

Cataract

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ABSTRACT

INTRODUCTION: Cataract accounts for over 47% of blindness worldwide, causing blindness in about 17.3 million people in 1990. Surgery for cataract in people with glaucoma may affect glaucoma control. **METHODS AND OUTCOMES:** We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of surgery for age-related cataract without other ocular comorbidity? What are the effects of treatment for age-related cataract in people with glaucoma? What are the effects of surgical treatments for age-related cataract in people with diabetic retinopathy? What are the effects of surgical treatments for age-related cataract in people with chronic uveitis? We searched: Medline, Embase, The Cochrane Library, and other important databases up to May 2010 (Clinical Evidence reviews are updated periodically; please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). **RESULTS:** We found 20 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. **CONCLUSIONS:** In this systematic review we present information relating to the effectiveness and safety of the following interventions: for people with cataract without other ocular co-morbidity: cataract surgery alone, cataract surgery with non-concomitant glaucoma surgery, concomitant cataract and glaucoma surgery, intracapsular extraction, manual (large or small) incision extracapsular extraction, and phaco extracapsular extraction; for people with cataract with co-morbid diabetic retinopathy: cataract surgery alone, and adding diabetic retinopathy treatment to cataract surgery; for people with cataract and co-morbid chronic uveitis: cataract surgery, and medical control of uveitis at the time of cataract surgery.

QUESTIONS

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What are the effects of treatment for age-related cataract in people with glaucoma?	12
What are the effects of surgical treatments for age-related cataract in people with diabetic retinopathy?	15
What are the effects of surgical treatments for age-related cataract in people with chronic uveitis?	19

INTERVENTIONS

AGE-RELATED CATARACT WITHOUT OTHER OCULAR COMORBIDITY

Beneficial

Manual large- or small-excision extracapsular extraction (manual large-excision extracapsular extraction more effective than intracapsular extraction, but less effective than phaco extracapsular extraction; unclear how manual small-excision [SICS] compares with phaco extracapsular extraction) 3

Phaco extracapsular extraction (improved visual acuity with fewer complications than manual large-incision extracapsular extraction; unclear how it compares with manual small-incision extracapsular extraction [manual SICS]) 6

Likely to be beneficial

Intracapsular extraction (more effective than no extraction;* less effective than manual large-incision extracapsular extraction and has more complications) 11

AGE-RELATED CATARACT IN PEOPLE WITH GLAUCOMA

Likely to be beneficial

Concomitant cataract plus concomitant glaucoma surgery (reduced intraocular pressure compared with cataract surgery alone) 13

Unknown effectiveness

Cataract surgery alone 12

Cataract surgery plus non-concomitant glaucoma surgery 12

AGE-RELATED CATARACT IN PEOPLE WITH DIABETIC RETINOPATHY

Likely to be beneficial

Cataract surgery in people with diabetic retinopathy 5

Unknown effectiveness

Adding diabetic retinopathy treatment to cataract surgery 17

AGE-RELATED CATARACT IN PEOPLE WITH CHRONIC UVEITIS

Unknown effectiveness

Cataract surgery (phaco or manual extracapsular extraction) in people with chronic uveitis **New** 19

Different methods of medical control of uveitis at the time of cataract surgery **New** 19

Covered elsewhere in Clinical Evidence

Age-related macular degeneration

Glaucoma

Uveitis (acute anterior)

To be covered in future updates

Different incisional types of cataract surgery

Unilateral versus bilateral cataract extraction

Footnote

*Based on consensus.

Key points

- Cataracts are cloudy or opaque areas in the lens of the eye that can impair vision. Age-related cataracts are defined as those occurring in people >50 years of age, in the absence of known mechanical, chemical, or radiation trauma.
 - Cataract accounts for over 47% of blindness worldwide, causing blindness in about 17.3 million people in 1990.
 - Surgery for cataract in people with glaucoma may affect glaucoma control.
 - There is contradictory evidence about the effect of cataract surgery on the development or progression of age-related macular degeneration (ARMD).
- Expedited [phaco extracapsular extraction](#) may be more effective at improving visual acuity compared with waiting list control in people with cataract without ocular comorbidities.
 - When combined with foldable posterior chamber intraocular lens implant (IOL), phaco extracapsular extraction seems more effective than manual large-incision extracapsular extraction at improving vision, and has fewer complications.
 - This procedure has largely superseded manual large-incision extracapsular cataract extraction in developed countries.
- [Manual large-incision extracapsular extraction](#) has also been shown to be successful in treating cataracts.
 - Combined with IOL, manual large-incision extracapsular extraction is significantly better at improving vision compared with intracapsular extraction plus aphakic glasses.
 - Small-incision manual extracapsular extraction (manual SICS) techniques and phaco extracapsular extraction techniques are similarly beneficial at improving visual acuity for advanced cataracts at 6 months, with few complications.
 - This finding may be particularly relevant to treatment in developing countries.
- [Intracapsular extraction](#) is likely to be better at improving vision compared with no extraction, although it is not as beneficial as manual (large or small) incision extracapsular extraction.
 - The rate of complications is also higher with this technique compared with extracapsular extraction.
- In people with glaucoma and cataract, [concomitant cataract surgery \(phaco or manual large-incision extracapsular extraction\) and glaucoma surgery](#) seems more beneficial than [cataract surgery alone](#), in that they both improve vision to a similar extent, but the glaucoma surgery additionally improves intraocular pressure.
 - We found no trials comparing different types of cataract surgery in people with glaucoma.
- In people with diabetic retinopathy and cataract, [phaco extracapsular extraction](#) may improve visual acuity and reduce postoperative inflammation compared with manual large-incision extraction.
 - Performing procedures in the order of cataract surgery first followed by pan retinal photocoagulation may be more effective than the opposite order at improving visual acuity and reducing the progression of diabetic macular oedema in people with cataract and diabetic retinopathy secondary to type 2 diabetes. However, these results come from one small RCT.
- One of the possible harms of cataract surgery is cystoid macular oedema, which people with uveitis also frequently suffer from.
 - We found no trials comparing different types of cataract surgery in people with chronic uveitis.
 - We don't know whether intravitreal triamcinolone acetonide is more effective than orbital floor injection of triamcinolone acetonide in improving outcomes after cataract surgery in people with chronic uveitis as we found few trials.

DEFINITION [Cataracts](#) are cloudy or opaque areas in the lens of the eye (which should usually be completely clear). This results in changes that can impair vision. **Age-related (or senile) cataract** is defined as cataract occurring in people >50 years of age, in the absence of known mechanical, chemical, or radiation trauma. This review covers treatment for age-related cataract in 4 different populations: people without ocular comorbidity, people with glaucoma, people with diabetic retinopathy, and people with chronic uveitis. Surgery for cataracts in people with glaucoma may affect glaucoma control and, in people with diabetic retinopathy, visual acuity after surgery for cataracts may be lower; the optimal strategy for treating these conditions when they co-exist is not clear. See also reviews on glaucoma, diabetic retinopathy, and uveitis.

INCIDENCE/ PREVALENCE Cataract accounts for over 47% of blindness worldwide, causing blindness in about 17.3 million people in 1990. ^[1] A cross-sectional study in a representative sample of an urban population in New South Wales, Australia, in 1997 (3654 people aged 49–96 years) found that the prevalence of late cataract (of all types) in people aged 65 to 74 years was 21.6%, and in people aged 85 years and older it was 67.3%. ^[2] This rate excluded those people who had already had cataract surgery. The incidence of non age-related cataract within this population is so small that this can be taken as the effective incidence of age-related cataract. Glaucoma has an overall prevalence

of about 2.0% rising to about 4.5% in people aged 70 years and older (the peak age for cataract surgery). In 2006, the 5-year incidence of nuclear cataract with open-angle glaucoma in people aged >50 years was estimated to be 25%.^[3]

AETIOLOGY/ RISK FACTORS Diet, smoking,^[4] and exposure to ultraviolet light^[5] are thought to be risk factors in the development of age-related cataract. In addition, some people may have a genetic predisposition to development of age-related cataract.^[6] ^[7] Oxidative stress is also thought to be a factor in cataract development,^[8] although the impact of dietary anti-oxidants on cataract development remains uncertain.

