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Comparison of stent versus medical therapy for symptomatic patients with intracranial atherosclerotic stenosis: A meta-analysis

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ABSTRACT

Purpose: To compare the outcomes of intracranial stent implantation and medical therapy for treatment of severe intracranial stenosis.
Methods: Articles were identified from Medline, Cochrane, EMBASE, and Google Scholar published up to August 25, 2016. Eligible studies reported stroke occurrence, transient ischemic attack (TIA), and event-free survival rates in patients who suffered recent TIA or stroke caused by stenosis of a major intracranial artery and treated with either medical therapy or stenting. 4 studies enrolled a total 739 patients.
Results: While no association between intracranial endovascular therapy and short-term stroke risk was found (pooled OR = 1.349, 95% CI = 0.541 to 3.367, $P = 0.521$), significantly higher rate of stroke occurrence was observed in patients treated with stent therapy within 30 days of treatment (pooled OR = 3.143, 95% CI = 1.755 to 5.628, $P < 0.001$). No association was found between the type of treatment and TIA occurrence (pooled OR = 0.702, 95% CI = 0.277 to 1.781, $P = 0.457$) and event-free survival rate (pooled HR = 1.170, 95% CI = 0.947 to 1.447, $P = 0.145$).
Conclusion: Patients with symptomatic intracranial atherosclerotic stenosis undergoing stent therapy may have higher risk of short-term stroke.

1. Introduction

Atherosclerotic stenosis of the major intracranial arteries is the most common cause of stroke worldwide [1]. It is prevalent among African, Asian, and Hispanic populations, and is a cause of 30% to 50% of strokes in Asia and 8% to 10% of strokes in North America [2]. Intracranial atherosclerotic stenosis can be clinically asymptomatic or can be associated with neurological symptoms [3]. Patients with asymptomatic atherosclerotic stenosis have relatively low risk of stroke [4]. With symptomatic stenosis, however, the risk of repeat stroke may be higher than 20%, especially with 70% or higher luminal narrowing [5,6]. Treatment options for intracranial stenosis are limited, and include antiplatelet and antithrombotic agents. However, the safety and efficacy of antithrombotics in the treatment of intracranial atherosclerotic lesions is debatable [6,7]. Furthermore, despite aggressive medical therapy, a large percentage of patients suffer recurrent stroke soon after the initial event [8].

Angioplasty with stenting was developed as therapeutic option for treatment of symptomatic intracranial stenosis over the past few decades as alternative or complement to medical therapy [9]. Later, advances in microcatheter and balloon technology lead to development of the Wingspan™ stent system with Gateway™ percutaneous transluminal angioplasty balloon catheter that was approved by the Food and Drug Administration in 2005 for patients with symptomatic, severe intracranial atherosclerotic stenosis who have failed medical management with antiplatelet therapy [10]. The results of the first randomized controlled trial of Stenting versus Aggressive Medical Management for Preventing Recurrent stroke in Intracranial arterial Stenosis (SAMMPRIS) were disappointing: the 30-day stroke risk with percutaneous transluminal angioplasty and stenting was approximately twice as high compared to previous trials [11,12], while the 30-day stroke risk under medical treatment alone was approximately half of that seen in the Warfarin and Aspirin for Symptomatic Intracranial Stenosis study (WASID) [6]. Besides, patients in both treatment groups surviving the first 30 days were at the same risk of subsequent stroke [12]. Despite the negative results of the SAMMPRIS trial, stenting continues to be used and has shown promising results in patients with symptomatic severe stenosis of the internal carotid artery or middle cerebral artery in later trials [13,14].

Abbreviations: TIA, (transient ischemic attack); FDA, (Food and Drug Administration); SAMMPRIS, (Stenting versus Aggressive Medical Management for Preventing Recurrent stroke in Intracranial arterial Stenosis); WASID, (Warfarin and Aspirin for Symptomatic Intracranial Stenosis study); QUIPS, (Quality In Prognosis Studies tool); OR, (Odds ratio); HR, (hazard ratio).

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The aim of the present meta-analysis is to provide an updated review of the safety and effectiveness of intracranial angioplasty with stenting compared to best medical treatment alone for management of intracranial atherosclerosis.

2. Materials and methods

2.1. Search strategy

We followed the PRISMA guidance for systematic reviews of observational and diagnostic studies [15], and searched the published literature using following databases: Medline, Cochrane, EMBASE, Google Scholar up to August 25, 2016, with various combinations of following keywords: intracranial atherosclerotic stenosis, stent, medical therapy. In addition, we manually searched references in relevant publications to identify additional eligible trials. Specifically, we included randomized controlled trials (RCTs), prospective and retrospective studies that evaluated patients who suffered recent TIA or stroke caused by stenosis of a major intracranial artery and treated with either medical therapy or stenting. Cohort studies, letters, comments, editorials, case report, proceeding, personal communication, as well as studies that did not provide quantitative outcome were excluded.

