CASE REPORT

Bringing Down the Door-to-needle Time: Patient Thrombolysed in 6 Minutes—A Case Report

Ankur Verma, MBBS, MEM1; Sanjay Jaiswal, MBBS, MEM1

E-pub: 02/24/2021

ABSTRACT

Introduction: It has been clearly established that thrombolysis using recombinant tissue plasminogen activator is strongly beneficial for acute stroke patients. The sensitivity of brain tissue to ischemia causes this time dependence on the effectiveness of recombinant tissue plasminogen activator. Early recognition of stroke and activation of a stroke alert/code are imperative to treat acute stroke patients effectively and to realize positive outcomes.

Case Presentation: A 68-year-old man with right-sided weakness arrived at our emergency room and was thrombolysed in 6 minutes from time of arrival, after ruling out all contraindications.

Conclusion: The case and our rapid thrombolysis protocol that helped in achieving the 6-minute door-to-needle time are described. A structured protocol is recommended to reduce door-to-needle times for thrombolysis in acute ischemic stroke.

INTRODUCTION

Approximately 11% of deaths around the world are the result of stroke, making it the second most common cause of death.1 In India alone, 1.44 to 1.64 million new cases of acute stroke are reported every year,2 and the 30-day case fatality ranges from 18% to 41%.3 Recently, there has been a lot of emphasis on stroke prevention and early management protocols, and this has led to a decrease in mortality rates worldwide.4

One of the major spokes of stroke care includes early initiation of thrombolytic therapy. It has been clearly established that thrombolysis using recombinant tissue plasminogen activator (rTPA) is strongly beneficial for acute stroke patients.5 Studies have shown that for every 15-minute reduction in door-to-needle time, there is a 5% lower odds of risk-adjusted inhospital mortality.6 We describe a case with a 6-minute door-to-needle time and provide an overview of our Rapid Thrombolysis Protocol.

CASE REPORT

A 68-year-old hypertensive man (being treated for hypertension) was brought to our emergency department (ED) with a sudden onset of right-sided weakness and inability to speak 30 minutes before arrival. On arrival, the patient had a pulse of 79/minute, a blood pressure of 150/90 mmHg, a respiratory rate of 20/minute, a serum random sugar level of 172 mg/dL, and he was saturating at 100% on room air. On examination, the patient was aphasic, had left-sided gaze preference, and had right-sided dense hemiplegia with facial involvement, with complete sensory loss of the right half of his body. He had an initial National Institutes of Health Stroke score of 26. A stroke code was announced and the patient was immediately sent for computed tomography (CT) of the brain. During the CT scan, the family was counseled regarding the patient’s condition and diagnosis, and the probable need for thrombolysis. Consent for the same was acquired immediately. The patient had no contraindications for thrombolysis. Because the CT scan was not suggestive of any intracranial hemorrhage, thrombolysis with rTPA was started while the patient was in the CT scanner: a 7-mg intravenous bolus followed by 63 mg over 1 hour. This was achieved in 6 minutes from the time of arrival (36 minutes from time of onset). With the ongoing thrombolytic infusion, the patient underwent CT angiography of the brain, which revealed a thrombosed distal M1 segment of the left middle cerebral artery (Figure 1). The patient was moved back to the ED, and admission to the stroke Intensive Care Unit was initiated. The patient achieved remarkable neurological recovery in 2 hours (National Institutes of Health Stroke Scale score of 5). For secondary prevention, the patient was kept on conservative management with 150 mg acetylsalicylic acid and 80 mg atorvastatin. Repeat CT angiography of the brain on day 5 showed good flow in the bilateral middle cerebral arteries, including the M1 segment of the left middle cerebral artery (Figure 2). The patient was discharged on day 6 with normal speech and mild hemiparesis, and a National Institutes of Health Stroke Scale score of 1. The patient was advised neurological follow-up and outpatient physiotherapy.

Rapid Thrombolysis Protocol

Our inhospital protocol (Table 2) was created with the aim of reducing our door-to-needle times in acute ischemic stroke patients. Patients arriving at the triage area with any symptoms of stroke are brought to the attention of the senior ED physician by a triage nurse. If we have prehospital information regarding a stroke patient arriving, a green corridor is established from triage to CT/magnetic resonance imaging. Counseling of the family is done regarding the condition and diagnosis, and probable need for...
thrombolysis by the doctor/emergency medical technician in the ambulance, and live locations are shared with the ED team. The vital signs of the patient are recorded by a trained triage nurse while physicians quickly evaluate the patient in the triage room itself. On confirmation of clinical stroke, a stroke code is announced by dialing the emergency code.

The calls are received by the neurologist on call, radiology, the laboratory, and medical administration. The patient is sent immediately to radiology for brain CT or magnetic resonance imaging (diffusion weighted and fluid attenuation inversion recovery). Magnetic resonance image is done for patients who have wakeup stroke, when the exact time of onset is not known, or when symptoms and signs are vague. If magnetic resonance imaging is contraindicated and a radiological diagnosis is required, then a CT perfusion study is completed. While the patient is undergoing CT, the family is counseled regarding the patient’s clinical diagnosis and condition, and probable need for thrombolysis; consent for the same is obtained. All contraindications are ruled out during the scan. rTPA is brought to the radiology department by an ED nurse to save time in case thrombolysis is required. If the CT scan is normal and clinical diagnosis of ischemic stroke is established, the patient is given a bolus dose followed by infusion over 1 hour. All stroke blood samples are sent before giving the bolus drug. The neurologist is then consulted regarding the need for additional CT angiography. If required, the infusion is continued in the CT scanner. The patient is then sent back to the ED, where an ED physician and nurse monitor his or her hemodynamic values and neurological recovery/worsening. The neurology team meets to determine whether there is a need for mechanical thrombectomy. The patient is then sent to the stroke Intensive Care Unit.

