

Post-Stroke Delirium: Prognostic Variability between Anterior Circulation Strokes and Posterior Circulation Strokes "SEEK and DESTROY!"

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ABSTRACT

Background: Delirium is a common complication of stroke. It is not only under-diagnosed but also undertreated. Untreated post-stroke delirium may render permanent damage to the brain and can also considerably increase mortality.

Aim: To observe and compare spontaneous progression and prognosis of post stroke delirium in anterior and posterior circulation strokes.

Method: A total of 37 patients were selected who had been admitted to the hospital through the ER following acute stroke episode and were clinically judged to be having developed delirium. Memorial Delirium Rating Scale (MDRS) was used for delirium assessment and applied on the patients on 2nd and Rating 5th post-admission day.

Result: The comparison of MDRS scores of 2nd and 5th day show that delirium following anterior circulation stroke has a tendency towards spontaneous improvement. Whereas, delirium in patients with posterior circulation stroke did not show significant spontaneous improvement, rather, showed a worsening trend.

Conclusion: It is concluded that active intervention and treatment of post-stroke delirium following posterior circulation stroke is required as it does not have good prognosis and can lead to permanent residual brain damage and increased mortality.

Keywords: MDRS: Memorial Delirium Rating Scale, MCA: Middle Cerebral Artery, PCA: Posterior Cerebral Artery, TBM: Tuberculous Meningitis

INTRODUCTION

Delirium, also referred to as encephalopathy or acute confusional state, is a term used to describe a sudden decline in either brain cognitive function and/or level of consciousness. Attention and concentration are the two brain modalities that are most frequently disturbed¹. Psychomotor activity disturbances are also observed with hyper/hypo kinetic or mixed features.¹ Delirium, despite being life-threatening, has a potential of reversibility, although, recent advance in research indicate that delirium can render some permanent damage to the brain at a sub-clinical level that can lead to dementia and long term mortality.² Delirium can be complicated by many medical conditions like chronic renal or hepatic disease, metabolic abnormalities, neurological diseases etc but it is most commonly observed after acute brain ischemia or hemorrhage. Following a stroke, Delirium usually develops quite quickly and can be recognized and calibrated using the available delirium rating scales like Memorial Delirium Rating Scale (MDRS), Confusion

Assessment Method (CAM), Delirium Rating Scale(DRS) etc but there is still no consensus over the preference hierarchy of these tools³. Memorial Delirium Rating Scale calibrates the severity of delirium on range of 0 to 30; a cut-off value of 13 is used to determine the presence or absence of delirium⁴. Evidence suggests that abnormalities in levels and functioning of neurotransmitters like acetylcholine, dopamine, serotonin, glutamate, GABA are implicated in delirium states.¹ The Hypo-kinetic subtype of delirium is less frequently diagnosed by physicians and thus usually goes untreated. Untreated delirium states increase the mortality rates in patients with co-morbid medical conditions¹.

The **posterior cerebral circulation** (or simply, **posterior circulation**) is the blood supply to the posterior portion of the brain, including the occipital lobes, cerebellum and brainstem⁵. The posterior circulation is supplied by the vertebral arteries that combine to form the basilar artery which then divides into the posterior cerebral arteries⁵.

The **anterior circulation** of the brain consists mainly of anterior cerebral artery, middle cerebral arteries and anterior choroidal artery⁶.

The anterior cerebral artery (ACA) supplies the whole of the medial surfaces of the frontal and

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parietal lobes, the anterior four fifths of the corpus callosum, the frontobasal cerebral cortex, the anterior diencephalon, and the deep structures⁶. The anterior choroidal artery supplies the lateral thalamus and posterior limb of the internal capsule⁶.

The middle cerebral artery (MCA) is the largest of the intracerebral vessels and supplies through its pial branches almost the entire convex surface of the brain, including the lateral frontal, parietal, and temporal lobes; insula; claustrum; and extreme capsule. The lenticulostriate branches of the MCA supply the basal ganglia, including the caput nuclei caudati, the putamen, the lateral parts of the internal and external capsules, and sometimes the extreme capsule⁷.

