Cochrane
Library

Cochrane Database of Systematic Reviews

Pars plana vitrectomy versus scleral buckling for repairing simple rhegmatogenous retinal detachments (Review)

Znaor L, Medic A, Binder S, Vucinovic A, Marin Lovric J, Puljak L

Znaor L, Medic A, Binder S, Vucinovic A, Marin Lovric J, Puljak L.
Pars plana vitrectomy versus scleral buckling for repairing simple rhegmatogenous retinal detachments.
Cochrane Database of Systematic Reviews 2019, Issue 3. Art. No.: CD009562.
DOI: [10.1002/14651858.CD009562.pub2](https://doi.org/10.1002/14651858.CD009562.pub2).

www.cochranelibrary.com

Pars plana vitrectomy versus scleral buckling for repairing simple rhegmatogenous retinal detachments
(Review)

Copyright © 2019 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

WILEY

TABLE OF CONTENTS

HEADER	1
ABSTRACT	1
PLAIN LANGUAGE SUMMARY	2
SUMMARY OF FINDINGS	4
BACKGROUND	6
OBJECTIVES	7
METHODS	7
RESULTS	9
Figure 1.	10
Figure 2.	12
Figure 3.	13
Figure 4.	14
Figure 5.	17
DISCUSSION	18
AUTHORS' CONCLUSIONS	19
ACKNOWLEDGEMENTS	19
REFERENCES	20
CHARACTERISTICS OF STUDIES	23
DATA AND ANALYSES	39
Analysis 1.1. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 1 Primary retinal reattachment rate at least 3 months after operation.	41
Analysis 1.2. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 2 Postoperative visual acuity at final follow-up.	42
Analysis 1.3. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 3 Postoperative visual acuity, all follow-up times [logMAR].	42
Analysis 1.4. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 4 Final anatomical success.	44
Analysis 1.5. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 5 Recurrence of retinal detachment.	45
Analysis 1.6. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 6 Number of interventions needed to achieve final anatomical success.	46
Analysis 1.7. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 7 Quality of life.	46
Analysis 1.8. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 8 Adverse effects.	46
APPENDICES	48
CONTRIBUTIONS OF AUTHORS	50
DECLARATIONS OF INTEREST	50
SOURCES OF SUPPORT	50
DIFFERENCES BETWEEN PROTOCOL AND REVIEW	51
INDEX TERMS	51

[Intervention Review]

Pars plana vitrectomy versus scleral buckling for repairing simple rhegmatogenous retinal detachments

Ljubo Znaor^{1,2}, Aleksej Medic¹, Susanne Binder³, Ana Vucinovic¹, Josipa Marin Lovric¹, Livia Puljak⁴

¹Department of Ophthalmology, University Hospital Centre Split, Split, Croatia. ²Department of Ophthalmology, University of Split School of Medicine, Split, Croatia. ³Department of Ophthalmology, Sigmund Freud Privatuniversität, Vienna, Austria. ⁴Center for Evidence-Based Medicine and Health Care, Catholic University of Croatia, Zagreb, Croatia

Contact address: Ljubo Znaor, Department of Ophthalmology, University Hospital Centre Split, Spinciceva 1, Split, 21000, Croatia. ljuboznaor@gmail.com.

Editorial group: Cochrane Eyes and Vision Group.

Publication status and date: New, published in Issue 3, 2019.

Citation: Znaor L, Medic A, Binder S, Vucinovic A, Marin Lovric J, Puljak L. Pars plana vitrectomy versus scleral buckling for repairing simple rhegmatogenous retinal detachments. *Cochrane Database of Systematic Reviews* 2019, Issue 3. Art. No.: CD009562. DOI: [10.1002/14651858.CD009562.pub2](https://doi.org/10.1002/14651858.CD009562.pub2).

Copyright © 2019 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

ABSTRACT

Background

Rhegmatogenous retinal detachment (RRD) is a separation of neurosensory retina from the underlying retinal pigment epithelium. It is caused by retinal tears, which let fluid pass from the vitreous cavity to the subretinal space. Pars plana vitrectomy (PPV), scleral buckling surgery and pneumatic retinopexy are three accepted management strategies whose efficacy remains controversial. Pneumatic retinopexy is considered in a separate Cochrane Review.

Objectives

The primary objective of this review was to assess the efficacy of PPV versus scleral buckling for the treatment of simple RRD (primary RRD of any extension with up to two clock hours large break(s) regardless of their anterior/posterior localisation) in people with (phakia) or without (aphakia) a natural lens in the eye, or with an artificial lens (pseudophakia). A secondary objective was to assess any data on economic and quality-of-life measures.

Search methods

We searched CENTRAL, which contains the Cochrane Eyes and Vision Trials Register; MEDLINE; Embase; LILACS; the ISRCTN registry; ClinicalTrials.gov and the WHO ICTRP. The date of the search was 5 December 2018.

Selection criteria

We included randomised controlled trials (RCTs) comparing PPV versus scleral buckling surgery with at least three months of follow-up.

Data collection and analysis

We used standard Cochrane methodology. Two review authors independently extracted the data and study characteristics from the studies identified as eligible after initial screening. We considered the following outcomes: primary retinal reattachment, postoperative visual acuity, final anatomical success, recurrence of retinal detachment, number of interventions needed to achieve final anatomical success, quality of life and adverse effects. We assessed the certainty of evidence using GRADE.

Main results

This review included 10 RCTs (1307 eyes of 1307 participants) from Europe, India, Iran, Japan and Mexico, which compared PPV and scleral buckling for RRD repair. Two of these 10 studies compared PPV combined with scleral buckling with scleral buckling alone (54 participants).

Pars plana vitrectomy versus scleral buckling for repairing simple rhegmatogenous retinal detachments (Review)

Copyright © 2019 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

All studies were high or unclear risk of bias on at least one domain. Five studies were funded by non-commercial sources, while the other five studies did not report source of funding.

There was little or no difference in the proportion of participants who achieved retinal reattachment at least 3 months after the operation in the PPV group compared to those in the scleral buckling group (risk ratio (RR) 1.07, 95% confidence intervals (CI) 0.98 to 1.16; 9 RCTs, 1261 participants, low-certainty evidence). Approximately 67 in every 100 people treated with scleral buckling had retinal reattachment by 3 to 12 months. Treatment with PPV may result in 4 more people with retinal reattachment in every 100 people treated (95% confidence interval (CI) 2 fewer to 11 more).

There was no evidence of any important difference in postoperative visual acuity between participants in the PPV group compared to those in the scleral buckling group (mean difference (MD) 0.00 logMAR, 95% CI -0.09 to 0.10, 6 RCTs, 1138 participants, low-certainty evidence).

There was little or no difference in final anatomical success between participants in the PPV group and scleral buckling group (RR 1.01, 95% CI 0.99 to 1.04, 9 RCTs, 1235 participants, low-certainty evidence). There were 94 out of 100 people treated with control (scleral buckling) that achieved final anatomical success compared to 96 out of 100 in the PPV group.

Retinal redetachment was reported in fewer participants in the PPV group compared to the scleral buckling group (RR 0.75 (95% CI 0.59 to 0.96, 9 RCTs, 1320 participants, low-certainty evidence). Approximately 28 in every 100 people treated with scleral buckling had retinal detachment by 3 to 36 months. Treatment with PPV may result in seven fewer people with retinal detachment in every 100 people treated (95% CI 1 to 11 fewer).

Participants treated with PPV on average needed fewer interventions to achieve final anatomical success but the difference was small and data were skewed (MD -0.20, 95% CI -0.34 to -0.06, 2 RCTs, 682 participants, very low-certainty evidence).

Very low-certainty evidence on quality of life suggested that more people in the PPV group were "satisfied with vision" compared with the scleral buckling group (RR 6.22, 95% CI 0.88 to 44.09, 1 RCT, 32 participants).

All included studies reported adverse effects, however, it was not always clear whether they were reported as number of participants or number of adverse effects. Cataract development or progression was more prevalent in the PPV group (RR 1.71, 95% CI 1.45 to 2.01), choroidal detachment was more prevalent in the scleral buckling group (RR 0.19, 95% CI 0.06 to 0.65) and new/iatrogenic breaks were observed only in the PPV group (RR 8.21, 95% CI 1.91 to 35.21). Estimates of the relative frequency of other adverse effects, including postoperative proliferative vitreoretinopathy, postoperative increase in intraocular pressure, development of cystoid macular oedema, macular pucker and strabismus were imprecise. Evidence for adverse effects was low-certainty evidence.

Authors' conclusions

Low- or very low-certainty evidence indicates that there may be little or no difference between PPV and scleral buckling in terms of primary success rate, visual acuity gain and final anatomical success in treating primary RRD. Low-certainty evidence suggests that there may be less retinal redetachment in the PPV group. Some adverse events appeared to be more common in the PPV group, such as cataract progression and new iatrogenic breaks, whereas others were more commonly seen in the scleral buckling group such as choroidal detachment.

PLAIN LANGUAGE SUMMARY

Comparison of surgical interventions for retinal detachment

What is the aim of this review?

The aim of this Cochrane Review was to find out how pars plana vitrectomy (PPV) compares to scleral buckling in the treatment of retinal detachment. The Cochrane Review authors searched for relevant studies to answer this question and found 10 studies.

Key messages

There may be little or no difference between PPV and scleral buckling in terms of success of the operation and vision achieved. PPV may be associated with less recurrence of the detachment. Some adverse events, such as cataract progression and new iatrogenic breaks, appeared to be more common in the PPV group whereas choroidal detachment was more common in the scleral buckling group.

What was studied in the review?

Rhegmatogenous retinal detachment (RRD) is the most common type of retinal detachment. It is the separation of the retina (the light-sensitive tissue at the back of the eye) from its underlying layer in the eye. This occurs because of retinal breaks or tears, which lead to the vitreous gel (the clear substance that fills the centre of the eye) leaking under the retina.

PPV is a surgical procedure which involves removing the vitreous from the eye through the pars plana (part of the middle layer of the eye).

Scleral buckling surgery requires applying local pressure on to the retina by suturing (stitching) material (silicone) onto the outer part of the eye (sclera), to push it inwards. PPV involves removal of the vitreous, using a laser to seal the break, and injecting silicone oil into the vitreous cavity to apply pressure to the retina. PPV may be combined with scleral buckling surgery if needed.

What are the main results of the review?

The Cochrane Review authors found 10 relevant studies with 1307 participants from Europe, India, Iran, Japan and Mexico. All studies compared scleral buckling with PPV alone or combined with scleral buckling for treating RRD. All studies had at least three months of follow-up. Five studies were funded by non-commercial sources, while the other five studies did not report source of funding.

