Statins for the prevention of contrast-induced nephropathy: a systematic review and meta-analysis

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CRD summary
The authors concluded that limitations of the evidence precluded definitive conclusions regarding the protective effects of statins for contrast-induced nephropathy. The review had some procedural limitations, but the authors acknowledged certain limitations of the included studies, such as heterogeneity, short-term follow-up and small clinical trial sample sizes. Given these limitations, the authors’ conclusions seem appropriate.

Authors’ objectives
To assess the effects of statins in the prevention of contrast-induced nephropathy (CIN).

Searching
MEDLINE (1966), EMBASE (1974), The Cochrane Library (2010), CNKI (1994) and Conference Proceedings Citation Index (2005) were searched through to July 2010. There were no language restrictions. Search terms were reported.

Study selection
Randomised controlled trials (RCTs) were eligible for inclusion if they compared short-term high-dose statins versus short-term low-dose statins or placebo. Cohort studies that compared a chronic statin pre-treatment group with a statin-naive group were eligible for inclusion. Eligible studies were required to report incidence of CIN (defined as an increase in serum creatinine level >25% or ≥0.5mg/dL).

Most of the RCTs used coronary angiography with or without percutaneous coronary intervention. Statins (simvastatin or atorvastatin) were administered at doses that ranged from 140 to more than 460mg over two to more than seven days. The mean age of patients ranged from 54 to 76 years. Some patients had chronic kidney disease or diabetes. Some patients received additional preventative agents (oral N-acetylcysteine).

Most of the cohort studies used percutaneous coronary intervention alone. Statins used included pravastatin, simvastatin, atorvastatin and rosuvastatin. Treatment duration, where reported, ranged from more than one week to more than 28 days. Where reported, all patients in some studies had chronic kidney disease. Some patients had diabetes or chronic heart failure. The mean age of patients, where reported, ranged from 63.6 to 72.7 years.

Two reviewers independently screened studies for inclusion and resolved discrepancies by consensus.

Assessment of study quality
The quality of RCTs was assessed according to reporting of methods of randomisation, concealment of allocation, blinding, power calculation and missing data.

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Outcome data were extracted from RCTs and cohort studies. Data from RCTs were used to calculate risk ratios and 95% confidence intervals (CIs). Where data were reported in cohort studies, odds ratios and 95% CIs, adjusted for risk factors using logistic regression, were extracted.

The authors did not state how many reviewers extracted data.

Methods of synthesis
Risk ratios and 95% CIs from RCTs were pooled using a fixed-effect and random-effects model. Statistical heterogeneity was assessed using the Q and I² statistics. Cohort data were pooled as a narrative synthesis.
Results of the review
Six RCTs (1,194 participants analysed) and six cohort studies (one prospective and five retrospective; 31,174 participants, range 279 to 28,871) were included in the review. Four RCTs described method of randomisation, three reported concealment of allocation, one RCT was double-blind and two were single blind. Three RCTs reported power calculation. Only one RCT reported loss to follow-up. Follow-up in the RCTs ranged from one day to six months.

RCTs showed a non-significant protective trend towards decreased incidence of CIN with statin treatment using a fixed-effect model ($I^2=38\%$). Two RCTs reported long-term effects: one trial reported one death in the statin group and one patient in the control group underwent temporary haemofiltration within one month. The second study showed no differences between treatment groups at six month follow-up.

Four cohort studies reported adjusted odds ratios, which suggested significant reductions in the incidence of CIN with statin treatment. Other outcome effects were reported in the review.

Authors' conclusions
Due to the limitations of the evidence, definitive conclusions regarding the protective effects of statins for CIN could not be made.

CRD commentary
The review question was clearly stated and supported by appropriate inclusion criteria. A satisfactory literature search was undertaken. The lack of language restrictions reduced the risk of language bias. No formal assessment of publication bias was reported. Screening of studies was undertaken in duplicate; it was unclear whether this was also the case for quality assessment and data extraction, so reviewer error and bias could not be ruled out. The quality of RCTs was assessed using appropriate criteria and found to be generally poor; only one double-blind RCT fulfilled all the reporting requirements.

The combination of cohort studies as a narrative synthesis appeared appropriate given the evidence of clinical heterogeneity. The authors acknowledged clinical heterogeneity among the RCTs, but statistical tests did not show significant levels of heterogeneity.

The authors acknowledged certain limitations with the included studies, such as short-term follow-up and small sample sizes in the RCTs. Given these limitations, the authors' conclusions seem appropriate.

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

Research: The authors stated that large well-designed studies were needed to further assess the effects of statins on longer term clinical outcomes.

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