

Presentations of Acute Stroke Treated with Thrombolysis: A Clinical Profile

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Abstract

Introduction: Cerebrovascular accident is a leading cause of disability adjusted life years. With the advent of the therapeutic procedure of thrombolytic therapy, hope for the alleviation of the significant morbidity faced by these patients was seen. Along with the therapeutic procedure came the contradictory question of whether the benefits of truly outweighed the risks associated with the procedure.

Aims & Objectives: To (1) create a profile of patients who have undergone Intra-venous Thrombolysis (IVT), Intra-arterial Thrombolysis (IAT) or IVT-IAT bridge therapy in a tertiary care hospital, (2) to compare the procedures and (3) to correlate their outcomes with a number of associated factors.

Materials & Methods: Design: Cross-sectional, Record Based Study – Retrolective Data Collection. Setting: Tertiary Care Centre in Mangalore, Karnataka, India. Participants: All cases of acute stroke, treated with IAT or IVT or IAT-IVT bridge therapy, as defined by the inclusion and exclusion criteria for undergoing thrombolysis in stroke patients.

Main Outcome Measures: Permission was obtained from the Institutional Ethics Committee of Kasturba Medical College, Mangalore (Manipal University) to carry out the research. Approval was obtained from the Medical Superintendent to access hospital records. Data was collected in a semi-structured proforma. The data was collated and analysis was carried out using convenience sampling.

Results: 25 non-randomized cases were studied. The mean ages were: men - 58 years and women - 57 years. Most patients were brought in between 0-3 hours. The commonest territory of infarction was the left MCA territory, and the commonest presenting symptom was right hemiparesis. IVT was more commonly used but IAT showed better outcomes. Hypertension was the most common associated risk factor (64.00%), and IAT showed a better outcome in hypertensives. MRS 6 was seen 100.00% in bridging therapy, 26.67% in IVT and 0.00% in IAT.

Conclusions: IAT generally presented with a better outcome. Aphasia was related to a better outcome and facial palsy, to a poorer outcome.

Keywords: Bridge therapy, Cerebrovascular accident, Intra-arterial thrombolysis, Intra-venous thrombolysis, Stroke

INTRODUCTION

Cerebrovascular accident is a leading cause of disability adjusted life years in all ages. According to the Global burden of disease 2004 update by the WHO, cerebrovascular disease ranks 6th with a DALY of 46.6 million across all age groups.¹⁻³ Stroke has a devastating manifestation and equally crippling consequences. With the ever changing modalities of treatment, clinicians have been targeting to not only reduce the mortality of a disease, but to also reduce its morbidity by improving the long term outcome

of the patient, post treatment. With the advent of the therapeutic procedures of intra-venous thrombolysis (IVT) and intra-arterial thrombolysis (IAT) with plasminogen activators [rt-PA – *recombinant technology plasminogen activators*], hope for this was found as opposed to simply arresting the progression of stroke.⁴ The NINDS (National Institute of Neurological Disorders and Stroke) and ECASS (European Co-operative Acute Stroke Study) did clinical trials and the 2 most significant findings were found contradictorily to be as follows:

1. The outcome of patients after 90 days was much better.
2. The incidence of intra-cerebral haemorrhage was significantly increased. Now the biggest question that arose from this was – do the benefits of IVT and IAT outweigh the risks associated with it?^{5,6}

The basis for the study was instituted on the following trains of thoughts – therapeutic procedures are compared well in controlled settings; however when actually instituted in a mass population, how would a past history of specific drug usage or any associated co-morbidities affect the outcome after therapy?⁷ As IAT and IVT popularised, although the FDA (U.S. Food and Drug Administration) approved IVT was more commonly used, IAT had shown better outcomes. So, how do these procedures both compare to each other individually?⁸ It was also seen, that till date, the process of thrombolysis is still under review to compare the outcome of a patient with the associated risk of intra-cerebral haemorrhage.⁹

MATERIAL & METHODS

The aims of this study were to (1) Create a profile of patients who have undergone IVT, IAT or IVT-IAT bridge therapy in a tertiary care hospital in Mangalore, Karnataka, India, (2) Compare the more commonly used procedure of IVT as opposed to IAT and IVT-IAT bridge therapy with respect to their outcomes (3) Associate a number of factors (e.g. Risk factors, time between stroke and being brought to the hospital etc.) with the outcomes of the patients who have undergone IVT, IAT or IVT-IAT bridge therapy.