The results of the review show that for people with RRD, there is little or no difference between PPV and scleral buckling in terms of primary success rate, visual acuity and final anatomical success (low-certainty evidence); PPV is associated with lower rates of retinal redetachment compared to scleral buckling (low-certainty evidence); there was only very low-certainty evidence on number of operations required and quality of life.

All the studies reported adverse effects (side effects). Cataract development or progression was more common in the PPV group, choroidal detachment was more common in the scleral buckling group and new/iatrogenic breaks were observed only in the PPV group.

How up-to-date is this review?

The Cochrane Review authors searched for studies that had been published up to 5 December 2018.

SUMMARY OF FINDINGS

Summary of findings for the main comparison. Pars plana vitrectomy (PPV) compared to scleral buckling for repairing simple rhegmatogenous retinal detachments

Patient or population: people with simple rhegmatogenous retinal detachments

Setting: clinical centres

Intervention: pars plana vitrectomy (PPV)

Comparison: scleral buckling (SB)

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	N° of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with SB	Risk with PPV				
Primary retinal reattachment at least 3 months after operation	668 per 1000	714 per 1000 (654 to 775)	RR 1.07 (0.98 to 1.16)	1261 (9 RCTs)	⊕⊕⊕⊕ Low ^{1,2}	Overall heterogeneity (I ² value) = 34%
Postoperative visual acuity (logMAR) range 0 to 2; higher values of logMAR indicate worse visual acuity at least 3 months after operation	The mean postoperative value for visual acuity (logMAR) ranged from 0.1 to 0.96	MD 0 higher (0.09 lower to 0.1 higher)	-	1138 (6 RCTs)	⊕⊕⊕⊕ Low ^{1,3}	Overall heterogeneity (I ² value) = 68%
Final anatomical success at least 3 months after operation	938 per 1000	956 per 1000 (938 to 985)	RR 1.01 (0.99 to 1.04)	1235 (9 RCTs)	⊕⊕⊕⊕ Low ^{1,2}	Overall heterogeneity (I ² value) = 0%
Recurrence of retinal detachment at least 3 months after operation	279 per 1000	209 per 1000 (165 to 268)	RR 0.75 (0.59 to 0.96)	1320 (9 RCTs)	⊕⊕⊕⊕ Low ^{1,2}	Overall heterogeneity (I ² value) = 18%
Number of interventions needed to achieve final anatomical success at final follow-up	The mean number of interventions needed to achieve final anatomical success ranged from 0.63 to 0.77	MD 0.20 lower (0.34 lower to 0.06 lower)	-	682 (2 RCTs)	⊕⊕⊕⊕ Very low ^{1,3,4}	Overall heterogeneity (I ² value) = 53%
Quality of life (satisfaction with vision)	71 per 1000	444 per 1000 (63 to 1000)	RR 6.22 (0.88 to 44.09)	32 (1 RCT)	⊕⊕⊕⊕ Very low ^{1,5}	

at least 3 months after operation			
Adverse effects	Cataract development or progression was more prevalent in the PPV group (RR 1.71, 95% CI 1.45 to 2.01), choroidal detachment was more prevalent in the SB group (RR 0.19, 95% CI 0.06 to 0.65) and new/iatrogenic breaks were observed only in the PPV group (RR 8.21, 95% CI 1.91 to 35.21). Estimates of the relative frequency of other adverse effects, including postoperative proliferative vitreoretinopathy, postoperative increase in intraocular pressure, development of cystoid macular oedema, macular pucker, strabismus) were imprecise.	⊕⊕⊕⊖ Low ^{1,2}	It was not always clear whether adverse effects were reported as number of participants or number of adverse effects
at any time point			Overall heterogeneity (I ² value) for these analyses ranged from 0% to 30%

***The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; **MD:** mean difference; **PPV:** pars plana vitrectomy; **RR:** risk ratio; **SB:** scleral buckling

GRADE Working Group grades of evidence

High-certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate-certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low-certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low-certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

¹Downgraded 1 level because we found unclear or high risk of bias for some domains in all studies.

²Downgraded 1 level for imprecision as confidence intervals included null value or clinically insignificant effect.

³Downgraded 1 level for inconsistency as I² greater than 50%.

⁴Downgraded 1 level for indirectness as data were skewed and the summary measure may not be a good estimate of effect.

⁵Downgraded 2 levels for imprecision as there was only one study with few participants and very wide confidence intervals.

BACKGROUND

Description of the condition

Retinal detachment refers to the separation of the neurosensory retina (NSR) from the underlying retinal pigment epithelium (RPE) causing fluid accumulation within this potential space (Ghazi 2002). There are four major types of retinal detachment with accompanying accumulation of subretinal fluid, which are classified according to pathogenetic mechanisms: rhegmatogenous, tractional, exudative and combined tractional/rhegmatogenous retinal detachment (Ghazi 2002).

Rhegmatogenous retinal detachment (RRD) is the most common type of retinal detachment and three prerequisites for its development are liquefied vitreous (a clear, jelly-like substance that fills the middle of the eye); tractional forces that produce a retinal tear and keep it open, and a full-thickness retinal tear through which fluid gains access into the subretinal space (Ghazi 2002). Retinal tears do not cause retinal detachment if liquefied vitreous and vitreoretinal traction are not present (Byer 1998). The most frequent cause of RRD is posterior vitreous detachment (PVD) (Green 2001). It appears with aging and is caused by advanced liquefaction of the vitreous. Other less frequent causes of RRD include various forms of necrotising retinitis such as toxoplasmosis, cytomegalovirus infection, and acute retinal necrosis syndrome. People often present with floaters and flashes which are usually caused by acute PVD (Gariano 2004). Sudden visual field loss may be another sign of RRD, which usually starts in the periphery with relatively fast progression toward the central visual field (Gariano 2004). The treatment of RRD is surgical, with urgency of repair depending on the extent of the retinal detachment and macular involvement.

Population-based studies reported that annual incidence of RRD varies between 7 to 12 cases per 100,000 (Tornquist 1987; Wilkes 1982), with a lifetime risk (up to 60 years of age) of 0.6% (Haimann 1982; Wilkes 1982). It is much more frequent in older people and there are several well known risk factors of RRD development such as previous cataract surgery, high myopia, eye trauma, ocular infections, lattice degeneration and glaucoma (Sodhi 2008).

Rhegmatogenous retinal detachment is one of the most frequent indications for vitreoretinal surgery (Ah-Fat 1999). Symptomatic RRD is a clear indication for surgery, while the benefit of the surgery remains dubious for people with asymptomatic RRD (Sodhi 2008).

Despite obvious surgical and technological advancements, primary (80% to 84%) and final (89% to 94%) anatomic success rates for retinal detachment repair in 1999 were similar to those reported in 1970 (Minihan 2001). Visual recovery is dramatically better after macula-on retinal detachments than macula-off retinal detachments, with correlation to the duration of macular involvement (Burton 1982). These results suggest that the selection of the appropriate management strategy remains a necessity (Sodhi 2008).

Description of the intervention

Three surgical approaches for RRD are currently in use: scleral buckling, pars plana vitrectomy (PPV), and pneumatic retinopexy.

Scleral buckling surgery has been the gold standard for more than 60 years. It involves identifying all retinal tears, which have to

be treated with cryopexy and consecutively externally supported with silicone explants (usually sponge). Explants are sutured on the external surface of the sclera and may be positioned radially or circumferentially.

Pars plana vitrectomy is a newer surgical technique, which primarily involves surgical removal of the vitreous. The retina is reattached by different techniques according to the location of the retinal tear and the extent of the retinal detachment. During surgery, the retinal tear is usually surrounded and sealed using endolaser or cryopexy. At the end of the vitrectomy, gas or silicone oil is injected into the vitreous cavity to provide a tamponade for the retina to heal. PPV may be combined with buckling surgery in selected cases.

Pneumatic retinopexy, the third surgical approach, is the subject of an ongoing Cochrane Review (Hatef 2015), and therefore we did not consider it in this review.

How the intervention might work

The three surgical approaches mentioned above have the common goal of bringing the detached retina closer to the eye wall, which subsequently permits the retina to reattach.

In scleral buckling surgery, a silicone explant is sutured on the outer surface of the sclera creating an indentation in the wall of the eye. The primary intention is to bring the wall of the eye closer to the detached retina corresponding to the retinal tear, and to relieve eventual vitreoretinal traction which keeps the retinal tear open. The retina around the tear is treated with cryotherapy or photocoagulation in order to induce chorioretinal adhesion. Once the retinal tear is sealed and no fresh liquefied vitreous can enter the subretinal space, the remaining subretinal fluid will be reabsorbed with a subsequent retinal reattachment.

Pars plana vitrectomy consists of surgical excision of the vitreous body and therefore vitreoretinal traction. The retina is flattened intraoperatively by using silicone oil or a gas bubble and tears are sealed by chorioretinal adhesion induced by endophotocoagulation or cryopexy.

Why it is important to do this review

If untreated, most RRDs progress to a complete detachment and result in loss of vision. For a long period of time, scleral buckling was the only available surgical option. After the arrival of PPV, scleral buckling became the gold standard for primary RRD with single break, limited retinal detachment and good visibility of the fundus. Initially, PPV was considered as high-risk surgery and therefore reserved only for complicated retinal detachments, such as giant retinal tears, proliferative vitreoretinopathy (PVR), and tractional detachments in people with diabetes. However data from 1999 show that PPV gained popularity and became in some centres the most frequently performed surgery for RRD (Minihan 2001). Currently, most surgeons would agree that PPV is usually the surgical method of choice for the repair of complex RRD (giant retinal tears, vitreous haemorrhage, breaks at the posterior pole or RRD associated with PVR) (Machemer 1971; Machemer 1995) on one hand, and scleral buckling and pneumatic retinopexy for the repair of RRD with good visibility of the fundus, single breaks or limited retinal detachments on the other hand (AAO 1990; Benson 1999; Heimann 2001). However there is more debate about large numbers of RRDs with multiple, large, or

unusually shaped tears, which may be positioned posterior to the equator, or where no break was found preoperatively. Therefore, two people with comparable retinal detachments may currently undergo completely different surgical procedures according to their surgeon's preference.

Despite dramatic progress in success rates of surgeries for the treatment of RRD, disagreement exists as to which therapeutic approach, PPV or scleral buckling, is the best primary retinal reattachment surgery option. For this reason a systematic review of the efficacy of these treatment modalities may be useful to ophthalmologists, other allied professionals and people with RRD.

