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Surgery for post-vitrectomy cataract

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Abstract

Background—Cataract formation or acceleration can occur after intraocular surgery, especially following vitrectomy, a surgical technique used in the treatment of disorders that affect the posterior segment of the eye. The underlying problem that led to vitrectomy may limit benefit from cataract surgery.

Objectives—The objective of this review was to evaluate benefits and harms of surgery for post-vitrectomy cataract.

Search methods—We searched CENTRAL (*The Cochrane Library* 2011, Issue 2), MEDLINE (January 1950 to April 2011), EMBASE (January 1980 to April 2011), Latin American and Caribbean Health Sciences Literature Database (LILACS) (January 1982 to April 2011), the *meta*Register of Controlled Trials (*m*RCT) (www.controlled-trials.com), ClinicalTrials.gov (www.clinicaltrial.gov) and the Australian New Zealand Clinical Trials Registry (ANZCTR)

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(www.anzctr.org.au). There were no date or language restrictions in the electronic searches for trials. The electronic databases were last searched on 19 April 2011.

Selection criteria—We planned to include randomized and quasi-randomized trials comparing cataract surgery with no surgery in adult patients who developed cataract following vitrectomy.

Data collection and analysis—Two authors screened the search results independently. No studies were eligible for inclusion in the review.

Main results—We found no randomized or quasi-randomized trials comparing cataract surgery with no cataract surgery for patients who developed cataracts following vitrectomy.

Authors' conclusions—There is no evidence from randomized or quasi-randomized controlled trials on which to base clinical recommendations for surgery for post-vitrectomy cataract. There is a clear need for randomized controlled trials to address this evidence gap. Such trials should stratify participants by their age, the retinal disorder leading to vitrectomy, and the status of the pathologic process in the contralateral eye. Outcomes assessed in such trials may include gain of 8 or more letters vision on the Early Treatment Diabetic Retinopathy Study (ETDRS) scale, quality of life, and adverse events such as posterior capsular rupture. Both short-term (six months) and long-term (one-year or two-years) outcomes should be examined.

Plain language summary—Surgery for post-vitrectomy cataract

Vitrectomy or surgery for removal of vitreous, the substance in the center of the eye, for several conditions can result in formation or acceleration of cataract, specifically nuclear sclerotic cataract (that due to hardening and opacification of the central portion of the lens in the eye). We found no randomized trials evaluating the benefits and/or risks of cataract surgery following vitrectomy. Since cataract surgery may lead to deterioration of vision due to worsening or recurrence of the condition that prompted the vitrectomy, its role in these patients remains uncertain. Future trials should stratify participants by age, the retinal disorder leading to surgery (vitrectomy) and the status of the disease process in the opposite eye. Outcomes relevant to patients such as a gain of 8 or more letters of vision on the ETDRS (Early Treatment Diabetic Retinopathy Study) scale, quality of life measures, and important adverse events should be examined both in the short-term (six months after surgery) and in the long-term (one-year to two-years after surgery).

Background

Description of the condition

Cataract, an opacification of the crystalline lens in the eye, can be caused by many factors including the natural aging process, metabolic abnormalities, nutritional disorders, chronic ocular inflammation, and trauma. There are three types of cataract that are classified according to the location of the opacity: cortical, nuclear sclerosis, and posterior subcapsular. Cataract formation or acceleration can also occur after intraocular surgery, especially following vitrectomy, a surgical technique to treat certain disorders affecting the posterior segment of the eye. Vitrectomy causes progression of nuclear sclerotic cataracts.

Vitrectomy was first developed by Machemer in 1971 (Machemer 1971). Vitrectomy is a microsurgical technique in which specialized instruments and techniques are used to gain access to the vitreous cavity and retina. During vitrectomy surgery, three small incisions,