PROGNOSIS Age-related cataract progresses with age, but at an unpredictable rate. Cataract surgery is indicated when the chances of significant visual improvement outweigh the risks of a poor surgical outcome. It is not dependent on reaching a specific visual-acuity standard. Cataract surgery may also be indicated where the presence of cataract makes it hard to treat or monitor concurrent retinal disease, such as diabetic retinopathy.

AIMS OF INTERVENTION To restore vision and to improve quality of life with minimal adverse effects of treatment. Surgery in people with comorbid glaucoma aims to treat the cataract without adversely affecting glaucoma control.

OUTCOMES Uncorrected visual acuity; corrected visual acuity; speed and stability of visual rehabilitation; quality of life (including frequency and severity of accidents); adverse effects of treatment, such as endophthalmitis, vitreous loss, cystoid macular oedema, induced astigmatism, and retinal detachment. In people with glaucoma, intraocular pressure is used as a surrogate measure for glaucoma control (with increasing pressure implying increased risk of glaucoma progression). We have reported intraocular pressure in the absence of data on clinical outcomes. In people with cataract and concomitant diabetic retinopathy, final visual-acuity outcomes after cataract surgery may be compromised because of the retinopathy, and the cataract surgery may affect the progression of the retinopathy.

METHODS *Clinical Evidence* search and appraisal May 2010. The following databases were used to identify studies for this systematic review: Medline 1966 to May 2010, Embase 1980 to May 2010, and The Cochrane Database of Systematic Reviews May 2010 (online) (1966 to date of issue). When editing this review we used The Cochrane Database of Systematic Reviews 2010, issue 3. An additional search within The Cochrane Library was carried out for the Database of Abstracts of Reviews of Effects (DARE) and Health Technology Assessment (HTA). We also searched for re-tractions of studies included in the review. Abstracts of the studies retrieved from the initial search were assessed by an information specialist. Selected studies were then sent to the contributor for additional assessment, using predetermined criteria to identify relevant studies. Study design criteria for inclusion in this review were: published systematic reviews of RCTs and RCTs in any language, single blind unless blinding is impossible, and containing >20 individuals of whom >80% were followed up. The minimum length of follow-up required to include studies was 6 months. We included systematic reviews of RCTs and RCTs where harms of an included intervention were studied applying the same study design criteria for inclusion as we did for benefits. In addition we did an observational harms search for specific harms as highlighted by the contributor, peer reviewer, and editor. We searched for prospective cohort studies with or without a control group. In addition we use a regular surveillance protocol to capture harms alerts from organisations such as the FDA and the MHRA, which are added to the reviews as required. To aid readability of the numerical data in our reviews, we round many percentages to the nearest whole number. Readers should be aware of this when relating percentages to summary statistics such as relative risks (RRs) and odds ratios (ORs). We have performed a GRADE evaluation of the quality of evidence for interventions included in this review (see table, p 23). The categorisation of the quality of the evidence (high, moderate, low, or very low) reflects the quality of evidence available for our chosen outcomes in our defined populations of interest. These categorisations are not necessarily a reflection of the overall methodological quality of any individual study, because the Clinical Evidence population and outcome of choice may represent only a small subset of the total outcomes reported, and population included, in any individual trial. For further details of how we perform the GRADE evaluation and the scoring system we use, please see our website (www.clinicalevidence.com).

QUESTION What are the effects of surgery for age-related cataract without other ocular comorbidity?

OPTION MANUAL (LARGE OR SMALL) INCISION EXTRACAPSULAR EXTRACTION

- For GRADE evaluation of interventions for Cataract, see table, p 23 .

- Manual large-incision extracapsular extraction has been shown to be more successful than intracapsular extraction in treating cataracts and has been associated with lower rates of complications, including cystoid macular oedema or posterior capsule opacification.
- However, manual large-incision extracapsular extraction is less effective than phaco extracapsular extraction combined with foldable posterior chamber intraocular lens implant (IOL), and has higher complication rates.
- Phaco extracapsular extraction has largely superseded manual large-incision extracapsular extraction in developed countries.
- Manual small-incision extracapsular extraction plus rigid posterior chamber IOL may be as effective as phaco extracapsular extraction plus foldable intraocular lens implant but further confirmatory data are needed.
- We found no direct information from RCTs about whether manual (large or small) incision extracapsular extraction is better than no active treatment.

Benefits and harms

Manual (large or small) incision extracapsular extraction versus no extraction:

We found no systematic review or RCTs comparing manual (large or small) incision extracapsular extraction versus no extraction. There is consensus that the clinical and quality-of-life benefits of modern cataract removal are such that an RCT including non-intervention would be unethical.

Manual large-incision extracapsular extraction versus intracapsular extraction:



We found one RCT comparing manual large-incision extracapsular extraction plus intraocular lens implant (IOL) versus intracapsular extraction plus aphakic glasses, with follow-up lasting 1 year (different lengths of follow-up reported in 4 papers).^{[9] [10] [11] [12]}

Visual acuity

Manual large-incision extracapsular extraction compared with intracapsular extraction Manual large-incision extracapsular extraction plus intraocular lens implant (IOL) may be more effective than intracapsular extraction plus aphakic glasses at improving visual acuity after 12 months (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
^{[9] [10] [11] [12]} RCT	3400 people aged 40 to 75 years	Best corrected vision 20/40 or over , 1 year 1420/1474 (96%) with manual large-incision extracapsular extraction plus intraocular lens implant (IOL) 1271/1401 (91%) with intracapsular extraction plus aphakic glasses	P <0.00001		manual large-incision extracapsular extraction
^{[9] [10] [11] [12]} RCT	3400 people aged 40 to 75 years	Visual function and quality of life (assessed using a specifically designed and validated questionnaire) , 12 months after surgery with manual large-incision extracapsular extraction plus IOL with intracapsular extraction plus aphakic glasses	Effect-size difference 0.61 in general visual function 99% CI 0.33 to 0.89 An effect size of 0.5 was considered "medium", and an effect size of 0.8 "large"		manual large-incision extracapsular extraction

Adverse effects

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Adverse effects					
[9] [10] [11] [12] RCT	3400 people aged 40 to 75 years	Cumulative serious complications over the first year after surgery , 12 months after surgery 247/1700 (15%) with intracapsular extraction plus aphakic glasses 131/1700 (8%) with manual large-incision extracapsular extraction plus IOL	P <0.001		manual large-incision extracapsular extraction plus IOL
[9] [10] [11] [12] RCT	3400 people aged 40 to 75 years	Clinical cystoid macular oedema , 12 months after surgery 59/1401 (4%) with intracapsular extraction plus aphakic glasses 23/1474 (2%) with manual large-incision extracapsular extraction plus IOL	RR 2.7 95% CI 1.7 to 4.3 See also further information on studies		manual large-incision extracapsular extraction plus IOL

Manual small-incision extracapsular extraction (manual SICS) versus intracapsular extraction:

We found no RCTs.

Manual (large or small) incision extracapsular extraction versus phaco extracapsular extraction:

See benefits of phaco extracapsular extraction, p 6 .

Further information on studies

[9] [10] [11] [12] The RCT followed participants for 1 year and then reviewed random samples of the participants at 3 and 4 years. The 4-year incidence of grade II or III **posterior capsule opacification** (grading: I = minor peripheral opacity only; II = present in central zone with mild obscuration of fundus detail; III = as II but with marked obscuration of fundus detail) in a sample of the people having manual large-incision extracapsular extraction was 13.1%, 95% CI 9.7% to 17.3%.