OBJECTIVES

The primary objective of this review was to assess the efficacy of PPV versus scleral buckling for the treatment of simple RRD (primary RRD of any extension with up to two clock hours large break(s) regardless of their anterior/posterior localisation) in people with (phakia) or without (aphakia) a natural lens in the eye, or with an artificial lens (pseudophakia). A secondary objective was to assess any data on economic and quality-of-life measures.

METHODS

Criteria for considering studies for this review

Types of studies

In this review, we included randomised controlled trials (RCTs) with at least three months of follow-up.

Types of participants

We included all studies in which participants with RRD were randomised to scleral buckling, PPV (including surgery with 20 g, 23 g and 25 g intraocular instrumentation) or a combination of both techniques. We excluded all cases with RRD not caused by PVD-associated retinal tears (retinal dialysis, traction tears in proliferative diabetic retinopathy, macular hole). We also excluded cases with multiple breaks with localised detachment(s), small single breaks or neighbouring small breaks, traumatic RRD, and PVR grade B and C.

Types of interventions

We included studies that compared PPV (alone or combined with scleral buckling) to scleral buckling alone..

Types of outcome measures

Primary outcomes

Proportion of participants with primary retinal re-attachment (attachment of the retina at least three months after the initial surgery with no need for further re-attachment surgery; with no tamponade present; and no subretinal fluid present). We did not exclude eyes with anterior subretinal fluid walled by 360° retinopathy, eyes with small traction detachments posterior to a circumferential or encircling buckle, and eyes subsequently operated to remove silicone oil, or cataract. We defined retinal re-attachment as attachment of the retina central to the equator at the final follow-up visit without any retina affecting the procedure (Heimann 2007 phakic; Heimann 2007 pseudophakic).

Secondary outcomes

- Postoperative best corrected visual acuity, expressed as logarithm of the minimum angle of resolution (logMAR) scale) or decimal values, either as postoperative values, or change from baseline to at least three months postoperatively using scoring on Early Treatment Diabetic Retinopathy Study (ETDRS) charts. As reported in the Heimann 2007 phakic and Heimann 2007 pseudophakic trial, "in case of very low visual acuity, such as counting fingers, hand movements, light perception and no light perception, it was substituted with logMAR values of 1.7, 2.0, 2.5 and 3.0 respectively".
- Proportion of participants with final anatomical success (retinal reattachment) after at least three months of follow-up, regardless of number or type of additional treatments needed (such as laser photocoagulation, cryopexy, intraocular tamponade, scleral buckling or its revision, and additional vitrectomy).
- Proportion of participants with recurrence of retinal detachment and its likely cause.
- Number of interventions needed to reattach the retina.
- Any other validated measures of visual function as available in the studies.

Adverse effects

We considered surgical adverse effects such as appearance of PVR, cataract development or progression, postoperative increase in intraocular pressure, development of cystoid macular oedema, macular pucker (epiretinal membrane, EPR), choroidal detachment, strabismus following scleral buckling and others reported in the included studies.

Quality-of-life measures

We planned to assess quality of life based on all included studies that used a Visual Function Questionnaire as an index for quality of life (Mangione 2001). Since none of the included studies used such questionnaires, we summarised any other measures of quality of life reported in the included studies.

Economic data

None of the included studies reported economic data.

Follow-up

We included all studies with a minimum of three months' follow-up period in this review. If the eligible studies had clinically relevant data for multiple time points, we presented them in our analyses.

Search methods for identification of studies

Electronic searches

The Cochrane Eyes and Vision Information Specialist conducted systematic searches in the following databases for randomised controlled trials and controlled clinical trials. There were no language or publication year restrictions. The date of the search was 5 December 2018.

- Cochrane Central Register of Controlled Trials (CENTRAL; 2018, Issue 11) (which contains the Cochrane Eyes and Vision Trials Register) in the Cochrane Library (searched 5 December 2018) (Appendix 1).
- MEDLINE Ovid (1946 to 5 December 2018) (Appendix 2).

- Embase Ovid (1980 to 5 December 2018) ([Appendix 3](#)).
- LILACS (Latin American and Caribbean Health Science Information database (1982 to 5 December 2018) ([Appendix 4](#)).
- ISRCTN registry (www.isrctn.com/editAdvancedSearch; searched 5 December 2018) ([Appendix 5](#)).
- US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov (www.clinicaltrials.gov; searched 5 December 2018) ([Appendix 6](#)).
- World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) (www.who.int/ictip; searched 5 December 2018) ([Appendix 7](#)).

Searching other resources

We handsearched the reference list of the included studies to identify other possible studies. We also contacted the first/ corresponding author of reports of included studies and other experts in the field, for information on any additional studies (published or unpublished) that might be relevant for this review.

Data collection and analysis

Selection of studies

Two members of the review team independently screened the titles and abstracts of all reports of studies identified by the electronic searches and handsearching against the [Criteria for considering studies for this review](#). We classified each report as follows: (1) definitely include, (2) possibly include, (3) definitely exclude. Each review author obtained and assessed the full text of each study classified by either review author as (1) and (2) and reclassified the study as: (a) include, (b) awaiting classification or (c) exclude. The two review authors compared their individual classifications and any eventual disagreement was solved by discussion after review by a third author. We contacted and requested additional information from study investigators for each study classified as (b). We documented all studies classified as (c) in the [Characteristics of excluded studies](#) table.

Data extraction and management

Two members of the review team extracted data independently using data extraction forms developed by Cochrane Eyes and Vision. Two review authors compared the two sets of extracted data against each other, and identified any discrepancies, which they resolved through discussion and by consulting a third review author when necessary. The review authors were not masked to the authors, interventions or results obtained in the included studies. Where studies reported both preliminary and final results, we included only the final report (including full number of participants).

We extracted the following information for each included study:

- methods (for example, study design, sample size, inclusion and exclusion criteria, demographic characteristics of each intervention group, and settings);
- intervention details (type of retinal detachment, type of operation performed, length of follow-up, loss to follow-up, number of operations needed to obtain retinal reattachment);
- outcomes (detailed list and description of both the beneficial and adverse reported outcomes, time points, and methods of assessment);

- results for each outcome of interest (missing data, and summary data for each intervention); and
- other data such as sample size calculation (yes-no), and funding sources.

One review author entered data into Review Manager 5 (RevMan 5) ([Review Manager 2014](#)) and a second review author verified the entries. We contacted study authors if additional information was needed.

Assessment of risk of bias in included studies

We evaluated each included study for the risk of different types of biases, such as selection bias, performance bias, attrition bias, detection bias, and reporting bias. Two review authors independently assessed risk of bias using a domain-based evaluation tool, as described in Chapter 8 of the *Cochrane Handbook of Systematic Reviews of Interventions* ([Higgins 2017](#)). We assessed one or more specific questions for each domain (random sequence generation, allocation concealment, blinding (masking), incomplete outcome data, selective outcome reporting, and other sources of bias) as having a low risk of bias; high risk of bias; or 'unclear' risk of bias, indicating inadequate information for assessment of the risk of bias. Where we assessed domains as 'unclear', we attempted to contact the study investigators and obtain further information. In case of no response, we classified the included study report according to available information. We provided the description for each domain question from which we made 'Risk of bias' judgements. We also assessed magnitude and direction of bias estimation.

Measures of treatment effect

Dichotomous outcome measures

We presented dichotomous data as risk ratios (RR) with 95% confidence intervals (CIs) for the following outcomes.

Primary outcome

Proportion of participants with primary retinal re-attachment after at least three months of follow-up.

Secondary outcomes

Proportion of participants with final retinal re-attachment (regardless of number or type of additional re-attachment treatments needed), proportion of participants with recurrence of retinal detachment, and relief of symptoms at the time of last follow-up as quality-of-life measure.

Continuous outcome measures

We presented the mean difference with 95% confidence intervals for the following outcomes.

Secondary outcome

Best corrected visual acuity at last available follow-up visit.

Economic data

No economic data were available in the included studies.

Unit of analysis issues

The unit of analysis was an individual participant with one eye affected by retinal detachment.

Dealing with missing data

We conducted intention-to-treat (ITT) analysis including studies with missing data according to the guidelines in Chapter 16 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). Where important summary data were missing, we performed analysis based on the data as reported.

If some important summary data were incomplete or completely missing, we contacted corresponding authors for more information, but we received no response. We also contacted corresponding authors to obtain information regarding 'Risk of bias' assessment, when relevant information was unclear or missing, but we received no response.

For data presented only as a graph we used Plot Digitizer software to extract the data from the figure (Jelicic Kadic 2016; Plot Digitizer 2001). We did this for the outcome visual acuity in one study (Koriyama 2007).

Assessment of heterogeneity

We tested statistical heterogeneity by χ^2 and I^2 values (Higgins 2003). We interpreted a χ^2 test resulting in a P value less than 0.10 as indicating significant statistical heterogeneity. In order to assess and quantify the possible magnitude of inconsistency (i.e. heterogeneity) across studies, we used the I^2 statistic with a rough guide for interpretation as follows: 0% to 40% might not be important; 30% to 60% may represent moderate heterogeneity; 50% to 90% may represent substantial heterogeneity; 75% to 100% considerable heterogeneity (Deeks 2017).

Assessment of reporting biases

If there were at least 10 studies included in any meta-analysis, we would have created a funnel plot of effect estimates against their standard errors to assess a possible between-study reporting bias. However, there were no such analyses (Sterne 2017).

Data synthesis

We used a random-effects model as the primary method of meta-analysis, provided there were more than three studies eligible for meta-analysis. Otherwise, we used a fixed-effect model. In case of significant heterogeneity, we planned to report results in tabular form and not pool data across studies (Deeks 2017).

Subgroup analysis and investigation of heterogeneity

In our protocol (Znaor 2012) we planned to conduct the following subgroup analyses:

- phakic versus pseudophakic/aphakic participants, because pseudophakic and aphakic eyes usually have poor dilation and may have retinal tears that are missed due to inability to visualise complete retinal periphery;

- people with myopia versus people with emetropia/hyperopia, because those with myopia have higher incidence of RRD;
- tears only in lower quadrants versus tears in upper quadrants, because it is known that retinal tears in lower quadrants are subject to higher postoperative rates of retinal redetachment.

Of these, we conducted subgroup analysis for phakic versus pseudophakic participants. We were unable to conduct the other two subgroup analyses because we did not find relevant data.

Sensitivity analysis

We planned sensitivity analysis to assess how the results of meta-analysis might have been affected by the inclusion of studies at unclear and high risk of bias. However, we did not conduct sensitivity analysis because we judged the included studies at unclear risk of bias in the majority of 'Risk of bias' domains.

