

Describe an innovation/research area in interventional radiology and discuss its impact on current/future IR practices.

Word count: 500

Few conditions have proven as recalcitrant to effective treatment as ischaemic stroke. From 1,026 interventions tested preclinically, 114 reached clinical trials and only one— intravenous alteplase—had proven clinically efficacious by 2006.¹ Similarly, trial evidence for endovascular treatment was disappointingly neutral.²⁻⁴ Then, in 2015, several trials demonstrated significant benefit from endovascular thrombectomy (EVT) with stent retriever devices.⁵⁻⁹ A new era had arrived in stroke management, with a number-needed-to-treat as low as 2.6.¹⁰

While EVT has been transformational in stroke, a number of key challenges lie ahead, the most crucial of which are refinement of patient selection, optimisation of EVT delivery, and the issue of adjunct neuroprotection.

First, although the relative benefit of EVT over standard care is enormous, the absolute functional outcomes remain variable. Estimates of functional independence are around 46% of patients in trial populations¹⁰ and <40% in registry studies,¹¹ despite good recanalization in >70%.¹⁰ This highlights the importance of identifying patients who are likely to benefit, and the development of imaging-guided selection is perhaps the most important area of ongoing research in EVT. Identification of salvageable tissue on CT/CTP has already enabled the extension of the time window up to 24 hours after onset, hugely expanding the number of eligible patients.^{12, 13} Novel imaging selection algorithms will allow us to truly individualise treatment based on tissue viability, beyond simply relying on the presence of large-vessel occlusion and limited ischaemic change.

Increasing the number of eligible patients will place additional demands on resources, and it is crucial that healthcare systems are able to meet these. Strikingly, despite NICE guidance¹⁴ and pledges by NHS England to improve EVT provision,¹⁵ only two UK centres are currently operating a 24/7 EVT service, with only 1.4% of UK ischaemic stroke patients receiving thrombectomy¹⁶ – despite 7-13% being eligible.¹⁷ Such limited availability would be unthinkable in coronary revascularisation after STEMI, yet is the reality faced by many patients who have a stroke out-of-hours. Continued investment into 24/7 EVT services would further improve outcomes, and also be highly cost-effective.¹⁸ Additional financial resources must be paralleled by continued growth in neuroradiology training positions, to ensure the availability of appropriately trained interventionists.

Finally, we must explore adjunct treatments in EVT. The prior failure of neuroprotection in stroke was arguably due to lack of recanalization in trials, contrasting sharply with preclinical models of ischaemia-reperfusion where the drugs were highly efficacious.¹⁹ Therefore, both novel agents, and some compounds that previously failed, are worthy of investigation in the setting of EVT. This field remains in its infancy, but trials are already underway for agents such as NA-1 (clinicaltrials.gov, NCT02930018) and more will surely follow.

EVT has transformed ischaemic stroke management from a predominantly passive approach to one requiring immediate action. It has opened new avenues of research

for further improvement, creating imperatives for reorganisation of stroke care provision in the UK and globally. It serves as a shining example of innovation in interventional radiology, and will continue to grow in importance over the coming years as its implementation and impact widen.

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