Thrombolysis, Angioplasty and Stenting of Acute Basilar Artery Occlusion in an Octogenarian

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We present a case of an elderly male with sudden onset of a posterior circulation stroke that rapidly progressed to a deteriorating level of consciousness. Despite a dismal prognosis due to his age, the cause of his stroke, and his rapid clinical deterioration, he had an exceptional outcome. We attribute his favorable outcome to a number of factors including his good premorbid health, his timely presentation for definitive diagnosis and treatment, and rapid re-establishment and maintenance of flow in his occluded basilar artery using several endovascular techniques. The case report is exemplary of what may be achieved in elderly patients with acute posterior circulation stroke in contradistinction to what has been previously thought to be a universally fatal disease.

Introduction

We present a case of an elderly male with sudden onset of a posterior circulation stroke that rapidly progressed to a deteriorating level of consciousness. Despite a dismal prognosis due to his age, the cause of his stroke, and his rapid clinical deterioration, he had an exceptional outcome. The case report is exemplary of what may be achieved in elderly patients with acute posterior circulation stroke in contradistinction to what has been previously thought to be a universally fatal disease.

Case Report

An 84-year-old right handed male experienced the sudden witnessed onset of right hand numbness, slurred speech, facial droop, left-sided paralysis, nausea, and recurrent vomiting while at home. His daughter, a registered nurse, administered a single dose of Aspirin 325 mg. and called 9-1-1. He was seen and evaluated in the Emergency Room (ER) 56 minutes after the onset of his symptoms. Upon initial neurological examination, his Glasgow Coma Scale was 11 out of 15 (Eyes 4, Motor 5, and Verbal 2) His initial National Institute of Health Stroke Scale (NIHSS) score was 17. He was alert and aware of his environment but he was not capable of answering orientation questions or able to follow simple
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commands. He was able to emit incomprehensible sounds but no words. Neurological exam abnormalities included left upper motor neuron pattern of facial weakness, dysarthria, absent gag, involuntary shivering, left hemiparesis grade 2 out of 5, generalized hyperreflexia left greater than right, bilateral extensor plantar responses, and brief stimulus induced decerebrate posturing. Within the first 30 minutes of his presentation, he was exhibiting progressive decline in level of consciousness, deterioration in neurological function, quadriparesis, dyspnea, tachypnea, decreasing O2 saturation and recurrent vomiting. He was therefore intubated.

Further history obtained from the family indicated that the patient had been experiencing neurological symptoms for the last 6 weeks. He complained of transient recurrent episodes of vertigo, blurring of vision, disequilibrium and gait instability lasting 30-60 seconds and occurring daily or every other day. The patient did not seek medical attention. Vascular risk factors included the patient’s age and gender. He had no prior cardiac or cerebrovascular history, smoking, hypertension, diabetes, hyperlipidemia, peripheral vascular disease or family history of stroke. He was on no medication and other than a remote history of prostate cancer was in good health.

Unenhanced computed tomogram (CT) of the head did not demonstrate any hemorrhage or early signs of infarction. ASPECT (Alberta Stroke Program Early CT) score was 10 (Range 0-10, 0=complete middle cerebral artery territory infarct; 10=no infarct.). The basilar artery did appear hyperdense (Figure 1). CT perfusion study was hampered by patient motion but did demonstrate delayed time to peak in the posterior cerebral artery territory (Figure 2). CT angiogram demonstrated a 1.7 cm segment of unopacified basilar artery indicating the presence of thrombus (Figure 3). The distal basilar artery and proximal posterior cerebral arteries were filling from posterior communicating arteries. The cervical vertebral arteries were free of disease.

At this time, 2.5 hours after the onset of symptoms, the patient was intubated, ventilated, and comatose. He was not felt to meet criteria for acute intravenous tissue plasminogen activator (TPA) therapy, given his poor neurological status, and it was elected to proceed to the angiography suite and attempt intra-arterial (IA) TPA administration along with mechanical clot extraction if required.

Routine laboratory studies, chest x-ray, and electro-

Figure 1. 84-year-old man with stroke. CT scan shows hyperdense basilar artery due to thrombosis (arrow).
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cardiogram (ECG) were all normal.