each approximately 1.4 mm in length, are made in the eye in order to place instruments: a vitreous cutter, a fiberoptic light source to illuminate the inside of the eye, and an infusion cannula to maintain proper intraocular pressure during the surgery. During the past 35 years, advances in surgical technique and instrumentation have made vitrectomy a common surgical procedure for posterior segment disorders. Vitrectomy is indicated for numerous ocular conditions including vitreous loss in cataract surgery, subluxation of the lens, malignant glaucoma, dense pupillary membranes, non-clearing vitreous hemorrhage due to diabetic retinopathy or vein occlusions, retinal detachment, macular hole, macular pucker, vitreo-macular traction, and endophthalmitis. Although vitrectomy has revolutionized the treatment of posterior segment disorders and improved visual outcomes in patients with retinal diseases requiring surgical intervention, vitrectomy also is associated with co-morbidities that may compromise visual acuity such as retinal detachment, corneal decompensation, and cataract formation or progression in phakic eyes (Benson 1988). The type of cataract that forms or accelerates is nuclear sclerotic cataract. Cataract formation or progression is believed to be the most common complication associated with vitrectomy. In fact, in many eyes undergoing vitrectomy, the lens is removed at the same time. Often, the nuclear sclerotic cataracts that develop after vitrectomy limit visual acuity outcomes to a degree that would result in surgical removal of the lens in an otherwise “normal” eye. The exact pathogenesis of cataract formation or acceleration after vitrectomy is unknown. Older studies have suggested that light toxicity, oxidation of lens proteins, use of intraocular gas and length of operative time may be causative factors (Cherfan 1991; de Bustros 1988; Ogura 1991). Newer research suggests that vitrectomy surgery increases oxygen tension within the eye; oxygen exposure has been linked with progressive nuclear sclerotic cataract formation (Holekamp 2005: Palmquist 1988).

Epidemiology—Although cataract progression is common after vitrectomy, only a few prospective studies have evaluated this occurrence. Do and Hawkins performed a review (unpublished) of the pertinent literature in the PubMed database published from 1966 through 2005. A total of 51 studies were found. The majority of published studies on cataract progression after vitrectomy were retrospective analyses. The reported incidence of cataract is highly variable, from 6% to 100% of cases, depending upon the condition that prompted vitrectomy, duration of follow up, and the method used to monitor development of cataract. These retrospective studies are limited by the non-uniformity of the lens grading system used or the absence of a description of the lens grading system in the published report.

The Vitrectomy for Macular Hole Study, a randomized clinical trial that evaluated vitrectomy for the treatment of macular holes, retrospectively examined the incidence of cataract development among 74 eyes that participated in the study (Cheng 2001). Investigators used a scoring system similar to the Lens Opacities Classification System II, which contains five grading categories for nuclear and posterior subcapsular opacities. Although duration of surgery did not increase the risk for cataract progression, vitrectomy itself was a risk factor for cataract acceleration; 81% of eyes in the surgery cohort had nuclear sclerotic cataract progression at six months of follow up, compared to only 18% of eyes in the control group. By two years, 100% of eyes in the surgery cohort had cataract

progression, compared to 8% of control eyes. Similarly, Cherfan and colleagues retrospectively reviewed 100 eyes after vitrectomy for idiopathic macular pucker (Cherfan 1991). After an average follow up of 29 months (range six to 99 months), 80 eyes in the vitrectomy group had developed a visually significant nuclear sclerotic cataract or had undergone cataract extraction compared to only 24 eyes in the control group.

During the late 1990s, the Submacular Surgery Trials (SST) were initiated to evaluate surgical removal of subfoveal choroidal neovascularization (CNV) compared with observation in patients with age-related macular degeneration (AMD) (SST Group N and Group B), ocular histoplasmosis syndrome (OHS) (SST Group H), and idiopathic CNV (SST Group H) (SST 2004a; SST 2004b; SST 2004c). In these three randomized clinical trials, visually significant cataract was defined as either cataract surgery or lens opacity reported by the SST ophthalmologist to be sufficient to reduce visual acuity by 2 or more lines in a normal eye. Among the AMD participants in the SST Group N study, 80% of eyes assigned to vitrectomy and surgical removal of their subfoveal CNV developed visually significant cataracts at two years of follow up. Sixty per cent of eyes underwent cataract surgery by their last follow-up examination two to four years after enrollment. Among the OHS participants in the SST Group H study, 39% of eyes assigned to vitrectomy developed visually significant cataracts, among which 24% underwent cataract removal. The stark difference between eyes with AMD and eyes with OHS developing post-vitrectomy cataract is likely due to the median age of the patients. Patients under the age of 50 years are relatively protected from developing post-surgical accelerated nuclear sclerosis (Melberg 1995). Data from the SST will provide the largest and most complete follow up of eyes undergoing vitrectomy that are at high risk for developing visually significant post-surgical nuclear sclerotic cataracts.

