Drug-eluting stents versus coronary artery bypass grafting for the treatment of coronary artery disease: a meta-analysis of randomized and nonrandomized studies


CRD summary
This review concluded that, compared to coronary artery bypass graft (CABG), drug-eluting stents were associated with fewer periprocedural risks, but evidence suggested that drug-eluting stents were inferior to CABG in terms of postprocedural myocardial infarction, repeat revascularisation and 12-month combined outcome. Concerns about data quality mean that the authors conclusions should be treated with caution.

Authors' objectives
To assess the safety and efficacy of drug-eluting stents versus coronary artery bypass graft (CABG).

Searching
PubMed, EMBASE, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL) and DARE were searched from inception to September 2009. Search terms were reported. Reference lists of retrieved articles were checked. Only studies published in English were eligible for inclusion.

Study selection
Studies that compared drug-eluting stents to CABG in people with coronary artery disease were eligible for inclusion.

In the included studies, where reported, mean ages ranged from 58 to 72 years in the drug-eluting stents groups and 61 to 70 years in the CABG groups. Mean ejection fraction ranged from 28% to 62% in the drug-eluting stents group and 27% to 62% in the CABG group. Participants had single or multivessel disease and some had diabetes or left ventricular dysfunction. Some of the CABG procedures were off pump (OPCAB). The outcomes reported were all-cause mortality, all-cause stroke, myocardial infarction, repeat revascularisation and major adverse cardiovascular and cerebrovascular events (MACCE). Follow-up ranged from six to 36 months. Studies were performed between 1997 and 2007.

It appeared that two authors independently selected studies for inclusion. Discrepancies were resolved by discussion and consensus with a third author.

Assessment of study quality
The numbers of participants lost to follow-up was reported. No other details of any quality assessment were given.

Data extraction
Data were extracted in order to calculate relative risks (RR) and 95% confidence intervals (CI).

It appeared that data were extracted by two authors independently. Discrepancies were resolved by discussion and consensus with a third author.

Methods of synthesis
Pooled relative risks and 95% CI were calculated using fixed-effect and random-effects models. Results for the random-effects model were reported. Statistical heterogeneity was assessed using $\chi^2$ and $I^2$. Subgroup analyses were performed based on those with multivessel disease and those with OPCAB.

Results of the review
Twenty-five studies (34,278 participants) were included: one randomised controlled trial (1,800 participants) and 24 observational studies that compared drug-eluting stents with CABG cohorts (32,478 participants). One study contributed 17,400 participants; others ranged from 77 to 3,720 participants.

Compared to CABG, drug-eluting stents were associated with lower all-cause mortality at 30 days (RR 0.50, 95% CI 0.31 to 0.80).
0.34 to 0.75, I²=0%; 20 studies), but no statistically different difference at 12 months (12 studies) or 24 months (five studies).

Drug-eluting stents were associated with lower stroke at last follow-up (RR 0.33, 95% CI 0.22 to 0.50, I²=0%; 17 studies), increased rate of myocardial infarction at last follow-up (RR 1.11, 95% CI 1.01 to 1.22, I²=0%; 23 studies) and increased repeat revascularisation (RR 3.75, 95% CI 2.80 to 5.02, I²=77%; eight studies).

MACCE was lower in the drug-eluting stent group at 30 days (RR 0.56, 95% CI 0.32 to 0.98, I²=51.3%; 10 studies) but higher at 12 months (RR 1.61, 95% CI 1.23 to 2.12, I²=68.2%; 10 studies).

In subgroup analyses of those with multivessel disease, drug-eluting stents were associated with increased rates of repeat revascularisation (RR 4.03, 95% CI 2.70 to 6.01, I²=84.4%; 10 studies) and MACCE at 12 months (RR 1.74, 95% CI 1.24 to 2.44, I²=55.1%; six studies). There was no statistically significant difference in periprocedural myocardial infarction (seven studies) or myocardial infarction at last follow-up (11 studies). Studies with OPCAB groups showed no statistically significant difference in the rate of stroke between the drug-eluting stents and the OPCAB group (two studies).

Authors' conclusions
Although drug-eluting stents were associated with fewer periprocedural risks, evidence suggested that drug-eluting stents were inferior to CABG in terms of postprocedural myocardial infarction, repeat revascularisation and 12-month MACCE.

CRD commentary
The aims of the review were clearly stated in terms of participants and interventions; those for study type were less clear. The search covered a number of relevant sources, but was limited to studies in English and it was unclear whether unpublished studies were sought so language bias or publication bias may have affected the review. The review methods aimed at reducing reviewer error and bias.

The validity of the included studies was not assessed, except for reporting numbers of dropouts, so it was not possible to comment on the quality of included data. Most data came from observational studies and these are prone to influence from confounding factors. In particular, for results to be valid the participants' characteristics should be similar across the comparison groups and this is less likely to be true for non-randomised studies. Limited reporting made it impossible to establish the extent of this problem.

The methods of synthesis were generally appropriate, although there was significant heterogeneity between studies in some comparisons. Little detail was given about the included participants or any concomitant medications. This could affect the generalisability of the results.

Concerns about the quality of included data mean that the authors conclusions should be treated with caution.

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

Research: The authors stated a need for large-scale RCTs with long follow-up to compare drug-eluting stents with CABG, but they also stated that technological advances may make the results of these obsolete.

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