The study period was between 1 May 2012 to 31 July 2012, and the study design was a cross-sectional, record based study and retrospective data collection was done. The study was set in a tertiary care centre in Mangalore, Karnataka, India. All cases of acute stroke, treated with Intra-arterial and Intra-venous thrombolysis were the study subjects taken into consideration and the inclusions were: all the patients that: (1) presented with acute stroke, (2) underwent treatment with intra-arterial and intra-venous thrombolysis. The exclusions were all the patients that (1) presented with acute stroke that did not undergo treatment with IAT/IVT as defined by the exclusion criteria for undergoing intra-arterial and intra-venous thrombolysis, (2) had any other forms of intra-cerebral lesions.

The sample size was of 25 patients [All patients with acute stroke that were treated with IVT, IAT or IVT-IAT bridge therapy] and the sampling technique used was non-probability universal sampling (Convenience Sampling). The instrument used to carry out the research was a semi-structured proforma. Data collection was done after obtaining permission from the Institutional Ethics

Committee as well as permission to access the Medical records from the Medical Superintendent. The data obtained was then entered into the proforma (outcome assessment was done using the Modified Rankin Scale – MRS), collated, and data analysis was subsequently performed.

RESULTS

The study on the presentations with acute stroke treated with thrombolysis, were done with respect to 25 cases obtained from procedures carried out at a tertiary care centre in Mangalore, Karnataka, India.

Of the 25 cases, 19 (76.00%) cases were males and 6 (24.00%) cases were females. The mean age of men was seen to be 58 years and that of women was seen to be 57 years. Most cases were brought in to the hospital within the time window of 0-3 hour, one in the 3-4.5 hour time window and one in the 4.5-6 hour time window. The most commonly infarcted territory was the left MCA territory which accounted for 48.00% of the total cases, which was then followed by the right MCA territory which accounted for 20.00% of all the cases. The most common presenting symptom was hemiparesis (64.00% - right sided hemiparesis, 16.00% - left sided hemiparesis). Out of the cases being studied, it can be clearly seen that hypertension is the most significant underlying risk factors, being present in 64.00% of the total cases. 44.00% of people presented with a history of diabetes mellitus, and 36.00% of the cases presented with a history of cardiac disease. Only 8.00% of the cases were smokers, whereas 48.00% were non-smokers. IVT was carried out in 60.00% of the patients whereas IAT was carried out in 32.00% of the patients. IVT-IAT bridging therapy was used in only 8.00% of the cases. Of the outcomes of the cases being studied, 26.09% of all the cases had an MRS score of 6 i.e. dead. The remaining 73.91% show outcomes of an MRS between 0 – 5. 12.00% of the total cases that were treated and had the best possible outcome of MRS 0 underwent IVT. But, 25.00% of all the cases that underwent IAT had an outcome of MRS 0 as opposed to only 20.00% of those that underwent IVT. 26.67% of IVT cases resulted in death (MRS 6), as opposed to 0.00% of IAT cases having an MRS of 6. 100.00% of the bridging therapy using combined IAT and IVT therapy resulted in an MRS score of 6.

DISCUSSION

The finding of a larger number of males as opposed to females was generally unremarkable due to the biased nature of the study, as all cases being treated were considered. However, as pointed out by Arnold M. *et al*¹⁰;