Presentation and diagnosis—Patients who develop post-vitrectomy cataracts present with decreased visual acuity despite anatomic and/or functional success of the vitrectomy surgery. Individuals who have undergone vitrectomy may have lower levels of baseline (pre-cataract) visual acuity due to the underlying nature of their retinal pathology; therefore patients with post-vitrectomy cataracts are more likely to present with poorer vision than individuals with typical senile cataracts. Diagnosis is made with ocular examination using slit-lamp biomicroscopy.

Description of the intervention

Cataract surgery, typically using phacoemulsification and intraocular lens implantation, commonly is recommended for individuals with visually significant lens opacities. Two features of post-vitrectomy nuclear sclerosis make affected lenses especially challenging for cataract surgeons to remove. The nucleus tends to be harder than in age-related nuclear sclerosis, requiring longer phacoemulsification time during the procedure. Also, the absence of vitreous in the posterior segment allows for more mobility of the posterior capsule, increasing the risk of capsular rupture. Thus, surgery for post-vitrectomy nuclear sclerotic cataract may have a higher incidence of complications, although evidence from comparative studies is lacking (Ahfat 2003; Biro 2002).

How the intervention might work

Patients who develop cataract after vitrectomy may undergo cataract extraction; however, visual acuity and other outcomes after cataract surgery may be poor due to the underlying retinal disorder. Most patients who have vitrectomy surgery have serious underlying problems, as indicated by the reasons for vitrectomy. Furthermore, eyes with post-vitrectomy cataract are at risk of complications that affect other patients undergoing cataract surgery such as endophthalmitis, cystoid macular edema, etc. Thus, vision often already is impaired before cataract surgery and may remain impaired after vitrectomy. Although cataract surgery in a normal eye typically improves vision, the visual prognosis after surgery for post-vitrectomy cataract may be uncertain. It will likely depend on the success of treatment for the retinal disorder and avoidance of complications during cataract surgery.

Why it is important to do this review

The incidence of cataract formation after vitrectomy varies widely and has been reported to be between 6% and 100%. The majority of published studies confirm that a high rate of cataract formation occurs, but little data are available on visual acuity outcomes after cataract removal. The retinal problem that led to vitrectomy may progress or recur. However, peer-reviewed data on outcomes after surgery for post-vitrectomy cataract are scarce. Even in situations in which cataract formation is not due to vitrectomy, visual impairment can still exist despite cataract extraction. The Los Angeles Latino Eye Study (Barañano2007) published visual acuity outcomes after cataract extraction in adult Latinos and reported that 41% of eyes had visual impairment (defined as a best-corrected visual acuity of 20/40 Snellen equivalent or less). AMD and diabetic retinopathy (DR) accounted for approximately 57% of retinal pathology after cataract extraction. In addition, in eyes that have undergone vitrectomy surgery the absence of vitreous in the posterior segment allows for more mobility of the posterior capsule, increasing the risk of capsular rupture. Surgery for post-vitrectomy nuclear sclerotic cataract may have a higher incidence of complications. Additional studies are needed to provide long-term visual outcomes and to determine whether cataract extraction, either at the time of vitrectomy or at a subsequent date, is beneficial in this population. A systematic review of outcomes from controlled clinical trials would provide information for adequate counseling of patients and for guiding ophthalmologists' recommendations.

Objectives

The objective of this review was to evaluate benefits and adverse outcomes of surgery for post-vitrectomy cataract with respect to visual acuity, quality of life, and other outcomes.

Methods

Criteria for considering studies for this review

Types of studies—We planned to include both randomized and quasi-randomized controlled trials in this review. We considered quasi-randomized trials to be trials that had adopted a method of allocation intended to allocate patients in a random fashion but were not strictly random. Examples include allocation by date of birth, social security number,

etc. We were to include trials with at least six months' follow up to allow for reporting of early adverse effects, even though our primary analyses were planned to focus on outcomes at the end of one year of follow up.

Types of participants—We planned to include trials that enrolled adult participants (age 18 years and over) with cataract developing after vitrectomy for any indication except for trauma. However, we planned not to exclude trials that included both adult patients who had post-traumatic vitrectomy and patients who had other indications for vitrectomy. We planned to exclude trials that included only trauma cases, because these patients typically are younger and the pathogenesis of cataract formation is different.

Types of interventions—We planned to include trials that compared cataract surgery (of any type) with no surgery in such patients.

Types of outcome measures

Primary outcomes: Visual acuity improvement after cataract surgery of at least 3 letters on a logMAR chart, 1 line on the Snellen chart or equivalent changes on other scales. While we planned to analyze the outcomes at one year, two years and at longer time points of follow up as available from included studies, our primary analysis was to focus on one year follow up.

