Commentary: Middle Meningeal Artery Embolization for Chronic Subdural Hematoma Using N-Butyl Cyanoacrylate With D5W Push Technique

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Received, April 18, 2022.
Accepted, April 24, 2022.
Published Online, June 7, 2022.

We commend Majidi et al[1] on their article titled "Middle Meningeal Artery Embolization for Chronic Subdural Hematoma Using N-Butyl Cyanoacrylate with D5W Push Technique."[1] Through a retrospective analysis of their database, the authors discussed their experience with middle meningeal artery embolization (MMA) in the treatment of chronic subdural hematomas (CSDHs) with n-butyl cyanoacrylate

(n-BCA) (Cordis-Codman). Their study is one of the earliest sizeable single-center series describing the use of n-BCA with concomitant 5% dextrose in water (D5W) for MMA embolization in patients with CSDH. The annual incidence of CSDH is approximately 1.7 to 18 per 100 000 population and is estimated to be higher in patients older than 65 years.[2] These numbers are predicted to double by 2030 because of population aging, which would make CSDH the most frequent neurosurgical disorder in the United States. Burr hole craniotomy with subdural drainage is the gold standard for hematoma evacuation.[3,4] Although surgical evacuation has shown better functional outcomes than conservative treatment in symptomatic patients with cerebral compression, recurrence is challenging as it occurs in 10% to 25% of postsurgical cases.[4] CSDHs are prone to recurrence because of chronic inflammation and neovascularization, which lead to the formation of a subdural vascular membrane that is prone to bleeding.[5]

MMA embolization has recently emerged as a modality to potentially decrease recurrence rates for CSDH. Embolization of the MMA occludes a major source of subdural membrane neovascularization, thus decreasing microhemorrhages and hematoma recurrence rates. Polyvinyl alcohol particles (Boston Scientific) were the first reported embolic material used to embolize the MMA.[6-8] Liquid embolics such as Onyx (Medtronic Inc) and n-BCA have also been used.[9] Their potential advantages over polyvinyl alcohol particles include improved distal penetration of the embolic material, improved visualization, permanent stability of vascular occlusion, and decreased incidence of reflux, which can be especially important in cases where there are dangerous extracranial to intracranial anastomoses.[1,5] However, MMA is not optimal for every case. Dangerous anatomic variants, such as MMA originating from the ophthalmic artery, render the endovascular approach infeasible.[10]

The authors in the present study reported their cohort experience of 61 patients who underwent MMA embolization for CSDH using n-BCA. All patients had complete obliteration of the frontal and posterior branches of the MMA. Within 3 to 6 months of follow-up, a computed tomography scan revealed recurrence of subdural hematomas in only 3 patients (5%). The authors reported the absence of any permanent postprocedure neurological sequelae. The authors used a triaxial system in all patients, including a 6-Fr guide catheter, 5-Fr Sofia (Microvention Inc) intermediate catheter, and a Headway DUO (Microvention Inc) microcatheter. They selectively embolized the frontal and posterior branches of the MMA using a diluted n-BCA (10%-30%) accompanied by a D5W injection through the intermediate catheter by a second operator while the primary operator is injecting the n-BCA. This maneuver minimizes the proximal reflux and boosts the distal penetration of n-BCA. The authors conclude that MMA embolization with n-BCA using this technique is safe, effective, and associated with good clinical outcomes, enhanced distal penetration, complete branch obliteration, and minimal periprocedural thromboembolic complications. We usually perform MMA embolization with 20% n-BCA and have found similar levels of efficacy with low complication rates. Dilute n-BCA has the added advantage that often only the frontal or posterior MMA branch needs to be embolized decreasing time and cost of additional microcatheters. With a distal position in the frontal MMA branch, we are often able to use dilute glue to cast this territory and then down the territory supplied by the posterior branch through collaterals.

There are, however, some inherent limitations related to the retrospective nature of this study making it vulnerable to selection bias. In particular, 78% of the study cohorts were male, and only 20% of patients underwent 6-month follow-up imaging. The short follow-up period precludes it from evaluating the modality's long-term advantages.

There are many ongoing randomized clinical trials[5,11-13] that assess the safety and efficacy of different embolic systems for MMA embolization. One of the embolic materials being assessed is Onyx which is used for MMA embolization in the (EMBOLISE) clinical trial.[5,11] Another embolisate currently being assessed is n-BCA in the (MEMBRANE) clinical trial.[12] Although the results of these randomized controlled trials will shed further light on the risks and benefits of the technique, retrospective studies such as this one are important steps in assessing the efficacy of MMA embolization for CSDH.

Funding

This study did not receive any funding or financial support. Dr Starke's research is supported by NIH.

Disclosures

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article. Dr Starke's research is supported by the NREF, Joe Niekro Foundation, Brain Aneurysm Foundation, Bee Foundation, and by National Institute of Health (R01NS111119-01A1) and (UL1TR002736, KL2TR002737) through the Miami Clinical and Translational Science Institute, from the National Center for Advancing Translational Sciences and the National Institute on Minority Health and Health Disparities. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH. Dr Starke has an unrestricted research grant from Medtronic and has consulting and teaching agreements with Penumbra, Abbott, Medtronic, Balt, InNeuroCo, Cerenovus, Naglreiter and Optimize Vascular.

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