Comment: See comment in [phaco extracapsular extraction \(phacoemulsification\) option, p 6](#) for details of a review on the effect of cataract surgery on driving-related difficulties and a review assessing complications after manual large-incision extracapsular cataract extraction with posterior chamber intraocular lens implantation (IOL), phaco extracapsular cataract extraction with posterior chamber IOL, or intracapsular cataract extraction with flexible anterior chamber IOL.

Effect of cataract surgery (type not specified) on incidence of age-related maculopathy

We found one systematic review and one subsequent cohort study assessing the risk of age-related macular degeneration (ARMD) with any type of cataract surgery. [13]

The systematic review (search date 2006) found two controlled clinical trials and 5 epidemiological studies; however, we have only reported the results of those prospective studies with long-term follow-up (at least 5 years). The review found long-term follow-up data from two prospective cohort studies reported in three publications. [14] [15] [16] A pooled analysis of the two cohort studies after 5 years (8580 people at baseline, 6019 people [315 eyes with cataract surgery, 11,076 control eyes] at 5 years' follow-up) found a significantly higher risk of developing late-stage age-related maculopathy (ARM) following cataract surgery after adjusting for age, sex, smoking status, site,

and presence of early ARM.^[14] Follow-up data at 10 years were reported separately for each cohort.^[15] ^[16] One of the cohorts (4926 people at baseline, 2764 people at 10-year follow-up)^[16] also found a significant increase in late ARM at 10 years after adjusting for age, sex, smoking status, heavy drinking, vitamin use, and systolic blood pressure. However, it found no significant difference in early ARM or progression of ARM with cataract surgery versus no surgery, although these were more frequent with cataract surgery. The second cohort study (3654 people at baseline, 2335 people at 5-year follow-up 1952 people at 10-year follow-up) combined results for eyes assessed at 5-year and 10-year follow-up (results for 4763 eyes analysed, 132 eyes with cataract surgery, 4631 control eyes).^[15] The study similarly found a significant increase in late ARM (after adjusting for age, sex, smoking status, and early ARM) with cataract surgery at 10 years but no significant difference in early ARM (after adjusting for age, sex, and smoking status).

The subsequent cohort study (8050 eyes at baseline; 6127 eyes at 5 years' follow-up)^[17] reported that the progression of ARMD to geographic atrophy was significantly lower in the control group although there was no significant difference in the risk of progression of ARMD to neovascular age-related macular degeneration or central geographic atrophy at 5 years after adjusting for covariates (not further defined).

The topic is considered to be important because of the large number of cataract surgeries performed in a population already at risk of developing ARMD. There are theoretical reasons for thinking that the pigments which build up in the ageing crystalline lens give some protection to the retina from potential phototoxicity of short wavelength light (violet/blue). It is difficult to understand why there is such a difference between the results of the cohort studies above^[14] ^[15] ^[16] and the subsequent cohort study.^[17] By far, the most important risk factor for ARMD and for cataract (and cataract surgery) is age. Therefore, if surgery occurs on average at an earlier age than severe ARMD is usually manifest or when detectable early ARMD is present, one might expect that cataract, and therefore cataract surgery, would precede ARMD, and consequently a relationship would reflect the normal temporal relationship of these two diseases. However, the most obvious difference in the populations studied is that the AREDS study is a cohort of people who volunteered for an RCT and who at baseline already have early ARMD in at least one eye before surgery.^[17] It could be argued, therefore, that they are a population sub-set with ARMD manifesting earlier, and any potential additional effect of cataract surgery has been masked.

Clinical guide:

The RCT comparing [manual large-incision extracapsular extraction](#) versus [intracapsular extraction](#) is particularly relevant to developing countries.^[9] ^[10] ^[11] ^[12] The use of different forms of optical correction in the two treatment arms (intraocular lens implant and aphakic glasses) will have accounted for some of the difference in visual acuity and outcomes. The [posterior capsule opacification](#) rate was less than might be expected given the techniques and intraocular lenses used in the study. The setting was a high-volume service with experienced surgeons, and therefore the findings should be generalised with caution.

OPTION PHACO EXTRACAPSULAR EXTRACTION (PHACOEMULSIFICATION)

- For GRADE evaluation of interventions for Cataract, [see table, p 23](#) .
- Expedited phaco extracapsular extraction may be more effective at improving visual acuity compared with waiting list control in people with cataract without ocular comorbidities.
- When combined with foldable posterior chamber intraocular lens implant (IOL), phaco extracapsular extraction seems more effective than manual large-incision extracapsular extraction at improving vision, and has fewer complications.
- This procedure has largely superseded manual large-incision extracapsular cataract extraction in developed countries.
- Phaco extracapsular extraction may be less likely than manual large-incision extracapsular extraction to cause complications such as posterior capsule opacification or cystoid macular oedema.
- Manual small-incision extracapsular extraction plus rigid posterior chamber IOL may be as effective as phaco extracapsular extraction plus foldable intraocular lens implant but further confirmatory data are needed.
- We found no clinically important results from RCTs about the effects of phaco extracapsular extraction compared with intracapsular extraction.

Benefits and harms

Phaco extracapsular extraction versus no extraction:


We found no systematic review or RCTs comparing phaco extracapsular extraction versus no extraction. There is consensus that the clinical and quality-of-life benefits of modern cataract removal are such that an RCT including non-intervention would be unethical.

Expedited versus delayed phaco extracapsular extraction :

We found one systematic review (search date 2007, 3 RCTs) looking at the effects of expedited versus delayed cataract surgery on vision improvement. [18]


Visual acuity

Expedited phaco extracapsular extraction compared with routine cataract surgery Expedited phaco extracapsular extraction may be more effective than delayed cataract surgery at improving visual acuity (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
[18] Systematic review	737 people with cataract 3 RCTs in this analysis	Vision improvement (visual acuity, contrast sensitivity, glare disability, sign recognition, and distance estimation) with expedited phaco extraction surgery with routine cataract surgery	OR 7.22 95% CI 3.15 to 16.55 P <0.00001 Significant statistical heterogeneity (I ² = 78%; P = 0.01) but reasons not reported		expedited phaco extraction surgery

Quality of life

Expedited phaco extracapsular extraction compared with routine cataract surgery We don't know how effective expedited phaco extracapsular extraction is compared with routine cataract surgery at reducing falls in women over 70 years old (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Falls					
[18] Systematic review	545 women, aged >70 years with cataract 2 RCTs in this analysis	Incidence of falls 76/274 (28%) with expedited phaco extraction surgery 87/271 (32%) with routine cataract surgery	OR 0.81 95% CI 0.55 to 1.17 P = 0.26 Review reported that the 2 RCTs did not adequately control for confounding variables; not further defined		Not significant

Adverse effects

No data from the following reference on this outcome. [18]

Phaco extracapsular extraction versus manual large-incision extracapsular extraction:

We found one systematic review (search date 2006), [19] which identified one RCT [20] that met the inclusion criteria. We also found one additional RCT. [21]

Visual acuity

Phaco extracapsular extraction compared with manual large-incision extracapsular extraction Phaco extracapsular extraction plus foldable posterior chamber intraocular lens implant (IOL) seems to be more effective than manual large-incision extracapsular extraction plus rigid posterior chamber IOL at improving visual acuity after 1 year, but we don't know how phaco extracapsular extraction and extracapsular cataract extraction compare when the same type of posterior chamber IOL is used. ([moderate-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
[20] Systematic review	476 people aged >40 years, mean age 71.1 years in the phaco extracapsular extraction group v 72.3 years in the large-incision manual extracapsular extraction group In review [19] Data from 1 RCT	Proportion achieving 20/30 vision unaided , 1 year 87/224 (39%) with phaco extracapsular extraction plus foldable posterior chamber intraocular lens implant (IOL) 42/215 (20%) with manual large-incision extracapsular extraction plus rigid posterior chamber IOL	OR 1.99 95% CI 1.45 to 2.73		phaco extracapsular extraction plus foldable posterior chamber IOL
[21] RCT	41 eyes of 39 people aged 54 to 88 years	Mean corrected visual acuity , 6 months 0.87 with phaco extracapsular extraction 0.81 with extracapsular cataract extraction LogMAR = 0.07 with phaco extracapsular extraction, and logMAR = 0.10 with extracapsular cataract extraction Both groups received the same type of posterior chamber IOL	P = 0.35		Not significant

