Comparison between primary angioplasty and stent placement for symptomatic intracranial atherosclerotic disease: meta-analysis of case series

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CRD summary
Angioplasty with stent placement may have some advantages over primary angioplasty alone in treatment of symptomatic intracranial stenosis with improved procedural technical success and lower restenosis, stroke and death rates after one year. Most of the review was well-conducted. The authors acknowledged the problems with using indirect comparisons and in view of this their conclusions should be treated with caution.

Authors' objectives
To compare angioplasty alone with angioplasty and stent placement for short- and long-term rates of stroke and/or death.

Searching
PubMed, Cochrane Database of Systematic Reviews and ClinicalTrials.gov databases and Ovid were searched between January 1980 and May 2008; search terms were reported. Abstracts from scientific meetings and references of review articles and textbook chapters were searched. No language restrictions were applied.

Study selection
Studies of endovascular treatment (primary angioplasty alone or with stents) for symptomatic intracranial atherosclerotic disease (defined as ≥50% stenosis on a preoperative angiogram with symptoms referring to the target vessel) that reported death and stroke up to one year were eligible for inclusion. Studies had to be of at least 10 patients and report baseline characteristics and outcomes separately if both endovascular procedures were used.

Most of the included studies were case series; there were a few clinical trials and data from registries. Baseline data and results were reported separately for treatment with angioplasty or angioplasty with stents. Mean ages were 62 years (range 48 to 68) for angioplasty treated patients and 62 years (range 42 to 74) for stent treated patients. Proportions of women were 24% (angioplasty) and 24.1% (stent). Mean pre-treatment stenosis was 85% (range 50% to 98% angioplasty) and 82% (range 50% to 95% stent).

Two reviewers independently selected studies.

Assessment of study quality
The authors did not assess study validity.

Data extraction
Data for all major and minor clinical strokes and death from any cause at one month and one year were extracted. Data for technical success (≤50% residual stenosis of the target vessel after treatment) and restenosis rates on follow-up angiography (≥50% of the treated lesion) whether scheduled or because of symptoms were extracted for up to one year after the procedure. Results were reported as numbers and percentages. Studies with less than six months follow-up were excluded.

Data were extracted by two reviewers. Discrepancies were resolved with the help of a third reviewer. Authors were contacted for more information if necessary.

Methods of synthesis
Incidence rates for stroke and death were pooled using a DerSimonian and Laird random-effects model; 0.5 was used as a correction for studies with zero events. Heterogeneity was assessed using the Cochrane's Q test and I² statistic. The total number of events for each treatment was used to calculate relative risks (RR) with 95% confidence intervals (CI).
Incidence rates were compared between studies (X² test). Random-effects meta-regression was used to investigate the impact of publication year on one-year rates of stroke and death. Sensitivity analyses were used to compare results from registries or clinical trials with those from case series (X² test).

Results of the review
Thirty-nine studies (n=2,318) were included: 33 studies of angioplasty alone (n=1,027) and 36 of additional stent treatment (n=1,291). Mean post-treatment stenosis was 30% (range none to 55% for angioplasty) and 10% (range none to 20% for stent).

Stroke and/or death:
At one month there were 91 strokes and/or deaths for angioplasty only treated patients (incidence 8.9%, 95% CI 7.1% to 10.6%; 33 studies) and 104 for stent treated patients (incidence 8.1%, 95% CI 6.6% to 9.5%; 36 studies). There were no significant difference between them (p=0.488).

At one year there were 125 strokes and/or deaths for angioplasty only treated patients (pooled incidence 19.7%, 95% CI 16.6% to 23.5%; 27 studies) and 123 for stent treated patients (incidence 14.2%, 95% CI 11.9% to 16.9%; 31 studies), which was significantly higher for the angioplasty patients (RR 1.39, p=0.009).

Heterogeneity was low to moderate (I²=35%, 95% CI 11% to 53%). The year of study publication or study design had no effect on incidence rates.

Angiographic outcomes:
Technical success rates were lower after angioplasty only treatment (incidence 79.8%, 95% CI 74.7% to 84.8%; nine studies) compared with stent treatment (incidence 95%, 95% CI 93.4% to 96.6%; 21 studies) with a relative risk of 0.84 (95% CI 0.8 to 0.9, p=0.0001).

Restenosis rates were higher after angioplasty only treatment (incidence 14.2%, 95% CI 11.8% to 16.6%; 26 studies) compared with stent treatment (incidence 11.1%, 95% CI 9.2% to 13.0%; 31 studies) with a relative risk of 1.28 (95% CI 1.0 to 1.6, p=0.0433).

Sensitivity analyses showed similar results when only the trials or registries were analysed, but the number of studies was small (one for angioplasty and four or six for stent treatment).

Authors' conclusions
Angioplasty with stent placement may have some advantages over primary angioplasty alone in the treatment of symptomatic intracranial stenosis as it was associated with improved procedural technical success, a lower restenosis rate and lower rates of stroke and death after one year.

CRD commentary
This review had clearly stated objectives and specified study inclusion criteria for treatments, the medical condition and outcomes. There were no restrictions on study design. The search strategy covered a number of relevant databases. Attempts were made to locate unpublished research. There were no restrictions by language. Studies were selected and data extracted by two reviewers to minimise the risk of error or bias. Study validity was not assessed, but the authors performed sensitivity analyses that excluded the case series and which showed similar results. A forest plot and details of heterogeneity were presented for one outcome only, which made it difficult to judge the reliability of all the pooled analyses. The results for relative risk should be treated with caution as they compared two different sets of studies and so the relative risk was not a reliable result as it was not based on randomised comparisons within each study. Most of the review was well-conducted. The authors acknowledged the problems with using indirect comparisons and in view of this their conclusions should be treated with caution.

Implications of the review for practice and research
Practice: The authors did not state any recommendations for practice.
The authors stated that a randomised controlled trial was needed to compare clinical outcomes from angioplasty alone with angioplasty plus stent placement for intracranial atherosclerotic disease.

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