



PREDICTORS OF TREATMENT OUTCOMES IN PATIENTS WITH POSTERIOR CIRCULATION STROKES UNDERGOING THROMBECTOMY

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ABSTRACT

The present study was conducted to identify the predictors of successful treatment and outcomes of thrombectomy in patients who underwent posterior circulation strokes. This retrospective study was conducted in the Neurology Department of Teaching Hospital Rawalpindi from February 2024 to February 2025. A total of 100 patients with posterior circulation strokes of any NIH stroke score who underwent primary aspiration or stent retriever thrombectomy were consecutively selected for the study. The selection of the first-line strategy was done based on previous treatment of patients. When distal aspiration was initially performed and the procedure began with at least one attempt of a stent retriever device, the stent retriever approach was opted. However, in cases where aspiration thrombectomy was initially performed alone with a large-bore aspiration catheter, the primary aspiration approach was considered. Results showed that patients with favourable outcomes had a high recanalization rate (97.5 vs 65%) and a shorter window between symptoms onset and treatment (421 ± 343 minutes vs 636 ± 511 minutes, $p=0.022$). Multivariate analysis also indicated an association between good outcome and treatment ($p=0.009$) and recanalization within 6 hours of onset ($p=0.0042$). It is concluded that a favourable clinical outcome of thrombectomy in patients with posterior circulation strokes was significantly associated with initiation of treatment within 6 hours of onset.

Keywords: Strokes, Thrombectomy, Thrombolysis

INTRODUCTION

Recent research focuses on finding the best treatment for acute ischemic strokes comparing endovascular thrombectomy and traditional approaches including IV thrombolysis. Almost all major randomized trials have confirmed the effectiveness of thrombectomy instead of medical treatment alone especially in patients with anterior circulation strokes.^{1, 2} It restores the blood flow promptly and increases the chances of recovery. However, AHA and ASA, although unsure, have also recommended thrombectomy for posterior circulation strokes, within 6 hours of their onset.

In practice, too, posterior circulation stroke patients are treated with endovascular therapy with distal aspiration catheters and stent retrievers, called mechanical thrombectomy, which yields diverse outcomes.^{3, 4} However, the literature regarding its clinical risk factors for successful results and recanalization is scarce as compared to anterior circulation strokes.^{5, 6}

The present study was conducted to identify the predictors of successful treatment and outcomes of thrombectomy in patients who underwent posterior circulation strokes.

METHODOLOGY

A retrospective study was conducted in the Neurology Department of Teaching Hospital Rawalpindi from February 2024 to February 2025. A total of 100 patients with posterior circulation strokes of any NIH stroke score who underwent primary aspiration or stent retriever thrombectomy were consecutively selected for the study. Patients with large brain stem strokes undergoing treatment were excluded.

All patients were examined by CT, MRI or CTA and treated within 24 hours of onset of strokes. Patients' data such as age, gender, NIHSS score at admission, cardiovascular comorbidities, timing of stroke symptoms onset, type of imaging performed and use of IV tPA in the emergency department. Treatment details include the use of a stent retriever or direct aspiration, duration between onset and femoral artery puncture, rescue therapy recanalization time and number of retrieval passes. The selection of the first-line strategy was done based on previous treatment of patients. When distal aspiration was initially performed and the procedure began with at least one attempt of a stent retriever device, the stent retriever approach was opted. However, in cases where aspiration thrombectomy was initially performed alone with a large-bore aspiration catheter, the primary aspiration approach was considered.

The procedure was considered a success if a TIC1 score of 2b or 3 was obtained, showing recanalization. Neurological functionality was assessed 3 months after the procedure by the Rankin scale with a score of 2 or less indicating favourable results. If intracranial haemorrhage was a risk factor for poor NIHSS score, it was considered symptomatic.

All data was statistically analyzed by SAS software. Univariate analysis of continuous data was done by tailed t-tests and for categorical data by Fisher's exact tests or Mann-Whitney U test. All other data was analyzed by multivariate ANOVA. Statistical significance was set at a probability value of less than 0.05.