the sex of the patient did not show a significant impact on the outcome of the recanalization rates and outcomes of patients being treated with thrombolysis. It can also be inferred that age group of patients are not specific to the gender of patients. But it is also important to remember that in a community based study, the age might have played an important factor in bringing patients in the right time window (as, perhaps stroke may not be suspected so easily in younger people, and older people may have been less mobile – thus causing both groups to be noticed as well as brought in to the hospital late). But, as shown by Costello CA et al¹¹, age over 80 years was not seen to be associated with an increased haemorrhagic transformation after the thrombolysis of stroke, and so it can be taken in to consideration that outcomes had very little to do with the ages of the patients. The territory of occurrence of stroke was in accordance with the fact that occlusion of the MCA accounts for approximately 90% of all strokes and about two thirds of all first strokes (Table 1).¹² The proportions of the presenting symptomatology and grades of power of the limbs were in accordance with the proportions of the infarcted territories (Table 2). The role of hypertension, diabetes mellitus and cardiac disease were in accordance with the basis of the pathophysiology of a stroke⁴ Although a very small proportion of cases were seen to be smokers, the detrimental effects of smoking are very well known in the pathophysiology of many diseases, and so no conclusive statement can be drawn (Tables 3 and 4). IVT was seen to be the commonly used treatment modality than IAT – which remains in accordance with the norm.¹³ No formally defined cut-off score on the MRS exists to allow a distinction between a good and a bad outcome and hence only a very subjective statement can be made about the demarcation (Table 5).

The cases being studied adhere along the norms of the guidelines for thrombolysis therapy, and no major anomalies or deviations of the basic characteristics of the patients were seen that would cause or require a major amendment to the remainder of the factors being studied and associated. A higher overall proportion of IVT having an MRS of 0 was probably attributed to the fact that generally was a larger number of cases that underwent IVT. The scale however does substantiate in favour IAT over IVT, as when looked at individually, IAT yielded a higher number of outcomes of an MRS 0, and follows through with the same statement for an MRS of 1, 2 and 3. The sole discrepancy could be made when there were more cases of IVT with an MRS of 4 and 5. But, the scale skews to prefer IAT once again when no cases of IAT were seen to result in an MRS of 6 (Table 5). IAT generally resulted in a much better outcome than the procedure of IVT, despite being less commonly and more judiciously used, as supported by Zhang B et al¹² study concluding that IAT was more effective

Table 1: Basic characteristics of patients who presented with acute stroke and underwent thrombolysis

| Characteristics | Total cases | % out of total cases | Males | % males | Females | % females |
|--------------------|-------------|----------------------|-------|---------|---------|-----------|
| Total cases | 25 | 100.00 | 19 | 76.00 | 6 | 24.00 |
| Age | | | | | | |
| 40-49 | 6 | 24.00 | 4 | 66.67 | 2 | 33.33 |
| 50-59 | 8 | 32.00 | 6 | 75.00 | 2 | 25.00 |
| 60-69 | 7 | 28.00 | 6 | 85.71 | 1 | 14.29 |
| 70-79 | 4 | 16.00 | 3 | 75.00 | 1 | 25.00 |
| Time window | | | | | | |
| 0-3 | 19 | 76.00 | 15 | 78.95 | 4 | 21.05 |
| 3-4.5 | 5 | 20.00 | 3 | 60.00 | 2 | 40.00 |
| 4.5-6 | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Infarct Territory | | | | | | |
| Right MCA | 5 | 20.00 | 4 | 80.00 | 1 | 20.00 |
| Left MCA | 12 | 48.00 | 10 | 83.33 | 2 | 16.67 |
| Right ACA | 1 | 4.00 | 0 | 0.00 | 1 | 100.00 |
| Left ACA | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Left PCA | 2 | 8.00 | 1 | 50.00 | 1 | 50.00 |
| Pontine | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Left PCA & MCA | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Left MCA, ACA, PCA | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Left & Right ICA | 1 | 4.00 | 0 | 0.00 | 1 | 100.00 |

Table 2: Presenting symptoms and presenting power of patients who presented with acute stroke and underwent thrombolysis