**DISCUSSION**

Until recently, the recommended door-to-needle time for acute ischemic stroke is 60 minutes or less. We suggest that a structured protocol can greatly reduce door-to-needle times. It is well established that early thrombolysis can achieve much better outcomes for ischemic stroke patients. The sensitivity of brain tissue to ischemia causes this time dependence on the effectiveness of rTPA. Thus, it is imperative that institutions have a streamlined, robust stroke protocol.

Recognition of stroke begins in the prehospital setup. Paramedics who are transporting patients via ambulance...
should be trained to recognize stroke and to transfer patients to the appropriate center. Triage nurses play an equally important role in the early recognition of stroke when patients arrive at the ED. Nurse training is paramount for a successful stroke protocol. Early recognition by nurses leads to early diagnosis and shorter door-to-needle times.

The use of a stroke code alert system has been shown to improve time to diagnosis and treatment, and to reduce intravenous rTPA door-to-needle times. Worldwide studies have shown there are multiple inhospital delays when delivering rTPA to stroke patients. There is a lot of scope for reducing door-to-needle times to improve outcomes. Through regular audits and protocol checks, many of the delays that hamper timely thrombolysis may be identified and rectified.

A robust stroke program requires a significant volume of stroke patients arriving at the ED, trained paramedics and triage nurses, and trained emergency medicine physicians and inhouse neurologists available 24/7. In addition, the radiology department, laboratory, and catheter suite for thrombectomies must be available, along with a stroke Intensive Care Unit for postthrombolytic care. Last, there should be regular data collection and discussions regarding all cases to recognize delays and revise any protocols if required.

Although our report highlights the feasibility of achieving such short door-to-needle times, it may not always be possible because there may be factors that delay thrombolysis, such as a delay in receiving family consent, the family wanting a second opinion, a determination of hypertension (which needs to be controlled prior to thrombolysis), incomplete drug history, and so on.

Our case does not highlight the target door-to-needle time because it is not possible for every patient. We do not highlight the target door-to-needle time because it is not possible for every patient. We do

### Table 1. Patient timeline for relevant past medical history and interventions, including relevant personal, family, and psychosocial history; important past interventions; outcomes; and follow-up.

<table>
<thead>
<tr>
<th>Date</th>
<th>Summaries from initial and follow-up visits</th>
<th>Diagnostic testing (including dates)</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/1/2019</td>
<td>Patient presented with right-sided weakness and aphasia 30 minutes before arrival. Patient was hypertensive and on medication (amlodipine).</td>
<td>Random blood sugar test, EKG, complete blood count, renal function test, liver function test, prothrombin time, INR, and brain CT with brain and neck CTA were performed. CTA revealed a thrombus in the distal M1 segment of the left middle cerebral artery. All investigations done on 10/1/2019. All bloodwork was normal.</td>
<td>Injected recombinant tissue plasminogen activator bolus dose followed by infusion over 1 hour. Started 6 minutes from the time of arrival after brain CT. Tablet aspirin, amlodipine, and atorvastatin were started. Patient recovered neurologically, with National Institutes of Health Stroke scores of 26 and 5 within 2 hours.</td>
</tr>
<tr>
<td>10/6/2019</td>
<td>Patient recovered full function neurologically.</td>
<td>Repeat brain CTA performed on 10/6/2019 revealed good flow in the bilateral middle cerebral arteries.</td>
<td>Patient continued on amlodipine, aspirin, and atorvastatin, and planned for discharge the following day.</td>
</tr>
<tr>
<td>10/7/2019</td>
<td>Patient had a full recovery.</td>
<td>No investigations performed.</td>
<td>Patient was discharged in stable condition on amlodipine, aspirin, and atorvastatin, with follow-up advised after 1 month.</td>
</tr>
<tr>
<td>11/8/2019</td>
<td>Patient followed up in the Neurology OPD and was perfectly stable with no residual neurological deficits. No adverse events such as recurrent stroke or bleeding occurred.</td>
<td>No investigations ordered.</td>
<td>Patient advised to continue amlodipine, aspirin, and atorvastatin.</td>
</tr>
<tr>
<td>4/10/2020</td>
<td>At the 6-month follow-up, the patient was leading a normal life with no neurological deficit. No adverse events occurred.</td>
<td>No investigations ordered.</td>
<td>Patient advised to continue oral medications as prescribed and to schedule follow-ups every 6 months.</td>
</tr>
</tbody>
</table>

**Relevant past medical history and interventions**

- Known case of hypertension and was taking amlodipine tablets.
- Antihypertensive medication has been continued.

*Include genetic information if available.

CT = computed tomography; CTA = computed tomographic angiography; EKG = electrocardiogram; INR = international normalized ratio; OPD = out patient department.
recommend that a structured protocol, such as our Rapid Thrombolysis Protocol, can reduce mean and median door-to-needle times substantially (to much less than 60 minutes) for acute ischemic stroke.

Disclosure Statement
The authors have no conflicts of interest to disclose.

Authors’ Contributions
Ankur Verma, MBBS, MEM, is the principal author and contributed to the conception, literature review, and design of the manuscript. Sanjay Jaiswal, MBBS, MEM, contributed to drafting, discussion, and critical revision of the manuscript. The authors did not have any third-party contributions to design, data collection, data analysis, or manuscript preparation.

Disclaimer
The views expressed in the article are the authors’ own and not an official position of the institution.

Funding
No funding was received for this case report.

References