RESULTS

The mean age of patients was 62.4 years with a mean stroke score of 18.7 ± 7.8 . The procedure was successful in 78 (78%) patients while 6 (6%) experienced intracranial hemorrhage. 30 (30%) patients died during hospital stay. 60 (60%) had poor outcomes and 40 (40%) had good outcomes at follow-up. Demographic variables and location of location did not differ significantly between both groups. Imaging methods did not impact the overall clinical outcomes. The NIH stroke score at admission was lower in patients with favourable outcomes (14.9 ± 7.1) than in patients with poor outcomes (20.6 ± 9.3) ($p=0.0005$). Patients with favourable outcomes had a high recanalization rate (97.5 vs 65%) and a shorter window between symptoms onset and treatment (421 ± 343 minutes vs 636 ± 511 minutes, $p=0.022$).

As the duration increased, the likelihood of good outcomes decreased but the Mann-Whitney U test found this correlation to be statistically insignificant ($p=0.055$) as shown in Table I. However, when only patients with successful recanalization were considered by applying time dichotomy, excluding the impact of recanalization on clinical outcomes, time of procedure and procedural success were significantly correlated ($p=0.018$) (Table II). Multivariate analysis in Table III also indicated an association between good outcomes and treatment ($p=0.009$) and recanalization within 6 hours of onset ($p=0.0042$).

The stent retriever strategy was opted in 59 (59%) patients while 41 (41%) underwent thrombectomy by primary aspiration, half of which were converted to stent procedure. The clinical outcomes, procedure time, recanalization rate and requirement for rescue therapy were not

significantly different between patients of both procedures. A total of 20 patients were administered rescue therapy among which 14 (70%) had successful recanalization, however, the use of rescue therapy was not correlated to poor outcome (Table IV).

Table I: Baseline Demographic Information and Treatment Details (n=100)

	Favorable Outcome (n=40)	Poor Outcome (n=60)	P
Mean age	62.3 ± 14	62.5 ± 13	0.88
NIHSS score at admission	14.9 ± 7.1	20.6 ± 9.3	0.0005
Female gender	15 (37.5%)	18 (30%)	0.70
Atrial fibrillation	12 (30%)	17 (28.4%)	1.0
CAD or MI	16 (40%)	18 (30%)	0.42
Diabetes	12 (30%)	24 (40%)	0.49
Hypertension	30 (75%)	46 (76.7%)	1.0
Dyslipidemia	27 (67.5%)	34 (56.7%)	0.5
Smoking	14 (35%)	18 (30%)	0.6
Site of occlusion			
Top of Basilar artery	18 (45%)	30 (50%)	0.75
Other locations on the basilar artery	16 (40%)	31 (51.7%)	0.4
Posterior cerebral artery	10 (25%)	21 (35%)	0.6
Vertebral artery	7 (17.5%)	14 (23.4%)	0.58
Imaging			
MRI	2 (5%)	6 (10%)	0.20
CT perfusion	28 (70%)	34 (56.7%)	0.33
CTA	34 (85%)	47 (78.4%)	0.39
Treatment data			
General anaesthesia	18 (45%)	42 (70%)	0.048
IV tPA	20 (50%)	15 (25%)	0.015
Stent retriever approach	24 (60%)	35 (58.4%)	0.77
Aspiration approach	16 (40%)	25 (41.6%)	0.77
Rescue therapy	4 (10%)	15 (25%)	0.24
Mean duration between symptom onset and femoral artery puncture	421 ± 343 minutes	636 ± 511 minutes	0.022
0-3 hours	9 (22.5%)	8 (13.4%)	0.055
3-6 hours	16 (40%)	14 (23.4%)	
6-12 hours	7 (17.5%)	18 (30%)	
More than 12 hours	8 (20%)	20 (33.3%)	
Duration of procedure	50 ± 36	51 ± 41	0.91
Outcome			
Successful recanalization	39 (97.5%)	39(65%)	0.0015
Symptomatic intracranial hemorrhage	2 (5%)	4 (6.8%)	0.72

Table II: Predictors of Treatment Outcome in Patients with Successful Recanalization (n=78)

	Favorable Outcome (n=33)	Poor Outcome (n=45)	P
Imaging			
MRI	1 (3.1%)	4 (9%)	0.41
CT perfusion	23 (69.9%)	27 (60%)	0.69
CTA	29 (88%)	34 (75.6%)	0.32
Treatment data			
General anaesthesia	16 (48.5%)	32 (71.2%)	0.071
Duration of procedure	49 ± 29	47 ± 30	0.93
IV tPA	17 (51.6%)	7 (15.6%)	0.0009
Duration from symptom onset to femoral artery puncture			
0-3 hours	8 (24.3%)	4 (9%)	0.018
3-6 hours	14 (42.5%)	10 (22.3%)	
6-12 hours	6 (18.3%)	15 (33.4%)	
More than 12 hours	5 (15.1%)	16 (35.5%)	

