Comparative Study on outcome for Anterior versus Posterior circulation Stroke

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Abstract: _Introduction_: _Among the non - communicable diseases, stroke is the second leading cause of mortality and third leading cause of disability worldwide Therefore, it is important to understand the risk factors and outcomes of stroke and its subtypes to improve the quality of care._ _Aims and objectives_: _The intention of this study is to clinically compare the two types of stroke patients admitted in KGMCH based on the NIHSS score and mRS as well as prediction of prognosis based on the result of these two scales._ _Materials and methods_: _An observational cross – sectional study was conducted by Department of Neurology, KGMC for period of 1year (March2021to March2022). 140 patients of acute is chemicstroke were included in the study. Samples were collected by systematic random sampling. The two types of strokes are compared on the basis of severity and NIHSS score. The clinical features, outcome and prognosis between anterior and posterior circulation stroke group are compared and results are analyzed._ _Results_: _In anterior circulation, hypertension was seen in 73 (91.3%) enrolled patients. In posterior circulation, hypertension was seen in 54 (90.0%) enrolled patients. Association of type of stroke vs hypertension was statistically not significant (p = 0.8008). In anterior circulation, diabetes mellitus was seen in 51 (63.8%) enrolled patients. In posterior circulation, diabetes mellitus was seen in 37 (61.7%) enrolled patients. Association of type of stroke vs diabetes mellitus was statistically not significant (p = 0.8006). In case of anterior circulation, the mean of NIHSS score on day 0 (mean ± SD) of the enrolled patients was 13.9875 ± 4.0362. In posterior circulation, the mean of NIHSS score on day 0 (mean ± SD) of the enrolled patients was 23.8833 ± 4.5737. Difference of mean NIHSS score on day 0 vs type of stroke was seen to be statistically significant (p<0.0001). In anterior circulation, the mean of mRS score (mean ± SD) of enrolled patients on day 5 was 2.1125 ± 0.9936. In posterior circulation, the mean of mRS score (mean ± SD) of enrolled patients on day5 was 4.6333 ± 0.8227. The difference of mean mRS score on day 5 vs type of stroke was found to be statistically significant (p<0.0001)._ _Conclusion_: _Posterior circulation stroke was found to be associated with poorer outcomes compared to anterior circulation stroke. This is supported by higher NIHSS and mRS scores which indicates worse prognosis._

Keywords: Anterior circulation stroke, Posterior circulation stroke, Hypertension, Diabetes mellitus, NIHSS score, mRS score

1. Introduction

According to World Health Organization statistics stroke is the second largest cause of death worldwide killing about 6.7 million people in the year 2012[1]. A leading cause of adult disability and the second leading cause of mortality all over the world[2]. By definition, Anterior circulation strokes are described as strokes which involve areas of brain supplied by the anterior cerebral artery and the middle cerebral artery while posterior circulation strokes are described as strokes involve areas of brain supplied by the vertebrobasilar artery and posterior cerebral artery. Posterior circulation infarcts (PCI) have been generally considered to have a poor outcome with high mortality and morbidity. The comparative functional outcome of patients with posterior versus anterior circulation stroke has been little studied, especially the subset of patients with minor initial deficits. Therefore, it is imperative to compare these two conditions.

Aims and objectives

The intention of this study is to clinically compare the two types of stroke patients admitted in KGMCH based on the NIHSS score and mRS as well as prediction of prognosis based on the result of these two scales.

2. Materials and Methods

An observational cross - sectional study was conducted for 12 months (March 2021–March 2022) in patients above 18 years of age admitted with ischemic stroke in KGMCH. A sample size of 140 patients was taken, samples were collected by systematic random sampling. A patient admitted with stroke (clinical stroke) was evaluated meticulously and scoring was done on the basis of NIHSS score followed by neuro imaging to confirm the nature of stroke Exclusion criteria consisted of: Patients having multiple infarcts, intracranial haemorrhage and presentation within time - window for thrombolysis. The two types of strokes are compared on the basis of severity and NIHSS score. Standard therapy for ischemic strokes is given to the patients. Evaluation of the patient was done based on mRS on day 5 of admission and a prediction of outcome and prognosis was made based on that. Before 5 days of hospital stay, if any patient is found to expire, the mRS of that patient is automatically taken 6 (worst outcome). If before day 5, any patient goes to another healthcare centre or a hospital by signing the risk bond, he is excluded from the study automatically. Outcome definitions and parameters were based on the NIHSS score of all the ischemic stroke patients admitted in KGMCH and thus a severity comparison

between the anterior and posterior circulation strokes was done along with prediction of their prognosis based on mRS. Statistical analysis was performed using SPSS software.

3. Result and Analysis

In anterior circulation, hypertension was seen in 73 (91.3%) enrolled patients. In posterior circulation, hypertension was seen in 54 (90.0%) enrolled patients. Association of type of stroke vs hypertension was statistically not significant (p = 0.8008). In anterior circulation, diabetes mellitus was seen in

51 (63.8%) enrolled patients. In posterior circulation, diabetes mellitus was seen in 37 (61.7%) enrolled patients. Association of type of stroke vs diabetes mellitus was statistically not significant (p = 0.8006). In case of anterior circulation, the mean of NIHSS score on day 0 (mean ± SD) of the enrolled patients was 13.9875 ± 4.0362. In posterior circulation, the mean of NIHSS score on day 0 (mean ± SD) of the enrolled patients was 23.8833 ± 4.5737. Difference of mean NIHSS score on day 0 vs type of stroke was seen to be statistically significant (p<0.0001).

