Infarct artery reocclusion after primary angioplasty, stent placement, and thrombolytic therapy for acute myocardial infarction

Authors' objectives
To analyse the frequency and timing of reocclusion after percutaneous transluminal coronary angioplasty (PTCA) and stent placement during acute myocardial infarction (AMI) from all available studies. These were compared with published reocclusion rates after thrombolysis.

Searching
MEDLINE was searched from January 1966 to December 1998 for publications in the English language. The keywords used were 'reocclusion', 'myocardial infarction', and either 'angioplasty' or 'stent'. The scientific session abstracts published in Circulation (1996 to 1997) and the Journal of the American College of Cardiology (1996 to 1998) were also searched. The thrombolysis studies were taken from the paper published in 1996 by Verheugt et al. (see Other Publications of Related Interest); therefore, the most recent of those studies would be 1996.

Study selection
Study designs of evaluations included in the review
No specific study design was described, except for the minimum numbers of participants.

Specific interventions included in the review
Primary PTCA when administered within 24 hours of the onset of symptoms. PTCA with or without stent was acceptable for inclusion, and the stent could be either bailout or elective. PTCA was also compared with thrombolytic therapy; however, the data from trials where the patients were given thrombolytic therapy were taken from the publication by Verheugt et al. (see Other Publications of Related Interest). Therefore, there was no direct comparison of thrombolysis with PTCA.

Studies were excluded if thrombolysis was administered before PTCA.

Participants included in the review
Participants with symptoms of AMI that persisted for more than 30 minutes, accompanied by ST elevation of greater than 1 mm (0.1 mV) in at least two contiguous electrocardiographic leads. Presentation had to be within 24 hours of the onset of symptoms. Studies where PTCA alone was given were required to have at least 50 participants. For studies of PTCA and stent, the minimum number of participants acceptable was 30 and more than 60% of the participants in each trial must have had routine angiographic follow-up. Clinically indicated angiography alone was not regarded as routine follow-up. The paper on thrombolysis (see Other Publications of Related Interest) included patients who had at least 1 follow-up angiogram after successful thrombolytic therapy. Only studies with more than 75 participants were included.

Outcomes assessed in the review
The outcomes to be assessed were the incidence and timing of reocclusion. The odds ratios (ORs) for reocclusion at 26 weeks, and data on the incidence of reocclusion from 0 to 12 months, were presented. Reocclusion was defined as a Thrombolysis In Myocardial Infarction grade 0 to 1 flow on follow-up angiography. The authors state that the definitions of reocclusion varied among the different included studies. However, the majority of studies defined success of mechanical reperfusion as the achievement of a 50% residual stenosis of the infarct-related artery and a Thrombolysis In Myocardial Infarction grade 2 to 3 flow.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.
Assessment of study quality
The authors do not report the method used to assess validity, or how the validity assessment was performed.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.

The following data were extracted: the number of patients; the percentage of procedures that were successful; the number of patients having follow-up angiography; reocclusion; mean time to angiography; and indication for using a stent.

Methods of synthesis
How were the studies combined?
The data from studies on PTCA alone and studies on PTCA with stent were presented separately. The number of patients with or without reocclusion were calculated. Logistic regression analyses were conducted using the frequency option of PROC GENMOD in the SAS statistical package, with reocclusion as the dependent variable. The independent variables were weeks to angiography (log transformed), and two treatment dummy variables (with either PTCA or thrombolysis used as the reference treatment). In addition to analysing the effects of treatment and time, the interactions between treatment and time were examined. The models developed and tested were described in the paper. There were no methods to describe publication bias. Thrombolysis and PTCA were compared indirectly.

How were differences between studies investigated?
The authors do not discuss differences between the studies.

Results of the review
The total number of included studies was 17 (n=2,641): 10 studies of primary PTCA (n=1,943) and 7 of PTCA with stent (n=698). There were 19 studies (n=4,231) of thrombolysis only.

Studies on PTCA alone.
The initial success rate of PTCA ranged from 80 to 97%. Among patients with a successful procedure, follow-up angiography was performed in 1,391 (71%) of the included patients at between 2 days and 12 months. The reocclusion rates were between 5 and 16.7%.

Studies on PTCA with stent.
The reocclusion rates were between 0 and 5.6%. Follow-up angiography was performed on 686 (98.2%) of the participants at between 6.2 days and 7.7 months. Time to reocclusion PTCA versus thrombolysis, where the thrombolysis studies were taken from the paper by Verheugt et al. (see other Publications of Related Interest). The results of the logistic regression analysis were as follows.

1. PTCA with no stent: there was no significant lowering of the odds of reocclusion when compared with thrombolysis using the main effects model (described as overall differences between treatment with no time treatment interactions). The OR was 0.76 (95% confidence interval, CI: 0.53, 1.10, p=0.15).
2. PTCA and no stent significantly reduced the odds of reocclusion when compared with thrombolysis (OR 0.38, 95% CI: 0.24, 0.57, p<0.0001). The model adjusted for non-linearity and time effects, and used a time point of 26 weeks.
3. PTCA plus stent significantly reduced the odds of reocclusion when compared with PTCA alone (OR 0.28, 95% CI: 0.14, 0.6, p<0.0001).
4. PTCA plus stent significantly reduced the odds of reocclusion when compared with thrombolysis (OR 0.11, 95% CI: 0.05, 0.22, p<0.0001).
**Authors' conclusions**
Reocclusion after PTCA during AMI was less frequent than after thrombolysis, and appeared to be even less frequent when coronary stents were used. This may contribute to the superior outcome of patients treated with PTCA and stent placement, compared with thrombolytic therapy, in the AMI setting.

**CRD commentary**
The review question was interesting and relevant. No baseline characteristics of the participants, such as age and co-morbidity, were recorded. The inclusion criteria were very good for the participants. However, the description of the interventions was difficult to decipher, especially as many studies included in the review were taken from another publication. In addition, there was no distinction between bailout and primary stenting in the logistic regression analysis.

The inclusion criteria for study design were not described. The paper appears to have compared the data collected in one set of studies on PTCA, with and without stent, with data from a published systematic review on thrombolysis. It was unclear whether the studies were, for example, randomised controlled trials, observational or case-control studies. The search terms were limited, and the search was restricted to English language publications and a single database (MEDLINE). Therefore, it is possible that the search might have missed studies. In addition, there was no attempt to look for unpublished studies. The validity assessment was not described. Details of the primary data were provided. The logistic regression analysis was described well. However, an analysis or description of heterogeneity between the studies was not discussed. Indirect comparisons were undertaken.

The authors' conclusions are based on these indirect comparisons and, therefore, may be unreliable. It may be useful to look at studies in which PTCA and thrombolysis were compared directly, within the same studies.

**Implications of the review for practice and research**
The authors did not state any implications for further research and practice.

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Other publications of related interest

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.