Table III: Multivariate Analysis of Predictors of Good Outcome at Follow-Up (n=100)

	Favorable Outcome (n=40)	Poor Outcome (n=60)	P
Older than 80 years	6 (15%)	6 (10%)	0.751
NIHSS greater than 20	10 (25%)	25 (41.7%)	0.090
Treatment within 0-6 hours of onset	26 (65%)	22 (36.7%)	0.009
Procedure longer than 1 hour	10 (25%)	12 (20%)	0.53
Recanalization within 6 hours	22 (55%)	15 (25%)	0.0042
Administration of general anaesthesia	18 (45%)	40 (66.8%)	0.049
Rescue therapy	4 (10%)	15 (25%)	0.193
Successful recanalization	39 (97.6%)	42 (70%)	0.00091

Table IV: Determinants of Successful Recanalization

	Successful recanalization (n=78)	Poor recanalization (n=22)	P
Site of occlusion			
Top of the basilar artery	35 (45%)	11 (50%)	0.78
Basilar artery	39 (50%)	9 (41%)	0.52
Posterior cerebral artery	23 (29.6%)	9 (41%)	0.36
Vertebral artery	16 (20.6%)	4 (18.5%)	0.60
Treatment data			
IV tPA	23 (29.6%)	9 (41%)	0.38
Stent retriever approach	43 (55.2%)	15 (68.5%)	0.56

Aspiration approach	35 (45%)	8 (36.4%)	0.56
Rescue therapy	13 (16.7%)	7 (32%)	0.18
Mean duration between symptom onset and femoral artery puncture			
0-3 hours	13 (16.7%)	4 (18.2%)	0.799
3-6 hours	23 (29.6%)	6 (27.5%)	
6-12 hours	20 (25.7%)	2 (9.1%)	
More than 12 hours	22 (28.2%)	10 (45.4%)	

DISCUSSION

This study was conducted to assess the determinants of outcomes of thrombectomy in patients with posterior circulation strokes. The results showed a significant impact of duration from symptoms onset to treatment on the success of the procedure. The patients who were provided treatment within 6 hours of onset, had a rate of favourable outcome twotimes more than patients who received delayed treatment. The same pattern of outcomes due to treatment and perfusion timings is also reported in anterior circulation strokes.^{7, 8} However, no such impact was seen on recanalization rates. In addition to time from onset to EVT, Lee et al recognized neurological severity, collateral circulation and infarct volume as prognostic variables for enhancing therapeutic efficacy.⁹

The six-hour cut-off is clinically important in our opinion and needs to be studied further in posterior circulation stroke patients undergoing thrombectomy. A systematic review of 10 studies including patients with basilar artery occlusion reported that in most of the studies, this 6-hour window was not observed and treatment was initiated after this time.¹⁰ In our study, 40% of the patients who were administered IV tPA received treatment later than 6 hours. It maybe because endovascular treatment was only started if the tPA failed, which is not recommended for anterior circulation strokes by AHA and ASA as of 2023. A parallel approach of simultaneous initiation of tPA and EVT is the best option to avoid delay.

However, the latest research like clinical trials including ATTENTION and BAOCHE provide strong evidence regarding the preference of EVT especially in patients with basilar artery occlusion even after surpassing the 6-hour window. ATTENTION trial reported the effectiveness of EVT when initiated within 0-24 hours.¹¹ The BAOCHE trial focuses on the thrombectomy within a 6-24 hours window as compared to medical intervention.¹²

Pirson et al had similar results to our study in 264 posterior circulation stroke patients, the majority of which involved the basilar artery. The mortality rate was 43% and 3% of patients experienced intracranial hemorrhage. The success rate was 75%, hence reporting a highly favourable clinical outcome rate despite a high rate of mortality.¹³

Dong et al conducted a systematic review and meta-analysis of 6 studies including 1385 patients with posterior circulation ischemic strokes.¹⁴ They compared the effectiveness of EVT plus standard medical treatment vs the standard medical treatment alone. The concurrent treatment significantly improved the 3-month functional outcome ($p<0.001$), recanalization rates ($p<0.001$) and reduced mortality ($p<0.001$) but posed a higher risk of intracranial hemorrhage ($p=0.001$).

CONCLUSION

A favourable clinical outcome of thrombectomy in patients with posterior circulation strokes was significantly associated with the initiation of treatment within 6 hours of onset.

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