Original Article

Accuracy of Siriraj Stroke Score in Ascertaining the Type of Stroke

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Abstract

Objectives: To determine the accuracy of Siriraj Stroke Score in ascertaining the type of stroke by comparing with findings of Computerized Tomography (CT) scan.

Subjects and Methods: This cross-sectional study was conducted in Medical Department of District Head Quarter (DHQ) Hospital Rawalpindi on patients with clinical diagnosis of stroke. Siriraj Stroke Score was calculated for each case and was classified as suffering from Intracerebral Haemorrhage (ICH) or Hemorrhagic stroke if score was >1, and Cerebral Infarction or ischemic stroke if score value <-1. The stroke type was uncertain if the value is in between -1 and 1. Computerized Tomography (CT) scan brain was done in all patients and was reported by the Radiology Department of District Headquarters Hospital and results were compared with Siriraj Stroke Score.

Results: Our study included 85 patients. The mean age of the patients was 60.11 year ±13.2 SD. 54% (n=46) were males and 46% (n=39) were females. 57.6% (n=49) patients had infarction on the CT scan. 42.4% (n=36) patients had intracerebral bleed on CT scan. Among 49 ischemic strokes on CT scan 63.3% (n=31) were predicted on Siriraj score to have ischemic stroke, 22.4% (n=11) were predicted to have hemorrhagic stroke and 14.3% (n=7) were inconclusive. Whereas, among 36 hemorrhagic strokes on CT scan 72.2% (n=26) were predicted on Siriraj score to have hemorrhagic stroke, 13.9% (n=5) were predicted to have ischemic stroke and 13.9% (n=5) were inconclusive.

Conclusion: Siriraj score is not highly accurate in diagnosing the type of stroke as compared to the CT scan findings.

Key Words: Hemorrhagic stroke, Ischemic stroke, Siriraj Stroke Score, Stroke.

Introduction

Cerebrovascular accident (CVA) or stroke is defined as an acute onset of focal neurological deficit resulting from cerebrovascular disease.¹ It is the third most common cause of death among adults and one of the leading cause of long-term disability and has vast social, financial and personal implications.² Decisions regarding management of stroke require accurate diagnosis of stroke types. Timely diagnosis is especially important in ischemic stroke, because early thrombolytic therapy and anti platelet drugs not only improve the functional outcome but also reduce mortality and recurrent strokes.³ An appropriately timed Computerized Tomography (CT) scan brain helps to differentiate an infarction from a haemorrhage.⁴ However a vast majority of patients do not have access to brain imaging in the third world countries like Pakistan. Therefore the clinical criteria for distinguishing between ischemic and hemorrhagic stroke has been emphasized.⁵ Different scoring systems are used to differentiate clinically between hemorrhagic and ischemic stroke, famous and commonly used are Siriraj Stroke Score (SSS) and Guys Hospital Scoring System.⁶ Some studies conducted in India reported that Siriraj Stroke Score is better than Guy's hospital score to differentiate between stroke types in Indian population. Siriraj Score despite its limitations and lesser reliability compared to CT scan, still has a place

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in practice of Medicine. This is especially pertinent for developing countries where newer diagnostic facilities may not be available except for major cities. In rural setting, there may be none. Hence clinical tool to diagnose and differentiate between ischemic and haemorrhagic stroke still retains its utility. We conducted this study to see the accuracy of Siriraj Stroke Score in our population. The results of this study may be useful in non-specialist institutions in providing empirical therapy and would therefore reduce the morbidity caused by delay in treatment due to non-availability of diagnostic imaging facilities especially in the rural areas of Pakistan.

**Subjects and Methods**

This cross sectional, observational study was conducted at Department of Medicine, District Headquarters Hospital Rawalpindi from April 2011 to October 2011. Sampling was done by Non-probability consecutive sampling. Study included all patients of both genders, >20 years of age presenting with localized neurological weakness of any part of the body persisting for >24 hours with no apparent cause other than impairment of blood supply of the brain. Patients presenting with stroke due to tumor or trauma, history of head injury in the past 6 months, patients on anticoagulants, duration of stroke > 14 days, patients refusing CT scan or consent and repeat or recurrent stroke were not included in the study. Informed written consent was taken from each patient or from relatives where ever relevant. Before conducting the study, ethical approval for the study was taken from Departmental Ethical Committee.

All patients were managed according to standard protocols depending upon the stroke type and condition of the patient. Collection of data and filling up of proformas was done by the researcher personally. Siriraj stroke score was computed for each case and was classified as suffering from intracerebral hemorrhage if score is >1, and cerebral infarction if score <-1. The stroke type was uncertain if the value was in between -1 and 1. CT scan brain was done in all patients and was reported by the radiology department of District Headquarters Hospital. Comparison of Siriraj Stroke Score with CT scan results was the end point of the study.

SPSS (version 13) was used to enter and analyze the data. Mean and Standard Deviation were calculated for quantitative variables like gender, true positives and true negatives.

**Results**

Our study included 85 patients. The mean age of the patients was 60.11 years ±13.2 SD (ranging from 24 to 100 years). Among these 85 patients, 46 (54 %) were males and 39 (46%) were females. The Siriraj score of the patients ranged from –5.5 to 16. The mean Siriraj score of the patients was 1.36±5.1. The mean Siriraj Score of patients with ischemic stroke on CT scan was -1.08±3.27 and the mean Siriraj Score of patients with hemorrhagic stroke on CT scan was 4.68±5.34. Based on Siriraj Stroke Score 42.3% (n=36) were predicted to have ischemic stroke, 43.5% (n=37) were predicted to have hemorrhagic stroke and 14.1% (n=12) had inconclusive results. CT Scan showed that 57.6% (n=49) had ischemic stroke whereas 42.4% (n=36) had hemorrhagic stroke (Table 1).