At 3 hours and 45 minutes post onset, diagnostic catheter angiogram confirmed the presence of a basilar thrombosis (Figure 4A). Due to the small caliber of his dominant left vertebral artery it was felt that it would be prudent to proceed with IA thrombolysis first rather than place an 8 French (F) guiding catheter (as required for the Merci retrieval device (Concentric Medical, Inc, Mountainview, CA)) into a small vertebral artery and risk occlusion, spasm or dissection. The patient received 4000 U heparin intravenously for prevention of thrombus formation in the guide catheter. Then after placing a 6F guiding catheter in the left cervical vertebral artery followed by placement of a microcatheter through the guiding catheter into the distal basilar artery beyond the clot, intra-arterial TPA was given. After receiving 4 mg of TPA (2 mg into the clot and 2 mg distal to the clot) the basilar artery was completely recanalized with no evidence of distal embolization (Figure 4B). However, angiography demonstrated a critical stenosis of his basilar artery at the site of the thrombolysed clot. Within 5 minutes, the basilar artery spontaneously rethrombosed (Figure 4C). Therefore, an additional 2 mg of TPA was infused into the clot and balloon angioplasty with a 2.5 x 15 mm semi-compliant balloon (Gateway Balloon, Boston Scientific Corporation, Natick, MA) was performed. This resulted in complete persistent recanalization of the basilar artery at 5 hours and 49 minutes after his initial stroke symptoms (Figure 4D). However, there was felt to be a residual 80% stenosis of the basilar artery (Figures 4E and F).

It was decided to desist with further intervention and reassess the patient clinically. If there was significant neurological recovery, then we would consider stenting the residual basilar artery stenosis at a later date. The patient was given a loading dose of clopidogrel 600 mg and aspirin (ASA) 650 mg via a nasogastric tube. He continued to receive IV heparin infusion at a rate of 12 units/kg/hour to maintain partial thromboplastin time (PTT) in the range of 50-75 seconds for 6 hours.

The patient made a remarkable recovery in the next 12 hours and by 24 hours he was extubated and had an NIHSS of 5. He had a mild left facial droop, mild dysarthria and only mild residual right hemiparesis. Magnetic resonance imaging (MRI) demonstrated small areas of diffusion restriction in the mid-pons and medial right thalamus (Figure 5). Magnetic resonance angiogram (MRA) demonstrated the patent basilar artery but...
residual stenosis in the mid-segment as seen on the final angiogram post angioplasty. Given the patient’s significant neurological improvement and the risk of recurrent stroke with residual 80% stenosis of his basilar artery and recent stroke, we elected to proceed with stenting of the basilar artery. Four days after his initial presentation, the patient underwent uneventful stenting of his basilar artery under a general anesthetic. A 4.0 x 15 mm Wingspan self-expanding nitinol stent (Boston Scientific Corporation, Natick, MA) was placed. There was no need to predilate the lesion with balloon angioplasty in order to cross the stenosis with the stent. The final angiogram demonstrated approximately 30% residual stenosis (Figure 4 G and H). It was felt that there was no need to perform a post-stenting angioplasty.

The patient was continued on ASA 325 mg. daily and clopidogrel 75 mg. p.o. daily for 6 weeks. His cholesterol was 188 mg/dL and he was started on a statin, atorvastatin calcium 10 mg. daily. He developed an aspiration pneumonitis that was successfully treated with intravenous antibiotics. He was transferred to rehabilitation medicine 6 days after admission and then home 20 days after admission where he functions independently and ambulates without an assist device. He has almost returned to his pre-stroke baseline function with the exception of mild gait instability. His NIHSS was 2 when evaluated 27 days after his presentation. There was mild left upper motor neuron pattern of facial weakness and mild right upper extremity pronator drift and 4+/5 power in right upper and lower extremities. Otherwise his other deficits had completely resolved. He has returned to his premorbid level of function with the addition of the use of a walking cane for added confidence and stability when ambulating. At 4 months his NIHSS score was 2 and Modified Rankin Scale score was 1. He was independent with all activities of daily living, ambulating without any assistive devices, and had resumed driving. He continued to be free of new or recurrent stroke symptoms, 1 year after presentation.

