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Perioperative Complications and Long-term Outcomes Associated with Direct, Indirect, and Combined Revascularization Approaches for Treating Adult Patients with Moyamoya Disease – A Systematic Review and Meta-analysis

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Introduction

We compare direct, indirect and combined bypass approaches with regard to their rates of perioperative complications, and long term outcomes in treating adults with moyamoya disease (MD).

Methods

Relevant studies were identified via exhaustive search . Data regarding rates of preoperative hemorrhage and ischemia, long -term hemorrhage and ischemia, and rates of favorable clinical outcomes were extracted. We then performed both meta- and pooled analyses on all five outcome measures among three bypass approaches. Odd ratio and 95% confidence interval were computed for each comparison.

Results

Forty-seven studies met our inclusion criteria. Eight were classified as 1 and 2 with regard to their level of evidence. Our meta-analysis showed there is no statistical difference in rates of perioperative hemorrhage or ischemia among three surgical bypass approaches. The pooled analysis however showed that indirect bypass carried lower risk for perioperative hemorrhage than direct (OR 0.03, 95% CI 0.002 – 0.5, p = 0.02) and combined (OR 0.03, 95% CI 0.002 – 0.5, p = 0.02) bypass procedures. The meta-analysis showed that the direct revascularization is better at preventing long-term hemorrhage than the indirect method (OR 0.3, 95 CI 0.1-0.8, $p < 0.05$). The pooled analysis showed that direct bypass is better than indirect (OR 0.4, 95% CI 0.2-0.6, $p < 0.01$) and combined (OR 0.5, 95% CI 0.3-0.9, p = 0.01) bypasses in preventing long-term ischemia. Finally, the meta-analysis showed that direct was better than indirect bypass in producing long-term favorable outcomes (OR 2.6, 95% CI 1.2-5.8, $p < 0.05$).

Conclusions

Our analyses suggest that, when treating adult patients with MD, the direct revascularization should always be attempted because it is likely to confer better outcomes than the indirect approach alone despite that direct anastomosis might lead to higher risk of perioperative hemorrhage.

Learning Objectives

The best treatment for patients affected by Moyamoya disease (MD) is surgical revascularization. There are several modalities of revascularization that can be divided into direct, indirect or combined approaches. At present, it is unclear which is the best approach for treating adult patients with moyamoya disease. This study is conducted to help elucidate the best revascularization approach for adult patient with this disease,

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