| Characteristics | Total cases | % of total cases | Males | % males | Females | % females |
|-----------------------------|-------------|------------------|-------|---------|---------|-----------|
| Symptoms | | | | | | |
| Right hemiparesis | 16 | 64.00 | 12 | 75.00 | 4 | 25.00 |
| Right hemiplegia | 3 | 12.00 | 3 | 100.00 | 0 | 0.00 |
| Left hemiparesis | 4 | 16.00 | 3 | 75.00 | 1 | 25.00 |
| Left hemiplegia | 3 | 12.00 | 2 | 66.67 | 1 | 33.33 |
| Aphasia | 12 | 48.00 | 9 | 75.00 | 3 | 25.00 |
| Right homonymous hemianopia | 3 | 12.00 | 2 | 66.67 | 1 | 33.33 |
| Left homonymous hemianopia | 0 | 0.00 | - | - | - | - |
| Facial palsy | 2 | 8.00 | 1 | 50.00 | 1 | 50.00 |
| Sweating | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Vomiting | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Presenting power | | | | | | |
| Right side | | | | | | |
| 0 | 8 | 32.00 | 6 | 75.00 | 2 | 25.00 |
| 1 | 0 | 0.00 | - | - | - | - |
| 2 | 5 | 20.00 | 4 | 80.00 | 1 | 20.00 |
| 3 | 4 | 16.00 | 3 | 75.00 | 1 | 25.00 |
| 4 | 2 | 8.00 | 1 | 50.00 | 1 | 50.00 |
| 5 | 2 | 8.00 | 2 | 100.00 | 0 | 0.00 |
| Left side | | | | | | |
| 0 | 3 | 12.00 | 2 | 66.67 | 1 | 33.33 |
| 1 | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| 2 | 0 | 0.00 | 0 | - | 0 | - |
| 3 | 0 | 0.00 | 0 | - | 0 | - |
| 4 | 0 | 0.00 | 0 | - | 0 | - |
| 5 | 17 | 68.00 | 13 | 76.47 | 4 | 23.53 |

Table 3: Presence of risk factors & relevant history in patients who presented with acute stroke and underwent thrombolysis

| Characteristics | Total cases | % of total cases | Males | % males | Females | % females |
|----------------------------|-------------|------------------|-------|---------|---------|-----------|
| Risk factors | | | | | | |
| Hypertension | 16 | 64.00 | 12 | 75.00 | 4 | 25.00 |
| Diabetes mellitus | 11 | 44.00 | 9 | 81.82 | 2 | 18.18 |
| Cardiac disease | 9 | 36.00 | 8 | 88.89 | 1 | 11.11 |
| Obesity | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 |
| Smoker | 2 | 8.00 | 2 | 100.00 | 0 | 0.00 |
| Raised haematocrit | 1 | 4.00 | 0 | 0.00 | 1 | 100.00 |
| Blood lipids | 4 | 16.00 | 4 | 100.00 | 0 | 0.00 |
| OCP | 0 | 0.00 | - | - | 0 | 0.00 |
| Past history | | | | | | |
| Family history of stroke | 5 | 20.00 | 3 | 60.00 | 2 | 40.00 |
| Previous episode of stroke | 1 | 4.00 | 1 | 100.00 | 0 | 0.00 |
| Long term therapy | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 |
| Associated treatment | 3 | 12.00 | 2 | 66.67 | 1 | 33.33 |

Table 4: Absence of risk factors & relevant history in patients who presented with acute stroke and underwent thrombolysis

| Characteristics | Total cases | % of total cases | Males | % males | Females | % females |
|----------------------------|-------------|------------------|-------|---------|---------|-----------|
| Risk factors | | | | | | |
| Hypertension | 6 | 24.00 | 5 | 83.33 | 1 | 16.67 |
| Diabetes mellitus | 10 | 40.00 | 8 | 80.00 | 2 | 20.00 |
| Cardiac disease | 9 | 36.00 | 6 | 66.67 | 3 | 33.33 |
| Obesity | 9 | 36.00 | 5 | 55.56 | 4 | 44.44 |
| Smoker | 11 | 44.00 | 8 | 72.73 | 3 | 27.27 |
| Raised haematocrit | 7 | 28.00 | 5 | 71.43 | 2 | 28.57 |
| Blood lipids | 6 | 24.00 | 3 | 50.00 | 3 | 50.00 |
| OCP | 0 | 0.00 | - | - | 0 | 0.00 |
| Past history | | | | | | |
| Family history of stroke | 4 | 16.00 | 3 | 75.00 | 1 | 25.00 |
| Previous episode of stroke | 8 | 32.00 | 5 | 62.50 | 3 | 37.50 |
| Long term therapy | 8 | 32.00 | 5 | 62.50 | 3 | 37.50 |
| Associated treatment | 8 | 32.00 | 5 | 62.50 | 3 | 37.50 |

than IVT in allowing patients to achieve independence, (Table 6) alongside the fact that the safety of the procedure of IAT within 6 hours was comparable to the safety of a narrower window period of 4.5 hours in IVT. Looking at the outcomes of patients treated with thrombolysis with respect to the territories of infarction - the definitive implications that can be drawn are that - (a) the territory in which infarction occurs supports the normal trend of IAT

