Decisions in Distal Medium Vessel Occlusions

Pivot points in an evolving ischemic stroke algorithm.

With James Milburn, MD, MMM, FSNIS, FACR

If you had to estimate, what percentage of the ischemic strokes you encounter are from distal medium vessel occlusions (DMVOs)? Are there any notable differences in presentation status compared to large vessel occlusions (LVOs)?

Estimates in the literature suggest that 25% to 40% of all acute ischemic strokes may be attributed to DMVOs, and most of these involve the M2 and M3 segments. DMVOs present with smaller perfusion deficits, but they can still be quite disabling with National Institutes of Health Stroke Scale (NIHSS) score of 5 or higher.

It should be noted that DMVOs have been defined in several ways. Anatomic definitions include occlusions in the M2-4, A2-3, P2-3, anterior inferior cerebellar, posterior inferior cerebellar, and superior cerebellar arteries. Others have proposed a size definition that describes large vessels as > 2 mm, medium vessels between 0.75 and 2 mm, and small vessels < 0.75 mm. Others define them using both size and clinical deficit criteria. Many would consider dominant proximal M2 occlusions to be functionally closer to M1 occlusions, whereas more distal and nondominant M2 occlusions are MVOs.

Another important point to understand is that these DMVOs and MVOs can be primary events or secondary after fragmentation of a more proximal clot, and that can occur primarily or after intervention.

How do anatomic factors such as vessel size and tortuosity affect your DMVO decision-making? What are you looking for on imaging to guide your decisions?

Each patient is individually considered based on specific symptoms and anatomic considerations. If we believe the tissue responsible for the deficits is still viable, we strongly consider endovascular therapy (EVT). Our current catheter technology can reach very distal arteries, but we understand that treating the smaller and more distal occlusions may have more risk of subarachnoid hemorrhage during thrombectomy. This seems especially true with tortuosity at the M3 level and beyond.

What tips can you share for ensuring optimal visualization?

The most important factor for accurate visualization and safe catheter navigation is having the patient under sufficient anesthesia. Our department has converted to performing all thrombectomies using general anesthesia, and this has made a big difference in our likelihood of treating distal lesions. General anesthesia allows for good road mapping and higher magnification when necessary. Even if a patient initially seems calm under sedation, they often start moving as you advance the devices intracranially. Randomized studies have shown that converting from sedation to general anesthesia during thrombectomy cases is associated with worse outcomes, so we now begin with general anesthesia for almost all thrombectomy patients.

What is your bailout point for an endovascular approach? When do you pivot to plan B?

Tortuosity and distal atherosclerosis are major limiting factors. Difficult arch anatomy can also make distal navigation more challenging. If it is difficult to reach a distal lesion on a patient with a thrombectomy system, I will usually not persist for very long given the limited evidence to support the therapy. Although there are multiple possible techniques, when I can reach a lesion

without difficulty, my usual initial approach is direct aspiration, and I may attempt this multiple times.

My second option is a stent retriever, which can be combined with local aspiration at the face of the clot. Another option, if the lesion cannot be reached or for occlusions that persist after several attempts, is local tenecteplase infusion into the clot using a smaller microcatheter. For proximal lesions, my final bailout is percutaneous transluminal angioplasty and stenting, especially if intracranial atherosclerotic disease is suspected. I do not place stents into distal vessels because they have a lower chance of remaining patent, and they will require more aggressive antiplatelet treatment.

What lesion locations and characteristics suggest a case isn't suitable for an endovascular approach? What options do you consider in these scenarios?

One of the more challenging lesions I have found is a distal calcified emboli, because they are difficult to remove with any technique. I also would suggest that in some distal right-sided lesions with tortuous anatomy, the risk of EVT may outweigh the benefit. Also, if the territory at risk is small and not considered eloquent, EVT is probably not indicated.

What is the bigger impediment to current DMVO decision-making: data or dedicated device availability?

I believe the biggest impediment is lack of trial data to help direct our decision-making. DMVOs were underrepresented in the HERMES meta-analysis, and they only receive level IIB recommendation in the current American Heart Association/American Stroke Association guidelines. Many neurointerventionalists perform these treatments based on their own anecdotal experiences that produce bias in their individual thinking. Large surveys have shown that many respondents were treating DMVOs that fall outside our current guidelines. Europeans and those who were more recently trained were more likely to treat DMVOs with EVT initially. Fortunately, there are at least five ongoing randomized clinical trials for DMVOs, and I believe we will have early outcome data from some of the trials very soon.

There are many good devices for DMVO with multiple companies introducing smaller stent retrievers, adjustable stent retrievers, and small flexible aspiration catheters. These can be used alone or in combination. New small devices compatible with distal vessels will continue to be produced by companies, and they may be even more trackable with better aspiration capability in the future, but our current technology is already good.

What data would be most helpful to you in making DMVO decisions?

Important data from the DMVO randomized trials comparing EVT versus best medical therapy will include 90-day analysis of modified Rankin Scale score, change in NIHSS at 24 hours, mortality rates, and symptomatic hemorrhage rates. It will be important to have data on right-sided versus left-sided EVT, because I am more likely to treat a DMVO patient who has aphasia as one of the presenting symptoms.

What are some common misconceptions regarding DMVOs and their treatment?

I have found that occasionally a clinician will push to treat all DMVOs because they have seen some successful cases with great outcomes in the past. Every patient and scenario is different, and I believe it will be difficult to ever view these as simply as we do LVOs where the literature shows such clear benefit for EVT. The clinician may not understand the subtle anatomic variables that add risk and limit potential benefit. Sometimes medical therapy is the best option.

How do your expectations for both short- and long-term results differ between DMVO and LVO, if at all?

My expectations for treatment of DMVO and LVO are the same: to improve the patient's symptoms and overall outcome. The patient should be having disabling symptoms from the occlusion for me to choose EVT. It is understood that DMVO patient long-term outcomes are better than those with LVO without treatment, so we need to be more selective compared to patients with LVO. However, DMVO treatment has been shown to be feasible and relatively safe in many studies, and my personal experience is that many patients have major improvements with treatment. I predict that trial data will be positive in the near future, and in upcoming years we will likely see expanded recommendations for this group of patients. ■

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