Coronary angioplasty or intravenous thrombolysis: the dilemma of optimal reperfusion in acute myocardial infarction. A critical review of the literature
Amit G, Weiss A T, Zahger D

Authors' objectives
To compare coronary angioplasty and intravenous thrombolysis in the treatment of evolving acute myocardial infarction.

Searching
MEDLINE (dates not stated) was searched using the terms 'acute myocardial infarction', 'thrombolytic therapy'. Only studies published in English were included in the review.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and studies which reported the results of large registries of consecutive patients in which treatment was assigned by the attending physician. Only studies published in manuscript form were included. Registry based studies had to have at least 1000 patients in each treatment arm.

Specific interventions included in the review
Intravenous thrombolysis (tissue plasminogen activator (tPA) or streptokinase) compared with primary percutaneous transluminal coronary angioplasty (PTCA). Studies of intravenous coronary thrombolysis or of PTCA after failure of thrombolysis were excluded.

Participants included in the review
Patients with typical chest pain and a compatible ECG with no contraindications to lytic therapy. Participant age was not stated, although two studies did have an age limit for inclusion (age not stated). Patients in shock were excluded in two studies.

Outcomes assessed in the review
Mortality, re-infarction, need for intervention (as long and short term outcomes), left ventricular function and time to reperfusion.

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 authors performed the selection.

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

Data extraction
The authors do not state how or what data were extracted from the included studies. Data extraction tables presented information on study design, year of study, intervention, number of subjects in each treatment arm, the proportion of subjects in the PTCA arm who actually received treatment, PTCA success rate, proportion of emergency/early CABG (coronary artery bypass graft), number of thrombolytic therapy patients requiring rescue PTCA, and outcome details.

Methods of synthesis
How were the studies combined?
A narrative discussion was used.

How were differences between studies investigated?
The differences between the studies in terms of patient selection, baseline characteristics, intervention and outcome measures were discussed.

Results of the review
Six RCTs (n=2132, n=1054 in PTCA arms and n=11078 on thrombolysis) and two registry based studies (n=11982, n=2186 in PTCA arms and n=9796 on thrombolysis). The thrombolytic agents used in the RCTs were streptokinase (n=3), tPA (n=3), in the registry based studies one study used tPA, the other did not state which thrombolytic agent was used.

PTCA patients were younger, more often smokers, had more anterior infarctions more often had prior PTCA and were more often shock than the tPA-treated patients in one of the registry based studies.

Short-term outcomes (30 days to 6 weeks after randomisation):
1. Short-term mortality (RCTs, 2 registry studies).
   All except one study showed higher mortality in the TT arms (range 2-6%) compared to the PTCA arms (range 2-7%). This difference was significant in one of the RCTs (p=0.024).
2. Reinfarction (3 RCTs, 2 registry studies).
   All studies showed higher rates in the TT treated patients (range 2.9-10.1%) than the PTCA treated patients (1.3 to 4.4%), this difference was significant in one of the RCTs study (p<0.001).
3. Death or reinfarction (3 RCTs).
   The incidence of these two outcomes combined was significantly higher in the TT treated group (range 13-17%) compared to the PTCA treated group (range 3.3-10.1%) for the two studies that reported on significance (p<0.02).
4. Need for intervention (4 RCTs).
   All studies showed higher rates in the TT groups (range 31-56%) than the PTCA treated group (range 4-15%), although the significance of these findings was not reported.
5. Left-ventricular function (3 RCTs, 1 registry study).
   Two studies found no differences between the two treatment groups. One study found improved ventricular function in the PTCA treated patients compared to the TT treated patients (p<0.001).

Long-term outcomes (6 months after randomisation)(3 RCTs, 1 registry study).
1. Mortality and reinfarction rates.
   One study found no significant difference in mortality or reinfarction rates 6 months after randomisation, this study found greater revascualisation in the TT group then the PTCA group (p=0.075). Another study found a significant reduction in the combined end point of death or reinfarction in the PTCA group (p=0.01). Another trial showed that the initial small advantage of PTCA was no longer evident at 6 months: at this time no significant differences for combined endpoint of death, reinfarction and disabling stroke (OR=0.89, 95% CI: 0.63-1.25).
2. Incidence of coronary angiography, need for bypass surgery and hospital admission.
   The registry-based study followed up patients for 4 years. It found an increase in coronary angiography at 1 and 3 years in the PTCA group (p<0.001), and an increase in coronary angioplasty at 1 year (p=0.03) but not at 3 years (p=0.15).
There was no difference between the groups in the need for bypass surgery or hospital admission.

