Middle Meningeal Artery Embolization for Chronic Subdural Hematoma: A Systematic Review and Meta-analysis

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Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.
Introduction

• Incidence of chronic subdural hematomas (cSDHs) is 1 to 5.3 cases per 100,000.
• Rate is higher in those > 65 years old ranging from 8.2 to 18.8 cases per 100,000.
• Burr-hole with surgical drainage is often considered as first-line treatment for patients with cSDH.
• There is no consensus on surgical management for those with refractory or recurrent cSDH.
• Recurrence rate after burr-hole drainage has been reported to be approximately 5 to 10%.
• Middle meningeal artery (MMA) embolization: alternative, minimally-invasive treatment to burr-hole surgery for cSDH, either as an upfront intervention or an adjuvant to surgical evacuation.
• The aim of this systematic review and meta-analysis is to review reported data on outcomes of MMA embolization for chronic subdural hematoma.
A systematic review was performed using PubMed, Embase, Oxford journal, Cochrane and Google Scholar.

Studies published in English comprising cSDH patients treated with MMA embolization were included.

Outcomes included rates of cSDH recurrence, surgical rescue, and complications.

A meta-analysis comparing MMA embolization versus conventional treatment was performed.
Results

- **Demographics:** Mean age of conventional group was 67.5 ± 12.9 compared to 71.3 ± 11.2 in MMA group (p = 0.0005).
- **Comorbidities:** MMA group has higher incidence of liver dysfunction (10.3%, p=0.0067), heart disease (22.2%, p=0.0003), renal disease (7.2%, p=0.0009), VP shunt (14.8%, p=<0.0001), brain atrophy (33.6%, p=0.0416), and antiplatelet/anticoagulation (48.7%, p=<0.0001).
- **cSDH characteristic:** Conventional group had higher percentage of patients with stage 1 (homogenous or laminar) (69.9% vs 48.9%, p = 0.0002) while MMA group had higher percentage of patients with stage 2 or 3 (separated or trabecular) (57.6% vs. 30.3%, p < 0.0001)
11 studies, which yielded 204 treated with MMA embolization and 502 patients treated with either conservative management or conventional surgery.

Recurrence, surgical rescue, and complications were encountered in 3.4%, 2.9%, and 1.0% of patients treated with MMA embolization, respectively.

Corresponding pooled estimates were 2.5% (95% CI: 0.0–5.3%), 2.1% (95% CI: 0.0–4.9%), and 0.3% (95% CI: 0.0–1.6%), respectively.

### Results

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<tr>
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<th>Recurrence (%)</th>
<th>Surgical Rescue (%)</th>
<th>Complications (%)</th>
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<tbody>
<tr>
<td>MMA</td>
<td>2.5 (0.0 to 5.3)</td>
<td>2.1 (0.0 to 4.9)</td>
<td>0.3 (0.0 to 1.6)</td>
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<td>(11 studies, n = 204)</td>
<td>(11 studies, n = 204)</td>
<td>(11 studies, n=204)</td>
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<tr>
<td>Conventional</td>
<td>27.6 (21.6 to 33.6)</td>
<td>21.7 (3.3 to 40.2)</td>
<td>4.3 (2.0 to 6.6)</td>
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<td>(3 studies, n = 502)</td>
<td>(3 studies, n = 502)</td>
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Three studies were included in meta-analysis, comprising 96 and 502 patients in MMA embolization and conventional groups, respectively.

Rates of recurrence (2.1% vs. 27.7%; OR=0.08 [0.02–0.30], p=0.0002) and surgical rescue (1.0% vs. 19.5%; OR=0.08 [0.02–0.35], p=0.0008) were lower in the MMA embolization group.

Complication rates were comparable between the two groups (2.2% vs. 4.5%; OR=0.51 [0.06–4.25], p = 0.54).
Conclusion

- MMA embolization for cSDH appears to have a reasonable risk to benefit profile, with low recurrence and surgical rescue rates.
- Compared to surgical drainage of cSDH, MMA embolization is associated with a lower recurrence rate and lesser need for surgical rescue with comparable complication rates.
- Additional prospective studies and randomized controlled trials are necessary to validate the role of MMA embolization in the management of cSDH.

Thank you