Effectiveness of recanalization of chronic total occlusions: a systematic review and meta-analysis
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CRD summary
This review concluded that among highly selected patients considered for recanalisation of chronic total occlusion, successful recanalisation appeared to be associated with an improvement in mortality and a reduction for the need for subsequent coronary artery bypass graft surgery compared to failed recanalisation. These conclusions should be interpreted cautiously given the possibility of publication and language biases.

Authors' objectives
To assess the effectiveness of recanalisation of chronic total occlusion on patient-centered clinical outcomes.

Searching
PubMed, EMBASE, Web of Science and The Cochrane Library were searched up to January 2009 for studies in English and French. Search terms were reported. Reference lists of retrieved publications were screened. The PubMed related article feature was used to identify additional studies. ClinicalTrials.gov was searched for ongoing trials. Data from unpublished sources were not searched.

Study selection
Randomised controlled trials (RCTs) and observational studies that compared percutaneous recanalisation with medical management (either intentionally or as a result of failed recanalisation) in patients with documented chronic total occlusion who underwent percutaneous coronary interventions were eligible for inclusion. Eligible studies had to report at least one of death, myocardial infarction, major adverse cardiac events, subsequent coronary artery bypass graft surgery and residual/recurrent angina. Studies of patients who had experienced recent myocardial infarction were excluded.

Included studies assessed various types of percutaneous recanalisation that included balloon angioplasty, bare-metal stent and drug-eluting stent implantation. All the included studies compared outcomes after successful versus failed chronic total occlusion recanalisation attempt. Mean age of patients in the included studies ranged from 54 to 70 years. Most participants were male. Included studies were published between 1979 and 2006.

The authors did not state how many reviewers assessed studies for inclusion.

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

Data extraction
Data were extracted on event rates for each treatment arm to enable the calculation of odds ratios (ORs) with 95% confidence intervals (CIs). Where necessary, event rates were converted from graphs.

Two reviewers independently performed data extraction. Any disagreements were resolved by consensus.

Methods of synthesis
The included studies were combined in meta-analyses. Pooled odds ratios with 95% CIs were calculated using a random-effects model. Statistical heterogeneity was assessed using the I² statistic. Sensitivity analyses were performed by excluding studies where event rates were converted from graphs.

Results of the review
Thirteen observational studies were included in the review (n=7,288 participants). No relevant RCTs were identified.
Follow-up ranged from one to 10 years.

Compared with failed recanalisation, successful recanalisation was associated with a significant reduction in all-cause mortality (OR 0.56, 95% CI 0.43 to 0.72; 13 studies), subsequent coronary artery bypass graft surgery (OR 0.22, 95% CI 0.17 to 0.27; 10 studies) and residual/recurrent angina (OR 0.45, 95% CI 0.30 to 0.67; six studies).

There were no significant differences in myocardial infarction or major adverse cardiac events between the two groups. There was significant reduction in in-hospital mortality after successful recanalisation (OR 0.34, 95% CI 0.18 to 0.65; five studies).

Significant heterogeneity was observed only for outcomes of residual/recurrent angina ($I^2=65\%$) and major adverse cardiac events ($I^2=78\%$). Results of sensitivity analyses were not reported.

**Authors' conclusions**
Among highly selected patients considered for recanalisation of chronic total occlusion, successful recanalisation appeared to be associated with an improvement in mortality and a reduction for the need for subsequent coronary artery bypass graft surgery compared to failed recanalisation.

**CRD commentary**
This review's inclusion criteria were clear. Relevant databases were searched. Efforts were made to find published studies but not unpublished studies, which increased potential for publication bias. The search was limited to studies in English and French, so language bias could not be ruled out. Steps were made to minimise errors and biases during data extraction; it was unclear whether or not the process of study selection was performed in duplicate. No formal validity assessment was performed. All the included studies were observational studies (a type of study design with lower methodological rigour). Statistical heterogeneity was assessed. Appropriate methods were used to pool the results.

The authors' conclusions reflect the evidence presented, but should be interpreted cautiously given the possibility of publication and language biases.

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

**Research:** The authors stated that, given the observational nature of the reviewed evidence, randomised clinical trials were required to confirm the findings.

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