Adverse effects

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Adverse effects					
[20] Systematic review	476 people aged >40 years, mean age 71.1 years in the phaco extracapsular extraction group v 72.3 years in the large-incision manual extracapsular extraction group In review [19] Data from 1 RCT	Posterior capsule opacification , 1 year with phaco extracapsular extraction plus foldable posterior chamber IOL with manual large-incision extracapsular extraction plus rigid posterior chamber IOL Absolute results not reported	OR 2.1 95% CI 1.0 to 4.5		phaco extracapsular extraction plus foldable posterior chamber IOL

No data from the following reference on this outcome. [21]

Phaco extracapsular extraction versus manual small-incision extracapsular extraction (SICS):

We found one quasi-randomised RCT, which compared phaco extracapsular extraction plus foldable intraocular lens implant (IOL) versus manual SICS plus rigid posterior chamber IOL. [22]

Visual acuity

Phaco extracapsular extraction compared with manual small-incision extracapsular extraction (manual SICS) Phaco extracapsular extraction plus foldable posterior chamber intraocular lens implant (IOL) and manual SICS plus rigid IOL may be equally effective at improving visual acuity at 6 months (very low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
[22] Pseudo-randomised trial	108 people, median age 64 to 65 years with advanced cataract, 22% to 24% with visual acuity of hand motions or worse, remaining with average visual acuity 20/300 to 20/353	Proportion of people achieving unaided vision of at least 20/60 , 6 months 85% with phaco extracapsular extraction 89% with manual small-incision extracapsular extraction (SICS) Absolute numbers not reported	P = 0.3 98% of each group achieved the same standard with spectacle correction	↔	Not significant
[22] Pseudo-randomised trial	108 people, median age 64 to 65 years with advanced cataract, 22% to 24% with visual acuity of hand motions or worse, remaining with average visual acuity 20/300 to 20/353	Proportion of people achieving unaided vision of 20/30 , 6 months 54% with phaco extracapsular extraction 32% with manual SICS Absolute numbers not reported	P = 0.295	↔	Not significant
[22] Pseudo-randomised trial	108 people, median age 64 to 65 years with advanced cataract, 22% to 24% with visual acuity of hand motions or worse, remaining with average visual acuity 20/300 to 20/353	Proportion of people achieving unaided vision of 20/30 , 6 months 54% with phaco extracapsular extraction 32% with manual SICS Absolute numbers not reported	P = 0.0028	○○○	phaco extracapsular extraction

Adverse effects

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Adverse effects					
[22] Pseudo-randomised trial	108 people, median age 64 to 65 years with advanced cataract, 22% to 24% with visual acuity of hand motions or worse, remaining with average visual acuity 20/300 to 20/353	Posterior capsule opacification , 6 months 20/46 (43%) with phaco extracapsular extraction 7/48 (15%) with manual SICS Absolute numbers not reported	Significance not assessed		

Further information on studies

^[19] The RCT ^[20] also reported on visual acuity at 3 weeks and 6 weeks. It found that phaco extracapsular extraction significantly improved the number of people achieving 20/30 vision unaided at 3 weeks and the number achieving good combined vision and refraction results at 6 weeks compared with manual large-incision extracapsular extraction. It also found that a significantly greater proportion of people had complications with manual large-incision extracapsular extraction than with phaco extracapsular extraction (complications during surgery: 17/246 [7%] with phaco extracapsular extraction v 48/233 [21%] with manual large-incision extracapsular extraction; $P < 0.0001$; suture removal within 3 months of surgery: 8/245 [3%] with phaco extracapsular extraction v 85/232 [37%] with manual large-incision extracapsular extraction; $P < 0.0001$). Further analysis of the results of the RCT ^[20] found no significant difference in endothelial cell loss between groups at 1 year after surgery (adjusted mean percentage cell loss: 16% with phaco extracapsular extraction v 14% with manual large-incision extracapsular extraction; $P = 0.14$). ^[23]

^[22] It is not clear whether the trial examiners at follow-up were blinded to treatment allocation in this RCT. The RCT also found a transient increase in central corneal thickness in people receiving phaco extraction compared with manual small-incision extracapsular extraction (SICS) (mean increase in thickness compared with baseline on postoperative day 1: 70 micrometres with phaco v 9 micrometres with manual SICS; on postoperative day 5, decreasing to: 29 micrometres with phaco v 4 micrometres with manual SICS; returning to baseline at 3 weeks postoperatively; no further statistical data reported).

Comment: One systematic review (search date 2007, 7 cohort studies) reported on the effectiveness of any type of cataract surgery in reducing driving-related difficulties in older people (not further defined). ^[24] It pooled data from 5 cohort studies (1642 people) and found that cataract surgery significantly reduced driving-related difficulties.

We also found a systematic review (search date not reported; earliest and latest papers cited dated 1979 and 1991; 90 observational studies) ^[25] assessing complications after [manual large-incision extracapsular cataract extraction](#) with posterior chamber [intraocular lens implantation \(IOL\)](#), [phaco extracapsular cataract extraction](#) with posterior chamber IOL, or [intracapsular cataract extraction](#) with flexible anterior chamber IOL. Major complications found by the systematic review were [endophthalmitis](#) (16 studies, 30,656 eyes: 0.13%, 95% CI 0.09% to 0.17%), retinal detachment (42 studies, 33,603 eyes: 0.7%, 95% CI 0.6% to 0.8%), and bullous keratopathy (27 studies, 15,971 eyes: 0.3%, 95% CI 0.2% to 0.4%). These figures represent pooled results for all included types of cataract surgery, although the authors noted that there were no apparent differences between treatments. Less serious complications showing significant differences ($P < 0.05$), all in favour of phaco extracapsular extraction, were as follows: angiographic cystoid macular oedema (3% [2 studies, 873 eyes] with phaco extracapsular extraction v 9% [2 studies, 393 eyes] with manual large-incision extracapsular extraction); iris trauma (1% [2 studies, 2033 eyes] with phaco extracapsular extraction v 4% [6 studies, 1314 eyes] with manual large-incision extracapsular extraction); and vitreous loss (0.24% [4 studies, 2732 eyes] with phaco extracapsular extraction v 1.08% [22 studies, 7284 eyes] with manual large-incision extracapsular extraction).

Clinical guide:

Phaco extracapsular extraction has largely superseded manual large-incision extracapsular cataract extraction in developed countries, on the basis of clinical experience. The RCT comparing phaco extracapsular extraction plus foldable posterior chamber intraocular lens implant (IOL) versus manual large-incision extracapsular extraction plus rigid posterior chamber IOL is therefore important as a randomised study of the two techniques. ^[20] The trial was specifically designed to employ surgeons experienced in both techniques. The target level of postoperative vision was more demanding than in the earlier observational studies reported in the other systematic review reported in the comments above. ^[25] Phaco relies on sophisticated technology and technical expertise, and is therefore not appropriate for many resource-poor settings. One quasi-randomised trial found that visual acuity was similarly improved by the new manual small-incision extracapsular extraction (manual SICS) technique compared with phaco extracapsular extraction performed by a phaco expert in a rural setting, with none of the increase in complications reported for the older large-incision extracapsular surgery, and at a lower cost. ^[22] The higher incidence of transient corneal oedema in the phaco extracapsular extraction group in this trial is possibly because of the advanced nature of the cataracts in a resource-poor setting.

[See comment on the effects of cataract surgery \(type not specified\) on the incidence of age-related maculopathy in the manual \(large or small\) incision extracapsular extraction option, p 3 .](#)

OPTION INTRACAPSULAR EXTRACTION

- For GRADE evaluation of interventions for Cataract, [see table, p 23](#) .
- Intracapsular extraction is likely to be better at improving vision compared with no extraction, although it is not as beneficial as manual (large or small) incision extracapsular extraction.
- The rate of complications is also higher with this technique compared with manual extracapsular extraction.
- As phaco extracapsular extraction has, in turn, been shown to be better than manual large-incision extracapsular extraction, a further direct comparison with the older intracapsular technique is not appropriate.
- Intracapsular extraction is no longer the preferred cataract-removal technique in Western medicine.