Table 5: Treatment given to, and, outcomes of patients who presented with acute stroke and underwent thrombolysis

| Characteristics | Total cases | % of total cases | Males | % males | Females | % females |
|---------------------|-------------|------------------|-------|---------|---------|-----------|
| Thrombolysis | | | | | | |
| IVT | 15 | 60.00 | 11 | 73.33 | 4 | 26.67 |
| IAT | 8 | 32.00 | 6 | 75.00 | 2 | 25.00 |
| IVT and IAT | 2 | 8.00 | 2 | 100.00 | 0 | 0.00 |
| MRS | | | | | | |
| 0 | 5 | 21.74 | 5 | 100.00 | 0 | 0.00 |
| 1 | 3 | 13.04 | 1 | 33.33 | 2 | 66.67 |
| 2 | 5 | 21.74 | 4 | 80.00 | 1 | 20.00 |
| 3 | 2 | 8.70 | 1 | 50.00 | 1 | 50.00 |
| 4 | 1 | 4.35 | 0 | 0.00 | 1 | 100.00 |
| 5 | 1 | 4.35 | 1 | 100.00 | 0 | 0.00 |
| 6 | 6 | 26.09 | 5 | 83.33 | 1 | 16.67 |

Table 6: Comparison of the outcomes of the treatment of patients who presented with acute stroke and underwent thrombolysis

| | Thrombolysis | | |
|----------------------|--------------|-------|-----------|
| | IVT | IAT | IAT & IVT |
| Total cases | | | |
| No. of cases | 15 | 8 | 2 |
| % of total cases | 60.00 | 32.00 | 8.00 |
| MRS Score | | | |
| 0 | | | |
| No. of cases | 3 | 2 | 0 |
| % of total procedure | 20.00 | 25.00 | 0.00 |
| % of total cases | 12.00 | 8.00 | 0.00 |
| 1 | | | |
| No. of cases | 1 | 2 | 0 |
| % of total procedure | 6.67 | 25.00 | 0.00 |
| % of total cases | 4.00 | 8.00 | 0.00 |
| 2 | | | |
| No. of cases | 3 | 2 | 0 |
| % of total procedure | 20.00 | 25.00 | 0.00 |
| % of total cases | 12.00 | 8.00 | 0.00 |
| 3 | | | |
| No. of cases | 1 | 1 | 0 |
| % of total procedure | 6.67 | 12.50 | 0.00 |
| % of total cases | 4.00 | 4.00 | 0.00 |
| 4 | | | |
| No. of cases | 1 | 0 | 0 |
| % of total procedure | 6.67 | 0.00 | 0.00 |
| % of total Cases | 4.00 | 0.00 | 0.00 |
| 5 | | | |
| No. of cases | 0 | 1 | 0 |
| % of total procedure | 0.00 | 12.50 | 0.00 |
| % of total cases | 0.00 | 4.00 | 0.00 |
| 6 | | | |
| No. of cases | 4 | 0 | 2 |
| % of total procedure | 26.67 | 0.00 | 100.00 |
| % of total cases | 16.00 | 0.00 | 8.00 |
| Unknown | | | |
| No. of cases | 2 | 0 | 0 |
| % of total procedure | 13.33 | 0.00 | 0.00 |
| % of total cases | 8.00 | 0.00 | 0.00 |

Table 7: Association of the infarct territory with the treatment of the presentation of acute stroke and their respective outcomes

| Infarct Territory | Procedure | MRS (number of cases (%)) | | | | | | |
|--------------------|-----------|---------------------------|------------|------------|------------|------------|------------|------------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Right MCA | IVT | 0 (0.00) | 0 (0.00) | 2 (66.67) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (33.33) |
| | IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Left MCA | IVT | 2 (40.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 3 (60.00) |
| | IAT | 2 (50.00) | 2 (50.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 2 (100.00) |
| Right ACA | IVT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Left ACA | IVT | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Left PCA | IVT | 0 (0.00) | 1 (50.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Pontine | IVT | - | - | - | - | - | - | - |
| | IAT | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Left PCA & MCA | IVT | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Left MCA, ACA, PCA | IVT | - | - | - | - | - | - | - |
| | IAT | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Left and Right ICA | IVT | - | - | - | - | - | - | - |
| | IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |

