

Interventional management of stroke

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Stroke is a leading cause of mortality and the most common cause of long-term adult disability worldwide. In New Zealand, stroke affects around 9,000 people per year with an estimated 50,000 people living with the effects of stroke in the community. The personal, social and economic costs of treatment and post-stroke care are substantial, with an annual cost of \$NZ750 million. A large proportion of the overall cost results from the long-term disability that can follow stroke. One in five people with stroke will require long-term institutional care costing \$NZ50,000 per year. Despite improved stroke prevention over the past decade, the population is increasing and ageing leading to growth in the overall stroke burden.

After many years of therapeutic nihilism there are treatments that reduce the extent of cerebral infarction and improve outcomes. These are intravenous thrombolysis with either alteplase, or in specific circumstances tenecteplase, and endovascular thrombectomy. Intravenous thrombolysis was first shown to be effective in a randomised controlled trial in 1996 but wasn't in widespread use until the mid- to late-2000s. One of the Ministry of Health's key performance indicators is that each district health board should be thrombolysing at least 12% of ischaemic stroke patients.

Endovascular thrombectomy is a more recent therapeutic advance. It has been provided at Auckland City Hospital since 2011 when patients were enrolled in the Australia/New Zealand EXTEND IA study, one of the pivotal endovascular thrombectomy studies published in 2015. Treatment was extended to patients living in Northland and the Midland Region in 2017. Christchurch and Wellington have also been providing thrombectomy to the Southern and Central Regions since this time.

Endovascular thrombectomy is a very effective therapy and is cost effective. Meta-analyses of randomised controlled trials have shown that in patients treated within 6 hours of stroke onset, there is clear evidence that endovascular thrombectomy improves functional outcome. When compared with what was considered standard therapy at the time of trials (intravenous thrombolysis), for every 100 patients treated with endovascular thrombectomy there are;

1. Forty more patients with functional improvement
2. Twenty three more who achieve functional independence
3. Sixteen fewer who require hospital level care
4. Four fewer deaths
5. No increased risk of symptomatic intracerebral haemorrhage.

These benefits extend to those treated 6-24 hours after stroke where treatment selection requires evidence of salvageable 'penumbral' brain tissue on CT or MRI perfusion imaging. When compared with standard therapy, for every 100 patients with evidence of penumbral brain tissue treated with thrombectomy 6-24 hours after symptom onset, there are;

1. Thirty two more who achieve functional independence.
2. Four fewer deaths

3. No increased risk of symptomatic intracerebral haemorrhage.

Regional networks of hub (treating) and spoke (referring) centres are required to provide this complex treatment. This is because endovascular thrombectomy requires close collaboration between ground and flight ambulance, emergency department, neurology, radiology and anaesthetic teams. Of the 225 patients treated in Auckland in 2020, only 15% were from the Auckland District Health Board (DHB) area with others transported from the two other Auckland DHBs by ambulance, and 30% flown by helicopter from Northland and the Midland regions encompassing a line north from Taranaki to Tairāwhiti.

There are currently three New Zealand hub treating hospitals; Auckland (Northern and Midland Regions), Wellington (Central Region) and Christchurch (Southern Region). It is envisaged that the number of hub hospitals will increase with time, with Waikato Hospital likely being the next to start treating patients from the Midland region.

Australian Acute Stroke Management Guideline recommendations regarding endovascular thrombectomy (summarised).

1. For patients with ischaemic stroke caused by a large vessel occlusion in the internal carotid artery, proximal middle cerebral artery (M1 segment), or the basilar artery, endovascular thrombectomy should be undertaken when the procedure can be commenced within six hours of stroke onset (Strong recommendation).
2. For patients with ischaemic stroke caused by a large vessel occlusion in the internal carotid artery, proximal middle cerebral artery (M1 segment), or with tandem occlusion of both the cervical carotid and intracranial large arteries, thrombectomy may be considered when the procedure can be commenced between 6-24 hours after a patient was last known to be well, if clinical and CT or MRI perfusion mismatch indicates the presence of salvageable penumbral brain tissue (Strong recommendation).
3. For patients with ischaemic stroke caused by occlusion in the M2 segment of the middle cerebral artery, endovascular thrombectomy may be considered based on favourable individual patient, and CT/MRI angiography and perfusion imaging, factors (Consensus based recommendation).
4. Eligible stroke patients should receive intravenous thrombolysis while concurrently arranging endovascular thrombectomy, with neither treatment delaying the other (Strong recommendation).
5. Endovascular thrombectomy should be performed by experienced neurointerventionists with recognised training in the procedure.

