical experience with navigated 3D ultrasound angiography (power Doppler) in microsurgical treatment of brain arteriovenous malformations. Acta Neurochir (Wien). 2016 May;158(5):875-83. doi: 10.1007/s00701-016-2750-3. Epub 2016 Mar 19. PubMed PMID: 26993142; PubMed Central PMCID: PMC4826661.