2.2. Study selection and data extraction

Data was extracted independently by two reviewers. A third reviewer was consulted in case of disagreements. We extracted data on study population (number, age, and gender of subjects in each group), study design, and the major outcomes.

2.3. Quality assessment

We assessed the study quality using the Quality In Prognosis Studies tool (QUIPS) [16]. This approach evaluates 6 areas to assess the validity and bias: participation, attrition, prognostic factor measurement, confounding measurement and account, outcome measurement, and analysis and reporting [16]. The quality assessment was performed by two independent reviewers; the third reviewer was consulted if no consensus could be reached.

2.4. Statistical analysis

The primary outcome was the rate of stroke occurrence. Secondary outcomes were rates of transient ischemic attack (TIA) and event-free survival.

Odds ratio (OR) and 95% confidence interval (95% CI) were used as the measure of effect size for stroke and TIA; an OR > 1 indicated that patients in the stent therapy group had greater odds of stroke or TIA than those in the medical treatment group. For event-free survival, hazard ratio (HR) and 95% CI were used as the effect size in the time-to-event analyses [17].

Heterogeneity among the studies was assessed by the Cochran Q and the I^2 statistic. The Q statistic was defined as the weighted sum of the squared deviations of the estimates of all studies; $P < 0.10$ was considered statistically significant for heterogeneity. For the I^2 statistic,

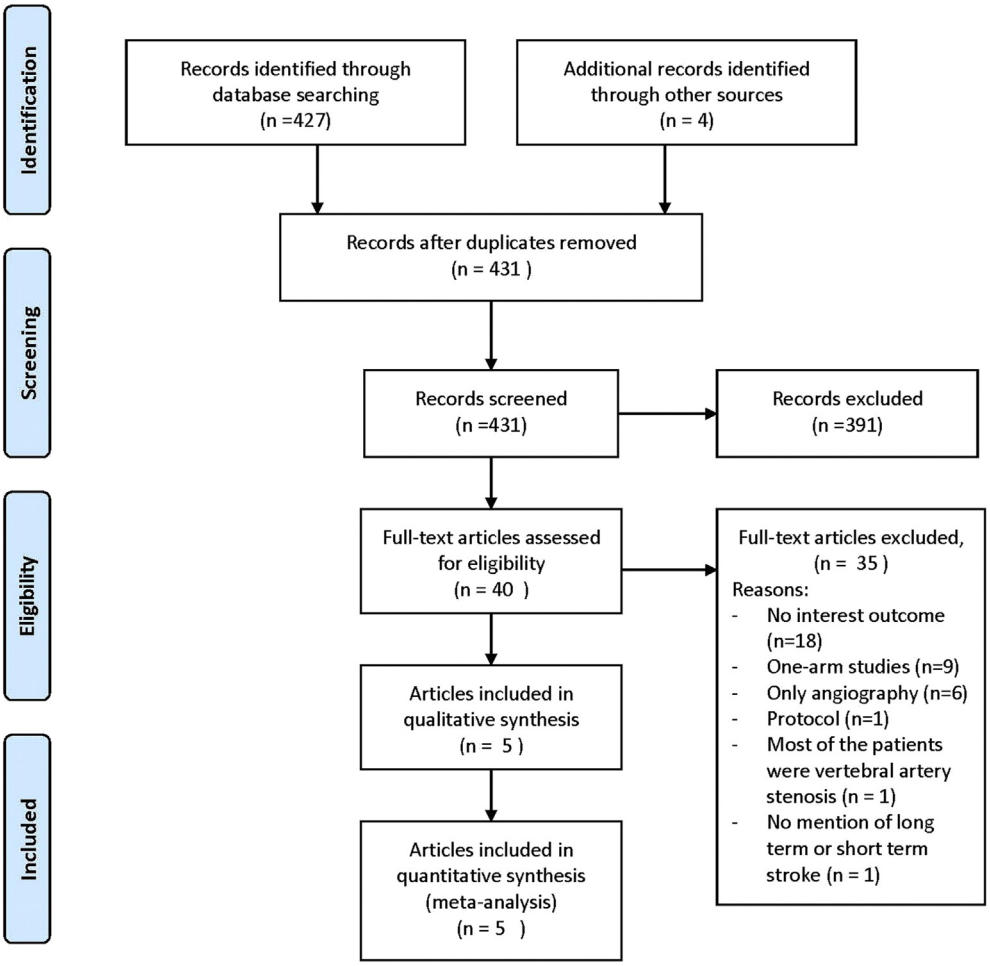

Fig. 1. PRISMA flow diagram.