'Summary of findings' table and GRADE

We prepared a 'Summary of findings' table. We graded the certainty of the evidence for each outcome using the GRADE classification (Schünemann 2013) and used GRADEpro GDT software to prepare the 'Summary of findings' table (GRADEpro GDT 2015). We included the following outcomes in the 'Summary of findings' table:

- Primary retinal reattachment rate at least 3 months after operation
- Postoperative visual acuity (logMAR)
- Final anatomical success
- Recurrence of retinal detachment
- Number of interventions needed to achieve final anatomical success
- Quality of life

RESULTS

Description of studies

See [Characteristics of included studies](#) and [Characteristics of excluded studies](#) table.

Results of the search

The electronic searches yielded 785 records (Figure 1). After 189 duplicates were removed the Cochrane Information Specialist (CIS) screened the remaining 596 records and removed 227 records that were not relevant to the scope of the review. We screened the remaining 369 records and obtained the full-text reports of 21 records for further assessment. Of these, we excluded three reports of three studies for reasons presented in the [Characteristics of excluded studies](#) table. We found one ongoing study, which we will assess when data become available (ISRCTN95808249). We assessed the remaining 17 reports and 10 studies met the inclusion criteria for this systematic review, see [Characteristics of included studies](#) for details.

Figure 1. Study flow diagram

Included studies

We included 10 RCTs from 17 reports (1307 eyes of 1307 participants). The studies included men and women (see [Characteristics of included studies](#)).

Participants and setting

Nine studies, which recruited 1299 eyes of 1299 participants had similar clinical and demographic characteristics. Therefore, we did not expect differences among recruited participants with simple RRD from different countries or study settings. Two studies conducted by Heimann and colleagues ([Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#)), were European multicentre RCTs; [Brazitikos 2005](#) enrolled people with simple RRD from a teaching hospital in Thessaloniki, Greece; [Tewari 2003](#), [Sharma 2005](#) and [Azad 2007](#) were conducted in India and they recruited participants from Dr. Rajendra Prasad Centre for Ophthalmic Sciences in New Delhi; [Ahmadieh 2005](#) enrolled participants from Iran who presented with simple RRD to Labbafinejad Medical Center, Tehran; [Koriyama 2007](#) also enrolled people with simple RRD from a teaching hospital in Osaka, Japan; [Lopez-Bolanos 2003](#) was conducted in Mexico, and recruited participants from the private ophthalmology clinic, Instituto de Oftalmologia "Fundacion Conde de Valenciana". The final study, [Martinez-Jardon 2002](#), was reported as a conference abstract only, and the only information about participants was their age; affiliation of authors is from Mexico.

Five studies ([Brazitikos 2005](#); [Koriyama 2007](#); [Lopez-Bolanos 2003](#); [Sharma 2005](#); [Tewari 2003](#)) were funded by non-commercial sources, while the remaining five included studies ([Ahmadieh 2005](#); [Azad 2007](#); [Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#); [Martinez-Jardon 2002](#)) did not report sources of funding or conflicts of interest. Only two studies mentioned protocol registration ([Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#)), but we could not access their protocols because the URL mentioned in the manuscript was not functional.

Interventions

All studies compared scleral buckling surgery with PPV alone or combined with scleral buckling. All studies employed similar

procedures for PPV and scleral buckling surgery. Procedures generally included draining of the subretinal fluid, laser photocoagulation or cryopexy to seal retinal breaks, gas or silicone oil injections, and suturing of the scleral buckle.

Outcomes

All studies assessed primary reattachment rate at least three months after operation. [Lopez-Bolanos 2003](#) did not assess visual acuity. [Martinez-Jardon 2002](#) reported change in best corrected visual acuity but without a standard deviation (SD) and therefore we did not use this outcome. [Tewari 2003](#) and [Martinez-Jardon 2002](#) did not assess recurrence of retinal detachment, while [Tewari 2003](#) did not assess final anatomical success. Only two studies reported number of interventions needed to achieve final anatomical success ([Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#)), and only [Koriyama 2007](#) measured quality of life.

Ongoing study

We found one registered ongoing study that fitted our inclusion criteria ([ISRCTN95808249](#)). The registered protocol describes a RCT that will randomise 120 participants in two groups. Those in the first group will receive PPV. Those in the second group will receive releasable scleral buckling (RSB) treatment. Reported 'overall trial start date' was 1 January 2017, and expected 'overall trial end date' is 1 August 2019 ([ISRCTN95808249](#)).

Excluded studies

We excluded three studies because they did not meet our inclusion criteria: one included participants that were not eligible for our review ([Betran-Loustaunau 1997](#)), one was not a randomised study ([Gungel 2012](#)) and one did not investigate scleral buckling surgery ([Romano 2011](#)).

Risk of bias in included studies

We have summarised our 'Risk of bias' assessments in [Figure 2](#) and [Figure 3](#).

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)
Ahmadiieh 2005	+	?	?	?	?	?
Azad 2007	?	?	?	?	?	?
Brazitikos 2005	?	?	?	?	?	?
Heimann 2007 phakic	+	?	-	?	+	?
Heimann 2007 pseudophakic	+	?	-	?	+	?
Koriyama 2007	?	?	?	?	?	?
Lopez-Bolanos 2003	?	?	?	?	?	?
Martinez-Jardon 2002	?	?	?	?	?	?
Sharma 2005	?	?	?	?	?	?
Tewari 2003	?	?	?	?	?	?

Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies

Allocation

Three studies clearly reported randomisation methods that we judged as having low risk of bias (Ahmadi²⁰⁰⁵; Heimann 2007 phakic; Heimann 2007 pseudophakic). We assessed the risk of bias for generating randomisation sequence as unclear in the other studies because they mentioned that the study was randomised, but did not describe the method of randomisation. Methods for allocation concealment were unclear in all included studies.

Blinding

None of the studies reported information about masking of participants. Corresponding authors of two studies (Heimann 2007 phakic; Heimann 2007 pseudophakic) provided information that masking of participants was not performed, and for this reason we judged the studies as having high risk of performance bias. For the remaining studies we were unable to get more specific information and therefore we judged them as having unclear risk of performance bias.

Only two studies (Heimann 2007 phakic; Heimann 2007 pseudophakic) reported masking of outcome assessment, but only for one outcome, while the other studies did not report on masking of outcome assessment; therefore we judged them all as having unclear risk of detection bias.

Incomplete outcome data

Most of the studies had unclear risk of attrition bias because attrition was not reported. Two studies (Heimann 2007 phakic; Heimann 2007 pseudophakic) reported low attrition.

Selective reporting

All outcomes specified in the methods were reported in the results of the included studies. However, none of the studies reported

registration and we could not find a protocol for any of the studies. We were unable to compare outcomes planned in the protocol and outcomes reported in the publications. We, therefore judged all included studies to have unclear risk of reporting bias.

Other potential sources of bias

We did not identify any other bias in the included studies.

Effects of interventions

See: [Summary of findings for the main comparison Pars plana vitrectomy \(PPV\) compared to scleral buckling for repairing simple rhegmatogenous retinal detachments](#)

See [Summary of findings for the main comparison](#).

Primary retinal reattachment rate

We defined primary retinal reattachment as the reattachment of the retina at least three months after the surgery. Nine studies reported this outcome (Ahmadi²⁰⁰⁵; Azad 2007; Brazitikos 2005; Heimann 2007 phakic; Heimann 2007 pseudophakic; Koriyama 2007; Martinez-Jardon 2002; Sharma 2005; Tewari 2003). The follow-up for this outcome ranged from 3 to 12 months. As reattachment is a desired effect, RRs less than 1 favour scleral buckling surgery and RRs greater than 1 favour PPV for this outcome. There was little difference between the groups. Slightly more participants achieved retinal reattachment in the PPV group (445/616; 72%) compared to those in the scleral buckling group (435/646; 67%); (RR 1.07, 95% CI 0.98 to 1.16; $P = 0.13$; $I^2 = 34\%$). See [Analysis 1.1](#) and [Figure 4](#). Approximately 67 in every 100 people treated with scleral buckling had retinal reattachment by 3 to 12 months. Treatment with PPV may result in 4 more people with retinal reattachment in every 100 people treated (95% confidence interval (CI) 2 fewer to 11 more).

Figure 4. Forest plot of comparison 1. Pars plana vitrectomy (PPV) vs scleral buckling, outcome: 1.1 primary retinal reattachment rate at least 3 months after operation

We conducted subgroup analysis for phakic versus pseudophakic participants, with one study in each subgroup. Among phakic participants there was the same rate of primary retinal reattachment in the PPV and scleral buckling groups (64% vs 64%, respectively), after follow-up of 12 months (RR 1.00 (95% CI 0.87 to 1.16; [Heimann 2007 phakic](#)). Among pseudophakic participants, more in the PPV group (72%), achieved the primary retinal reattachment rate compared to the scleral buckling group (53%) after follow-up of 12 months (RR 1.35 (95% CI 1.11 to 1.63; [Heimann 2007 pseudophakic](#)). There was significant difference between the subgroups ($\chi^2 = 5.87$, $df = 1$ ($P = 0.02$), $I^2 = 83.0\%$).

We reported this outcome at three months ([Koriyama 2007](#); [Martinez-Jardon 2002](#); [Tewari 2003](#)), six months ([Ahmadiieh 2005](#); [Azad 2007](#); [Sharma 2005](#)) and 12 months ([Brazitikos 2005](#); [Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#)). There was no apparent advantage of one procedure over another in these specific time frames for this outcome. There was no heterogeneity at three months and six months ($I^2 = 0\%$ for both), while heterogeneity was high for 12-month data ($I^2 = 66\%$). See [Analysis 1.1](#) and [Figure 4](#).

We assessed the certainty of the evidence as low due to imprecision and because there was high or unclear risk of bias for one or more domains in the included studies.

Visual acuity

Eight studies reported postoperative values for visual acuity ([Ahmadiieh 2005](#); [Azad 2007](#); [Brazitikos 2005](#); [Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#); [Koriyama 2007](#); [Sharma 2005](#); [Tewari 2003](#)). The follow-up for this outcome ranged from 6 to 36 months. One study ([Tewari 2003](#)) reported this outcome only as median and range; values in the PPV group were -1.06 (range from light perception to 0.33) and in the scleral buckling group were -1.05 (range from light perception to 0.33). We did not include these data in the meta-analysis.

Of the remaining seven studies, six reported postoperative values in logMAR values and one in Snellen decimal values ([Sharma 2005](#)). These two measurement scales differ in terms of direction, with higher Snellen decimal acuity values meaning better vision, and higher logMAR values meaning worse vision. Therefore, we did not combine them in the analysis.