Table 8: Association of presenting symptoms with the treatment of the presentation of acute stroke and their respective outcomes

| Symptoms | Procedure | MRS (number of cases (%)) | | | | | | |
|-----------------------------|-----------|---------------------------|------------|-----------|-----------|-----------|------------|------------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Right hemiparesis | IVT | 3 (33.33) | 1 (11.11) | 1 (11.11) | 1 (11.11) | 0 (0.00) | 0 (0.00) | 3 (33.33) |
| | IAT | 1 (20.00) | 2 (40.00) | 1 (20.00) | 1 (20.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| Right hemiplegia | IVT | - | - | - | - | - | - | - |
| | IAT | 1 (50.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| Left hemiparesis | IVT | 0 (0.00) | 0 (0.00) | 1 (25.00) | 0 (0.00) | 1 (25.00) | 0 (0.00) | 2 (50.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Left hemiplegia | IVT | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Aphasia | IVT | 2 (33.33) | 0 (0.00) | 1 (16.67) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 3 (50.00) |
| | IAT | 1 (20.00) | 1 (20.00) | 2 (40.00) | 1 (40.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Right homonymous hemianopia | IVT | 0 (0.00) | 1 (33.33) | 0 (0.00) | 1 (33.33) | 0 (0.00) | 0 (0.00) | 1 (33.33) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Facial palsy | IVT | - | - | - | - | - | - | - |
| | IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Sweating | IVT | - | - | - | - | - | - | - |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| Vomiting | IVT | - | - | - | - | - | - | - |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |

Table 9: Association of presenting power of the right side with the treatment of the presentation of acute stroke and their respective outcomes

| Presenting power (right side) | Procedure | MRS (number of cases (%)) | | | | | | |
|-------------------------------|-----------|---------------------------|-----------|------------|-----------|-----------|------------|------------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 0 | IVT | 0 (0.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) | 0 (0.00) |
| | IAT | 0 (0.00) | 1 (33.33) | 2 (66.67) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 2 (100.00) |
| 1 | IVT | - | - | - | - | - | - | - |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| 2 | IVT | 1 (50.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | 1 (33.33) | 1 (33.33) | 0 (0.00) | 1 (33.33) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| 3 | IVT | 2 (66.67) | 1 (33.33) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| 4 | IVT | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| 5 | IVT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |

Table 10: Association of presenting power of the left side with the treatment of the presentation of acute stroke and their respective outcomes

| Presenting power (left side) | Procedure | MRS (number of cases (%)) | | | | | | |
|------------------------------|-----------|---------------------------|-----------|-----------|-----------|-----------|------------|------------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 0 | IVT | 0 (0.00) | 0 (0.00) | 1 (50.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (50.00) |
| | IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| 1 | IVT | - | - | - | - | - | - | - |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| 2 | IVT | - | - | - | - | - | - | - |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| 3 | IVT | - | - | - | - | - | - | - |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| 4 | IVT | - | - | - | - | - | - | - |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| 5 | IVT | 3 (42.86) | 1 (14.29) | 2 (28.57) | 0 (0.00) | 1 (14.29) | 0 (0.00) | 0 (0.00) |
| | IAT | 2 (28.57) | 2 (28.57) | 2 (28.57) | 1 (14.29) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 2 (100.00) |

generally giving a better outcome than IVT, (b) that IVT is the more common mode of treatment, however at the same time it not only gives a good outcome, but also supports the fact that contradictorily, the risks of death is equally large, and (c) territory of infarction does not seem to greatly affect the outcomes of the specific treatment procedures, as the outcomes as seen are either [i] in case of IVT – either very good or result in death [ii] in case of IAT – MRS was generally around the scores of 1-3, apart from the exception in the right MCA territory, and [iii] bridging therapy resulted in an MRS of 6 for the proportion of cases treated by it (Table 7). Concordant with the above relationship of infarct

territories with the treatment modality employed and their outcomes, the presenting symptoms followed the guidelines placed by the above findings; i.e. the relationships were associated with the normal physiological presentations as determined by the territories of infarct. Patients with aphasia were seen to a good outcome of an MRS of 0, 1, 2 or 3. Aphasia therefore can be highlighted as a key feature to administer thrombolysis – it is not only easy to recognise and therefore report, but also may be further stressed on because of the association of a good prognostic outcome with it. Facial palsy on the other hand yielded in 100% MRS 5, and may be an indicator of a bad prognostic outcome

