Intra-arterial thrombolysis for acute ischemic stroke: Our institutional experience

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ABSTRACT

Introduction: The standard treatment for acute ischemic stroke is intravenous (IV) rtPA for patients who can reach the hospital within 3 to 4.5 h. There are case reports, where IA thrombolysis has helped patients in case an IV thrombolysis has failed. We report 14 cases of acute ischemic stroke treated by intra-arterial (IA) thrombolysis. **Materials and Methods:** We have retrospectively analyzed 14 cases of acute ischemic stroke treated at our department between December 2008 and October 2011 by intra-arterial thrombolysis. The patients with suspected large vessel occlusion (11 patients) and patients not responding to IV rtPA (3 patients) were considered for the IA thrombolysis. **Results:** We achieved complete recanalization (TIMI 3) in 11 patients. One patient had a bleed following the procedure but recovered well during the hospital stay. All the patients were followed up to 90 days. Majority of them have good functional outcome. **Conclusions:** Our study suggests that intra-arterial thrombolysis is a feasible option in the subgroup of patients with large vessel occlusion. However, there is a need for a randomized multi-centric study to support our results.

Key words: Acute stroke, intra-arterial thrombolysis, rtPA, urokinase

INTRODUCTION

Stroke is the second most common cause of death.[1] Ischemic stroke accounts for 87% of all strokes.[2] The standard treatment for acute ischemic stoke is IV rtPA for patients who can reach the hospital with in 3 to 4.5 h.[3] Pro-Urokinase for acute cerebral thrombo-embolism (PROACT II) study suggests that intra-arterial thrombolysis can be given up to 6 h of stroke onset.[4] In large vessel occlusion, early recanalization rate with IV rtPA is low, approximately 10% in internal carotid artery and approximately 30% in proximal MCA occlusion.[5,6] There are case reports, where IA thrombolysis has helped patients in case an IV thrombolysis has failed.[7]

MATERIALS AND METHODS

This is a retrospective study of 14 patients with acute ischemic stroke treated by intra-arterial thrombolysis (IAT) from December 2008 to October 2011 [Figures 1-3]. The patients were followed for three months and beyond. The clinical inclusion criteria were age between 9 and 82 years, focal neurological deficits consistent with stroke within 6 h of onset, measurable neurological deficit - National Institute of Health Stroke Scale (NIHSS) score more than or equal to four - and informed consent by either the patient or care giver. Clinical exclusion criteria included rapidly improving neurological signs, an NIHSS score greater than 30, history of stroke within the previous six weeks, seizures at onset, previous history of intracranial hemorrhage at any time, neoplasm, or subarachnoid hemorrhage, surgery within 30 days, head trauma within 90 days, active or recent hemorrhage within 30 days, known hemorrhagic diathesis, baseline international normalized ratio greater than 1.7, activated partial thromboplastin time more than 1.5 times than normal, or baseline platelet count less than 1,00,000/c.c. Computed tomographic (CT) scan exclusion criteria were intracranial tumors, hemorrhage, significant mass effect with midline shift, and acute hypodense parenchymal lesion or effacement of cerebral sulci in more than one-third of the vascular territory.

Patients who met all clinical and CT scan criteria, being within the stroke onset period of 3 h, were subjected to IV thrombolysis with rtPA. The dose of rtPA was calculated at 0.9 mg/kg body weight. 10% of total dose was injected bolus

Access this article online	
Quick Response Code:	Website: www.ijns.in
	DOI: 10.4103/2277-9167.94369

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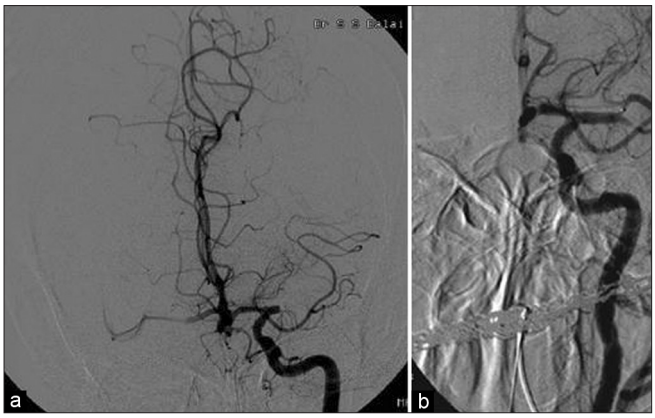

