Acute ischemic stroke

Patient history

An 89-year-old female patient, on anticoagulants, presented with GI bleeding (gastrointestinal bleeding) and admitted to the local hospital. Her anticoagulation treatment was stopped. Two days later, at 1am, she developed an acute onset of stroke of the left side as well as body weakness and slurred speech. Her NIHSS (National Institute of Health Stroke Scale) score was 12 to 15 at presentation. She was referred to a health care facility that was a 50 minutes’ drive from her hometown.

Morphological findings

Minimum imaging requirement for patients with stroke include a plain head CT followed by CT angiography of head and neck including arch of aorta.

For this patient, an emergency head CT followed by CTA were performed at 4.30 am. Plain head CT showed early ischemic changes in right middle cerebral artery (MCA) territory with an ASPECT (Alberta stroke program early CT score) of 5 to 6. CTA showed right distal M1 occlusion and moderate collaterals (Fig. 1).

Patient was not a suitable candidate for intravenous tissue plasminogen activator (tPA) as GI bleeding is a major contraindication for its use. EVT (endovascular thrombectomy) was planned and arrangements were made to transfer the patient to the nearest EVT center. It took another three and a half hours to reach the EVT center.

Post-processing and analysis

The patient arrived at the hospital at 9.30 am. The team of neurointerventionalists at the hospital ordered a CT perfusion (CTP) study to assess the eligibility of the patient for EVT. CTP images showed a large penumbra (ischemic tissue still viable) with a very small established infarct core (Fig. 2).

CT perfusion (CTP) is an important imaging technique to identify patients eligible for revascularization in the context of an acute stroke. It allows a distinction between normal brain tissue, ischemic but not irreversibly injured brain tissue (penumbra) and the infarcted core. Penumbra refers to cerebral tissue that is still salvageable despite decreased perfusion and can potentially be recovered using recanalization techniques.

Discussion

Mechanical thrombectomy is indicated in acute ischemic stroke patients with large vessel occlusions and salvageable brain tissue in whom intravenous thrombolysis is contraindicated. This procedure is now considered as the standard of care for patients with proximal anterior circulation occlusions. According to the American heart association guidelines, the indications for endovascular thrombectomy are: Patient’s Age >18 years, acute ischemic stroke receiving intravenous r-tPA within 4.5 hours of onset of symptoms, Aspects score > 6 on baseline CT scan, NIHSS score >6, time from onset...
of symptoms to groin puncture <6 hours, good pre-stroke functional status (mRS score 0 to 1) and presence of proximal intracranial vessel occlusion (ICA or proximal MCA, M1).

Time is brain. In acute ischemia, approximately 2 million neurons die/min if left untreated (Ref. 5). The main finding in our case was that endovascular therapy is still very beneficial in an elderly patient who presents with large vessel, proximal anterior circulation occlusion and whose time from onset of symptoms to groin puncture is greater than 6 hours. In our case the time from onset of symptoms to groin puncture was 9.5 hours. In the past, such patients had no hopes with the reperfusion therapies. But now the current management of acute ischemic stroke has recently changed with the publication of randomized trials using endovascular thrombectomy (EVT)(Ref. 6–8). One of these is the DAWN trial. It has expanded the time window for EVT from 6 hours to 24 hours after the time patient was last known well. Clinical imaging mismatch (CIM) was defined by age, core, and NIHSS. Included patients were aged >80 with an NIHSS score of >10 and a core volume <21 mL. For patients younger than 80 years, requirements were an NIHSS score of >10 and a core <31 mL or an NIHSS score of >20 and a core <51 mL.

In the light of the above, elderly patients, presenting with acute ischemic stroke, not eligible for IV tPA, meeting the clinical and imaging criteria for endovascular treatment, who present late to the treatment, should still be offered EVT to get a good clinical outcome.

![Fig.1](a) Non-contrast CT showed ASPECT score of 5-6. (b, c) CTA showed right distal M1 occlusion (arrow) and intermediate collaterals.
Fig. 2 CT perfusion images showed large penumbra on Tmax map (a) with only a small infarct core matched defect (arrow) on CBV (b) and CBF (c) maps.

Fig. 3 (a-c) Digital subtraction angiogram images after selective right carotid artery injection. Post EVT (d), complete recanalization of right M1 can be seen (arrow).
Conclusion

By the time the patient reached the hospital, she was out of the time window for EVT (6 hours). However, the team of neurointerventionalists at the hospital decided to perform EVT based on the findings of the CTP and a recent evidence by DAWN trial (Ref. 4) (DWI or CTP Assessment with Clinical Mismatch in the Triage of Wake-Up and Late Presenting Strokes Undergoing Neurointervention with Trevo) that recommends EVT up to 24 hours after onset of symptoms.

At 10.30am, EVT was done successfully (Fig.3, a-d). Groin puncture to recanalization time was 25 minutes. Patient was discharged home after 2 days with complete recovery. Her post treatment NIHSS score was 0.

References