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Outcomes and Characteristics of Large Vessel Occlusion Patients in a Multi-Hospital System with National Institute of Health Stroke Scale (NIHSS) ≤ 5 Treated with Endovascular Thrombectomy vs Medical Management

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Background
Since the dawn of endovascular thrombectomy (EVT), interventionists and stroke clinicians have been pushing the boundaries of time (therapeutic window, onset to puncture) and space (lesion location, access to care) to swiftly defuse stroke by extending this safe and efficacious treatment to as wide a population as possible.

With the publication of the 2018 updated acute stroke management guidelines, the American Stroke Association recommended extending the therapeutic window of EVT for ischemic stroke due to large vessel occlusion (LVO) from 6 hours to 24 hours for select patients who present with NIHSS ≥ 6.

The appropriate management of individuals who present with less symptomatic LVO is less certain. Anecdotally, many individuals with low NIHSS who are treated with EVT do well, while many stroke victims with low initial severity who are medically managed may be left with severe stroke-related disability.

Our objective was to retrospectively analyze stroke patients who presented with LVO and low (NIHSS ≤ 5) symptom severity within the Providence system. We were interested in patient characteristics that increased the likelihood of EVT treatment and outcomes of treated vs. untreated patients. Secondary analysis was performed to explore the role that early clinical deterioration may have played in the decision to treat.

Methods

Statistical analysis: Chi-squared, Fisher’s exact, and generalized linear and linear multivariable models were used to compare outcomes between groups.

Adjusted statistics: Multivariable models (length of stay, in-hospital mortality, discharge mRS ≥ 2, discharge to other than home/ARR) were adjusted for age, admission NIHSS, and last known well (LKWT) to account for differences in patient characteristics and admission NIHSS, and last known well time (LKWT) to account for time differences.

The appropriate management of individuals who present with less symptomatic LVO is less certain. Anecdotally, many individuals with low NIHSS who are treated with EVT do well, while many stroke victims with low initial severity who are medically managed may be left with severe stroke-related disability.

Outcome Exclusion Criteria:
- Presenting NIHSS ≤ 5
- Last known well ≥ 24 hours prior to arrival
- Discharged between 1/2014 and 5/2018
- Emergency arrival or transfer, or have M1 MCA or basilar artery lesions.

There were no significant differences in the safety (SICH rate) or efficacy (reperfusion rate of EVT treatment for Providence patients presenting with NIHSS ≤ 5 vs those presenting with NIHSS ≥ 6).

Figure 1: Outcomes of EVT treated vs excluded patients presenting with NIHSS ≤ 5

Treated patients with NIHSS ≤ 5 were younger, had higher admit NIHSS, and were more likely to be transferred.

There were no significant differences in in-hospital mortality or Hospice, discharge other than home or ARF, or discharge mRS ≥ 2.

A significant increase in length of stay was observed for EVT-treated patients. (Not pictured.) Adjusted percent difference (95% CI) = 36.2% (81, 64.3); p<0.012.

Figure 2: Secondary Analysis: Early clinical deterioration among LVO patients who present with NIHSS ≤ 5

Among the treated patients for whom a repeat NIHSS was performed prior to thrombectomy (n=37), there was significant early clinical deterioration prior to decision to treat (figure 2) is particularly important reminder of this bias.

Thus, we recommend the reader interpret with caution any outcome comparisons made here between treated and medically managed patients with low NIHSS.

Table 1: Patient Characteristics

<table>
<thead>
<tr>
<th>Group</th>
<th>Presenting NIHSS ≤ 5</th>
<th>Excluded from treatment for NIHSS ≥ 5</th>
<th>EVT Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Presenting</td>
<td>Presenting</td>
<td>EVT Treated</td>
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<tr>
<td>B</td>
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Table 2: Outcomes of EVT treated patients presenting with NIHSS ≤ 5 vs NIHSS ≥ 6

There were no significant differences in rate of reperfusion or symptomatic ICH (sICH) between groups.

Table 3: Outcomes of EVT treated patients presenting with NIHSS ≤ 5 vs NIHSS ≥ 6

There were no significant differences in the safety (SICH rate) or efficacy (reperfusion rate) of EVT treatment for Providence patients presenting with NIHSS ≤ 5 vs those presenting with NIHSS ≥ 6.

Although the length of stay for low NIHSS patients treated with EVT was longer than for those who were medically managed, there was no significant difference in complications or unfavorable outcomes between the two groups.

Careful patient selection may play an important role in these outcomes—Providence interventionists have tended to treat patients who are younger, more symptomatic, arrive by transfer, or have M1 MCA or basilar artery lesions.

Early clinical deterioration was a significant factor among patients for whom a repeat NIHSS was recorded prior to EVT treatment.

Limitations
This was a non-randomized, retrospective analysis. As such, we acknowledge the fact that our populations are unlikely to have had equivalent baseline characteristics, and have been inherently biased by the decision-making of each interventionist. Significant early clinical deterioration prior to decision to treat (figure 2) is particularly important reminder of this bias. Thus, we recommend the reader interpret with caution any outcome comparisons made here between treated and medically managed patients with low NIHSS.

Conclusions
Our analysis of Providence Health System stroke patient data supports the use of endovascular thrombectomy to treat ischemic stroke due to large vessel occlusion for select patients with low symptom severity (NIHSS ≤ 5).

Although the length of stay for low NIHSS patients treated with EVT was longer than for those who were medically managed, there was no significant difference in complications or unfavorable outcomes between the two groups.

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