Figure 4. (A) Diagnostic catheter angiogram. Arrow indicates proximal aspect of basilar artery clot as seen on left vertebral artery injection from catheter angiogram. Obstruction by clot is complete. (B) After intra-arterial TPA, there is partial recanalization of the basilar artery disclosing an underlying critical stenosis of the basilar artery (long arrow) and residual thrombus (arrowhead). The tip of the microcatheter is labeled with the short arrow.
This case report is unique in that excellent neurological recovery was achieved in an elderly patient who presented with basilar artery thrombosis with rapid progression to a comatose state. Prior to the availability of thrombolytic drugs, the mortality of patients with vertebrobasilar artery occlusion (VBO) was 80-90% [1]. In a recent report of retrospective results compiled from 5 stroke centers in Germany, the authors detail their experience with 180 patients who underwent intra-arterial fibrinolysis [1]. This is the largest reported series in the literature. Complete recanalization was achieved in 55% of patients with an overall mortality of 43%. This represents a tremendous reduction in death in a previously abysmal disease. Best clinical outcome was determined by the success at recanalization. However, even partial recanalization led to relatively satisfactory clinical outcome with a post-treatment modified Rankin Score (mRS) of 0-4 (0= no symptoms through 6= dead) in 57% of patients compared to 14% in non recanalized patients. In a smaller series of 26 patients, this was not the case as only patients in whom complete recanalization was achieved was there significant neurological improvement [2]. Complete recanalization was achieved in our patient. While most agree that good clinical outcome is dependent upon recanalization, considerable discussion continues regarding the best method to achieve recanalization [3-5].

This patient's excellent sustained recovery is unique given his age of 84 years. In a retrospective analysis of a large single center cohort of patients, Kim et al compared results of intra-arterial thrombolysis in patients 80 and older with patients younger than 80[6]. While there was no difference in recanalization rates, major symptomatic hemorrhage or any intracerebral hemorrhage between groups, lower 90 day rates of excellent functional outcome and survival were observed in the very elderly. However, despite less durable recovery in the elderly, one should not shy away from intervention in this population[7-10]. Non-disabling outcome was seen in a quarter of patients leading the authors to conclude that use of intra-arterial thrombolytics in the very elderly should be pursued particularly in the face of an aging population.

Discussion
Figure 4. (E) AP and (F) lateral view after angioplasty with significant residual stenosis. (G) AP and lateral (H) views after placement of a Wingspan stent. Arrows indicate position of proximal and distal stent markers.
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It is not uncommon to see early re-occlusion after thrombolysis of a VBO due to a high grade arteriosclerotic stenosis of the intracranial vertebral or basilar artery which can then be treated with angioplasty and/or stenting as in the present case [11]. With aggressive intra-arterial thrombolysis with TPA as well as intravenous abciximab (GPIIb/IIa inhibitor, 0.25 mg/kg bolus then 0.125 micrograms/kg infusion for 12 hours) and the addition of angioplasty and stenting in the setting of >70% residual stenosis after thrombolysis, significantly greater complete recanalization (45% vs. 22%) has been reported with lower mortality and with no increase in symptomatic intracranial hemorrhage compared to intra-arterial TPA alone [12]. Multimodal therapy has been described by others to be successful when intra-arterial therapy alone fails to achieve recanalization [13].

In addition to advanced age, coma is a poor prognostic indicator in posterior circulation stroke. So why did this octogenarian who presented with a rapid deterioration to coma, do so well in the face of such a bad disease? It would seem intuitive that the patient’s excellent health prior to presentation was an important factor in his sustained recovery. He was on no medications, exercised regularly and other than his age and gender had no vascular risk factors. Re-establishing flow early has been shown to be predictive of good outcome in the PROACT trials of intra-arterial pro-urokinase in stroke [14, 15]. In our patient complete flow was re-established in the occluded basilar artery less than 6 hours after onset of symptoms and 3.5 hours after the onset of coma. Finally, maintaining patency of the occluded artery with timely angioplasty and then stenting likely played a pivotal role in his sustained recovery.

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