Figure 1: Case 1: A 46-year-old female with sudden onset right hemiplegia. (a) Angiogram demonstrating occlusion of left MCA (M1); (b) Post IA thrombolysis demonstrating complete recanalization of left MCA

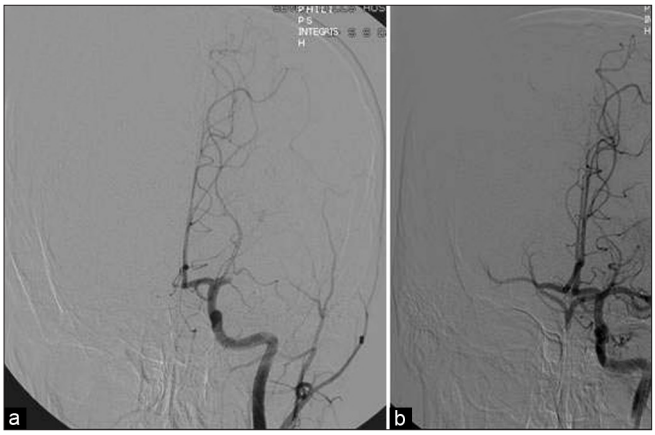

Figure 2: Case 2: A nine-year-old female, a known case of arrhythmia, was undergoing RF ablation of the arrhythmic focus. She had a sudden onset right hemiplegia on the Cathlab table; (a) Angiogram demonstrating occlusion of the left MCA (M1); (b) Post intra arterial thrombolysis (complete recanalization of left MCA)

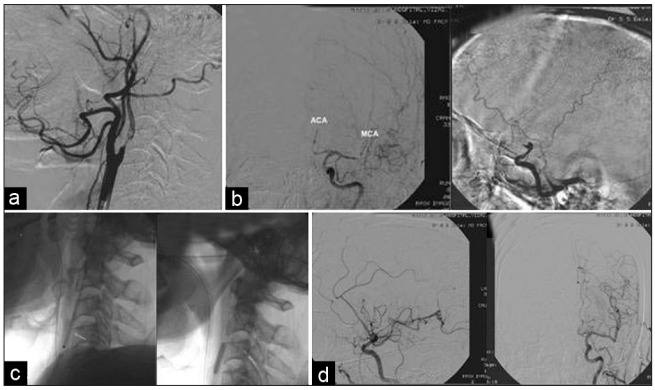

Figure 3: Case 3: A 49-year-old male presented with sudden onset blindness in the left eye with right hemiplegia; (a) Critical left internal carotid artery (ICA) stenosis; (b) Occluded left ACA and MCA; (c) Acute stenting of left ICA; (d) Post intra arterial thrombolysis (complete recanalization of left ACA and MCA)

and rest of the rtPA was injected over 1 h. Patients not responding to IV rtPA were considered for IA thrombolysis. Improvement of NIHSS score by 3 or more per hour following IV rtPA was considered as an improvement. The other group of patients reported to us after 3 h of stroke onset was directly considered for IA thrombolysis.

Patients considered for IA thrombolysis were taken for four-vessel diagnostic cerebral angiography after taking consent from patient/relatives. The patients were taken up for IAT, if there was a large vessel occlusion. Patients received 3000 U of heparin bolus intravenously. A 6F guiding catheter was placed into the symptomatic artery and angiogram was done. We found critical stenosis of carotid artery in three of our patients and critical stenosis of left vertebral artery in one of our patients (with basilar artery thrombosis and highly attenuated caliber of right vertebral artery). All the above four patients were stented prior to IA thrombolysis.

Microcatheter was then navigated into the thrombus. Intra-arterial infusion of Urokinase (UK) was performed. We have injected 5 lakh units of Urokinase in initial 15 min; it was followed by 5 lakh units of Urokinase in next 30 min. A final dose of 5 lakh units of Urokinase was injected over 1 h. Meanwhile, recanalization was observed by repeated angiography, in every 5 to 10 min. The Urokinase injection was stopped in case the recanalization was achieved before completing the entire dose of Urokinase. CT scan was done 24 h after the thrombolysis or before, if warranted clinically. NIHSS score and modified Rankin scale (mRS) score were documented at 24 h, 30 days and 90 days. All procedure-related complications were analyzed. We achieved complete recanalization in 11 out of 14 patients (TIMI 3). The other 3 patients had suboptimal opening with TIMI score of 2, 2 and 1.

