

Temporal Trends in Intravenous Thrombolysis in Acute Ischemic Stroke: Experience from a Tertiary Care Center in India

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Background: Acute ischemic stroke (AIS) is a time-dependent treatable cause of morbidity and mortality. Despite the increasing stroke incidence in developing countries, parallel increasing stroke thrombolysis rates have not been documented. *Aim:* This study aims to determine trends in patient characteristics and rates of recombinant tissue plasminogen activator (rtPA) use in AIS patients in a tertiary care center in northern India. *Methods:* All AIS patients presenting within 8 hours of symptoms onset from January 2011 to December 2015 were enrolled and analyzed. *Results:* A total of 867 AIS patients presented within 8 hours of symptoms onset. Out of 593 eligible patients, 189 (31.87%) underwent intravenous thrombolysis (IVT) with rtPA within 4.5 hours of the window period. Patients (undergoing) IVT had onset-to-door times of 2 hours or less (23.81%), 2-3 hours (33.86%), and 3.0-4.5 hours (42.33%). IVT rates in 2 hours or less of symptom onset increased from 22% to 25% and IVT rates in 2-3 hours increased from 38.9% to 43.8%. Door-to-computerized tomographic time (median 27 versus 11 minutes, $P = .0001$) and door-to-needle time (median 83 versus 67 minutes, $P = .011$) improved, with a significant improvement of computerized tomography imaging time within 25 minutes of arrival (from 50% to 78.4%, $P = .014$). Post-IVT symptomatic hemorrhage was noted in 5 patients (2.65%). The median National Institutes of Health Stroke Scale score at presentation was 11, whereas a favorable modified Rankin Scale score (0-1) at 3 months was seen in 39.68%. *Conclusions:* Encouraging trends in IVT over the years may be indicative of increasing community awareness of stroke and improving quality of stroke care in developing countries such as India. **Key Words:** Stroke—intravenous thrombolysis—rtPA—trends—developing countries.
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Introduction

Eligibility for acute ischemic stroke (AIS) interventions depends on the time from symptom onset to hospital arrival. Only a minority of patients arrived early enough to be considered for acute therapy, and most studies describe experiences of specific centers or regional networks over a limited time period.¹

Many patients without documented contraindications still do not receive intravenous (IV) recombinant tissue plasminogen activator (rtPA), despite being currently the only approved medical treatment for patients with AIS within 4.5 hours of stroke onset.^{1,2} Worldwide, professional

societies, different state and government agencies, and national patient support organizations are making efforts to increase rtPA use in eligible patients.³ Although studies in developed countries have demonstrated significant improvement in trends in intravenous thrombolysis (IVT), there are limited data from developing countries and the Indian subcontinent.⁴ The present study highlights trends in IV rtPA use over 5 years in a large tertiary care hospital in North India.

Methods

Case Definition

The stroke onset times were recorded as the time the patient was last known to be well and the time that symptom onset was discovered; approximate times were not allowed. The onset-to-door (OTD) time was defined as the time the patient arrived in the emergency department (ED) minus the stroke onset time. The onset-to-needle time (OTN) was equivalent to the window period, whereas the door-to-needle time was the time taken to start IVT after reaching the hospital. Thrombolysis-induced symptomatic intracranial hemorrhage was defined as a type 2 parenchymal hemorrhage with deterioration with a National Institutes of Health Stroke Scale (NIHSS) score of 4 points or higher or death, within 36 hours of thrombolysis (as per Safe Implementation of Thrombolysis in Stroke-Monitoring Study [SITS-MOST]).⁵

Patient Population

The primary objective of the study was to evaluate the changes in the patterns of use of IVT over a 5-year period from January 2011 to December 2015. We report data of all AIS patients who were treated with IVT within 4.5 hours of symptom onset. Data were derived from our hospital stroke registry and the Safe Implementation of Treatments in Stroke (SITS)—India registry, where our hospital data were also registered.

Our stroke team comprised neurology and neuroradiology physicians, fellows, and stroke nurses and had been in place before 2011. Acute stroke notification of the stroke team members was provided by emergency mobile notification. Stroke team members rotate on “first call” and are available 24 × 7. A regular education program of residents and nurses is carried out to train them on early and accurate recognition of acute stroke patients and to institute an acute stroke management pathway that includes immediate notification of our stroke team and early evaluation of patient and assessment of the usual exclusions to rtPA. In all eligible patients of thrombolysis, baseline blood pressure and blood sugar levels were determined and rapid coagulogram (point of care) was carried out before rtPA bolus dose. Data were recorded in a brief acute stroke card listing patients’ demographics, stroke type, intervals, and other critical

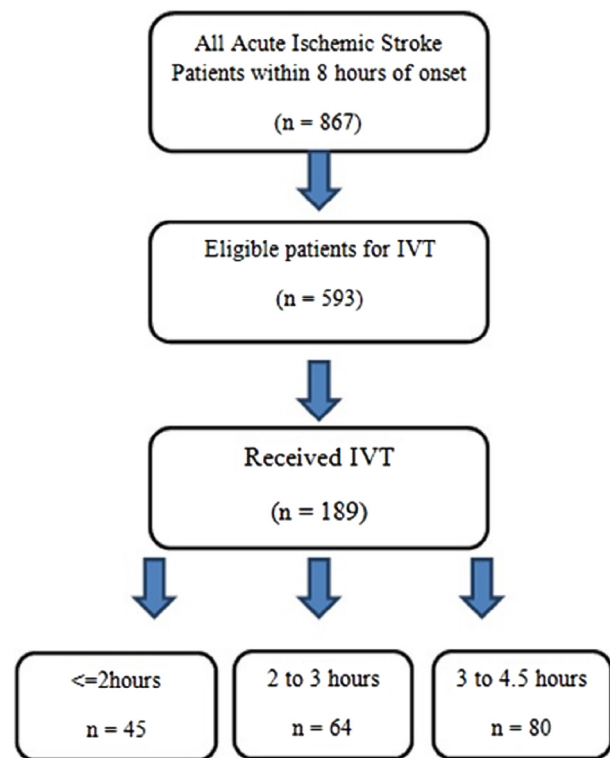


Figure 1. Recruitment profile of an acute ischemic stroke patient and thrombolysis window period. Abbreviation: IVT, intravenous thrombolysis.

information pertaining to thrombolysis. The platelet counts were immediately ordered, but IVT was started while the report was awaited, with instructions to stop IVT in case of low platelet counts. All patients were closely monitored closely in the post-thrombolytic period as per guidelines.⁶ Patients receiving IVT were divided into the following groups: within (1) 2 hours, (2) 2-3 hours, and (3) 3.0-4.5 hours. Patients treated after 4.5 hours of the window period were not included in the analysis. A total of 196 patients underwent IVT during this period; 7 patients were excluded as IVT was carried out after 4.5 hours (posterior circulation stroke) (Fig 1).

Imaging

All patients underwent a cranial CT scan with CT angiography. All patients underwent a follow-up CT scan at 24 hours of IVT. We have not included the CT angiographic data in the present study.

Statistical Analysis

For each of the 3 patient groups, demographics and clinical variables were analyzed (Table 1). Temporal trends were explored for the groups treated with IV rtPA within 4.5 hours of onset by calendar year from 2011 through December 2015 (Table 2). Yearly trends over time in OTN were tabulated according to the following categories: OTN time of 2 hours, OTN time of 2-3 hours, and OTN time

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