Drug-eluting stents versus bare metal stents in percutaneous coronary interventions (a meta-analysis)

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CRD summary
This review concluded that drug-eluting stents used in coronary disease are more beneficial than bare metal stents. This benefit was mainly due to a reduction in further revascularisation procedures, rather than any difference in mortality or incidence of myocardial infarction. Despite some methodological problems with the review, the authors’ conclusions seem reasonable.

Authors' objectives
To compare the safety and efficacy of drug-eluting stents (DES), used in percutaneous coronary interventions, to those of bare metal stents.

Searching
MEDLINE was searched from January 2002 to December 2004. The references of identified articles were checked and relevant journals (unspecified) were handsearched. Only English language studies were sought.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) only were sought.

Specific interventions included in the review
Studies that evaluated the use of sirolimus- or paclitaxel-eluting coronary stents, compared with bare metal stents, were eligible for inclusion. Some of the included paclitaxel studies assessed polymer paclitaxel-eluting stents and some nonpolymer paclitaxel-eluting stents. The mean stent length, where given, varied from 15.9 to 23.8 mm.

Participants included in the review
Studies of people with coronary artery disease were eligible for inclusion. In the included studies, the mean ages ranged from 60 to 66 years. The proportion of people with diabetes ranged from 13.5 to 28.7%. The mean vessel diameter ranged from 1.2 to 3.01 mm and the mean lesion length from 9.58 to 15 mm. Where reported, between 0 and 59% of the participants had type C lesions.

Outcomes assessed in the review
Only studies that reported on major adverse clinical events (MACE) were sought. These were defined as death, myocardial infarction (MI), coronary artery bypass grafting (CABG), and target lesion or target vessel revascularisation (TVR). The primary outcome reported was a combined outcome of MACE. The individual outcomes, as well as stent thrombosis, were also reported. The length of follow-up ranged from 6 to 12 months.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Studies were assessed on the basis of items relating to data analysis and presentation, description of the interventions, validity of randomisation, blinding of the participants and observers, and descriptions of the inclusion or exclusion criteria for participants. Scores were allocated on a scale of 0 to 1, where 1 was the full score. Two reviewers independently assessed the quality of the studies, and any disagreements were resolved through discussion.
Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

The data appears to have been extracted with reviewers blinded to author names and journal titles. The number of events for each outcome were extracted. Relative risks (RRs) and 95% confidence intervals (CIs) were calculated for individual and combined outcomes in the included studies.

Methods of synthesis
How were the studies combined?
Pooled RRs with 95% CIs were estimated using a random-effects model and a fixed-effect model. The results for the random-effects model were reported.

How were differences between studies investigated?
Separate meta-analyses were performed for studies using sirolimus-eluting stents and those using paclitaxel-eluting stents. Univariate and multivariate regression meta-analyses were performed to assess the effect on the outcomes of several variables: baseline lesion or vessel characteristics, stent characteristics, the percentage of included participants with diabetes, and the type of drug used in the eluting stents.

Results of the review
Eleven RCTs (5,137 participants) were included. Of these three (1,408 participants) assessed the use of nonpolymer paclitaxel-eluting stents. These three were excluded from the main analysis and were analysed separately.

The mean quality scores were 0.54 to 0.87 for single studies, 0.62 to 0.94 for study protocol, and 0.41 to 0.75 for data analysis and presentation.

For all the studies combined (8 RCTs), there was a decrease in MACE in the DES group in comparison with bare metal stents (RR 0.4, 95% CI: 0.33, 0.49). For individual outcomes, DES reduced the need for percutaneous revascularisation (RR 0.3, 95% CI: 0.22, 0.4) and CABG (RR 0.54, 95% CI: 0.32, 0.89). There were no statistically significant differences for other outcomes: death (RR 1.11, 95% CI: 0.58, 2.10), MI (RR 0.79, 95% CI: 0.57, 1.09) or thrombosis (RR 0.70, 95% CI: 0.30, 1.63).

The results were similar for meta-analyses of studies analysed by type of drug (paclitaxel or sirolimus), although the protective effect appeared greater with sirolimus-eluting stents; the RR for MACE was 0.33 (95% CI: 0.26, 0.42) with sirolimus and 0.52 (95% CI: 0.41, 0.65) with paclitaxel.

The results for nonpolymer paclitaxel-eluting stents showed no statistically significant benefit in comparison with bare metal stents for any of the outcomes; for MACE, the RR was 0.79 (95% CI: 0.60, 1.03).

The authors stated that there was no evidence of statistical heterogeneity. Regression meta-analyses showed sirolimus to be superior to paclitaxel in decreasing MACE. None of the other factors examined showed any significant influence on effect.

Authors’ conclusions
This meta-analysis demonstrated the superiority of DES over bare metal stents.

CRD commentary
The review addressed a clear research question using defined inclusion criteria. The database search was limited to MEDLINE and the search terms were not reported. Since only studies in English were sought and there was no mention of any search for unpublished studies, it is possible that studies were missed. Some of the methods of the review (study selection, data extraction) were not described clearly. The methodological quality of the studies was, however, assessed.
The statistical pooling of the studies was appropriate and statistical heterogeneity was investigated. The studies were clinically heterogeneous and some of the differences were investigated in a regression analysis. The authors' main conclusions follow from the evidence presented. However, the finding of a benefit of sirolimus-over paclitaxel-eluting stents should be viewed with caution, as this was based on an indirect comparison of the two stents.

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

Research: The authors stated that future studies should not be placebo-controlled but that any new DES should be assessed against the currently reviewed ones.

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