A systematic overview of the incidence of posterior capsule opacification
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Authors' objectives
To obtain a more precise overall estimate of the incidence of posterior capsule opacification (PCO) after cataract surgery, and to explore factors that might influence the rate of PCO development.

Searching
MEDLINE was searched from 1979 to 1996. The bibliographies of the retrieved articles were also examined for relevant articles. The authors did not state the search terms. Only English language publications were included.

Study selection
Study designs of evaluations included in the review
The authors do not report the specific study designs included. To be included, the studies had to report the sample size, the post-operative rate of PCO, and some measure of the length of follow-up for the patients’ eyes.

The duration of the studies ranged from 0.33 to 1.67 years in the 'one year' analysis, from 2 to 3.25 years in the 'three year' analysis and from 4 to 5 years in the 'five year' analysis.

Specific interventions included in the review
Extracapsular cataract surgery, including primarily standard extracapsular extractions and/or primarily phacoemulsification. Intraocular lens (IOL) styles varied among studies, although the majority (53%) reported the use of primarily polymethyl methacrylate.

Participants included in the review
Patients who had undergone extracapsular cataract extractions were included.

Outcomes assessed in the review
Pooled estimates of the proportion of eyes developing PCO were measured at three post-operative timepoints: 1, 3 and 5 years. The PCO rates were defined by the occurrence of Nd:YAG laser capsulotomy (or second surgical discission) in the majority of the included studies.

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

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

Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

The studies were categorised for analysis according to the length of follow-up: 1-year analysis (3 to 23 months), 3-year analysis (24 to 48 months) and 5-year analysis (more than 48 months).

Methods of synthesis
How were the studies combined?
A pooled estimate of the rate of PCO for each timeframe was obtained from the observed rates of the eligible studies using the general method of the weighted average. For comparison, the data were pooled using different weights: the total variance, i.e. weights equal to the inverse of the sum of the study variance and the among-study variance; no weighting; and weights equal to the sample size of each study.

In all cases, the 95% confidence intervals (CIs) were calculated using the standard errors derived from the method of moments approach, as proposed by DerSimonian and Laird (see Other Publications of Related Interest no.1).

How were differences between studies investigated?
Chi-squared tests for homogeneity of proportions were performed using the method outlined by Cochran (see Other Publications of Related Interest no.2) for each timeframe.

The authors performed a separate analysis of the four studies that directly compared IOLs with a convex posterior surface. A pooled estimate of the overall relative risk of PCO for the convex posterior versus plano posterior surface IOLs was obtained using the Mantel-Haenszel approach. The Breslow-Day test for homogeneity (see Other Publications of Related Interest no.3) was performed on these four studies.

Using both simple unweighted linear regression models and models weighted by the inverse total variance, the authors examined the relationship of time since surgery and PCO incidence. In these models, the following were tested:

- differences in PCO incidence among the three time frames (1,3, and 5 years);
- a linear trend in incidence; and
- differences in PCO incidence associated with the actual follow-up times reported in the studies.

The authors also investigated whether the actual follow-up time of the studies was associated with the PCO rate within their 1- and 3-year timeframes. In further linear regression models for the 1-year time period, the authors investigated whether other factors could account for a portion of the variability in the reported rates of PCO. The factors investigated included: the type of surgery (phacoemulsification versus standard extracapsular); the type of IOL material (silicone acrylate versus polymethylmethacrylate); the inclusion of a visual acuity threshold for performance of YAG capsulotomy (yes versus no); and the percentage of patients lost to follow-up.

Results of the review
There were 49 articles included in the analyses. The incidence of PCO after extracapsular cataract extraction with posterior chamber IOL implantation was measured in a 1-year analysis for 31 studies (12,335 participants), in a 3-year analysis for 19 studies (66,496 participants) and in a 5-year analysis for 5 studies (1,866 participants).

Significant heterogeneity was found in the reported rates of PCO at 1, 3 and 5 years after surgery (each p<0.001).

The pooled rates calculated using the inverse total variance weights were 11.8% (95% CI: 9.3, 14.3) at one year, 20.7% (95% CI: 16.6, 24.9) at 3 years, and 28.4% (95% CI: 18.4, 38.4) at 5 years. There were generally only minor differences between the unweighted and weighted linear regression models. The test for linear trend showed a significant increase in PCO incidence with time after surgery (p=0.0002), with an estimated rise in incidence of 4.1 percentage points between each interval (i.e. from 1 to 3 years and from 3 to 5 years). The results were similar when the actual reported follow-up times were used (p=0.0007). Compared with the 1-year timeframe, PCO incidence was significantly higher at both 3 years (p=0.04) and 5 years (p=0.0002), whereas the difference in incidence between the 3- and 5-year timeframes did not reach significance (p=0.07). There was a positive but non significant secular trend in the incidence of PCO in both the unweighted and the weighted regression models (p>0.3 for each time period).

There was weak evidence that PCO incidence in studies using a visual acuity threshold for performance of a
capsulotomy tended to be higher than in studies in which such a criterion was not used (p=0.06). None of the other factors examined were significantly associated with PCO incidence.

In the comparison of IOL styles, the overall relative risk of PCO was 0.69 (95% CI: 0.51, 0.94) for convex posterior surface versus plano posterior surface, after an average of 1 to 2 years following surgery. This indicated a significantly lower risk of PCO in the convex posterior surface IOL group. However, the Breslow-Day test results suggested significant heterogeneity (p<0.001) among the rates reported in one clinical trial and the three clinical series in this subanalysis. The heterogeneity of the relative risk estimates was attributed to one study, which showed a relative risk of 3.38 for convex versus plano posterior surface IOLs.

Authors' conclusions
Visually significant PCO developed in more than 25% of the patients undergoing standard extracapsular cataract extraction or phacoemulsification with posterior chamber IOL implantation, over the first five years after surgery. The patients' characteristics, surgical techniques, and differences in research design and reporting, may have accounted for some of the variability in the reported rates. More precise estimates of incidence and identification of risk factors for PCO will depend on the development of a standardised measurement of PCO, and the wider adoption of more rigorous study methodology.

CRD commentary
The review answered a well-defined question. The inclusion and exclusion criteria were appropriate.

The search was fairly narrow and could have been extended to include other databases such as EMBASE and an attempt to identify unpublished literature. The authors did not state the search terms and excluded articles not published in English; this could potentially lead to a publication bias. The validity of the included studies was not assessed. Few details of the individual studies were presented. Information on the types of study designs included, and the gender and mean age of the participants in the individual studies, would have been useful. The primary studies were combined despite inherent heterogeneity.

The authors stated that most studies suffered from high losses to follow-up, (the exact figures were not reported). Consequently, the accuracy with which the reported rates estimate the true rate of PCO is unclear. In addition, the authors noted that the majority of the included studies were case series, and that follow-up times varied widely within and among studies and were often poorly reported.

The authors’ conclusions follow from the results, but should be interpreted with the limitations in mind.

Implications of the review for practice and research
The authors state that the application of more rigorous study methodology, including a more standardised definition of PCO for clinical trials and epidemiological studies, would be instrumental in further delineating the true socioeconomic impact of PCO, as well as identifying factors that might lower the incidence of this important post-surgical morbidity.

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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.