In [Analysis 1.2](#) we included six studies with 1138 participants. Pooled results indicate that there was little difference in postoperative visual acuity between PPV and scleral buckling groups (MD 0.00, 95% CI -0.09 to 0.10, $P = 0.92$). We note that one small study included in this analysis has a higher weight than might be expected given its sample size ([Koriyama 2007](#)). The standard deviation for this study may be smaller than it should be. Staff at

the CEV editorial base double checked the data extraction for this study (from a figure) and it represents what is published. Repeating the analysis imputing a larger standard deviation for this study did not materially affect the analysis (data not shown). Heterogeneity was high in [Analysis 1.2](#) ($\text{Chi}^2 = 15.67$, $\text{df} = 5$ ($P = 0.008$); $I^2 = 68\%$), entirely due to the [Heimann 2007 phakic](#) study. This study had the opposite results compared to others in this subgroup. After we had excluded the [Heimann 2007 phakic](#) study from [Analysis 1.2](#), there was no evidence of heterogeneity ($\text{Chi}^2 = 2.75$, $\text{df} = 4$ ($P = 0.60$); $I^2 = 0\%$), and no important difference in the main effect (MD -0.04, 95% CI -0.11 to 0.02, $P = 0.18$). We assessed the certainty of the evidence as low due to inconsistency and because there was high or unclear risk of bias for one or more domains in the included studies.

We performed separate analysis for different follow-up times, where applicable. In the six studies that reported logMAR values, these follow-up times were after 1 week, and after 1, 2, 3, 4, 6, 12, 24 and 36 months. Based on data from one study, after one week results for visual acuity were better in the scleral buckling group compared to PPV. Results showed little difference for the other time points, most of which had data only from one study. See [Analysis 1.3](#).

[Sharma 2005](#) included 50 participants. This study measured postoperative values for visual acuity with Snellen decimal values. Higher Snellen decimal acuity values mean better vision. The study presented data for four follow-up times: one week, two weeks, six weeks and six months. Better vision, that is, higher Snellen decimal visual acuity was observed in the scleral buckling group after one week (0.03 ± 0.04 in PPV group vs. 0.09 ± 0.01 in scleral buckling group; $P = 0.05$) and after two weeks (0.04 ± 0.05 in PPV group vs. 0.1 ± 0.1 in scleral buckling group; $P = 0.007$), but not after six weeks (0.18 ± 0.13 in PPV group vs. 0.14 ± 0.15 ; $P = 0.31$ in scleral buckling group). After six months, better vision was observed in the PPV group (0.28 ± 0.12 in PPV group vs. 0.19 ± 0.15). Mean difference was 0.09 (95% CI 0.01 to 0.17, $P = 0.02$). Analysis not shown.

Final anatomical success

We defined final anatomical success with retinal reattachment regardless of the number of surgical procedures. Nine included studies reported this outcome ([Ahmadieh 2005](#); [Azad 2007](#); [Brazitikos 2005](#); [Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#); [Koriyama 2007](#); [Lopez-Bolanos 2003](#); [Martinez-Jardon 2002](#); [Sharma 2005](#)). The follow-up for this outcome ranged from 3 to 36 months. There was little difference between the groups. Slightly more participants achieved final anatomical success in the PPV group (576/601; 96%) compared to those in the scleral buckling group (592/634; 94%). As final anatomical success is a desired effect, RRs less than 1 favour scleral buckling surgery and RRs greater than 1 favour PPV for this outcome. However, results were imprecise and included little or no difference (RR 1.01, 95% CI 0.99 to 1.04; $P = 0.24$; $I^2 = 0\%$). See [Analysis 1.4](#).

We conducted subgroup analysis for phakic versus pseudophakic participants, with one study in each subgroup. Among phakic participants there was the same rate of final anatomical success in the PPV and scleral buckling groups (97% vs 97%, respectively) after follow-up of 12 months; RR 1.00 (95% CI 0.96 to 1.04) ([Heimann 2007 phakic](#)). Among pseudophakic participants, slightly more participants in the PPV group (95%) achieved primary retinal reattachment rate compared to the scleral buckling group (93%) after follow-up of 12 months; RR 1.02 (95% CI 0.97 to 1.09)

([Heimann 2007 pseudophakic](#)). There was no difference between the subgroups ($\text{Chi}^2 = 0.46$, $\text{df} = 1$ ($P = 0.50$), $I^2 = 0\%$). Analysis not shown.

We conducted analysis for this outcome at three months ([Martinez-Jardon 2002](#)), six months ([Ahmadieh 2005](#); [Azad 2007](#); [Sharma 2005](#)), 10 months ([Lopez-Bolanos 2003](#)), 12 months ([Brazitikos 2005](#); [Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#)) and 36 months ([Koriyama 2007](#)). There was no evidence of an advantage of one procedure over another in these specific time frames regarding this outcome.

We assessed the certainty of the evidence as low due to imprecision and because there was high or unclear risk of bias for one or more domains in the included studies.

Recurrence of retinal detachment

Nine studies reported this outcome ([Ahmadieh 2005](#); [Azad 2007](#); [Brazitikos 2005](#); [Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#); [Koriyama 2007](#); [Lopez-Bolanos 2003](#); [Sharma 2005](#); [Tewari 2003](#)). The follow-up for this outcome ranged from 3 to 36 months. Retinal redetachment was reported in fewer participants in the PPV group (139/661; 21%) compared to the scleral buckling group (184/659; 28%). Approximately 28 in every 100 people treated with scleral buckling had retinal detachment by 3 to 36 months. Treatment with PPV may result in seven fewer people with retinal detachment in every 100 people treated (95% CI 1 to 11 fewer). Since recurrence of retinal detachment is a negative effect, RRs less than 1 favour PPV and RRs greater than 1 favour scleral buckling for this outcome. The overall effect was RR 0.75 (95% CI 0.59 to 0.96, $P = 0.02$; $I^2 = 18\%$) indicating that scleral buckling was associated with retinal redetachment more often than PPV. See [Analysis 1.5](#).

We conducted subgroup analysis for phakic versus pseudophakic participants, with one study in each subgroup. Among phakic participants there was a slightly lower rate of recurrence of retinal detachment in the PPV group (25%) compared to the scleral buckling group (26%) after follow-up of 12 months; RR 0.95 (95% CI 0.69 to 1.32) ([Heimann 2007 phakic](#)). Among pseudophakic participants, significantly fewer participants in the PPV group (20%) had recurrence of retinal detachment compared to the scleral buckling group (40%) after follow-up of 12 months; RR 0.51 (95% CI 0.35 to 0.76) ([Heimann 2007 pseudophakic](#)). There was a significant difference between the subgroups ($\text{Chi}^2 = 5.61$, $\text{df} = 1$ ($P = 0.02$), $I^2 = 82.2\%$). Analysis not shown.

We conducted analysis for this outcome at three months ([Tewari 2003](#)), six months ([Ahmadieh 2005](#); [Azad 2007](#); [Sharma 2005](#)), 10 months ([Lopez-Bolanos 2003](#)), 12 months ([Brazitikos 2005](#); [Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#)), and 36 months ([Koriyama 2007](#)). There was no advantage of one procedure over another in these specific time frames regarding this outcome. . See [Analysis 1.5](#).

We assessed the certainty of the evidence as low because there was high or unclear risk of bias for one or more domains in the included studies and results were imprecise (upper CI is approaching 1).

Number of interventions needed to achieve final anatomical success

Only two included studies, with 12-month follow-up, reported the number of interventions ([Heimann 2007 phakic](#); [Heimann 2007](#)

pseudophakic). The overall effect was MD -0.20 (95% CI -0.34 to -0.06, $P = 0.005$; $I^2 = 53\%$), indicating that participants who were treated with PPV needed fewer interventions to achieve final anatomic success. There were 94 out of 100 people treated with control (scleral buckling) that achieved final anatomical success compared to 96 out of 100 in the PPV group. However, there was some evidence of skew (mean/standard deviation was less than 1) and therefore the overall summary measure might not be valid. See [Analysis 1.6](#). We judged this to be very low-certainty evidence.

Heimann 2007 phakic and Heimann 2007 pseudophakic defined, "procedures considered to be retina affecting" as, "laser photocoagulation, cryopexy, intraocular gas injection, scleral buckling or revisional scleral buckling, and vitrectomy or revisional vitrectomy, including macular pucker surgery".

One other study presented data on average number of procedures in both groups, which also included the primary operation ([Sharma 2005](#)). This study showed that the PPV group had on average 1.2 procedures per eye, while the scleral buckling group had on average 1.24 procedures per eye. The follow-up was six months. However, there was no SD or other measure of dispersion provided, and the means were not comparable to the other two studies included in this outcome, so we did not impute data on SD for this study.

Quality of life

Only one included study ([Koriyama 2007](#)) reported data about participants' quality of life, using a proxy outcome defined as

"satisfaction with vision". The outcome had follow-up of six months. More participants in the PPV group reported initial symptomatic relief after the treatment compared to the scleral buckling group, however, these results were imprecise, with wide CIs (RR 6.22, 95% CI 0.88 to 44.09, $P = 0.07$). See [Analysis 1.7](#). We assessed the certainty of the evidence as very low due to imprecision, few included participants, and because there was high or unclear risk of bias for one or more domains in the included studies.

Adverse effects

All the included studies reported adverse effects. However, it was not always clear whether they were reported as number of participants or number of adverse effects, therefore, we did not perform a cumulative analysis of all adverse effects. Instead, we carried out separate analyses for the eight main adverse effects. Cataract development or progression was more prevalent in the PPV group (RR 1.71, 95% CI 1.45 to 2.01), choroidal detachment was less prevalent in the PPV group (RR 0.19, 95% CI 0.06 to 0.65) and new/iatrogenic breaks were observed only in the PPV group (RR 8.21, 95% CI 1.91 to 35.21). Frequency of other adverse effects, including postoperative PVR, postoperative increase in intraocular pressure, development of cystoid macular oedema, macular pucker and strabismus were similar in both groups. See [Analysis 1.8](#) and [Figure 5](#).

Figure 5. Forest plot of comparison: 1 Pars plana vitrectomy (PPV) vs scleral buckling, outcome: 1.8 Adverse effects.