The aim of the study is to observe and compare spontaneous progression and prognosis of post stroke delirium in anterior and posterior circulation strokes

METHOD

A total of 37 patients were selected who had been admitted to the hospital through the ER following acute stroke episode and were clinically judged to be having developed delirium. There was no distinction of age or sex in the inclusion criteria. Data collected included type of stroke (hemorrhage/ischemia), risk factors including hypertension, diabetes and Tuberculous Meningitis (TBM), circulation (anterior/posterior) and lobe affected. Memorial Delirium Rating Scale (MDRS) was used for delirium

assessment and applied on the patients on 2nd and Rating 5th post-admission day. All the patients in the group didn't receive any medication for their delirious state during their stay.

Null hypothesis made was as follows:

"Delirium in patients with posterior circulation stroke show less spontaneous improvement than delirium in patients with anterior circulation stroke".

Data collected was analyzed statistically using SPSS and required frequencies and ratios were calculated in order to validate the hypothesis.

RESULTS

The SPSS Analysis confirms the hypothesis to be true since there is significance seen in the T-test Analysis that the anterior stroke patients progress better on the Memorial Delirium Rating Scale as compared to posterior stroke with total 0.0002 level of significance that is less than .05 which is minimum level of significance for the hypothesis to be approved. The mean MDRS score for patients with anterior circulation stroke was 23.23 on day 2 and 14.07 on day 5.

The prognosis of posterior stroke patients is seen poor and shows worsening on the Memorial Delirium Rating scale as compared to anterior stroke patients as the level of significance was 0.118 which is greater than the minimum level of significance of 0.05. The mean MDRS score for patients with posterior circulation stroke was 26.18 on day 2 and 28.91 on day 5.

Fig. 1: Comparison of MDRS mean scores on Day 2 and Day 5 in anterior circulation strokes.

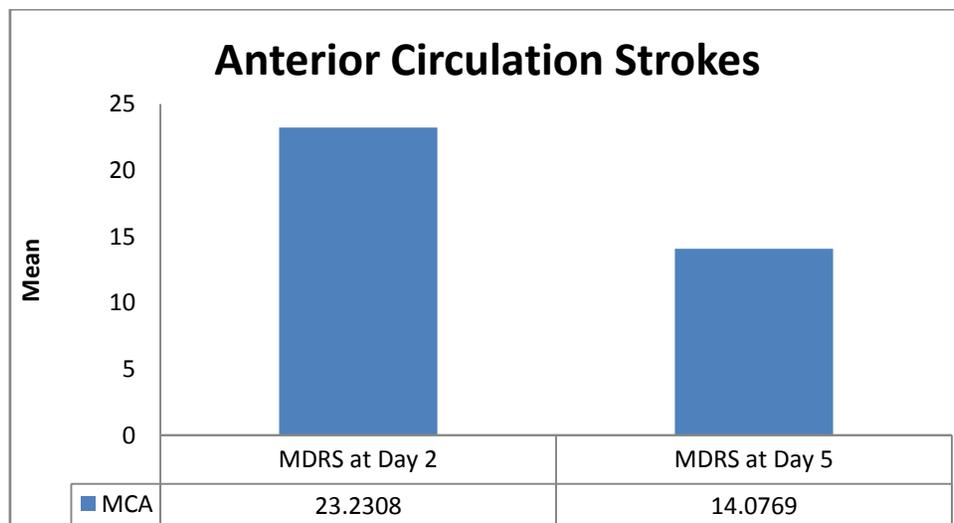
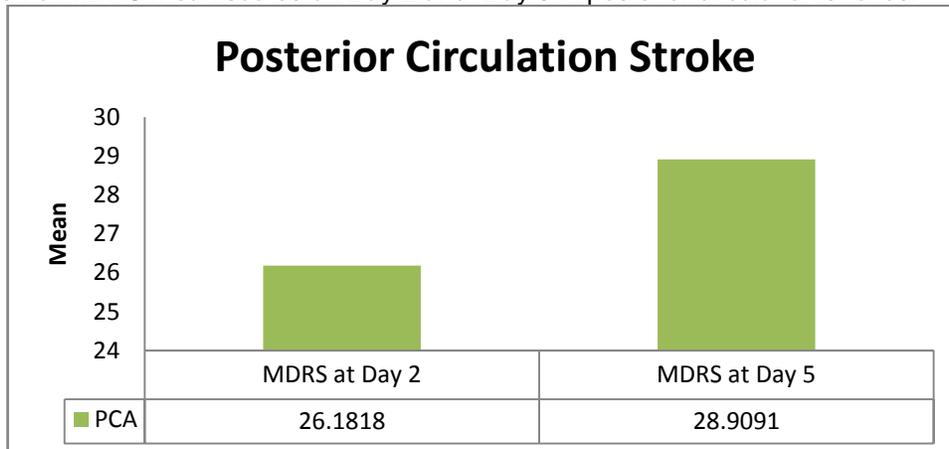


