Immediate angioplasty after thrombolysis: a systematic review

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CRD summary
This review investigated whether a strategy of thrombolysis followed by transfer for immediate or early percutaneous coronary intervention (PCI) is more effective than delayed PCI in the management of ST-segment elevation myocardial infarction. The authors appropriately concluded that there is currently inadequate evidence to recommend the routine transfer of patients for immediate or early PCI.

Authors' objectives
To determine whether a strategy of thrombolysis followed by transfer for immediate or early percutaneous coronary intervention (PCI) is safe, feasible and more effective than delayed PCI in the management of ST-segment elevation myocardial infarction.

Searching
MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, EMBASE, the Cochrane Database of Systematic Reviews, the Cochrane CENTRAL Register and the American Heart Association's Endnote 7 Master Library were searched from 1985 to 2004 using the terms listed. Reference lists of articles and reviews were handsearched for relevant studies. Studies reported only as abstracts were excluded, as were studies that had not yet been accepted for publication.

Study selection
Study designs of evaluations included in the review
Studies with no control group were excluded. Eight studies that were classified as poor quality were not included in this paper (see Validity Assessment).

Specific interventions included in the review
Studies where PCI was performed more than 24 hours after thrombolysis were excluded, as were studies in which only intracoronary thrombolysis was used. The included studies compared immediate or early PCI (with or without a stent) with a variety of delayed interventions. Delayed interventions included conservative non-interventional strategy, catheterisation after variable periods of time, thrombolysis without transfer, transfer for PCI, angiography with no PCI, delayed PCI and PCI only if ischaemic. The studies used various listed thrombolytic agents.

Participants included in the review
Studies with fewer than 30 participants were excluded. No further criteria relating to the eligibility of participants were specified.

Outcomes assessed in the review
There were no inclusion criteria for the outcomes. The outcomes included in the meta-analyses were death and a composite of death and reinfarction by 12 months (or 6 months) after the procedure.

How were decisions on the relevance of primary studies made?
Two reviewers independently assessed studies for inclusion.

Assessment of study quality
The studies were assessed for quality using the American Heart Association's International Liaison Committee on Resuscitation (ILCOR) evaluation process. The ILCOR evaluation process grades studies as excellent, fair, poor or unsatisfactory according to study design and method. In addition, the studies were graded from 1 (highest quality) to 8 (lowest quality) using the hierarchy of study design described by the same Committee. Two reviewers assessed the
quality and the level of evidence, but it was unclear if the assessments were performed independently.

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

**Methods of synthesis**

How were the studies combined?
The studies were grouped by results (studies reporting a benefit with immediate or early PCI versus studies reporting a neutral effect or no benefit) and combined in a narrative. RCTs that compared routine PCI within 24 hours of thrombolysis with more conservative management were pooled using a fixed-effect meta-analysis with an inverse variance approach. The potential for publication bias was assessed using funnel plots.

How were differences between studies investigated?
The RCTs used in the meta-analysis were analysed separately according to stent era (pre-stent era if coronary stents were used in fewer than 50% of PCI cases versus stent era) and an analysis of variance was used to test for differences between the two era types. The Q statistic was used to test for heterogeneity between the trials in the meta-analysis. Differences between the studies were also evident from the tables of included studies.

**Results of the review**
Twenty-nine studies (n=20,510) were included. Eight randomised controlled trials (RCTs; n=2,598) were included in the meta-analyses.

Ten studies were graded as providing level 1 evidence, ten as level 2, two as level 3 and seven as level 7. Thirteen studies reported a benefit with immediate or early PCI, while 16 studies reported a neutral effect or no benefit.

Meta-analysis.

Overall, there were no statistically significant differences in mortality (odds ratio, OR=0.89, 95% confidence interval, CI: 0.67, 1.19) or in a composite of death and reinfarction (OR 0.81, 95% CI: 0.65, 1.01) within 12 months between immediate/early PCI after thrombolysis and the noninvasive strategy.

Pre-stent era trials (5 studies, n=1,737).

There were no significant differences between immediate/early PCI after thrombolysis and the noninvasive strategy in mortality or combined death and reinfarction within 12 months.

Stent era trials (3 studies, n=861).

There were significantly lower rates of death (5.8% versus 10.0%; OR 0.55, 95% CI: 0.32, 0.92) and death and reinfarction (OR 0.59, 95% CI: 0.39, 0.89) within 12 months for patients receiving immediate/early PCI after thrombolysis compared with the noninvasive strategy.

There was a significant difference in treatment effects between the pre-stent era and the stent era groups (P<0.03 for death and P=0.01 for the composite outcome).

According to the funnel plots, publication bias did not influence the findings.

There was no evidence of significant heterogeneity among the 8 trials overall, among the 5 pre-stent era trials, or among the 3 stent era trials.

**Authors' conclusions**
At present, there is inadequate evidence to recommend the routine transfer of patients for immediate or early PCI after successful pre-hospital or in-hospital thrombolysis and initial stabilisation in community hospital emergency departments.

CRD commentary
The authors specified exclusion criteria relating to the intervention and study design; the broad inclusion criteria for study design resulted in a variety of study designs of variable quality being eligible for inclusion in the review. Poorer quality studies that met the inclusion criteria were excluded from this report; this decision appears to have been made post hoc. A range of electronic databases were searched, but it was unclear whether any language restrictions were applied. Unpublished studies were not included in the review, thus raising the potential for publication bias; the possibility of publication bias was assessed and no potential bias was found. Methods were used to minimise reviewer errors and bias in the study selection process, but it was unclear whether similar steps were taken in the assessment of validity and extraction of data.

The included studies were assessed for quality according to the study design and methods. However, the results of the assessments were not reported, so the results from these studies and any synthesis may not be reliable. The studies were also graded using a hierarchy of study design and the results reported for all studies, but this approach does not adequately assess the quality of individual studies. Only RCTs that compared similar interventions using the same outcomes were included in the meta-analyses. Statistical heterogeneity was assessed.

There were limitations to this review but, overall, the authors’ conclusions regarding the limited evidence appear reliable.

Implications of the review for practice and research
Practise: The authors stated that transfer for immediate PCI is recommended for patients with cardiogenic shock, haemodynamic instability or persistent ischaemic symptoms after thrombolysis.

Research: The authors stated that contemporary PCI techniques, including coronary stents, need to be evaluated in large RCTs. They stated that some large relevant RCTs are currently underway.

Bibliographic details
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Other publications of related interest
This additional published commentary may also be of interest. Suarez A, Rajdev S, Hillegasss WB. Review: Evidence supporting reduced death and reinfarction by percutaneous coronary intervention after thrombolysis is inconclusive. ACP J Club 2006;144:61.

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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.