Figure 5. (Continued)

Subtotal (95% CI)	2	126	8	153	100.0%	0.42 [0.11, 1.57]
Total events	2		8			
Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 0.91$, $df = 2$ ($P = 0.64$); $I^2 = 0\%$						
Test for overall effect: $Z = 1.28$ ($P = 0.20$)						
1.8.8 New/iatrogenic breaks						
Azad 2007	3	30	0	31	24.8%	7.23 [0.39, 134.21]
Brazitikos 2005	9	75	0	75	26.5%	19.00 [1.13, 320.67]
Lopez-Bolanos 2003	3	6	0	8	27.2%	9.00 [0.55, 147.08]
Tewari 2003	1	20	0	20	21.5%	3.00 [0.13, 69.52]
Subtotal (95% CI)		131		134	100.0%	8.21 [1.91, 35.21]
Total events	16		0			
Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 0.79$, $df = 3$ ($P = 0.85$); $I^2 = 0\%$						
Test for overall effect: $Z = 2.83$ ($P = 0.005$)

Besides those eight adverse effects, the included studies also reported other adverse effects, including media haze, scleral perforation, iris capture of intraocular lens, hyphaema, fibrin reaction, blurred vision, metamorphopsia, fish mouthing/hypotony, residual fluid, persistent epithelial defect, buckle infection, drainage complication, choroidal haemorrhage, retina incarceration, and intraocular lens posterior luxation. All those other adverse effects were recorded in 24 of 621 (4%) participants operated with PPV and 55 of 655 (8%) participants in the scleral buckling group. Analysis not shown.

Economic outcomes

None of the included studies reported economic outcomes.

DISCUSSION

Summary of main results

We identified 10 RCTs comparing PPV with scleral buckling surgery for simple RRD. For outcome measures such as primary retinal reattachment rate, improvement of visual acuity after surgery and final anatomical success rate, low- to very low-certainty evidence indicated that there was no important difference in the effect between groups. Low-certainty evidence suggests that scleral buckling is associated with more retinal redetachment compared to PPV, and if redetachment occurs, there is very low-certainty evidence that with PPV we need fewer reoperations to achieve final anatomical success compared to scleral buckling surgery. Only one study reported quality of life in the sense of initial symptom relief, and although results favoured PPV compared to scleral buckling surgery, they were imprecise with wide CIs. No studies reported economic measures. All included studies reported adverse effects, however, it was not always clear whether they were reported as number of participants or number of adverse effects. Cataract development or progression was more prevalent in the PPV group, choroidal detachment was more prevalent in the scleral buckling group and new/iatrogenic breaks were observed only in the PPV group. Frequency of other adverse effects, including postoperative proliferative vitreoretinopathy, postoperative increase in intraocular pressure, development of cystoid macular oedema, macular pucker and strabismus were not statistically different but were imprecisely measured and we cannot exclude important differences. We judged the evidence for adverse effects to be low-certainty evidence. If there is really no

difference in clinical efficacy between the two studied techniques, than any difference in adverse events becomes all the more important. Namely, the main important difference, which occurs much more frequently, in the PPV group is probably the occurrence of progression of cataract. This finding could influence decision-making.

Overall completeness and applicability of evidence

The aim of this review was to determine the effect of PPV compared to scleral buckling as surgical treatments for RRD. The review included RCTs only; published as full-text reports in a peer-reviewed journal or as conference proceedings. All the included studies had data for the primary outcome, which was primary retinal reattachment rate at least three months after operation. However, some of the secondary outcomes, such as number of interventions needed to achieve final anatomical success (reported in two studies) or quality of life (reported in one study) were largely neglected and evidence about those outcomes is incomplete. Additionally, none of the studies reported any economic outcomes so cost-benefit of these interventions cannot be appraised.

The review included 1307 participants from 10 studies conducted in clinical centres across the globe, including Europe, Iran, India, Japan and Mexico, which could be representative of people with RRD.

Only one study followed-up participants longer than one year (Koriyama 2007). This study had a 36-month follow-up. More studies with longer follow-up are needed to fully appraise long-term effects of these interventions.

Quality of the evidence

Certainty of evidence was low or very low, depending on the outcome appraised, because all the included studies had high or unclear risk of bias on at least one domain, for some outcomes the pooled effect measures were imprecise and for some analyses there was statistical heterogeneity. We further downgraded certainty for quality of life because only one study with a small sample size (32 participants) reported this outcome. One of the included studies was published only as a conference abstract and it included a total of eight participants.

Potential biases in the review process

Some outcomes were not measured and reported similarly or consistently between studies. We cannot exclude the possibility that there are unpublished studies but note that the results of the review do not consistently favour either intervention which suggests to us that publication bias is unlikely to explain the results.

Agreements and disagreements with other studies or reviews

A systematic review published in 2014 examined all surgical interventions for RRD ([Steel 2014](#)). Some of the results in that review agree with ours, namely that we still do not know whether PPV is more effective than scleral buckling at increasing primary reattachment rates and at improving postoperative visual acuity. On the other hand, our results are discordant with that review related to their finding that PPV and scleral buckling seem equally effective at reducing rates of recurrence of retinal detachment. We found that scleral buckling is associated with retinal redetachment more often compared to PPV. The probable cause for this discordance is the number of studies included, where for this particular outcome measure we included nine RCTs ([Analysis 1.5](#)) while [Steel 2014](#) included only one of them.

AUTHORS' CONCLUSIONS

Implications for practice

Low- or very low-certainty evidence indicates that there may be little or no difference between pars plana vitrectomy (PPV) and scleral buckling in terms of primary success rate, visual acuity gain and final anatomical success in repairing primary rhegmatogenous retinal detachment (RRD). Low-certainty evidence suggests that there may be less retinal redetachment in PPV groups, and if the redetachment occurs, there is very low-certainty evidence that with PPV we may need fewer re-operations to achieve final anatomical success compared to scleral buckling surgery. Some adverse events

appeared to be more common in the PPV group, such as cataract progression and new iatrogenic breaks, whereas others were more commonly seen in the scleral buckling group such as choroidal detachment.

Implications for research

Our review highlights the absence of high-quality evidence to support one particular operative technique for repair of simple RRD. Since this systematic review found no convincing evidence in regard to most of the examined outcome measures, further high-quality studies of PPV versus scleral buckling, including sufficient numbers of participants and based on sample size calculation, are required. New studies should analyse all relevant outcomes for RRD analysed in this review, particularly number of interventions needed to achieve final anatomical success and quality of life because few available studies analysed those. They should also have a follow-up of one year (as it is clinically relevant).

ACKNOWLEDGEMENTS

We are very grateful to:

- Anupa Shah, Managing Editor for Cochrane Eyes and Vision (CEV) and Jennifer Evans, Editor for CEV for their guidance in production of this review.
- Dario Sambunjak, MD, PhD for his help and contribution to the protocol.
- Danny Mitry and Claudia Belting for their comments on the protocol and David Yorston for his advice on the outcome measures.
- Catey Bunce and Stanislao Rizzo for their comments on the protocol and review.
- Authors of the two Heimann studies who responded to our questions.

Cochrane Eyes and Vision created and executed the electronic search strategies.

REFERENCES

References to studies included in this review

Ahmadiéh 2005 {published data only}

* Ahmadiéh H, Moradian S, Faghihi H, Parvaresh MM, Ghanbari H, Mehryar M, et al. Anatomic and visual outcomes of scleral buckling versus primary vitrectomy in pseudophakic and aphakic retinal detachment: six-month follow-up results of a single operation--report no. 1. *Ophthalmology* 2005;**112**(8):1421-9.

Ahmadiéh H, Moradian S, Golestan B. Scleral buckling vs. primary vitrectomy in pseudophakic and aphakic retinal detachment: a multicenter clinical trial (Report # 2). *American Academy of Ophthalmology*. 2005:177.

Ahmadiéh H, Moradian S, Habibabadi HF, Parvaresh MM, Ghanbar H, Heidari E, et al. Visual and anatomic outcome of scleral buckling vs primary vitrectomy in aphakic and pseudophakic retinal detachment. *American Academy of Ophthalmology*. 2003:151.

Azad 2007 {published data only}

Azad RV, Chanana B, Sharma YR, Vohra R. Primary vitrectomy versus conventional retinal detachment surgery in phakic rhegmatogenous retinal detachment. *Acta Ophthalmologica Scandinavica* 2007;**85**(5):540-5.

Brazitikos 2005 {published data only}

* Brazitikos P, Androudi S, Christen WG, Stangos N. Primary pars plana vitrectomy versus scleral buckle surgery for the treatment of pseudophakic retinal detachment: a randomized clinical trial. *Retina* 2005;**25**(8):957-64.

Brazitikos P, Androudi SN, Christen W, Stangos N. Pars plana vitrectomy vs scleral buckle for primary rhegmatogenous pseudophakic retinal detachment: a randomized clinical trial. *American Academy of Ophthalmology*. 2003:151.

Heimann 2007 phakic {published data only}

Feltgen N, Heimann H, Hoerauf H, Walter P, Hilgers RD, Heussen N, et al. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR study): risk assessment of anatomical outcome. SPR study report no. 7. *Acta Ophthalmologica* 2013;**91**(3):282-7.

Heimann H, Bartz-Schmidt KU, Bornfeld N, Hilgers RD, Nodov M, Weiss C, et al. Results of the scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR Study). *Investigative Ophthalmology and Visual Science* 2006; Vol. 47, issue 13:47 ARVO E-abstract 2690.

* Heimann H, Bartz-Schmidt KU, Bornfeld N, Weiss C, Hilgers RD, Foerster M, et al. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment: a prospective randomized multicenter clinical study. *Ophthalmology* 2007;**114**(12):2142-54.

Heimann H, Hellmich M, Bornfeld N, Bartz-Schmidt KU, Hilgers RD, Foerster MH. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment (SPR Study): design issues and implications. SPR Study report no. 1.

Graefe's Archive for Clinical and Experimental Ophthalmology 2001;**239**(8):567-74.

Heussen N, Feltgen N, Walter P, Hoerauf H, Hilgers RD, Heimann H, et al. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR Study): predictive factors for functional outcome. Study report no. 6. *Graefe's Archive for Clinical and Experimental Ophthalmology* 2011;**249**(8):1129-36.

Heussen N, Hilgers RD, Heimann H, Collins L, Grisanti S. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR Study): multiple-event analysis of risk factors for reoperations. SPR Study report no. 4. *Acta Ophthalmologica* 2011;**89**(7):622-8.

Heimann 2007 pseudophakic {published data only}

Feltgen N, Heimann H, Hoerauf H, Walter P, Hilgers RD, Heussen N, et al. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR study): risk assessment of anatomical outcome. SPR study report no. 7. *Acta Ophthalmologica* 2013;**91**(3):282-7.