Benefits and harms**Intracapsular extraction versus no extraction:**

We found no systematic review or RCTs comparing [intracapsular extraction](#) versus no extraction. There is consensus that the clinical and quality-of-life benefits of modern cataract removal are such that an RCT including non-intervention would be unethical.

Intracapsular extraction versus manual large-incision extracapsular extraction:

See benefits of manual (large or small) incision extracapsular extraction, p 3 .

Intracapsular extraction versus manual small-incision extracapsular extraction:

We found no systematic review or RCTs.

Intracapsular extraction versus phaco extracapsular extraction:

We found no systematic review or RCTs.

Further information on studies

Comment: See [comment in phaco extracapsular extraction \(phacoemulsification\) option, p 6](#) for details of a review on the effect of cataract surgery on driving-related difficulties and a review assessing complications after manual large-incision extracapsular cataract extraction with posterior chamber intraocular lens implantation (IOL), phaco extracapsular cataract extraction with posterior chamber IOL, or intracapsular cataract extraction with flexible anterior chamber IOL. Also [see the comment on the effects of cataract surgery \(type not specified\) on the incidence of age-related maculopathy in the manual \(large or small\) incision extracapsular extraction option, p 3](#) .

Clinical guide:

We found no direct comparisons of [intracapsular extraction](#) with [phaco extracapsular extraction](#). This arises from the way that these techniques have evolved, with [manual large-incision extracapsular extraction](#) superseding intracapsular extraction in developed countries because of its benefits and reduced harm. As phaco extracapsular extraction has been shown to be better than manual large-incision extracapsular extraction, a further direct comparison with the older intracapsular technique is not appropriate. Intracapsular extraction is no longer the preferred cataract-removal technique in Western medicine.

QUESTION What are the effects of treatment for age-related cataract in people with glaucoma?

OPTION CATARACT SURGERY ALONE

- For GRADE evaluation of interventions for Cataract, [see table, p 23](#) .
- We found no clinically important results from RCTs about the effects of cataract surgery alone compared with no surgery, or compared with cataract surgery plus non-concomitant glaucoma surgery, in people with glaucoma.

Benefits and harms

Cataract surgery alone versus no surgery:

We found one systematic review (search date 2000), which assessed intraocular pressure control after cataract surgery in people with glaucoma. ^[26] The review identified no RCTs comparing cataract surgery alone versus no surgery (see comment below).

Cataract surgery alone versus concomitant cataract and glaucoma surgery:

See benefits of concomitant cataract and glaucoma surgery, p 13 .

Cataract extraction alone versus cataract surgery plus non-concomitant glaucoma surgery:

See benefits of cataract surgery plus non-concomitant glaucoma surgery, p 12 .

Further information on studies

Comment:

Cataract surgery alone versus no surgery:

The review found three case series reporting the intraocular pressure after [phaco extracapsular extraction](#), and 6 case series reporting the effects of [manual \(large or small\) incision extracapsular extraction](#) in people with glaucoma. ^[26] There was a consistent lowering of intraocular pressure by an average of 2 to 4 mm Hg 1 to 2 years after surgery.

OPTION CATARACT SURGERY PLUS NON-CONCOMITANT GLAUCOMA SURGERY

- For GRADE evaluation of interventions for Cataract, [see table, p 23](#) .
- We found no clinically important results from RCTs about the effects of cataract surgery plus non-concomitant glaucoma surgery compared with cataract surgery alone.

Benefits and harms

Cataract surgery plus non-concomitant glaucoma surgery versus cataract surgery alone:

We found one systematic review (search date 2000), which identified no RCTs comparing cataract surgery plus non-concomitant glaucoma surgery versus cataract surgery alone or concomitant cataract surgery and glaucoma surgery. ^[27]

Further information on studies

Comment: The review found three non-randomised controlled studies comparing cataract surgery plus non-concomitant glaucoma surgery versus concomitant cataract and glaucoma surgery. ^[27] All three studies found similar reductions in intraocular pressure between treatments after 1 to 2 years' follow-up (first study: 12.2 mm Hg with concomitant surgeries v 12.6 mm Hg with separate surgeries; P = 0.64; second study: 14.6 mm Hg with concomitant surgeries v 13.8 mm Hg with separate surgeries; P <0.1; third study: 15.9 mm Hg with concomitant surgeries v 17.1 mm Hg with separate surgeries; significance not assessed). ^[27]

OPTION CONCOMITANT CATARACT PLUS CONCOMITANT GLAUCOMA SURGERY

- For GRADE evaluation of interventions for Cataract, see table, p 23 .
- In people with glaucoma, concomitant cataract surgery (phaco or manual large-incision extracapsular extraction) and glaucoma surgery seems more beneficial than cataract surgery alone, in that they both improve vision to a similar extent, but the glaucoma surgery additionally improves intraocular pressure.
- We found no clinically important results from RCTs about the effects of phaco extracapsular extraction plus concomitant glaucoma surgery compared with manual large-incision extracapsular extraction plus glaucoma surgery.

Benefits and harms

Concomitant cataract plus glaucoma surgery versus cataract surgery alone :

We found one systematic review (search date 2000). ^[26] It identified three RCTs comparing long-term intraocular pressure (IOP) control versus phaco extracapsular extraction plus glaucoma surgery (any type) versus phaco extracapsular extraction alone, ^[28] ^[29] ^[30] and one RCT comparing manual large-incision extracapsular extraction plus glaucoma surgery (trabeculectomy) versus manual large-incision extracapsular surgery alone in people with glaucoma. ^[31]

Visual acuity

Concomitant cataract plus glaucoma surgery compared with cataract surgery alone Cataract surgery plus concomitant glaucoma surgery may be as effective as cataract surgery alone at improving visual acuity after 1 to 7 years (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
^[28] RCT	85 people	Logarithm of minimum angle of resolution (logMAR) , 1 year 0.47 with phaco extraction alone 0.53 with phaco extraction plus glaucoma surgery	Reported as not significant P value not reported	↔	Not significant
^[29] RCT	20 eyes, 18 people	Corrected visual acuity 6/12 or greater 7/10 (70%) with phaco extraction alone 8/10 (80%) with phaco extraction plus glaucoma surgery	Reported as equal improvement Significance assessment not performed		
^[31] RCT	70 eyes, 35 people Within-person design	Mean visual acuity improvement from 20/117 before surgery to 20/28 after surgery with manual large-incision extraction plus trabeculectomy from 20/119 before surgery to 20/33 after surgery with manual large-incision extraction alone	Difference reported as not significant P value not reported	↔	Not significant

Intraocular pressure

Concomitant cataract plus glaucoma surgery compared with cataract surgery alone Cataract surgery plus concomitant glaucoma surgery seems to be more effective at reducing intraocular pressure after 1 to 7 years (*moderate-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Intraocular pressure					
[28] RCT	85 people	Mean intraocular pressure (IOP) reduction , 1 year 3.7 mm Hg with phaco extraction alone 7.6 mm Hg with phaco extraction plus glaucoma surgery	P <0.001		phaco extraction plus glaucoma surgery
[28] RCT	85 people	Mean reduction in types of medication required , 1 year 0.5 with phaco extraction alone 1.5 with phaco extraction plus glaucoma surgery	P <0.001		phaco extraction plus glaucoma surgery
[29] RCT	20 eyes, 18 people	Median IOP reduction 6.5 mm Hg with phaco extraction alone 7.0 mm Hg with phaco extraction plus glaucoma surgery	Significance assessment not performed		
[30] RCT	106 people	Mean IOP reduction , 2 years 3.8 mm Hg with phaco extraction alone 6.1 mm Hg with phaco extraction plus glaucoma surgery	P <0.001		phaco extraction plus glaucoma surgery
[31] RCT	70 eyes, 35 people Within-person design	Mean IOP reduction , 6 to 7 years 4.4 mm Hg with manual large-incision extraction alone 8.2 mm Hg with manual large-incision extraction plus trabeculectomy	P = 0.0001		manual large-incision extraction plus trabeculectomy
[31] RCT	70 eyes, 35 people Within-person design	Mean reduction in types of medication , 6 to 7 years 1.28 with manual large-incision extraction alone 1.76 with manual large-incision extraction plus trabeculectomy	P = 0.0002		manual large-incision extraction plus trabeculectomy