3. Time to reperfusion.

Time from symptom onset to admission/randomisation:

If the therapy is only given in hospital then this time is equal for both study groups.

Time from pain to treatment (3 RCTs, 1 registry study):

Greater in the PTCA groups (range 216 to 277 minutes) than the TT groups (range 145-232 minutes) in all studies, this difference was significant (p<0.005) in all studies that measured the significance (2 RCTs 1 registry study). Time from randomisation to treatment (2 RCTs, 2 registry studies):

Greater in the PTCA groups (51 to 102 minutes) than the TT groups (range 20 to 60 minutes) for all studies and was significant (p<0.001) in the studies that measured significance (1 RCT, 2 registry studies).

Time from pain onset to resolution (1 RCT).

Significantly greater in the TT group (354 v 290 mins, p<0.004).

4. Incidence of strokes (3 RCTs, 1 registry study).

The incidence was greater in the TT group (range 1.6-3.5%) than the PTCA group (range 0-1.1%) for all studies, and was significant in one of the two studies (registry study) that measured the significance.

5. Incidence of intracranial bleeding (2 RCTs, 1 registry study).

Greater in the TT group (range 1-2%) than PTCA group (range 0-0.1%), this difference was significant in the two studies that reported on this (p<0.05).

6. Major bleeding (3 RCTs, 1 registry study).

Generally greater in the PTCA group (range 2.7-6.1%) than the TT group (range 1.9-6.5), of the two studies that presented measures of the significance this was only significant (p<0.01) in one study (registry study).

Cost information

The two reperfusion strategies were compared in terms of cost. In the RCTs the cost of treatment tends to be lower with direct PTCA, one study found hospital charges to be similar for low-cost uncomplicated patients in either treatment arm. One of the registry based studies reported that although TT treated patients stayed longer (mean 7.9 (sd=5.3), vs 6.8(4.4) days) in hospital than PTCA treated patients (p<0.001) they used less resources and their overall costs were lower both during the initial hospitalisation and after 3 years.

Authors' conclusions

There were substantial differences among the results of RCTs, particularly the smaller ones, and the large registries. Intravenous thrombolysis and direct angioplasty are good methods to open acutely occluded coronary arteries and are generally comparable.

CRD commentary

A reasonable review of the area. The review was limited by the literature search as only one database was searched and only studies published in English were included. No attempts were made to locate unpublished studies or to search for other studies by, for example, checking the references of included studies. Thus, this review may be subject to publication bias. Inclusion and exclusion criteria were clearly stated and individual study details reported. No validity
assessment was carried out and the validity of the studies was not discussed. The authors did, however, present the results separately for RCTs and registry-based studies. The authors did not say how the relevance of studies was assessed or how and what data were extracted from the included studies. In view of the heterogeneous nature of the studies no statistical pooling was attempted and a narrative summary of the results was provided which appears appropriate, although the authors could have used a formal test for heterogeneity to investigate whether it may have been appropriate to pool some of the results data. The authors' conclusion appear to follow from the results although, because of the limitations outlined above, these should be interpreted with some degree of caution.

**Implications of the review for practice and research**

**Practice:** The author states that the physician must keep in mind that the goal of treatment is restoration of normal and sustained coronary flow in the fastest possible manner, and must thus consider the various benefits of the two treatments. PTCA seems to be a better strategy to open occluded coronary arteries, but its clinical benefit is critically dependent on operator experience and on the time to treatment. It is the treatment of choice if the culprit lesions can be crossed within 1 hour of presentation.

**Research:** Coronary stenting and more effective platelet inhibition may improve the results of medical and interventional reperfusion, and further comparisons of these two strategies will be required.

**Bibliographic details**


**PubMedID**

10436141

**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Angioplasty, Balloon, Coronary; Fibrinolytic Agents /therapeutic use; Humans; Myocardial Infarction /therapy; Myocardial Reperfusion; Myocardial Reperfusion Injury; Randomized Controlled Trials as Topic; Treatment Outcome

**AccessionNumber**

11999001953

**Date bibliographic record published**

30/09/2000

**Date abstract record published**

30/09/2000

**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.