Endovascular Treatment Compared With Medical Treatment in Patients with Acute Ischemic Stroke: A meta-analysis of 1742 patients

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Professor of Neurology, Neurosurgery, and Radiology
President, International Society of Interventional Neurology

Morad Chughtai MD, Ahmed A. Malik MD

Zeenat Qureshi Stroke Institutes, and Centracare Health, St. Cloud, Minnesota, USA
Endovascular treatment for acute ischemic stroke has been identified as an integral item for comprehensive stroke centers and recommended in several guidelines.

Randomized trials have evaluated the comparative efficacy of endovascular treatment with medical treatment including intravenous thrombolysis; however, definitive evidence is lacking due to varying results.
Methodology

MEDLINE, PubMed, and Cochrane databases was supplemented by a review of bibliographies of relevant articles and personal files (2000-2015)

KEY WORDS: Endovascular, Interventional, Intraarterial, Acute Ischemic Stroke, Randomized, TPA, Thrombectomy, Stroke

Results not presented

Non randomized trials

8 articles included
## Summary of trials included

<table>
<thead>
<tr>
<th>Trial Details</th>
<th>Eligible Patients</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMS III</strong></td>
<td>Broderick et al. 2013</td>
<td>Eligible patients who had received IV rt-PA within 3 hours after symptom onset</td>
</tr>
<tr>
<td><strong>SYNTHESIS PLOT</strong></td>
<td>Ciccone et al. 2010</td>
<td>Patients within 4.5 hours after symptom onset with NIHSS score of ≥10 (8-9 with documented occlusion)</td>
</tr>
<tr>
<td><strong>SYNTHESIS EXPANSION</strong></td>
<td>Ciccone et al. 2013</td>
<td>Patients within 4.5 hours after symptom onset</td>
</tr>
<tr>
<td>Sen et al. 2009</td>
<td></td>
<td>Patients within 3 hours after symptom onset with major vessel occlusion</td>
</tr>
</tbody>
</table>
# Summary of trials included

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients eligibility</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ducrocq et al. 2005</td>
<td>Patients within 6 hours after symptom onset</td>
<td>Endovascular Rx, IV rt-PA only</td>
</tr>
<tr>
<td>Keris et al. 2001</td>
<td>Patients within 6 hours after symptom onset</td>
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</tr>
<tr>
<td>MR-RESCUE Kidwell et al. 2013</td>
<td>Patients with large-vessel, anterior-circulation occlusion within 8 hours after symptom onset, stratified by presence of favorable penumbral pattern</td>
<td>Endovascular Rx, Standard Rx (30% IV rt-PA)</td>
</tr>
<tr>
<td>MR CLEAN Berkhemer et al. 2015</td>
<td>Patients within 6 hours after symptom onset</td>
<td>Endovascular Rx, Standard Rx (90% IV rt-PA)</td>
</tr>
</tbody>
</table>
### Summary of trials included

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients within 6 hours after symptom onset</th>
<th>Presence of favorable penumbral pattern</th>
<th>Treatment</th>
</tr>
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<td>Ducrocq et al. 2005</td>
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</tbody>
</table>

- **Endovascular treatment in the era of mechanical thrombectomy.**
- **IV rt-PA administered to eligible patients randomized to medical Rx.**
**Statistical analysis**

<table>
<thead>
<tr>
<th>Endovascular treatment (± IV rt-PA)</th>
<th>Medical treatment (± IV rt-PA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>946</td>
<td>796</td>
</tr>
</tbody>
</table>

- **Software:** Comprehensive Meta Analysis (Biostat, Englewood, NJ)
- **Fixed effects model**
- **Randoms effect model (sensitivity analysis)**

**Endpoints**
- Favorable outcome: modified Rankin scale \([mRS \, 0-2]\) at 3 months
- Survival at 3 months
- Symptomatic intracerebral hemorrhage
Favorable outcome: modified Rankin scale [mRS 0-2] at 3 months (N analyzed=1690)

<table>
<thead>
<tr>
<th>Model</th>
<th>Study Name</th>
<th>Odds Ratio</th>
<th>Lower limit</th>
<th>Upper limit</th>
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<tr>
<td></td>
<td>Broderick et al 2013</td>
<td>1.107</td>
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<td>0.552</td>
<td>1.266</td>
<td>-0.846</td>
<td>0.397</td>
</tr>
<tr>
<td></td>
<td>Ducrocq et al 2005</td>
<td>2.143</td>
<td>0.436</td>
<td>10.526</td>
<td>0.938</td>
<td>0.348</td>
</tr>
<tr>
<td></td>
<td>Kidwell et al 2013</td>
<td>0.902</td>
<td>0.362</td>
<td>2.247</td>
<td>-0.221</td>
<td>0.825</td>
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<td></td>
<td>Berkhemer et al 2015</td>
<td>2.050</td>
<td>1.361</td>
<td>3.089</td>
<td>3.432</td>
<td>0.001</td>
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<td></td>
<td>Fixed</td>
<td>1.250</td>
<td>1.015</td>
<td>1.540</td>
<td>2.102</td>
<td>0.036</td>
</tr>
</tbody>
</table>