Further information on studies

Comment: **Phaco extracapsular extraction plus glaucoma surgery versus manual large-incision extracapsular extraction plus glaucoma surgery:**
The systematic review identified 9 observational studies comparing the effect of [manual large-incision extracapsular extraction](#) (manual nuclear expression) plus glaucoma surgery versus [phaco extracapsular extraction](#) plus glaucoma surgery. ^[27] Five of these observational studies found that phaco extracapsular extraction plus glaucoma surgery significantly reduced intraocular pressure

after 1 to 2 years' follow-up compared with manual nuclear expression plus glaucoma surgery, although 4 studies reported no significant difference.

Phaco extracapsular extraction plus glaucoma surgery using one or two sites:

We did not search specifically for this comparison; however, we report data here from one RCT (90 eyes of 76 people).^[32] The RCT reports on combined cataract and glaucoma surgery carried out through a single incision compared with surgery carried out concomitantly but through two incisions (one for cataract removal and one for trabeculectomy). At 3 years' follow-up there was no significant difference between the groups in the reduction in intraocular pressure and the reduction in the number of anti-glaucoma medications required.

QUESTION What are the effects of surgical treatments for age-related cataract in people with diabetic retinopathy?

OPTION CATARACT SURGERY IN PEOPLE WITH DIABETIC RETINOPATHY

- For GRADE evaluation of interventions for Cataract, see table, p 23 .
- In people with diabetic retinopathy, the risks of postoperative inflammation, posterior synechiae, and intraocular lens deposits are lower after phaco extracapsular extraction compared with manual large-incision extracapsular extraction after 1 year, but the risk of cystoid macular oedema is the same with both techniques after 6 months.


Benefits and harms

Phaco extracapsular extraction versus manual large-incision extracapsular extraction :

We found one RCT (46 people with bilateral cataract and diabetes, 34/46 [78%] of whom had retinopathy) comparing phaco extracapsular extraction (phacoemulsification) versus manual large-incision extracapsular extraction.^[33]

Visual acuity

Phaco extracapsular extraction compared with manual large-incision extracapsular extraction Phaco extracapsular extraction seems to be more effective at improving visual acuity after 1 year in people with diabetic retinopathy (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
^[33] RCT	46 people with bilateral cataract and diabetes, 34/46 (78%) of whom had retinopathy	Median logarithm of minimum angle of resolution (logMAR) visual acuity , 1 year 0.06 with phaco extracapsular extraction 0.08 with manual large-incision extracapsular extraction	Significance not assessed		
^[33] RCT	46 people with bilateral cataract and diabetes, 34/46 (78%) of whom had retinopathy	Snellen , 1 year 20/20 with phaco extracapsular extraction 20/25 with manual large-incision extracapsular extraction	P = 0.02		phaco extracapsular extraction

Progression of diabetic retinopathy

Phaco extracapsular extraction compared with manual large-incision extracapsular extraction Phaco extracapsular extraction does not seem to increase the risk of progression of diabetic retinopathy or development of high-risk retinopathy compared with manual large-incision extracapsular extraction (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Progression of diabetic retinopathy					
[33] RCT	46 people with bilateral cataract and diabetes, 34/46 (78%) of whom had retinopathy	Proportion of eyes with postoperative cystoid macular oedema , 6 months 6/39 (15%) eyes with phaco extracapsular extraction 6/38 (16%) eyes with manual large-incision extracapsular extraction	P = 1.0	↔	Not significant
[33] RCT	46 people with bilateral cataract and diabetes, 34/46 (78%) of whom had retinopathy	Progression of diabetic retinopathy in the first year , 1 year 15/46 (33%) eyes with phaco extracapsular extraction 14/46 (30%) eyes with manual large-incision extracapsular extraction	P = 0.8	↔	Not significant
[33] RCT	46 people with bilateral cataract and diabetes, 34/46 (78%) of whom had retinopathy	Development of severe high-risk retinopathy , 1 year 1/36 (2%) eyes with phaco extracapsular extraction 3/46 (7%) eyes with manual large-incision extracapsular extraction	P = 0.2	↔	Not significant

Adverse effects

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Adverse effects					
[33] RCT	46 people with bilateral cataract and diabetes, 34/46 (78%) of whom had retinopathy	Postoperative inflammation (posterior synechiae) , 1 year 1/46 (2%) eyes with phaco extracapsular extraction 7/46 (15%) eyes with manual large-incision extracapsular extraction	P = 0.04	○○○	phaco extracapsular extraction
[33] RCT	46 people with bilateral cataract and diabetes, 34/46 (78%) of whom had retinopathy	Intraocular lens deposits , 1 year 1/46 (2%) eyes with phaco extracapsular extraction 7/46 (15%) eyes with manual large-incision extracapsular extraction	P <0.0005	○○○	phaco extracapsular extraction

Further information on studies

[33] Subgroup analysis in people with retinopathy found similar significant improvements in visual acuity with phaco extracapsular extraction compared with manual large-incision extracapsular extraction (median logMAR visual acuity: 0.08 with phaco extracapsular extraction v 0.14 with manual large-incision extracapsular extraction; Snellen: 20/25 with phaco extracapsular extraction v 20/30 with manual large-incision extracapsular extraction; P = 0.01). The RCT also found a significantly lower incidence of postoperative inflammation within the first week

after phaco extracapsular extraction compared with manual large-incision extracapsular extraction (median anterior chamber cells at 1 week: P = 0.0004; flare at 1 week: P = 0.007).

Comment: **Clinical guide:** The finding that progression of diabetic retinopathy is not influenced by the choice of surgical technique (i.e., phaco or manual large-incision extracapsular) is an important one. In the past, there was wide variation in the reported incidence of progression after cataract surgery, and many surgeons have assumed that **phaco extracapsular extraction** is safer than **manual large-incision extracapsular extraction** in this respect. Most of these reports were retrospective and uncontrolled, but the rate of progression seemed greater with manual large-incision extracapsular extraction. However, the studies of extracapsular surgery were older, and surgery had often happened at a time before the importance of glycaemic control was fully appreciated as a predictor of retinopathy progression.

OPTION ADDING DIABETIC RETINOPATHY TREATMENT TO CATARACT SURGERY


- For GRADE evaluation of interventions for Cataract, [see table, p 23](#) .
- Performing procedures in the order of cataract surgery first followed by pan retinal photocoagulation may be more effective than the opposite order at improving visual acuity and reducing the progression of diabetic macular oedema in people with cataract and diabetic retinopathy secondary to type 2 diabetes. However, these results come from one small RCT.
- We found no RCTs in people with type 1 diabetes.

Benefits and harms

Pan retinal photocoagulation (PRP) followed by cataract surgery versus cataract surgery followed by PRP: We found one RCT (29 people, 58 eyes), ^[34] which compared pan retinal photocoagulation (PRP) first followed by cataract surgery in one eye with the opposite order of treatments in the second eye.