Fig. 2: Comparison of MDRS mean scores on Day 2 and Day 5 in posterior circulation strokes.



The further investigations of research are not showing any significant difference on prognosis of delirium on the basis of Age, gender, or type of damaged ISC/ IC probably because of the small sample.

Further Research findings:

1. Hypothesis confirmed as Prognosis of posterior stroke is bad in delirium as compared to anterior stroke.
2. No significant difference between patients having Diabetes and stroke with patients of stroke without Diabetes.
3. No significant difference on the basis of gender and age of patients.
4. The 3 patients in the data with TBM as a risk factor/co-morbidity showed the worst improvement of MDRS scores on 5th post admission days.

CONCLUSION/DISCUSSION

As mentioned above in the introduction, stroke very commonly complicates into a delirious state. Unfortunately, till present, the suspicion index of physicians for early identification and intervention in delirium following cerebro-vascular accidents, remains very low. Even in the identified cases of post stroke delirium, physicians usually adopt a conservative approach, regarding intervention, which can either be because of other co-morbidities in such patients limiting the use of medications indicated for treating delirium or they wait for spontaneous remission of delirious state associated with improving underlying medical condition. As mentioned in the literature review, many studies suggest that symptomatic treatment of post stroke delirium is very important and letting this complication slip by without identification and treatment greatly worsens the prognosis not only in short-term but also in the long

term. Some recent publications are also pointing towards permanent residual damage following clinically resolved delirious state. This study recommends early aggressive symptomatic treatment of post stroke delirium, especially in posterior circulation strokes because as it is noted in the results that delirium complicated in posterior circulation strokes shows much poorer spontaneous improvement and this prolonged delirious state exposes the patients to exponential increase in possible brain damage thereby, worsening the outcome. Anterior circulation strokes are usually caused by atherosclerotic etiologies and thus have a "one time hit" effect e.g clot blockages in middle cerebral artery whereas, posterior circulation strokes commonly involve an underlying encephalitic, vasculitic or some other inflammatory process predisposing a cerebro-vascular accident. Therefore, it can be hypothesized that poor spontaneous recovery from posterior circulation stroke delirium is due to the ongoing underlying inflammatory process present already at the site of lesion. This assumption is further compounded with the observations in this study that the three patients having Tuberculous meningitis as a comorbidity with stroke showed the least improvement on MDRS scores. Further studies are needed to ameliorate our understanding of the different diagnostic, interventional and prognostic dimensions of post stroke delirium.

Conflict of Interest: The authors of the study declare no financial or any other conflict of interest related with the study.

Limitations of the research:

1. This is not a comparative study because number of patients is not balanced/equal.
2. Role of other co-morbidities with stroke in implication and course of post-stroke delirium is not established by this study.

3. Patients were not followed for a longer period of time to assess the full scale of damage due to post-stroke delirium. Moreover, no intervention was done that could calibrate the improvement in short-come and long term outcome.

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