Table 11: Association of presence of risk factors with the treatment of the presentation of acute stroke and their respective outcomes

| Risk factors | Procedure | MRS (number of cases (%)) | | | | | | |
|--------------------|-----------|---------------------------|------------|------------|-----------|-----------|----------|------------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Hypertension | IVT | 3 (30.00) | 1 (10.00) | 1 (10.00) | 1 (10.00) | 1 (10.00) | 0 (0.00) | 3 (30.00) |
| | IAT | 0 (0.00) | 2 (66.67) | 1 (33.33) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 2 (100.00) |
| Diabetes mellitus | IVT | 2 (28.57) | 0 (0.00) | 0 (0.00) | 1 (14.29) | 1 (14.29) | 0 (0.00) | 3 (42.86) |
| | IAT | 0 (0.00) | 1 (50.00) | 1 (50.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| Cardiac disease | IVT | 1 (25.00) | 0 (0.00) | 1 (25.00) | 1 (25.00) | 0 (0.00) | 0 (0.00) | 1 (25.00) |
| | IAT | 0 (0.00) | 2 (66.67) | 1 (33.33) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| Smoker | IVT | 0 (0.00) | 0 (0.00) | 1 (50.00) | 1 (50.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Raised haematocrit | IVT | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Blood lipid | IVT | 2 (66.67) | 0 (0.00) | 0 (0.00) | 1 (33.33) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |

Table 12: Association of absence of risk factors with the treatment of the presentation of acute stroke and their respective outcomes

| Risk factors | Procedure | MRS (number of cases (%)) | | | | | | |
|--------------------|-----------|---------------------------|-----------|-----------|-----------|-----------|-----------|------------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Hypertension | IVT | 0 (0.00) | 0 (0.00) | 2 (66.67) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (33.33) |
| | IAT | 2 (66.67) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (33.33) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Diabetes mellitus | IVT | 1 (20.00) | 1 (20.00) | 2 (40.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (20.00) |
| | IAT | 2 (50.00) | 0 (0.00) | 1 (25.00) | 0 (0.00) | 0 (0.00) | 1 (25.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| Cardiac disease | IVT | 2 (33.33) | 1 (16.67) | 0 (0.00) | 0 (0.00) | 1 (16.67) | 0 (0.00) | 2 (33.33) |
| | IAT | 2 (66.67) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (33.33) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |
| Obesity | IVT | 3 (33.33) | 1 (11.11) | 1 (11.11) | 1 (11.11) | 1 (11.11) | 0 (0.00) | 2 (22.22) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Smoker | IVT | 3 (33.33) | 1 (11.11) | 1 (11.11) | 0 (0.00) | 1 (11.11) | 0 (0.00) | 3 (33.33) |
| | IAT | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) |
| Raised haematocrit | IVT | 3 (42.86) | 0 (0.00) | 0 (0.00) | 1 (14.29) | 1 (14.29) | 0 (0.00) | 2 (28.57) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Blood lipid | IVT | 1 (16.67) | 1 (16.67) | 0 (0.00) | 0 (0.00) | 1 (16.67) | 0 (0.00) | 3 (50.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |

(Table 8). The distribution of presentations with lower powers on the respective sides of the body were concordant to the side of infarction, and the results, 2 things could be seen – (a) IAT generally gave a better proportion of MRS scores closer to the value of 0. (b) No overly apparent associations of presenting power and outcome were seen, possibly due to the amalgam of symptoms leading to each case having too many variables for the presenting power to show any possible direct correlations with the outcome respective to the treatment (Tables 9 and 10). The presence

of hypertension yielded an almost similar outcome profile of patients in case of IVT therapy both in the presence and absence of this risk factor. No clear correlation can be seen between risk factors with regard to the type of therapy administered and their outcomes. In fact, a better outcome in many cases of patients with associated risk factors may have presented because – maybe their symptoms may have precipitated more obviously and they may also have been under constant watch due to previous warning for possible episodes as such – and hence they may have been brought

