CASE REPORT

Successful endovascular stroke therapy in a 103-year-old woman

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SUMMARY

People older than 80 years of age constitute the most rapidly growing age group in the world. Several trials confirming superior efficacy of endovascular therapy did not have an upper age limit and showed favorable treatment effects, regardless of age. Current American Heart Association/American Stroke Association guidelines do not restrict treatment based on age as long as other eligibility criteria are met. A 103-year-old woman presented 2 h after stroke onset secondary to a left internal carotid artery terminus (ICA-T) occlusion. Admission National Institutes of Health Stroke Scale (NIHSS) score was 38, with no early ischemic changes on imaging, pre-stroke modified Rankin Scale score was 0, and she lived independently with minimal help. After initiation of intravenous thrombolysis, the patient underwent successful mechanical thrombectomy with Thombosis in Cerebral Infaction-3 recanalization. She showed remarkable recovery (NIHSS score of 1 at 48 h). Stroke onset to recanalization was 3 h 40 min. Our objective in documenting the oldest patient to successfully undergo stroke intervention is to corroborate that with the current evidence, appropriate patients undergoing rapid treatment may allow us to advance the limits of endovascular therapy.

BACKGROUND

Three recent randomized trials for endovascular stroke therapy had no upper age limit in their inclusion criteria, and all of these demonstrated a treatment effect in favor of endovascular therapy.^{1–3} Specifically, predefined subgroup analyses in MR CLEAN (Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in The Netherlands) and ESCAPE (Endovascular Treatment for Small Core and Proximal Occlusion Ischemic Stroke) showed a similar favorable treatment effect in both <80-year-old and ≥80-year-old subgroups.^{1–3} The recently released American Heart Association/American Stroke Association guidelines recommend level IA evidence for endovascular treatment of acute ischemic stroke (AIS) patients secondary to a large vessel anterior circulation occlusion, independent pre-stroke functional status, and favorable imaging.⁴ Importantly, it does not define an upper age limit.⁴

We present a case of successful endovascular treatment in a 103-year-old woman, the oldest documented successful case of its kind.

CASE PRESENTATION

Her son last saw his 103-year-old mother with a pre-stroke modified Rankin Scale score of 0, who

led an independent functional life with minimal support, normal at 13:35 h. She was found down with right hemiplegia and facial droop at 13:40 h. Paramedics documented a Glasgow Coma Scale score of 7 and atrial fibrillation. She was intubated in the field for airway protection. She arrived at the emergency room at 15:26 h with a National Institutes of Health Stroke Scale (NIHSS) score of 38, although this was artificially high secondary to the residual effects of sedation post intubation. She did have persistent dense unilateral hemiplegia. The patient had a non-contrast CT (NCCT), CT angiogram (CTA), and CT perfusion imaging of the brain at 15:31 h. The non-contrast CT was without hemorrhage. The patient met the inclusion and exclusion criteria for intravenous thrombolysis, and recombinant tissue plasminogen activator (rt-PA) was initiated at 15:47 h (arrival to rt-PA time was 21 min; onset to rt-PA was 2 h 12 min). CTA showed a left internal carotid artery terminus (ICA-T) occlusion with an Alberta Stroke Program Early CT score of 10 and no core infarct changes in cerebral blood volume. Given her early arrival, favorable imaging, and independent functional status, she was taken to the endovascular suite at 16:12 h.

TREATMENT

The procedure was performed under general anesthesia. An 8 F sheath was placed in the right common femoral artery at 16:32 h. Because of significant tortuosity at the aortic arch and the left common carotid artery demonstrated on CTA, a triaxial technique was utilized (instead of our standard coaxial approach of a balloon guide catheter and stent retriever) with an 8 F balloon guide catheter (Flowgate; Stryker Neurovascular, Fremont, California, USA) in the common carotid artery, a 5 Max ACE distal aspiration catheter (Penumbra Inc, Mountainview, California, USA) in the supraclinoid ICA, and the stent retriever microcatheter distal to the occluded ICA-T. A Trevo thrombectomy device (Stryker Neurovascular) was deployed through the microcatheter at 17:00 h under aspiration through the 5 Max ACE, resulting in partial recanalization. The Trevo thrombectomy device (Stryker Neurovascular) was re-deployed with successful recanalization (Thombosis in Cerebral Infaction-3) at 17:17 h (figure 1). The time from emergency room arrival to groin puncture was 66 min, and the total time to recanalization from symptom onset was 3 h and 40 min.

