Effectiveness of cataract surgery in reducing driving-related difficulties: a systematic review and meta-analysis
Subzwari S, Desapriya E, Scime G, Babul S, Jivani K, Pike I

CRD summary
The authors concluded that cataract surgery was associated with an 88% decrease in the risk of driving-related difficulties. Given methodological problems in the review, the weak design of the included studies and their heterogeneity, these conclusions do not appear reliable.

Authors' objectives
To assess the effectiveness of cataract surgery in improving vision and driving standards and in reducing driving-related difficulties.

Searching
The following databases were searched from inception to May 2007: MEDLINE, EMBASE, CINAHL, DARE, EBM reviews, Cochrane Library, ACP Journal Club, Educational Resource Information Center (ERIC), International Biography of Social Sciences (IBSS), International Road Research Documentation (IRRD), TRANSDOC and Transportation Research Information Services. Reference lists of relevant studies were handsearched. Study authors and national and international agencies were asked to identify additional published and/or unpublished studies. The search was limited to studies in English.

Study selection
Studies of older drivers with cataracts undergoing any type of cataract surgery and reporting any type of driving-related indicator were eligible for inclusion. Included studies had to compare participants before and after surgery, or have a comparison group not undergoing surgery. A secondary outcome of interest was motor vehicle crash involvement. The following study designs were eligible: randomised controlled trial (RCT), non-randomised controlled trial, quasi-experimental, case-control, cohort, and controlled before-and-after study.

Most of the included studies did not report participants' risk factors, or the type or severity of cataracts. Surgery (where described) was photo-emulsion or any type of cataract surgery. The main outcome measure in the review was reduction in driving-related difficulties. This covered a diverse range of measures reported in the primary studies (e.g. ability to drive at night, in rush-hour, in driving test). In most studies (where stated) outcomes data were collected by means of a self-administered questionnaire before and after surgery. Other outcomes reported in the review were visual function and adverse effects. The included studies were conducted in Europe, USA, Australia and India.

Two reviewers independently selected studies for inclusion, with disagreements resolved by discussion, involving a third reviewer if necessary.

Assessment of study quality
The Effective Public Health Project Quality Assessment Tool 2003 was used to grade study quality as strong, moderate or weak. The following factors were assessed: methods of selection, allocation, data collection and analysis; confounding; blinding; withdrawals and drop-outs; and integrity of intervention.

Two reviewers blinded to study findings independently conducted the assessment.

Data extraction
Rates of driving-related difficulties before and after surgery were extracted for each study and odds ratios (ORs) and 95% confidence intervals (CIs) were calculated.

Data were extracted by two reviewers, with disagreements resolved at a reviewers' meeting.
Methods of synthesis
Data on driving-related difficulties were combined to calculate pooled odds ratios and 95% confidence intervals. A random-effects model was used, as there was significant heterogeneity with a fixed-effect model. Statistical heterogeneity was assessed using the $\chi^2$ test and $I^2$ statistic. The effects of study design (prospective /retrospective) were explored by an analysis including only prospective studies. Publication bias was assessed by means of a funnel plot. Data on other outcomes were summarised briefly in the text.

Results of the review
Seven studies were included in the review (n=1,915 participants); five studies were apparently prospective before-and-after studies, one was a retrospective before-and-after study and one was a prospective cohort study. All studies were described by the authors as cohort studies. Five studies were graded as of moderate quality and two as weak. Most studies adjusted for potential confounders. Only one reported use of a validated questionnaire. Drop-out rates varied. Five studies were included in meta-analysis.

When five before-and-after studies were pooled (n=approximately 838 participants), cataract surgery was associated with a statistically significant reduction in the risk of driving-related difficulties compared to pre-surgery (OR 0.12, 95% CI 0.10 to 0.16; random-effects model). There was significant heterogeneity ($p=0.005, I^2=73.4\%$), which persisted when the retrospective study was excluded from analysis. There were insufficient data for other sensitivity analyses.

All studies reported on visual function and reported that cataract surgery was associated with significant improvements in visual acuity; data for this outcome were not pooled.

No adverse effects were reported.

Authors’ conclusions
Cataract surgery was associated with an 88% decrease in the risk of driving-related difficulties.

CRD commentary
The objectives of the review were clear, but the decision to include studies lacking a non-surgical control group limited the value of the review findings, as this design could not show causality. Appropriate criteria were used to assess study validity, but the results for individual studies were not reported. The authors’ decision to statistically pool the data on driving-related difficulties did not appear appropriate, as the treatment and control groups were not independent of each other. The heterogeneity of the pooled results suggested that the overall effect measure was not clinically meaningful. The interpretation of the funnel plot was not reported, so the potential for publication bias was unclear.

There were inconsistencies in reporting, such as the large discrepancy in sample numbers between the tables and the forest plots, and the unexplained omission of two studies from the meta-analysis and results sections. The outcome of motor vehicle crash involvement was not reported, and findings for the outcome of visual function were mentioned only in passing, without numerical data. The authors acknowledged some of the limitations of the review, such as the potential bias of self-reported findings. With respect to the main conclusion of the review, the effect estimate was spuriously precise and lacked a sound evidence base, while the outcome (i.e. reducing driving-related difficulties) was so broad as to lack clinical applicability. Given methodological problems in the review, the weak design of the included studies and their heterogeneity, the authors’ conclusions do not appear reliable.

Implications of the review for practice and research
Practice: The authors stated that cataract surgery might improve driving in older people, reduce motor vehicle crashes and improve traffic safety and individual quality of life.

Research: The authors stated that a large RCT should be conducted to determine the optimal timing for cataract surgery: this might be of particular benefit to developing countries. They also suggested that research is needed to determine whether patient characteristics (e.g. type of cataract, gender) influence the effects of cataract surgery.
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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.