Secondary outcomes

1. Quality of life measured by a validated scale.
2. Cost-effectiveness.
3. Contrast sensitivity: improvement of at least one level, regardless of the manner in which it was measured in included trials.
4. Progression of the condition that was the original indication for vitrectomy in patients with DR and AMD as defined by standard grading scales such as the International Scale for AMD (Bird 1995) and Diabetic Retinopathy Scale for DR (ETDRS 1991).

Adverse outcomes: Specific adverse effects of interest included:

- cystoid macular edema
- intraocular lens-related complications, including dislocation, difficulty in placing the lens
- capsular opacification
- retinal detachment (new or recurrent)

We also planned to summarize all other adverse effects reported in included studies.

Search methods for identification of studies

Electronic searches—We searched the Cochrane Central Register of Controlled Trials (CENTRAL) 2011, Issue 2, part of *The Cochrane Library*. www.thecochranelibrary.com (accessed 19 April 2011), MEDLINE (January 1950 to April 2011), EMBASE (January 1980 to April 2011), Latin American and Caribbean Health Sciences Literature Database (LILACS) (January 1982 to April 2011), the Eye Portfolio contained in the UK Clinical Research Network Portfolio Database (UKCRN) the *meta*Register of Controlled Trials (*m*RCT) (www.controlled-trials.com), ClinicalTrials.gov (www.clinicaltrial.gov) and the Australian New Zealand Clinical Trials Registry (ANZCTR) (www.anzctr.org.au). There were no date or language restrictions in the electronic searches for trials. The electronic databases were last searched on 19 April 2011.

See: Appendices for details of search strategies for CENTRAL (Appendix 1), MEDLINE (Appendix 2), EMBASE (Appendix 3), LILACS (Appendix 4), *m*RCT (Appendix 5), ClinicalTrials.gov (Appendix 6) and ANZCTR (Appendix 7).

The UK Clinical Research Network Portfolio Database is no longer being searched for this review.

Searching other resources—We planned to search the reference lists of included studies and the Science Citation Index - Expanded database to identify any additional trials. We did not search any conference proceedings specifically for the purpose of this review.

Data collection and analysis

Selection of studies—Two review authors independently screened the titles and abstracts of all articles identified in the electronic and manual searches. Articles were to be labeled as A - include, B - unsure, C - exclude. Full-text of articles labeled B - unsure were screened by two authors and labeled as A - include or C - exclude based on consensus after review. Studies reported in articles labeled C and excluded after full-text review of the article were listed in the table of excluded studies with reasons for exclusion. We planned to assess methodological quality for studies labeled as A - include; however, none were labeled as A - include by either of the two review authors.

We found no trials eligible for inclusion in either the original review or the updated review. The methods described below will be applicable to future updates of the review when trials eligible for inclusion have been conducted and reported.

Data extraction and management—Two review authors will independently extract the data for the primary and secondary outcomes onto paper data collection forms developed in collaboration with the Cochrane Eyes and Vision Group. We will resolve discrepancies by discussion. We will contact authors of included studies for missing data. One review author will enter all data into RevMan 5.1 (RevMan 2011) and another author will verify the data.

Assessment of risk of bias in included studies—Two review authors, working independently, will assess the included studies for sources of systematic bias in the included trials according to the guidelines in Chapter 8 of the Cochrane Handbook for Systematic

Reviews of Interventions (Higgins 2011a). We will evaluate studies for the following criteria: method of randomization, allocation concealment (selection bias), masking of outcome assessment, rates of follow up, incomplete outcome data, and intention-to-treat analysis (attrition bias) and other potential sources of bias including source of trial funding. We will not assess masking of investigators as the interventions to be compared preclude such efforts. Though an artificial lens placed in eyes of patients in the intervention group may be recognized by the anatomic outcome assessor, visual acuity testing may have been performed by someone not responsible for examining the eye. Also, quality of life data may have been collected by some method that preserves masking of intervention and/or outcome assessment. Each criterion will be judged as either 'low risk of bias,' 'high risk of bias,' or 'unclear risk of bias'. We will use information in the Cochrane Handbook to guide our judgment for each criterion. We will contact authors of studies labeled 'unsure' for clarification. Differences between the two review authors will be resolved by discussion.

Measures of treatment effect—We will calculate a summary relative risk for dichotomous outcomes (visual acuity improvement, progression of the condition that was the original indication for vitrectomy, and adverse events). We will calculate the weighted mean difference for continuous outcomes (quality of life, cost-effectiveness, and contrast sensitivity).