<table>
<thead>
<tr>
<th>Interpretation on Siriraj score</th>
<th>CT scan</th>
<th>Other Stroke type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconclusively</td>
<td>Ischemic Stroke</td>
<td>Hemorrhagic Stroke</td>
<td></td>
</tr>
<tr>
<td>Ischemic Stroke</td>
<td>7</td>
<td>31</td>
<td>49</td>
</tr>
<tr>
<td>Hemorrhagic Stroke</td>
<td>5</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>36</td>
<td>85</td>
</tr>
</tbody>
</table>

Among 36 Ischemic strokes on Siriraj Score, 86.1% (n=31) had confirmed infarcts on CT scan (True positives). 13.9% (n=5) had hemorrhage on CT scan (False positives).

<table>
<thead>
<tr>
<th>Stroke type</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive predictive value</th>
<th>Negative predictive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic stroke</td>
<td>63.27%</td>
<td>84%</td>
<td>86.11%</td>
<td>59%</td>
</tr>
<tr>
<td>Hemorrhagic stroke</td>
<td>72.22%</td>
<td>74%</td>
<td>70.27%</td>
<td>75.61%</td>
</tr>
</tbody>
</table>

Among 37 Hemorrhagic strokes on Siriraj Score, 70.3% (n=26) had confirmed intracerebral bleed on CT scan (True positives) and 29.7% (n=11) had infarct...
on CT scan (False positives). Among 12 Inconclusive strokes on Siriraj score, 58.3% (n=7) had infarcts on CT scan and 41.7% (n=5) had hemorrhage on CT scan. Conversely, among 49 ischemic strokes on CT scan 63.3% (n=31) were predicted on Siriraj score to have ischemic stroke, 22.4% (n=11) were predicted to have hemorrhagic stroke and 14.3% (n=7) were inconclusive. Whereas, among 36 hemorrhagic strokes on CT scan 72.2% (n=26) were predicted on Siriraj score to have hemorrhagic stroke, 13.9% (n=5) were predicted to have ischemic stroke and 13.9% (n=5) were inconclusive. Siriraj Score therefore correctly predicted the type of stroke in 67.1% (n=57) cases whereas in 18.8% (n=16) cases it was incorrect and in 14.1% (n=12) cases it was inconclusive. Specificity and sensitivity of Siriraj Stroke Score in our study are detailed in Table 2.

**Discussion**

In our study Siriraj Stroke Score was more specific for identification of ischemic stroke with higher specificity and positive predictive value. Sensitivity was more for hemorrhagic stroke with higher negative predictive value as compared to ischemic stroke. Studies conducted to validate the Siriraj Stroke Score had variable results. A Meta-analysis of different studies shows sensitivity for ischemic stroke ranged from 30% to 85% while specificity ranged from 36% to 97%.

Kolapo K et al. in a study conducted in Nigeria showed 71% sensitivity and 63% specificity for ischemic stroke, whereas positive predictive value was 91% for ischemic stroke in their study. Specificity is bit high in our study as compared to this study, but sensitivity and positive predictive value are comparable. Another study conducted by Goswami RP et al. noted 71% sensitivity and 92% specificity for ischemic stroke. A local study conducted by Sherin A et al. showed 78% sensitivity, 90% specificity and positive predictive value of 94.73%. This is what we noted in our study also. Siriraj Stroke Score is not accurate enough to diagnose and start the treatment of ischemic stroke.

Sensitivity and specificity of Siriraj Stroke Score for hemorrhagic stroke is also different in different studies. A study conducted in Glasgow concluded that sensitivity and specificity of Siriraj Stroke Score is 68% and 64% respectively for intracerebral hemorrhage. These Findings are comparable with our results. These findings suggest that it is difficult to rule out hemorrhagic stroke confidently to give thrombolytic therapy or to start anti platelet therapy on the basis of Siriraj Stroke Score. Another study showed sensitivity of 84% and specificity of 89%. Our results are not matching with these findings. Study conducted by Islam SS et al. in Bangladesh also showed very high sensitivity and specificity for hemorrhagic stroke; 90% and 92% respectively. A local study conducted at Ayub Medical College showed sensitivity of only 52% for intracerebral hemorrhage. Another local study showed sensitivity of 68% and specificity of 94%.

Some studies done on validation of SSS proposed that stroke score may be used to distinguish ischemic from haemorrhagic stroke at places where neuroimaging is not available. However, other studies recommend though stroke scores may be helpful in differentiating acute ischemic stroke from acute hemorrhagic stroke, but critical decisions for initiation of therapy cannot be made without neuroimaging.

**Conclusion**

Siriraj score is not highly accurate in diagnosing the type of stroke as compared to the CT scan findings. It is evident from this study that Siriraj Score alone is not sufficient and one has to rely on CT scan that is the confirmatory diagnostic tool in establishing the type of stroke. It is however an expensive test and not easily available in most of the District Headquarters Hospitals in Pakistan, where this scoring system can be used for initial assessment.

**Conflict of Interest**

This study has no conflict of interest as declared by any author.

**References**