Visual acuity

Pan retinal photocoagulation (PRP) followed by cataract surgery versus cataract surgery followed by PRP PRP first followed by cataract surgery may be less effective at improving visual acuity at 12 months than cataract surgery first followed by PRP in people with cataract and diabetic retinopathy secondary to type 2 diabetes (**low-quality evidence**).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
^[34] RCT	58 eyes of 29 people aged >50 years with bilateral cataracts and bilateral diabetic retinopathy Study population had type 2 diabetes and untreated severe non-proliferative or early proliferative diabetic retinopathy	Number of eyes with best corrected visual acuity 20/40 or better on Snellen chart , 12 months 20/29 (69%) with pan retinal photocoagulation (PRP) followed by cataract surgery 28/29 (97%) with cataract surgery followed by PRP	RR 5.83 (for cataract surgery followed by PRP) 95% CI 5.58 to 6.08 P = 0.01		cataract surgery followed by PRP

Progression of diabetic retinopathy

Pan retinal photocoagulation (PRP) followed by cataract surgery versus cataract surgery followed by PRP PRP first followed by cataract surgery may be less effective than cataract surgery first followed by PRP at reducing the progression of diabetic macular oedema in people with cataract and diabetic retinopathy secondary to type 2 diabetes (**low-quality evidence**).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Progression of diabetic retinopathy					
[34] RCT	58 eyes of 29 people aged >50 years with bilateral cataracts and bilateral diabetic retinopathy Study population had type 2 diabetes and untreated severe non-proliferative or early proliferative diabetic retinopathy	Number of eyes with progression of diabetic macular oedema 16/29 (52%) with pan retinal photocoagulation (PRP) followed by cataract surgery 8/29 (28%) with cataract surgery followed by PRP Progression of macular oedema was defined as an increase of 1 or more grades on the ETDRS (Early Treatment Diabetic Retinopathy study) scale	RR 2.0 95% CI 1.49 to 2.51 P = 0.03		cataract surgery followed by PRP
[34] RCT	58 eyes of 29 people aged >50 years with bilateral cataracts and bilateral diabetic retinopathy Study population had type 2 diabetes and untreated severe non-proliferative or early proliferative diabetic retinopathy	Number of eyes with progression of diabetic retinopathy 8/29 (28%) with PRP followed by cataract surgery 12/29 (41%) with cataract surgery followed by PRP Progression of diabetic retinopathy was defined as an increase of 1 or more grades on the ETDRS (Early Treatment Diabetic Retinopathy study) scale	P = 0.27		Not significant

Adverse effects

No data from the following reference on this outcome. [34]

Adjunctive treatments during cataract surgery versus no adjunctive treatments:

We found no systematic review or RCTs.

Further information on studies

[34] No specific harms defined by us were reported in this study; however, it was reported that there was a significant increase in the aqueous flare intensity following treatment in the PRP-first group compared with the surgery-first group at 1 and 3 months postoperatively. Aqueous flare intensities at 6 and 12 months were increased in both groups but there was no significant difference between the two groups.

Comment:

Clinical guide:

The presence or absence of significant macular retinopathy is known to be a predictor for visual acuity after cataract surgery. Sometimes the retinopathy is refractory to treatment; sometimes the cataract makes adequate preoperative laser treatment impossible. However, where treatment is possible before surgery (at least for early proliferative and severe non-proliferative retinopathy), the RCT [34] indicates that this may be best postponed until after cataract surgery, although potential treatment of macular oedema must be considered when determining the timing of cataract surgery. Surgeons have therefore recently begun to use perioperative adjuncts, such as intravitreal corticosteroids.

teroids or growth-factor inhibitors. We found no RCTs meeting our quality criteria to allow a proper evaluation of the efficacy of this approach.

QUESTION What are the effects of surgical treatments for age-related cataract in people with chronic uveitis?

OPTION CATARACT SURGERY (PHACO OR MANUAL EXTRACAPSULAR EXTRACTION) IN PEOPLE WITH CHRONIC UVEITIS New

- For GRADE evaluation of interventions for Cataract, [see table, p 23](#) .
- We found no clinically important results from RCTs about the effects of cataract surgery in people with chronic uveitis.

Benefits and harms

Phaco extracapsular extraction versus manual extracapsular extraction:

We found no systematic review or RCTs.

Further information on studies

Comment: None.

OPTION DIFFERENT METHODS OF MEDICAL CONTROL OF UVEITIS AT THE TIME OF CATARACT SURGERY New

- For GRADE evaluation of interventions for Cataract, [see table, p 23](#) .
- One of the possible harms of cataract surgery is cystoid macular oedema, from which people with uveitis also frequently suffer.
- We don't know whether intravitreal triamcinolone acetonide is more effective than orbital floor injection of triamcinolone acetonide in improving outcomes after cataract surgery in people with chronic uveitis as we found few trials.

Benefits and harms

Injection of triamcinolone acetonide directly into the vitreous compared with orbital floor injection at the end of cataract surgery:

We found one RCT (40 people with bilateral cataract and chronic uveitis).^[35] People were pseudo-randomly allocated by a one-by-one alternation method to receive triamcinolone acetonide by intravitreal or orbital floor route at the end of cataract surgery.

Visual acuity

Injection of triamcinolone acetonide directly into the vitreous compared with orbital floor injection at the end of cataract surgery We don't know whether intravitreal triamcinolone acetonide is more effective than orbital floor injection of triamcinolone acetonide at improving visual acuity after cataract surgery in people with uveitis ([very low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Visual acuity					
[35] Pseudo-randomised trial	40 people with cataract and chronic uveitis No ocular inflammation was present	Best corrected visual acuity improvement (two or more lines) , 6 months 87% with intravitreal triamcinolone acetonide (0.1 mL; 4 mg)	P = 0.91	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
	for at least 3 months before surgery	100% with orbital floor triamcinolone acetonide (1 mL; 40 mg) Absolute numbers not reported See further information on studies for details of additional preoperative and postoperative medications given in the study			

Adverse effects

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
Cystoid macular oedema					
[35] Pseudo-randomised trial	40 people with cataract and chronic uveitis No ocular inflammation was present for at least 3 months before surgery	Presence of cystoid macular oedema on fluorescein angiography , 6 months 43% with intravitreal triamcinolone acetonide (0.1 mL; 4 mg) 55% with orbital floor triamcinolone acetonide (1 mL; 40 mg) Absolute numbers not reported 53% of people in the intravitreal group and 60% in the orbital floor group had cystoid macular oedema present on fluorescein angiography before surgery See further information on studies for details of additional preoperative and postoperative medications given in the study	Significance not assessed		

Medical control of uveitis at the time of cataract surgery versus no medical control at the time of surgery:
We found no systematic review or RCTs.

Further information on studies

[35] Immunosuppressant treatment was optimised before surgery for each patient, and in the preoperative week prednisolone acetate 1% eye drops were added 5 times daily. Postoperative treatment included prednisolone acetate 1% eye drops 5 times daily. Dosages were tapered off over 4 to 6 weeks according to the individual course of inflammation, while the pre-existing immunosuppression treatment was continued. The study [35] also reported on the presence of cystoid macular oedema 3 months after surgery, which was significantly lower in the intravitreal group compared with the orbital floor group. Other outcomes reported in the study included the presence of acute uveitis after surgery as measured by the presence of anterior chamber cells grade 1 or greater, which again was significantly lower in the intravitreal group compared with the orbital floor group. It also reported that flare measured after surgery using laser flare photometry was lower in the intravitreal group, but this difference was not significant, and that there was no significant difference in the occurrence of raised intraocular pressure (22 mm Hg or greater) (a known potential hazard with the use of triamcinolone) following surgery in either group.

Comment: **Clinical guide:** Clinical consensus is that intraocular inflammation should be reduced as far as possible in all patients, but particularly in those who may be vulnerable. Also, cystoid macular oedema may cause subtle and permanent changes in vision that are not easily measured by standard visual acuity. Therefore, it is potentially significant that this study^[35] shows a reduction in both outcomes if triamcinolone is administered intravitreally rather than onto the orbital floor, even though the significance between the groups was not assessed at 6 months after surgery. However, what is lacking is a good well controlled study to demonstrate if there is true value in routine triamcinolone at the end of surgery compared with standard topical therapy.