Dealing with missing data—We will attempt to contact the investigators of included trials for any missing data. If the investigators do not respond within four weeks, we will extract available data from the published report. We will refer to guidelines in Chapter 16 of the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2011b) for handling missing data.

Assessment of heterogeneity—We will examine the degree of overlap in the confidence intervals of the studies. If there is poor overlap, this will be taken to indicate the presence of statistical heterogeneity. We also will examine the forest plot of the results of studies for symmetry.

Statistical heterogeneity will be tested formally using the Chi^2 test and I^2 value. We will consider an I-square value greater than 50% to indicate substantial heterogeneity.

Assessment of reporting biases—We will examine a funnel plot to identify any evidence of publication bias.

Data synthesis—If no significant statistical heterogeneity is detected, either statistically or by review, or there is a small number of trials in the analysis (three or fewer), we will use a fixed-effect model. If the number of trials is greater than three and no heterogeneity has been detected, we will use a random-effects model.

If significant heterogeneity has been detected, we will not combine results to produce a single summary measure. In this case, we will describe the forest plot in the results section of the review.

Subgroup analysis and investigation of heterogeneity—Heterogeneity, if present, will be investigated through subgroup analyses. If sufficient data are available, we will conduct subgroup analyses based on the agents used to fill the vitreous space after vitrectomy, e.g., air, different gases, and by different indications for vitrectomy.

Sensitivity analysis—We will conduct sensitivity analyses to determine the impact of exclusion of studies of lower methodological quality, including quasi-randomized trials, and exclusion of industry-funded studies and unpublished studies.

Economic issues: We will tabulate or summarize data on costs of procedures, consequences of complications and any cost-effectiveness data reported in included studies in a narrative fashion.

Results

Description of studies

Results of the search—The original electronic searches retrieved a total of 1949 references and 29 additional titles and abstracts from clinical trials registers. After independent review of the titles and abstracts by two review authors, 36 full-text articles were retrieved. We found no randomized or quasi-randomized trials eligible for inclusion in the review.

An updated search was done in April 2011, 785 references and 18 titles and abstracts from clinical trials registers were retrieved. We assessed the records but none were eligible for inclusion in the review.

Included studies—We did not identify any studies eligible for inclusion in this review.

Excluded studies—Review of the full-text articles did not identify any studies that are relevant to the objective of this systematic review.

Risk of bias in included studies—We found no trials eligible for inclusion in the review for assessment of risk of bias.

Effects of interventions

We found no information on effects of interventions from trials eligible for inclusion in the review.

Discussion

The majority of the published literature on this subject is limited to retrospective case reports or non-randomized prospective case series (Ahfat 2003). Any attempt to draw conclusions from these non-randomized studies would be misleading. In addition, there is no reliable method to identify all observational studies on this topic; therefore data collection is likely to be incomplete. Thus, our protocol specifically stated that we were interested in outcomes based on randomized clinical trials, not observational studies. This dearth of

information on surgery for post-vitrectomy cataract indicates that information on this topic is needed, as thousands of patients undergo vitrectomy each year and are at risk of development of cataract and cataract surgery. Documentation of both the risks and benefits of surgery for post-vitrectomy cataract is needed to inform patient counseling and clinical recommendations.

Authors' conclusions

Implications for practice—In the absence of data from controlled trials, ophthalmologists have no reliable evidence to use when counseling patients regarding the risks and benefits of surgery for post-vitrectomy cataract, and no basis for recommendations for or against cataract surgery or when to intervene surgically. It is possible that some of the complications of surgery for post-vitrectomy cataract could be reduced if surgery were known to be beneficial if performed at an early stage of development of nuclear sclerosis. Data from retrospective studies are inadequate for these purposes.

Implications for research—There is a clear need for well-designed randomized controlled trials to evaluate the benefits and risks of surgery for cataracts that develop following vitrectomy. We recommend that randomization in such trials be stratified by patients' age, retinal disorder leading to vitrectomy, and status of the pathologic process in the contralateral eye. Because patients who undergo vitrectomy already have reduced vision due to the underlying condition that prompted vitrectomy, relevant outcomes such as quality of life should be considered in addition to visual acuity and other clinical measures of vision. We recommend that restoration or gain of 8 or more letters vision on the ETDRS scale with cataract surgery would be a reasonable expectation in this patient population. Analyses should include both short-term (six months) and long-term (one-year to two-years) outcomes. Data on adverse outcomes, including complications of surgery such as posterior capsular rupture, should be documented in future trials.

