Mechanical Thrombectomy for Acute Ischaemic Stroke

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Ischaemic stroke is caused by thrombotic or embolic occlusion of a cerebral artery, and can have devastating effects on patients' lives. Unfortunately, despite its high incidence, treatment options in the acute phase are often limited.

Mechanical thrombectomy is an endovascular technique whereby thrombus is removed using a retriever device. It was developed after trials of intra-arterial tissue plasminogen activator (PROACT-I and PROACT-II[1,2]) failed to demonstrate the level of clinical benefit required to justify widespread use[3]. Various thrombectomy devices were trialled, including the *AngioJet* device, which uses high-pressure saline jets to fragment and aspirate thrombus[3,4], and the MERCI device, which entraps and removes thrombus using an endovascular coil[5]. The TIME trial studied the former, but was abandoned before publication due to negative results. The latter saw widespread use following some promising initial data[3,6], until three randomised controlled trials (RCTs) in 2013 failed to show benefit over medical therapy alone[7-9].

Some neurointerventionalists reported success with stents similar to those used in coronary intervention[10,11], and thus were stent-retriever devices designed. These have performed exceptionally well in recent RCTs (MR CLEAN[12], ESCAPE[13], SWIFT PRIME[14], EXTEND-IA[15] and REVASCAT[16]). Subsequent meta-analyses found that, compared to medical management alone, thrombectomy was associated with significant improvement in 90-day functional independence (Odds ratio; OR: 2.14-3.1, number needed to treat; NNT: 4.25), and reduced disability at 90 days (OR: 2.22-2.7, NNT: 2.5-2.6)[17-21].

Stent-retriever thrombectomy is performed as follows. The occluded vessel (identified by CT-angiography) is accessed via femoral puncture. A guidewire is passed through the clot, and this is used to position a catheter with the tip distal to the clot. The catheter is used to position a stent-retriever device, which is deployed within the clot. The stent-retriever, and the entrapped clot, are then removed[22,23]. A balloon may be deployed distally to prevent embolization of fragments. Complication rates of 4-26% have been reported. These include vessel perforation or dissection, distal embolization and intracerebral haemorrhage. Access site complications such as vasospasm, pseudoaneurysm and retroperitoneal haematoma formation can also occur[24-26].

The strong evidence supporting stent-retriever thrombectomy has led the Royal College of Physicians to recommend this procedure for patients with proximal large vessel occlusion associated with an NIHSS score of >5 who present within 5h of symptom onset. Furthermore, patients who receive tissue plasminogen activator should be considered for thrombectomy within 24h for posterior circulation strokes, or 12h if imaging has demonstrated salvageable brain tissue[27]. NHS England is aiming to establish thrombectomy services in 24 centres across the UK, such that thrombectomy would be available to all eligible stroke patients. However, significant investments in infrastructure and training would be required to achieve this[28].

Thrombectomy for ischaemic stroke is one of the most exciting developments in the field of Interventional Radiology. High-quality evidence now suggests that this intervention should be standard of care for acute ischaemic stroke. The next challenge will be transforming what has previously been a rather niche subspecialty into something capable of providing a first-line intervention for one of the most common causes of morbidity and mortality in the country.

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