RESULTS

During the study period, 14 patients with acute ischemic stroke underwent IA thrombolysis [Table 1]. The mean age was 55.1 years (range 9 to 82 years) and nine were males. The mean duration of presentation was 4 h (range 1.5 h to 7.5 h). The median NIHSS score was 18 (range 12 to 24). Nine patients had middle cerebral artery (MCA), three had carotid and two had basilar artery (BA) occlusions. Eleven (78%) patients had TIMI 3 recanalization rate and ten (71%) patients had mRS score of <2. No death had been reported.

We had a nine-year-old patient treated with IA thrombolysis. This patient was undergoing RF ablation for arrhythmic focus in the heart. She developed a left MCA stroke. She was treated with IA thrombolysis within 30 min of the stroke onset. We had six patients who presented at or within 3 h duration. The mean age of these patients was 44.3 years (range 9 to 67 years) and

Table 1: Shows data of patients which were treated by intraarterial thrombolysis.

Name	Age/Sex	Time	Territory	MoT	TIMI	3 Month mRS
TR	38/M	3	AC	IAT	3	0
V	73/M	6	AC	IAT	3	0
MPR	49/M	5	AC	IAT	2	0
N	38/M	3.5	AC+CAS	IAT	3	–
GS	46/F	3	AC	IAT	3	–
SR	82/M	7.5	VB+VAS	IAT	3	4
AD	33/F	2.5	AC	IAT	3	1
L	9/F	0.5	AC+CAS	IAT	3	0
SL	57/M	2.5	AC	IAT	3	0
VR	74/M	6.5	VB	IAT	1	1
S	78/F	5	AC	IAT	2	0
GS	58/M	Not known	AC+CAS	IAT	3	2
AR	62/M	2	AC	IAT	3	0
MR	54/F	4	AC	IAT	3	o

three were males. The mean duration of presentation was 2.25 h (range 0.5 h to 3 h) and the median NIHSS score was 17 (range 12 to 22). One patient had a bleed following the procedure. He recovered well functionally before discharge from the hospital. There was no mortality in any of our patients.

DISCUSSION

The efficacy of intra venous thrombolysis in acute ischemic stroke has been proven in NINDS trial. However, the benefit declined with increasing NIHSS scores in these patients. Patients with NIHSS scores of more than 20 had 6% absolute risk reduction in achieving mRS score of <1 at 90 days. The efficacy of recanalization after intra venous thrombolysis in patients with large arteries occlusion (internal carotid artery, MCA - M1 segment, or BA especially proximal BA) would be 30% compared to 60 to 70% in intra arterial thrombolysis. In a large retrospective study, comparing IA and IV treatments in M1 occlusion presenting within 3 h, matched for age and stroke severity, favorable outcome was more frequent after IAT than after IVT (53% vs.23%; $P=0.001$).[8,9]

In our group of patients with MCA occlusion, 77% of patients had a favorable outcome. We had one symptomatic cerebral hemorrhage. In BA occlusion, one of the two patients had a favorable outcome. In ICA-T occlusion, three of the four patients had a favorable outcome.

In the study by Gonner *et al*., the recanalization rate was 63% and 21% of patients recovered to mRS score of 0 or 1 and 40% patients to mRS score of 2 or 3. Outcome was good (mRS 0-3) in 80% of patients with MCA occlusions, 33% with ICA, and in 50% with BA occlusion. Symptomatic cerebral hemorrhage occurred in 4.7% of patients.[10]

Our study has limitations like small cohort, retrospective collection of data, non randomized design, single center involvement and non-blinded nature of the study. Our study suggests that intra-arterial thrombolysis is a feasible option in the subgroup of patients with large vessel occlusion. However, there is a need for a randomized multi-centric study to support our results.

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How to cite this article: Narayana RV, Pati R, Dalai S. Intra-arterial thrombolysis for acute ischemic stroke: Our institutional experience. Indian J Neurosurg 2012;1:38-40.
Source of Support: Nil, **Conflict of Interest:** None declared.