Heimann H, Bartz-Schmidt KU, Bornfeld N, Hilgers RD, Nodov M, Weiss C, et al. Results of the scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR Study). *Investigative Ophthalmology and Visual Science* 2006; Vol. 47:ARVO E-abstract 2690.

* Heimann H, Bartz-Schmidt KU, Bornfeld N, Weiss C, Hilgers RD, Foerster M, et al. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment: a prospective randomized multicenter clinical study. *Ophthalmology* 2007;**114**(12):2142-54.

Heimann H, Hellmich M, Bornfeld N, Bartz-Schmidt KU, Hilgers RD, Foerster MH. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment (SPR Study): design issues and implications. SPR Study report no. 1. *Graefe's Archive for Clinical and Experimental Ophthalmology* 2001;**239**(8):567-74.

Heussen N, Feltgen N, Walter P, Hoerauf H, Hilgers RD, Heimann H, et al. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR Study): predictive factors for functional outcome. Study report no. 6. *Graefe's Archive for Clinical and Experimental Ophthalmology* 2011;**249**(8):1129-36.

Heussen N, Hilgers RD, Heimann H, Collins L, Grisanti S. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment study (SPR Study): Multiple-event analysis of risk factors for reoperations. SPR Study report no. 4. *Acta Ophthalmologica* 2011;**89**(7):622-8.

Koriyama 2007 {published data only}

Koriyama M, Nishimura T, Matsubara T, Taomoto M, Takahashi K, Matsumura M. Prospective study comparing the effectiveness of scleral buckling to vitreous surgery for rhegmatogenous retinal detachment. *Japanese Journal of Ophthalmology* 2007;**51**(5):360-7.

Lopez-Bolanos 2003 {published data only}

López Bolaños A, González Preciado J, Graue Wiechers FA. Scleral buckling vs vitrectomy with scleral indentation in the primary rhegmatogenous retinal detachment with no apparent injuries [Indentación escleral vs vitrectomía con indentación escleral en el desprendimiento de retina regmatógeno primario sin lesiones aparentes]. *Revista Mexicana de Oftalmología* 2003;**77**(1):19-23.

Martinez-Jardon 2002 {published data only}

Martinez-Jardon S, Morales-Canton V, Magdalenic R, Sinisterra J, Araya-Muñoz C, Quiroz-Mercado H. Pars plana vitrectomy versus scleral buckling for primary rhegmatogenous retinal detachment. *Investigative Ophthalmology and Visual Science* 2002; Vol. 43, issue 13:ARVO E-abstract 619.

Sharma 2005 {published data only}

Sharma YR, Karunanithi S, Azad RV, Vohra R, Pal N, Singh DV, et al. Functional and anatomic outcome of scleral buckling versus primary vitrectomy in pseudophakic retinal detachment. *Acta Ophthalmologica Scandinavica* 2005;**83**(3):293-7.

Tewari 2003 {published data only}

Tewari HK, Kedar S, Kumar A, Garg SP, Verma LK. Comparison of scleral buckling with combined scleral buckling and pars plana vitrectomy in the management of rhegmatogenous retinal detachment with unseen retinal breaks. *Clinical and Experimental Ophthalmology* 2003;**31**(5):403-7.

References to studies excluded from this review

Betran-Loustaunau 1997 {published data only}

Beltran Loustaunau, MA, Troconis D, Morales Canton V, Ochoa Contreras D, Dalma Weisdhausz J, Jimenez Sierra JM, et al. Comparative study of vitrectomy, pneumatic retinopexy, and scleral buckling for primary rhegmatogenous retinal detachment. *Investigative Ophthalmology and Visual Science* 1997;**38**:S673.

Gungel 2012 {published data only}

Güngel H, Paşaoğlu I, Osmanbaşıoğlu OA, Karaman S. Primary rhegmatogenous retinal detachment: scleral buckling and/or pars plana vitrectomy, properties of vitreous base and retinal tears. *Retina-Vitreus* 2012;**20**:13-21.

Romano 2011 {published data only}

Romano MR, Angi M, Valldeperas X, Costagliola C, Vinciguerra P. Twenty-three-gauge pars plana vitrectomy, Densiron-68, and 360° endolaser versus combined 20-gauge pars plana vitrectomy, scleral buckle, and SF6 for pseudophakic retinal detachment with inferior retinal breaks. *Retina* 2011;**31**(4):686-91.

References to ongoing studies

ISRCTN95808249 {published data only}

ISRCTN95808249. Releasable scleral buckling is recommend for phakic primary rhegmatogenous retinal detachment patients. www.isrctn.com/ISRCTN95808249 (first received 12 September 2017).

Additional references

AAO 1990

American Academy of Ophthalmology. The repair of rhegmatogenous retinal detachments. American Academy of Ophthalmology. *Ophthalmology* 1990;**97**(11):1562-72.

Ah-Fat 1999

Ah-Fat FG, Sharma MC, Majid MA, McGalliard JN, Wong D. Trends in vitreoretinal surgery at a tertiary referral centre: 1987 to 1996. *British Journal of Ophthalmology* 1999;**83**(4):396-8.

Benson 1999

Benson WE, Chan P, Sharma S, Snyder WB, Bloome MA, Birch DG. Current popularity of pneumatic retinopexy. *Retina* 1999;**19**(3):238-41.

Burton 1982

Burton TC. Recovery of visual acuity after retinal detachment involving the macula. *Transactions of the American Ophthalmological Society* 1982;**80**:475-97.

Byer 1998

Byer NE. What happens to untreated asymptomatic retinal breaks, and are they affected by posterior vitreous detachment?. *Ophthalmology* 1998;**105**(6):1045-9.

Deeks 2017

Deeks JJ, Higgins JPT, Altman DG (editors) on behalf of the Cochrane Statistical Methods Group. Chapter 9: Analysing data and undertaking meta-analyses. In: Higgins JPT, Churchill R, Chandler J, Cumpston MS (editors), *Cochrane Handbook for Systematic Reviews of Interventions* version 5.2.0 (updated June 2017), Cochrane, 2017. Available from www.training.cochrane.org/handbook.

Gariano 2004

Gariano RF, Kim CH. Evaluation and management of suspected retinal detachment. *American Family Physician* 2004;**69**(7):1691-8.

Ghazi 2002

Ghazi NG, Green WR. Pathology and pathogenesis of retinal detachment. *Eye* 2002;**16**(4):411-21.

Glanville 2006

Glanville JM, Lefebvre C, Miles JN, Camosso-Stefinovic J. How to identify randomized controlled trials in MEDLINE: ten years on. *Journal of the Medical Library Association* 2006;**94**(2):130-6.

GRADEpro GDT 2015 [Computer program]

McMaster University (developed by Evidence Prime). GRADEpro GDT. Version accessed 20 March 2018. Hamilton (ON): McMaster University (developed by Evidence Prime), 2015.

Green 2001

Green WR, Sebag J. Vitreoretinal interface. In: Ryan SJ, Wilkinson CP editor(s). *Retina*. 3rd Edition. Vol. 3, St Louis: Mosby, 2001:1882-960.

Haimann 1982

Haimann MH, Burton TC, Brown CK. Epidemiology of retinal detachment. *Archives of Ophthalmology* 1982;**100**(2):289-92.

Hatef 2015

Hatef E, Sena DF, Fallano KA, Crews J, Do DV. Pneumatic retinopexy versus scleral buckle for repairing simple rhegmatogenous retinal detachments. *Cochrane Database of Systematic Reviews* 2015, Issue 5. [DOI: [10.1002/14651858.CD008350.pub2](https://doi.org/10.1002/14651858.CD008350.pub2)]

Heimann 2001

Heimann H, Hellmich M, Bornfeld N, Bartz-Schmidt KU, Hilgers RD, Foerster MH. Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment (SPR Study): design issues and implications. SPR Study report no. 1. *Graefe's Archive for Clinical and Experimental Ophthalmology* 2001;**239**(8):567-74.

Higgins 2003

Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003;**327**:557-60.

Higgins 2011

Higgins JPT, Deeks JJ, Altman DG (editors). Chapter 16: Special topics in statistics. In: Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from www.training.cochrane.org/handbook.

Higgins 2017

Higgins JPT, Altman DG, Sterne JAC (editors). Chapter 8: Assessing risk of bias in included studies. In: Higgins JPT, Churchill R, Chandler J, Cumpston MS (editors), *Cochrane Handbook for Systematic Reviews of Interventions* version 5.2.0 (updated June 2017), Cochrane, 2017. Available from www.training.cochrane.org/handbook.

Jelicic Kadic 2016

Jelicic Kadic A, Vucic K, Dosenovic S, Sapunar D, Puljak L. Extracting data from figures with software was faster, with higher interrater reliability than manual extraction. *Journal of Clinical Epidemiology* 2016;**74**:119-23.

Machemer 1971

Machemer R, Buettner H, Norton EW, Parel JM. Vitrectomy: a pars plana approach. *Transactions of the American Academy of Ophthalmology and Otolaryngology* 1971;**75**(4):813-20.

Machemer 1995

Machemer R. Reminiscences after 25 years of pars plana vitrectomy. *American Journal of Ophthalmology* 1995;**119**(4):505-10.

Mangione 2001

Mangione CM, Lee PP, Gutierrez PR, Spritzer K, Berry S, Hays RD. Development of the 25-item National Eye Institute Visual Function Questionnaire. *Archives of Ophthalmology* 2001;**119**(7):1050-8.

Minihan 2001

Minihan M, Tanner V, Williamson TH. Primary rhegmatogenous retinal detachment: 20 years of change. *British Journal of Ophthalmology* 2001;**85**(5):546-8.

Plot Digitizer 2001 [Computer program]

SourceForge. Plot Digitizer. Version accessed 2 July 2017. SourceForge, 2001.

Review Manager 2014 [Computer program]

Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager 5 (RevMan 5). Version 5.3. Copenhagen: Nordic Cochrane Centre, The Cochrane Collaboration, 2014.

Schünemann 2013

Schünemann H, Brożek J, Guyatt G, Oxman A, (editors). Handbook for grading the quality of evidence and the strength of recommendations using the GRADE approach (updated October 2013). GRADE Working Group, 2013. Available from gdt.guidelinedevelopment.org/app/handbook/handbook.html.

Sodhi 2008

Sodhi A, Leung LS, Do DV, Gower EW, Schein OD, Handa JT. Recent trends in the management of rhegmatogenous retinal detachment. *Survey of Ophthalmology* 2008;**53**(1):50-67.

Steel 2014

Steel D. Retinal detachment. *Clinical Evidence* 2014;**03**:710.