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Figure 1 The pre-anterioposterior (AP) image demonstrates complete occlusion of the left internal carotid artery terminus. The post-AP image demonstrates complete recanalization of the occluded vessel.

OUTCOME AND FOLLOW-UP

The patient was transferred to the intensive care unit for post-care. Her NIHSS score at 1 h was 14, improving to 4 at 24 h and to 1 at 48 h, with the only residual deficit being mild drift involving the right arm. An MRI performed at 48 h showed minimal infarct in the left internal capsule with sparing of the entire hemisphere (figure 2). The patient passed a speech and

swallow evaluation, and was started on a regular diet, along with occupational and physical therapy. She was discharged for rehabilitation on day 3 with a discharge NIHSS score of 0. A 30 day follow-up interview with the patient's son reported that the patient is doing very well, currently in a nursing home. She is able to ambulate 90 feet on her own with a walker and can take care of herself.

Figure 2 A diffusion weighted MR image shows small localized infarct involving the left internal capsule.

DISCUSSION

Patients more than 80 years of age have the highest incidence of acute stroke⁵ and constitute the most rapidly growing age group in the world.⁶ Additionally, life expectancy at age 65 years is increasing at a much higher rate than life expectancy at birth.^{6,7} Previous intravenous thrombolysis studies showed a diminished rate of favorable outcomes in patients ≥ 80 years of age,^{8,9} and in general relatively poor outcomes in AIS patients over 80 years of age¹⁰ with significant dependence on a smaller core infarct volume in the elderly for good outcomes have also been discussed.¹¹ Age ≥ 80 years was an independent predictor of poor outcome in the North American Solitaire-FR Stent Retriever Acute Stroke Registry.¹² However, the favorable data from the current prospective randomized endovascular stroke trials challenge the notion that age by itself can make a patient ineligible for stroke interventions. Other than the comorbidities associated with the elderly, there are social factors that can affect the outcome following a major acute illness. Social isolation and depression, for example, are significantly associated with poor recovery following a stroke.^{13,14} Better cognitive and mental health in the elderly correlates with improved physical function,¹⁵ and pre-stroke physical activity is associated with good outcomes following a large vessel occlusion stroke.¹⁶

The patient in our report presented within 3 h of acute stroke onset secondary to a large vessel occlusion and had very favorable imaging without any early ischemic changes. She also lived an independent functional life with a robust family support structure. After receiving intravenous thrombolysis, a decision to

treat was based on the positive clinical, imaging, and social attributes discussed, as well as evidence from the endovascular trials. The current devices and techniques may allow us to stretch the limits of these therapies in the elderly. To our knowledge, this is the oldest patient to undergo a successful stroke intervention, and the purpose of this report was to document that in carefully selected patients, endovascular therapy may become a feasible option. Other than the clinical and imaging criteria typically utilized for patient selection, including their social, cognitive, and functional status may also enhance patient selection in the elderly.

Patient's perspective

The patient's perspective was obtained at 30 days post-procedure from the patient and her granddaughter, a nurse herself:

- **Patient:** "I am doing pretty good, able to feed myself, bathe myself with some help and walk around with a walker. I am looking forward to going home soon. Thank you for checking."
- **Granddaughter:** "Your team saved my grandma's life, she was very independent before the stroke, lived alone, cooking, cleaning, doing Laundry, and she still has some independence after the procedure. I Googled the procedure and I am glad she received TPA and the IR procedure."

Learning points

- Strokes are more frequent in the elderly, which is the most rapidly growing segment of our population.
- Recent endovascular trials did not have an upper age limit and have shown equal efficacy in elderly patients.
- This case illustrates that endovascular treatment can be safely and effectively performed in appropriately selected elderly patients.
- Like in all stroke interventions, speed is the key to a successful outcome.
- Additional selection criteria that are more relevant than age in the elderly include social, cognitive, and functional status.

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Patient consent Obtained.

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