GLOSSARY

Intracapsular extraction is removal of the entire lens and capsule with local anaesthesia (injection around the eye, or drops).

Posterior capsule opacification is opacification of the posterior capsule (which is left behind at the end of an extracapsular or phaco cataract extraction). When it occurs it is usually progressive and can result in reduced visual function. Grading: I = minor peripheral opacity only; II = present in central zone with mild obscuration of fundus detail; III = as II but with marked obscuration of fundus detail.

Cystoid macular oedema A condition in which fluid accumulates in cyst-like spaces in the outer plexiform layer of the retina. It is usually self-limiting, but can result in permanent reduction in visual acuity. It is thought to be associated with breakdown of the blood–retina barrier and is more common after complicated surgery. It is also more common in patients with diabetes or uveitis.

Endophthalmitis Inflammation of some or all parts of the eye. It is normally, if not qualified as such in this review, taken to be caused by postoperative intra-ocular infection.

Induced astigmatism Change in refractive power of the cornea along different meridians as a result of the change in shape caused by surgical incisions.

Intraocular lens implant The most common material used for the optic of intraocular lenses worldwide is poly(methylmethacrylate), which is rigid at room or body temperature and requires an incision of at least 5 mm to 6 mm for insertion. In resource-rich countries, other materials, such as silicone or different types of acrylic, are increasingly being used for intraocular lenses. These materials are plastic at room temperature and can be rolled or folded in half, allowing insertion through incisions of 3.5 mm or less; a small number of intraocular lenses can now be inserted through incisions of 2 mm or less.

Low-quality evidence Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Manual extracapsular extraction Removal of the anterior capsule and lens contents (nucleus and cortex) *en bloc* without using ultrasound or other methods of breaking up the nucleus before removal with local anaesthesia (injection around the eye, or drops). The posterior capsule is left behind. This technique has in the past required a large incision (chord length 9–10 mm, arc length 11–13 mm) and is commonly referred to simply as 'extracapsular extraction'. For clarity, we will refer to this procedure as manual large-incision extracapsular extraction in this review. Recent years have seen the development of smaller-incision sutureless techniques to achieve the same aim. This is referred to as manual small-incision extracapsular extraction or, more commonly, just 'manual SICS'.

Moderate-quality evidence Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Phaco extracapsular extraction (phacoemulsification) Use of ultrasound to break up the lens nucleus for less invasive extraction through a smaller incision with local anaesthesia (injection around the eye, or drops). The posterior capsule is left behind as in manual extracapsular extraction. This technique is commonly referred to as "phacoemulsification".

Snellen visual acuity The Snellen chart usually includes letters, numbers, or pictures printed in lines of decreasing size, which are read or identified from a fixed distance; distance visual acuity is usually measured from a distance of 6 m (20 feet). The Snellen visual acuity is written as a fraction: 6/18 means that from 6 m away the best line that can be read is a line that could normally be read from a distance of 18 m away.

Very low-quality evidence Any estimate of effect is very uncertain.

Vitreous loss Loss of the vitreous gel that normally fills the posterior segment (behind the lens) of the eye. Its loss during intracapsular cataract surgery, or in the presence of rupture of the posterior capsule in extracapsular surgery, can give rise to potentially sight-threatening complications.

SUBSTANTIVE CHANGES

Cataract surgery (phaco or manual extracapsular extraction) in people with chronic uveitis: New option. Categorised as Unknown effectiveness.

Different methods of medical control of uveitis at the time of cataract surgery New option. ^[35] Categorised as unknown effectiveness.

Adding diabetic retinopathy treatment to cataract surgery New evidence added. ^[34] Categorisation unchanged (Unknown effectiveness) as there remains insufficient evidence to judge this intervention.

Phaco extracapsular extraction: New evidence added. ^[18] ^[21] Categorisation unchanged (Beneficial).

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Competing interests: DA has had travel and accommodation expenses reimbursed by two companies manufacturing intraocular lenses and phacoemulsification machines. Honoraria have been paid into an equipment fund for use in the NHS.

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GRADE Evaluation of interventions for Cataract.

Important outcomes	Intraocular pressure, Progression of diabetic retinopathy , Quality of life, Visual acuity								Comment	
	Studies (Participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size		GRADE
<i>What are the effects of surgery for age-related cataract without other ocular comorbidity?</i>										
1, reported in 4 papers (3400) [9] [10] [11] [12]	Visual acuity	Manual large-incision extracapsular extraction versus intracapsular extraction		4	0	0	-2	0	Low	Directness points deducted for specialist setting and multiple interventions
3 (737) [18]	Visual acuity	Expedited versus delayed phaco extracapsular extraction		4	-1	-1	0	0	Low	Quality point deducted for incomplete reporting of results. Consistency point deducted for statistical heterogeneity
2 (545) [18]	Quality of life	Expedited versus delayed phaco extracapsular extraction		4	-1	0	-1	0	Low	Quality point deducted for not adequately controlling confounding variables in RCTs. Directness point deducted for reducing generalisability of results by limiting population to women aged >70 years
2 (515) [20] [21]	Visual acuity	Phaco extracapsular extraction versus manual large-incision extracapsular extraction		4	0	0	-1	0	Moderate	Directness point deducted for use of different intraocular lens implants in the 2 intervention arms of the systematic review
1 (108) [22]	Visual acuity	Phaco extracapsular extraction versus manual small-incision extracapsular extraction (SICS)		4	-3	-1	0	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and un-stated allocation concealment. Consistency point deducted for no consistent evidence of benefit across different measures of visual acuity
<i>What are the effects of treatment for age-related cataract in people with glaucoma?</i>										
3 (138) [28] [29] [31]	Visual acuity	Concomitant cataract plus glaucoma surgery versus cataract surgery alone		4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
4 (244) [28] [29] [30] [31]	Intraocular pressure	Concomitant cataract plus glaucoma surgery versus cataract surgery alone		4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
<i>What are the effects of surgical treatments for age-related cataract in people with diabetic retinopathy?</i>										
1 (46) [33]	Visual acuity	Phaco extracapsular extraction versus manual large-incision extracapsular extraction		4	-1	0	0	0	Moderate	Quality point deducted for sparse data
1 (46) [33]	Progression of diabetic retinopathy	Phaco extracapsular extraction versus manual large-incision extracapsular extraction		4	-1	0	0	0	Moderate	Quality point deducted for sparse data

Important outcomes	Intraocular pressure, Progression of diabetic retinopathy , Quality of life, Visual acuity									
	Studies (Participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
	1 (29, 58 eyes) ^[34]	Visual acuity	Pan retinal photocoagulation (PRP) followed by cataract surgery versus cataract surgery followed by PRP	4	-1	0	-1	0	Low	Quality point deducted for sparse data. Directness point deducted for limiting population to people with type 2 diabetes
	1 (29, 58 eyes) ^[34]	Progression of diabetic retinopathy	Pan retinal photocoagulation (PRP) followed by cataract surgery versus cataract surgery followed by PRP	4	-1	0	-1	0	Low	Quality point deducted for sparse data. Directness point deducted for limiting population to people with type 2 diabetes
<i>What are the effects of surgical treatments for age-related cataract in people with chronic uveitis?</i>										
	1 (40) ^[35]	Visual acuity	Injection of triamcinolone acetonide directly into the vitreous compared with orbital floor injection at the end of cataract surgery	4	-3	0	0	0	Very low	Quality points deducted for sparse data, pseudo-randomisation, and incomplete reporting of results

We initially allocate 4 points to evidence from RCTs, and 2 points to evidence from observational studies. To attain the final GRADE score for a given comparison, points are deducted or added from this initial score based on preset criteria relating to the categories of quality, directness, consistency, and effect size. Quality: based on issues affecting methodological rigour (e.g., incomplete reporting of results, quasi-randomisation, sparse data [<200 people in the analysis]). Consistency: based on similarity of results across studies. Directness: based on generalisability of population or outcomes. Effect size: based on magnitude of effect as measured by statistics such as relative risk, odds ratio, or hazard ratio.