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## **Comments on Brain AVM Embolization with Onyx**

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## Comments on Brain AVM Embolization with Onyx

This is an informative and encouraging single-center study on the embolization of brain arteriovenous malformations (AVMs) with Onyx, an alternative to the standard liquid embolic agent *N*-butyl cyanoacrylate. To date, there have only been 2 indexed manuscripts on brain AVM embolization with Onyx.<sup>1,2</sup> The current study had a complication rate of 13.6%, with hemorrhagic complications occurring in 3 (7%) patients, resulting in the only death. AVM volume reduction from embolization in these 3 patients ranged from 50% to 95%. Although the authors discussed subtotal nidal obliteration with subsequent venous outlet obstruction as a possible cause of the hemorrhagic complications, another possible cause that has been well documented in the literature is normal perfusion pressure breakthrough bleeding.<sup>3-5</sup> These studies highlight the physiologic derangement (changes in regional cerebral blood flow) of perinidal tissues before and after surgery and/or embolization with positron-emission tomography or single-photon emission CT, and they suggest that pretreatment nonin-

vasive evaluation of brain AVM patients may be helpful in identifying a subgroup with decreased autoregulatory capabilities who are at risk for normal perfusion pressure breakthrough after treatment. In this higher risk group, perhaps less aggressive nidal volume reduction at any single session by way of staged embolization procedures and more aggressive blood pressure management during the posttreatment period are indicated in an effort to reduce and prevent life-threatening brain hemorrhage.

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