Table 13: Association of presence of relevant past history with the treatment of the presentation of acute stroke and their respective outcomes

| Past history | Procedure | MRS (number of cases (%)) | | | | | | |
|----------------------------|-----------|---------------------------|------------|------------|------------|-----------|----------|-----------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Family history of stroke | IVT | 1 (20.00) | 1 (20.00) | 0 (0.00) | 1 (20.00) | 1 (20.00) | 0 (0.00) | 1 (20.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Previous episode of stroke | IVT | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Associated treatment | IVT | 0 (0.00) | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IAT | 0 (0.00) | 1 (100.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | IVT & IAT | - | - | - | - | - | - | - |

Table 14: Association of absence of relevant past history with the treatment of the presentation of acute stroke and their respective outcomes

| Past history | Procedure | MRS (number of cases (%)) | | | | | | |
|----------------------------|-----------|---------------------------|-----------|-----------|-----------|-----------|----------|-----------|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Family history of stroke | IVT | 2 (50.00) | 0 (0.00) | 1 (25.00) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (25.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Previous episode of stroke | IVT | 3 (37.50) | 1 (12.50) | 1 (12.50) | 0 (0.00) | 1 (12.50) | 0 (0.00) | 2 (25.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Long term therapy | IVT | 3 (37.50) | 1 (12.50) | 0 (0.00) | 1 (12.50) | 1 (12.50) | 0 (0.00) | 2 (25.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |
| Associated treatment | IVT | 3 (37.50) | 1 (12.50) | 0 (0.00) | 1 (12.50) | 1 (12.50) | 0 (0.00) | 2 (25.00) |
| | IAT | - | - | - | - | - | - | - |
| | IVT & IAT | - | - | - | - | - | - | - |

to the hospital as soon as the symptom was detected (Tables 11 and 12). Relationships with outcomes could not be conclusively compared with respect to a family history of stroke, long-term therapy with Aspirin/Clopidogrel/Warfarin or treatment of associated co-morbidities, as these were only treated with IVT, and none were treated with IAT (Tables 13 and 14).¹³

The biggest limitation of this study was the bias and non-randomization of the sample. This was primarily difficult to achieve because of the extremely selective nature of the procedure of thrombolysis, as well as the small subset of cases available to be studied. From this also stemmed the fact that there was not a significant enough distribution – between the factors being studied, and the therapeutic procedures of IVT, IAT and bridging therapy – for an apt comparison to be made at many points.

CONCLUSION

To probe more deeply into the subject and now start looking at the therapy with respect to the outcomes: larger test groups, stemming from these risk factors can be studied to show a more conclusive association with stroke and its

presentation in groups undergoing thrombolysis. The biased nature of the sample prevents the study from carrying out a conclusive, statistically significant test and hence only their relative proportional significance can be commented on. Of the other recorded associated co-morbidities and risk factors, it may be worth looking at the outcomes of thrombolysis on patients with HIV; this study cannot make a conclusive statement with reference to the fact that the outcome was of an MRS score 6, as there is only one recorded case. IAT must most definitely be further investigated for the purpose of conventional therapy, and must definitely be considered and further researched and developed for the first line of treatment in acute stroke patients, considering the fact that it almost consistently showed better outcomes individually as a therapeutic modality, as well as with respect to the factors being investigated. Thrombolysis should also be evaluated with respect to how exactly to define a good outcome in patients undertaking it, so a quantitative measurement of whether truly ‘the risks outweigh the benefits can be determined’. The study also shows that specific symptoms such as aphasia and facial palsy showed a correlation of a better and a worse outcome respectively. Hence, they may be evaluated so a prognosis may be determined beforehand, and the therapeutic approach may be developed so as to

achieve better outcomes in these patients and fulfil the purpose of the initial idea behind thrombolytic therapy in patients presenting with acute stroke.

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