However, there are ethical difficulties in conducting a randomized trial of surgery for post-vitrectomy cataract. Observation of progression of post-vitrectomy cataract may not be considered an ethical alternative. In certain patient populations, such as those with significant central vision loss due to macular scars, observation of post-vitrectomy cataract may be ethical, and conducting a randomized controlled trial to determine if cataract surgery improves quality of life may be a reasonable option. Concerns about surgical complications, prognosis for recovery of visual acuity, and uncertainty regarding progression of underlying retinal disorder are important considerations in establishing equipoise necessary for randomization. Further, insufficient information on outcomes important to patients, such as vision-related quality of life, indicate an inability to reasonably assess risks and benefits of surgery for post-vitrectomy cataract.

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Appendices

1 CENTRAL search strategy

#1 MeSH descriptor Cataract

#2 MeSH descriptor Cataract Extraction

#3 MeSH descriptor Capsulorhexis

#4 MeSH descriptor Phacoemulsification

#5 cataract* near extract* or aspirat* or operat* or remov* or surg* or excis* or implant*

#6 lens* near extract* or aspirat* or operat* or remov* or surg* or excis* or implant*

#7 pha?oemulsif*

#8 lensectom*

#9 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8)

#10 MeSH descriptor Vitrectomy

#11 vitrectom*

#12 (#10 OR #11)

#13 (#9 AND #12)

2 MEDLINE search strategy

1 randomized controlled trial.pt.

2 (randomized or randomised).ab,ti.

3 placebo.ab,ti.

4 dt.fs.

5 randomly.ab,ti.

6 trial.ab,ti.

7 groups.ab,ti.

8 or/1-7

9 exp animals/

10 exp humans/

11 9 not (9 and 10)

12 8 not 11

13 exp vitrectomy/

14 vitrectom$.tw.

15 or/13-14

16 exp cataract/

17 exp cataract extraction/

18 exp capsulorhexis/

19 exp phacoemulsification/

20 ((cataract$ adj3 extract$) or aspirat$ or operat$ or remov$ or surg$ or excis$ or implant $).tw.

21 ((lens$ adj3 extract$) or aspirat$ or operat$ or remov$ or surg$ or excis$ or implant$).tw.

22 pha?oemulsif$.tw.

23 lensectomy.tw.

24 or/16-23

25 14 and 24

26 12 and 25

The search filter for trials at the beginning of the MEDLINE strategy is from the published paper by Glanville et al (Glanville 2006).

3 EMBASE search strategy

1 exp randomized controlled trial/

2 exp randomization/

3 exp double blind procedure/

4 exp single blind procedure/

5 random$.tw.

6 or/1-5

7 (animal or animal experiment).sh.

8 human.sh.

9 7 and 8

10 7 not 9

11 6 not 10

12 exp clinical trial/

13 (clin$ adj3 trial$).tw.

14 ((singl$ or doubl$ or trebl$ or tripl$) adj3 (blind$ or mask$)).tw.

15 exp placebo/

16 placebo$.tw.

17 random$.tw.

18 exp experimental design/

19 exp crossover procedure/

20 exp control group/

21 exp latin square design/

22 or/12-21

23 22 not 10

24 23 not 11

25 exp comparative study/

26 exp evaluation/

27 exp prospective study/

28 (control$ or prospectiv$ or volunteer$).tw.

29 or/25-28

30 29 not 10

31 30 not (11 or 23)

32 11 or 24 or 31

33 exp vitrectomy/

34 vitrectom$.tw.

35 or/33-34

36 exp cataract/

37 exp cataract extraction/

38 exp phacoemulsification/

39 ((cataract$ adj3 extract$) or aspirat$ or operat$ or remov$ or surg$ or excis$ or implant $).tw.

40 ((lens$ adj3 extract$) or aspirat$ or operat$ or remov$ or surg$ or excis$ or implant$).tw.

41 pha?oemulsif$.tw.

42 lensectomy.tw.

43 or/36-42

44 35 and 43

45 32 and 44

4 LILACS search strategy

vitrectom$ and cataract or lens or phacoemulsif$

5 *meta*Register of Controlled Trials search strategy

cataract and vitrectomy

6 ClinicalTrials.gov search strategy

cataract AND vitrectomy

7 ANZCTR search strategy

cataract AND vitrectomy

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