Editorial

Clot Length Assessment in Stroke Therapy Decisions

Bruce C.V. Campbell, MBBS, BMedSc, PhD

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Identifying suitable patients for reperfusion therapies using imaging parameters is an exciting but controversial field of research. Numerous prognostic markers have been proposed, yet few modify the risk–benefit of reperfusion sufficiently to alter a decision to treat. The study by Yan et al[1] uses gadolinium-enhanced T1 magnetic resonance imaging to measure clot length as a potential biomarker of responsiveness to alteplase. The authors found that longer clots were less likely to recanalize with intravenous thrombolysis. The particular method using a gadolinium-enhanced T1 sequence allows a more accurate measure of clot length than susceptibility-weighted imaging because of a lack of blooming artifact that is generated by hemosiderin on T2*-weighted imaging. It also overcomes the difficulties of measurement using angiographic sequences where collateral flow to the distal end of the thrombus is often not visualized.

This builds on work measuring the length of hyperdense thrombus using noncontrast computed tomography, clot burden scores using computed tomographic angiography, and magnetic resonance imaging susceptibility–weighted imaging of thrombus. There is no doubt that longer and larger thrombi are associated with reduced probability of reperfusion after intravenous thrombolysis. However, although an initial report found that noncontrast computed tomographic hyperdense thrombus >8 mm did not respond to intravenous alteplase,[2] the relationship between clot length and recanalization was subsequently shown to be more variable.[3] Some authors have suggested that the distance from middle cerebral artery origin is more closely associated with thrombolytic success than the clot length itself.[4]

An underappreciated but key finding is that occult residual anterograde flow is strongly associated with successful thrombolysis even in patients with apparently long thrombi.[5] Detecting partial anterograde flow past a nonocclusive thrombus requires time-resolved imaging. Computed tomographic or magnetic resonance perfusion source data can be used for this purpose, but these raw images are often not routinely examined in clinical practice. It is intriguing to speculate that recent observations that thrombolysis success rates decrease over time[6] could be related to the loss of occult anterograde flow as thrombus becomes more firmly lodged in the vessel, in addition to proposed mechanisms of fibrin maturation.

It remains uncertain how knowledge of clot imaging characteristics might improve treatment decisions. Most research studies to date have focused on clot volume, but imaging may in future also provide insights into thrombus composition, which could have therapeutic implications. Given current randomized trial evidence, patients with large-vessel occlusion are considered for thrombectomy.[7] Clot length measurements may be useful to neurointerventionists when determining the appropriate sized device to use, but it would be difficult to justify delaying or withholding endovascular therapy in the presence of a short clot, especially as the only trial to use clot length selection criteria did not reach its primary end point.[8] The positive trials had no clot length limitations, and rates of alteplase-induced recanalization before angiogram were low (<10%). This suggests that, for most patients with large-vessel occlusion, a thrombectomy will still be indicated to maximize the probability and speed of recanalization. Perhaps the extra information may assist decision making in borderline cases, but careful scrutiny of every component of imaging selection is required to avoid delaying proven therapy unless the extra information genuinely improves the safety or effectiveness for the individual patient. At this stage, clot length assessment is yet to demonstrate such a role.

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Disclosures

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From the Department of Medicine and Neurology, Melbourne Brain Centre, Royal Melbourne Hospital and University of Melbourne, Parkville, Victoria, Australia.

Correspondence to Bruce Campbell, MBBS, BMedSc, PhD, Department of Neurology, Royal Melbourne Hospital, Grattan St, Parkville, Victoria, 3050, Australia. E-mail bruce.campbell@mh.org.au

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