		Number	Mean	SD	Minimum	Maximum	Median	p-value
NIHSS score on day 0	Anterior circulation	80	13.9875	4.0362	4.0000	22.0000	14.0000	<0.0001
	Posterior circulation	60	23.8833	4.5737	12.0000	29.0000	25.0000	
mRS score on day 5	Anterior circulation	80	2.1125	0.9936	1.0000	4.0000	2.0000	<0.0001
	Posterior circulation	60	4.6333	0.8227	3.0000	6.0000	5.0000	

In anterior circulation, the mean of mRS score (mean ± SD) of enrolled patients on day 5 was 2.1125 ± 0.9936. In posterior circulation, the mean of mRS score (mean ± SD) of enrolled patients on day5 was 4.6333 ± 0.8227. The difference of mean mRS score on day 5 vs type of stroke was found to be statistically significant (p<0.0001).

4. Discussion

Considering the NIHSS score on the admission day and the mRS on day 5, there were statistically significant differences when two strokes were compared. The NIHSS score on day 0 was significantly higher in the PCI group when compared to the ACI group. Subsequently, the mRS on day 5 was higher for the PCI group when compared with the ACI group. Thus it was observed from this study that the PCI stroke patients having statistically significant higher scores on both the scales are most likely to have a poorer prognosis than the ACI stroke patients. The TOAST (Trial of ORG 10172 in Acute Stroke Treatment) study compared the ACI vs PCI stroke patients.[3]The study included a sample size of 1, 039 patients with AC stroke and 180 patients with PC stroke. There were fewer women in the PC compared to the AC groups, but otherwise there were no differences in risk factors, demographics or stroke subtypes between the two groups. Headache (PC 15%, AC 8.7%, p = 0.013) and vomiting (PC 17.8%, AC 3.5%, p < 0.001) were more common among PC patients but in these results p value was not statistically significant. Mean baseline NIHSS score was lower (less severe) among PC group (6.1) than AC group (9.5; p < 0.001). This result was differed from the findings obtained in our study where the NIHSS score was significantly higher in PCI group in comparison to the ACI group

In a study published in 2011 in British Medical Journal (BMJ), 312 consecutive patients with ACS for the first time and 93 patients with PCS for the first time were analyzed prospectively.[4] The median NIHSS score in ACS was 8 and in PCS it was 4 (p = 0.004). Brain imaging revealed more often pathological findings in ACS compared to PCS. The proportion of non thrombolyzed patients with a favourable clinical outcome (mRS score 0–2) was similar in ACS and PCS (67.0 vs 78.4%; p = 0.08).[6] In this study though there was a higher NIHSS score in ACI patients compared to the PCI, the mRS of both group of patients were similar. However, both these results were statistically not significant considering the insignificant p values. This result also was different from the result in our study. In our study, NIHSS and mRS scores both were significantly higher in PCI group in comparison to ACI group.

Apart from the studies mentioned above, very few exist which compared these two types of strokes in terms of their outcome and prognosis. All other studies that performed comparison of the ACI and PCI strokes were related to their symptomatology, that is, what symptoms were more common in which group of patients. In a study of patients with brain stem infarction conducted by Kubik and Adams, disturbance of consciousness was considered to be an important feature of PCI.[5] This was followed by studies of patients with specific vertebrobasilar lesions, which included the midbrain, cerebellum and basilar artery occlusive disease separately; the rate of disturbed consciousness was high, frequently 20%.[6 - 9] In a study conducted by Archer and Horenstein, they reported 20 patients with basilar artery occlusion and out of them 19had various impairment of consciousness. While in contrast, Sato et al. reported a much lower rate of disturbed consciousness in patients with PCI compared to ACI (18 vs 41%; p = 0.001).

Out of all the above quoted studies none compared the outcome and prognosis of the conditions; also no comparison was done with respect to the NIHSS and mRS scale.

In our study, by comparing the NIHSS score on admission we can predict the severity as well as comparing the mRS score on day 5 we can predict the outcome and prognosis. The result showed us that both scores were higher in the PCI group than ACI group and so PCI strokes are likely to have a worse outcome compared to ACI stroke patients.

The region in the posterior circulation stroke involves mainly the brainstem and the cerebellum. Edema in these areas can cause compression of brainstem structures including the reticular activating system which may cause more drowsiness and altered sensorium. In the area of brainstem the descending tracts and ascending tracts are compactly arranged in a small area and edema in this area is likely to cause more neuro deficit compared to ACI strokes. This might be the likely explanation of worse outcome and more score in both NIHSS and mRS scales.

5. Conclusion

The study showed that on admission the NIHSS was significantly more in the group of PCI stroke as compared to ACI stroke group. The mRS score in PCI stroke group was significantly higher than the ACI stroke group. While, a higher NIHSS score predicts higher severity ofsymptoms in PCI stroke than ACI stroke. Higher mRS score of PCI stroke patients compared to ACI stroke patients predicts a likelihood of worse outcome and prognosis of PCI stroke patients in comparison to ACI stroke patients.

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