Two studies could not be included:
One used Scandinavian Stroke scale and other uses NIH Stroke scale as outcome measures
Favorable outcome: modified Rankin scale [mRS 0-2] at 3 months (N analyzed=1690)

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**Heterogeneity**

- Q-value (x2)=2.699
- Df=5
- P=0.026
- I-squared=60.628
## Favorable outcome: modified Rankin scale [mRS 0-2] at 3 months (N analyzed=1690)

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<td>3.089</td>
<td>3.432</td>
<td>0.001</td>
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<tr>
<td>Random</td>
<td>1.318</td>
<td>0.892</td>
<td>1.947</td>
<td>1.385</td>
<td>0.166</td>
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## Survival at 3 months (N analyzed=1735)

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<tr>
<td></td>
<td>Broderick et al 2013</td>
<td>1.001</td>
<td>0.674</td>
<td>1.487</td>
<td>0.006</td>
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<tr>
<td></td>
<td>Ciccone et al 2010</td>
<td>0.640</td>
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<td></td>
<td>Ciccone et al 2013</td>
<td>0.658</td>
<td>0.347</td>
<td>1.248</td>
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<td></td>
<td>Ducrocq et al 2005</td>
<td>1.333</td>
<td>0.235</td>
<td>7.556</td>
<td>0.325</td>
<td>0.745</td>
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<tr>
<td></td>
<td>Keris et al 2001*</td>
<td>4.706</td>
<td>0.891</td>
<td>24.864</td>
<td>1.824</td>
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<td></td>
<td>Kidwell et al 2013</td>
<td>1.374</td>
<td>0.567</td>
<td>3.329</td>
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<td>Berkhemer et al 2015</td>
<td>1.065</td>
<td>0.695</td>
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<td><strong>Fixed</strong></td>
<td><strong>1.011</strong></td>
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<td><strong>1.291</strong></td>
<td><strong>0.085</strong></td>
<td><strong>0.933</strong></td>
</tr>
</tbody>
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### Survival at 3 months (N analyzed=1735)

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<td>Berkhemer et al 2015</td>
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</table>

#### Odds ratio and 95% CI

![Odds ratio and 95% CI graph](image-url)
### Symptomatic ICH (N analyzed= 1742)

<table>
<thead>
<tr>
<th>Study Name</th>
<th>Statistics for each study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>Broderick et al 2013</td>
<td>0.525</td>
</tr>
<tr>
<td>Ciccone et al 2010</td>
<td>0.543</td>
</tr>
<tr>
<td>Ciccone et al 2013</td>
<td>1.000</td>
</tr>
<tr>
<td>Sen et al 2009</td>
<td>0.333</td>
</tr>
<tr>
<td>Ducrocq et al 2005</td>
<td>6.304</td>
</tr>
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<td>Keris et al 2001*</td>
<td>0.867</td>
</tr>
<tr>
<td>Kidwell et al 2013</td>
<td>1.279</td>
</tr>
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<td>Berkhemer et al 2015</td>
<td>1.231</td>
</tr>
<tr>
<td>Fixed</td>
<td>0.859</td>
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</table>
Symptomatic ICH (analyzed= 1742)

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Fixed
Random
Issues related to interpretation

- Most endovascular treatments were IV rt-PA followed by endovascular treatment.

- Intent-to-treat principle results in inclusion of patients in endovascular treatment group who did not receive any endovascular treatment.
Conclusions

- The 3-month independent functional status rates in patients treated with endovascular treatment were significantly higher than those treated with medical treatment.

- Approximately 30% higher odds of favorable outcome at 3 months was seen with endovascular treatment in patients treated between 0-8 hours.

- Further studies need to determine if certain patient populations are more likely to benefit with endovascular treatment using pooled data analysis.
Zeenat Qureshi Stroke Institutes 2015

PingAn Hospital, Shijiazhuang, China

St. Cloud, Minnesota, USA

Donka National Hospital, Conakry, Guinea

Thank you
Publication Bias

Begg and Mazumdar rank correlation:
Kendalls S Statistic : 3.000

Kendalls tau without continuity correction:
• Tau: 0.200
• Z-value for tau : 0.56360
• P-value 1-tailed: 0.28651
• P-value 2-tailed: 0.57303

Eggers regression intercept:
Intercept: 0.91114
Standard Error: 1.52076
95% LL 2-tailed: -3.31117
95% LL 2-tailed: 5.1334
I-value: 0.59913
Df: 4.0000
P-value 1-tailed: 0.29068
P-value 2-tailed: 0.58137

Kendalls tau without continuity correction:
• Tau: 0.13333
• Z-value for tau : 0.37573
• P-value 1-tailed: 0.35356
• P-value 2-tailed: 0.70711
Favorable outcome: modified Rankin scale [mRS 0-2] at 3 months—Funnel plot

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Funnel Plot of Standard Error by Log odds ratio

Medical

Endovascular