A Bayesian meta-analysis comparing AngioJet thrombectomy to percutaneous coronary intervention alone in acute myocardial infarction

CRD summary
This review concluded that people with higher risk acute myocardial infarction lesions (including thrombus) treated with AngioJet then percutaneous coronary intervention, had similar outcomes compared with lower risk lesions treated with percutaneous coronary intervention alone. Given problems with some of the review methods and results that were based on indirect comparisons, the authors’ conclusions should be treated with caution.

Authors' objectives
To assess the effects of AngioJet thrombectomy during percutaneous coronary intervention in people with acute myocardial infarction.

Searching
MEDLINE and FDA (Food and Drug Administration) sources were searched for studies published in English between January 1999 and March 2007. Search terms were reported. Only published percutaneous coronary intervention studies were eligible for inclusion; published and unpublished AngioJet studies were eligible.

Study selection
Studies on people with ST-segment elevation acute myocardial infarction who had chest pain for at least 30 minutes and less than 24 hours, and that assessed primary or rescue percutaneous coronary intervention (with or without stents) with or without AngioJet, were eligible for inclusion. Studies exclusively in people older than 75 years, or in people with cardiogenic shock, were excluded. Studies on AngioJet could be of any design, whereas those on percutaneous coronary intervention had to be published randomised controlled trials (RCTs).

Outcomes reported included short-term mortality, short-term major cardiovascular events, and post-procedural thrombolysis in myocardial infarction (TIMI) 3 flow. Short-term (for mortality and major cardiovascular events) was based on in-hospital, or 30 to 42 day reports. A major cardiovascular event was defined as death, recurrent myocardial infarction, stroke or target vessel revascularisation.

In the included studies, primary, facilitated and rescue angioplasty were included. The proportion of primary-only patients was 15% in AngioJet studies and 92% in the percutaneous coronary intervention studies. The proportion of patients treated after more than 12 hours was 47% in the AngioJet group and 3% in the percutaneous coronary intervention group. Entry criteria included angiographic thrombus in 72% of AngioJet patients and 1% of percutaneous coronary intervention patients. Adjunctive therapies included glycoprotein IIb/IIIa inhibitors and thrombolytic agents. Bare metal and drug eluting stents were used.

The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
The numbers and percentages of patients with each type of outcome event were calculated for each study. Data were extracted from other published met-analyses where necessary.

Data were extracted by one author.

Methods of synthesis
Separate meta-analyses were performed for the AngioJet and percutaneous coronary intervention data using Bayesian random-effects models. A normally distributed non-informative prior was used for mean outcomes and a uniform prior for the standard deviation between studies. The results from these two models were combined to estimate the odds ratio (method not reported). A Bayesian hierarchical model was used to compare results from RCTs and non-RCTs for short-term mortality. Sensitivity analyses were used to assess the impact of the choice of the prior distribution.

Heterogeneity was investigated by assessing outcomes according to risk profile (primary percutaneous coronary intervention, facilitated percutaneous coronary intervention and rescue percutaneous coronary intervention), according to symptom duration and presence of thrombus rich lesions.

Funnel plots were used to assess publication bias.

**Results of the review**

Ninety studies (25,094 participants) were included. Eleven studies (1,018 participants) assessed AngioJet treatment, of these two were treatment groups from RCTs and nine were from non-RCTs. One hundred and twenty four treatment groups from 81 RCTs (24,076 participants) assessed percutaneous coronary interventions.

There was no difference between AngioJet and percutaneous coronary intervention (PCI) for post procedural thrombolysis in myocardial infarction 3 flow (median flow rate 91.5% with AngioJet, 90.6% with PCI; OR 1.12, 95% CI 0.70 to 2.27); short term mortality (median rate 3.5% with AngioJet, 3.5% with PCI; OR 0.98, 95% CI 0.53 to 1.50), short-term major cardiovascular event (median rate 6.9% with AngioJet, 5.6% with PCI; OR 1.25, 95% CI 0.54 to 2.40).

Subgroup analyses showed similar results for the type of percutaneous coronary intervention (primary, facilitated, rescue and thrombus rich) and symptom duration.

Sensitivity analyses comparing different prior distributions led to similar results. The hierarchical model showed that for short term mortality there were no differences in results from RCTs and non-RCTs.

Funnel plots showed no evidence of publication bias.

**Authors' conclusions**

For higher risk lesions (including associated thrombus), treatment with AngioJet resulted in similar results for mortality, major cardiovascular events and thrombolysis in myocardial infarction flow compared with more typical (lower) risk lesions treated with percutaneous coronary intervention alone.

**CRD commentary**

The aims and inclusion criteria were only partly stated as no criteria for study design were stated. Database searching was limited to two sources and only studies published in English were sought, so studies may have been missed and publication bias may have had an effect on the results of the review. There were discrepancies in the inclusion of studies between the two treatments; unpublished studies of any design were included for AngioJet studies, but only published RCTs for percutaneous coronary intervention studies. This was source of potential bias. Methods of study selection were not described, so it is not possible to say if error or reviewer bias were introduced into the review. The method of data extraction was not the best for reducing errors. It was not clear if any validity assessment was made of included studies, so it was difficult to assess the reliability of results. Bayesian meta-analysis methods were used, but it appeared that separate analyses were performed for each treatment. Therefore the conclusions were based on indirect comparisons between groups of patients with different risk profiles. Results from the few studies directly comparing the two treatments were not presented. Sensitivity analyses were made to check assumptions made about the prior distributions, but it was unclear how the odds ratios were estimated from the results of the various models. Given the lack of detail on the review methods, validity assessment and direct comparisons of these treatments from RCTs, the conclusions should be treated with caution.

The first author is a consultant for Possis Inc (AngioJet device manufacturer). The analysis was performed by an independent contractor, Technomics Research LLC, with no financial ties to the sponsor.
Implications of the review for practice and research
The authors did not state any implications for practice or further research

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