Sterne 2017

Sterne JAC, Egger M, Moher D, Boutron I (editors). Chapter 10: Addressing reporting biases. In: Higgins JPT, Churchill R, Chandler J, Cumpston MS (editors), *Cochrane Handbook for Systematic Reviews of Interventions* version 5.2.0 (updated June 2017), Cochrane, 2017. Available from www.training.cochrane.org/handbook.

Tornquist 1987

Tornquist R, Stenkula S, Tornquist P. Retinal detachment. A study of a population-based patient material in Sweden 1971-1981. I. Epidemiology. *Acta Ophthalmologica* 1987;**65**(2):213-22.

Wilkes 1982

Wilkes SR, Beard CM, Kurland LT, Robertson DM, O'Fallon WM. The incidence of retinal detachment in Rochester, Minnesota, 1970-1978. *American Journal of Ophthalmology* 1982;**94**(5):670-3.

References to other published versions of this review

Znaor 2012

Znaor L, Medic A, Marin J, Binder S, Lukic I, George J. Pars plana vitrectomy versus scleral buckle for repairing simple rhegmatogenous retinal detachments. *Cochrane Database of Systematic Reviews* 2012, Issue 1. [DOI: [10.1002/14651858.CD009562](https://doi.org/10.1002/14651858.CD009562)]

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Ahmadiieh 2005

Methods	<p>Study design: parallel-group RCT</p> <p>1 eye per participant included in the study</p>
Participants	<p>225 eyes; men 63%, women 37%</p> <p>Average participant age: 62.5 (SD 11.2) years</p> <p>Inclusion criteria: RD in pseudophakic or aphakic eye</p> <p>Exclusion criteria: history of RD surgery in the affected eye, ocular trauma, diabetic retinopathy, glaucoma, uveitis, macular hole, wet type age-related macular degeneration and macular geographic atrophy, giant retinal tear, PVR > grade B, 1-eyed participants, participants < 15 years of age, participants with dense vitreous haemorrhage obscuring fundus view, and those with a localised detachment extending < 1 quadrant with a definite retinal break</p>
Interventions	<p>Intervention: PPV (n = 99)</p> <p>Comparator: SB (n = 126)</p>
Outcomes	<p>Primary outcomes: postoperative visual acuity, retinal reattachment rate</p> <p>Secondary outcomes: PVR, macular pucker, cystoid macular oedema, choroidal detachment, IOP, extraocular muscle dysfunction, anisometropia</p> <p>Adverse effects reported</p> <p>Follow-up: 6 months</p> <p>Follow-up intervals: 1, 2, 4, 6 months</p>
Notes	<p>Date conducted: not reported</p> <p>Sources of funding: supported by the National Research Center of Medical Sciences, Tehran, Iran, and the Ophthalmic Research Center of Shaheed Beheshti University of Medical Sciences, Tehran, Iran</p> <p>Declaration of interest: none of the study authors have a financial interest in the subject matter of the article</p> <p>Exclusions after randomisation: none</p> <p>Losses to follow-up: not reported</p> <p>Number randomised: 225</p> <p>Number analysed: not reported</p> <p>How were missing data handled? Not reported</p> <p>Reported power calculation: yes (sample size 150 eyes and power 0.8)</p> <p>Setting: hospital-based ophthalmology departments</p> <p>Ethnic group: Iranians</p> <p>Differences between groups in baseline characteristics for following variables: participants' age, preoperative visual acuity, family history of RD, RD extension, vitreous incarceration into cataract wound or adhesion to iris, and history of secondary IOL implantation</p>

Ahmadiieh 2005 (Continued)

Planned/actual length of follow-up: 6 months/6 months

Full study name: Anatomic and visual outcomes of scleral buckling vs primary vitrectomy in pseudophakic and aphakic retinal detachment

Reported subgroup analyses: yes

Were study investigators contacted? No

Study registration: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Simple random assignment was performed using SPSS software (version 10.0)."
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "to measure BCVA before and after the operation the optometrists were masked about the status of the patients". Masking of outcome assessment was not reported for other outcomes
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found and therefore we were unable to compare planned with reported outcomes

Azad 2007

Methods	Study design: parallel-group RCT 1 eye per participant included in the study
Participants	61 eyes of 61 participants; men = 40 (66%), women = 21 (34%) Average participant age: PPV group 41 (SD 15) years, SB group 36 (SD 16) years Inclusion criteria: phakic eyes with primary RRD, not complicated by PVR $\geq$ grade C and with a clear lens Exclusion criteria: cases with significant media opacities such as vitreous haemorrhage, which made SB impossible, PVR grade C, no-break RD, aphakia or pseudophakia, history of any previous intraocular surgery, traumatic RD, and any RD deemed to be unmanageable by conventional SB surgery
Interventions	Intervention: PPV (n = 30) Comparator: SB (n = 31)

Azad 2007 (Continued)

Outcomes	<p>Primary outcomes: percentage of surgical primary success, final visual acuity</p> <p>Secondary outcomes: cause of failure</p> <p>Adverse effects reported</p> <p>Follow-up: 6 months</p> <p>Follow-up intervals: 1 week, 1, 3, 6 months</p>
Notes	<p>Date conducted: October 2003-March 2005</p> <p>Sources of funding: not reported</p> <p>Declaration of interest: not reported</p> <p>Exclusions after randomisation (none)</p> <p>Losses to follow-up (none)</p> <p>Number randomised/analysed: 61/61</p> <p>How were missing data handled? No missing data</p> <p>Reported power calculation: no</p> <p>Setting: single hospital-based ophthalmology department</p> <p>Ethnic group: Indians</p> <p>Equivalence of baseline characteristics: yes</p> <p>Planned/actual length of follow-up: 6/6 months</p> <p>Full study name: Primary vitrectomy vs conventional retinal detachment surgery in phakic rhegmatogenous retinal detachment</p> <p>Reported subgroup analyses: no</p> <p>Were study investigators contacted? No</p> <p>Study registration: not reported</p>
Risk of bias	
Bias	Authors' judgement Support for judgement
Random sequence generation (selection bias)	<p>Unclear risk</p> <p>Quote: "All patients were randomly assigned to one of two treatment arms. Each patient was given one of a set of sequentially numbered randomization envelopes containing one of the two surgical options; the patient then received the treatment detailed in the envelope." Comment: method for generating random sequence was not reported</p>
Allocation concealment (selection bias)	<p>Unclear risk</p> <p>The study authors reported that they used "sequentially numbered randomization envelopes", but it is not clear whether the envelopes were opaque and sealed.</p>
Blinding of participants and personnel (performance bias) All outcomes	<p>Unclear risk</p> <p>Not reported</p>

Azad 2007 (Continued)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "Only patients who completed 6 months of follow-up were included in the final analyses." Comment: attrition not reported
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found and therefore we were unable to compare planned with reported outcomes

Brazitikos 2005

Methods	Study design: parallel-group RCT 1 eye per participant included in the study
Participants	150 participants; men = 87 (58%), women = 63 (42%) Average participant age (range): PPV group 73.01 (57-93) years, SB group 71.01 (57-91) years Inclusion criteria: previous cataract surgery with IOL implantation of any type in the involved eye; visual acuity of hand motion or better; presence of PVR $\leq$ stage B; and absence of known or clinically apparent macular disease that could affect the functional status of the macula or could interfere with the visual acuity result Exclusion criteria: history of severe eye trauma; history of intraocular eye surgery other than cataract surgery; presence of giant tear, macular hole, or macular pucker preoperatively; presence of posterior or retinal breaks difficult to support with a buckle; bullous keratopathy; clinically apparent vitreous haemorrhage; IOL dislocation in the vitreous; presence of lens material in the vitreous cavity; and inadequate pupil dilation (< 4 mm); deficient mental status that prevented understanding of the principles of the clinical study or informed consent or any social factor that could interfere with follow-up appointments; participants with visual acuity of $\leq 20/40$ in the fellow eye or the presence of a clinically obvious eye condition that could severely affect vision in the fellow eye
Interventions	Intervention: PPV (n = 75) Comparator: SB (n = 75)
Outcomes	Primary outcomes: retinal reattachment rate for single as well as multiple surgeries, axial length changes, and BCVA, break diagnosis, operating time, intraoperative and postoperative complications Adverse effects reported Length of follow-up and intervals at which outcomes assessed: 1 year
Notes	Date conducted: September 1997-September 2002 Sources of funding: not reported Declaration of interest: not reported Exclusions after randomisation: none Losses to follow-up: none Number randomised/analysed: 150/150

Brazitikos 2005 (Continued)

How were missing data handled? Available case analysis

Reported power calculation: no

Unusual study design/issues

Setting: hospital-based ophthalmology department

Ethnic group: Greeks

Equivalence of baseline characteristics: yes

Planned/actual length of follow-up: 1 year/1 year

Full study name: Primary pars plana vitrectomy vs scleral buckle surgery for the treatment of pseudophakic retinal detachment

Reported subgroup analyses: no

Were study investigators contacted? No

Study registration: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Study described as randomised, but randomisation method not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found and therefore we were unable to compare planned with reported outcomes

Heimann 2007 phakic

Methods	Study design: parallel-group RCT One eye per participant included in the study
Participants	416 included and randomised participants; men = 247 (59%), women = 169 (41%) Average participant age: PPV group 59.7 years (SD 10.5), SB group 61.3 years (SD 11.1)

Heimann 2007 phakic (Continued)

Inclusion criteria: primary RRDs with large breaks with a size between 1 and 2 clock hours, multiple breaks, superior bullous detachment, central extension of breaks, marked vitreous traction on the break

Exclusion criteria: RRDs that could be treated with a single 7.5 × 2.75-mm radial episcleral sponge; breaks posterior to the vessel arcades, PVR stage B or C, coexisting eye diseases that have an impact on visual acuity; previous intraocular surgery, with the exception of uncomplicated cataract surgery in the aphakic/pseudophakic study; myopia > -7.0 Ds, systemic disease that may influence the postoperative course or wound healing; pregnancy, age < 18 years

Interventions	<p>Intervention: PPV (n = 207)</p> <p>Comparator: SB (n = 209)</p>
Outcomes	<p>Primary outcomes: change in BCVA</p> <p>Secondary outcomes: primary and final anatomical success, PVR, cataract progression, and number of reoperations</p> <p>Adverse effects reported</p> <p>Length of follow-up and intervals at which outcomes assessed: 1 week, 8 weeks, 6 months, 1 year after surgery</p>
Notes	<p>Date conducted: August 1998-June 2003</p> <p>Sources of funding: supported by the Deutsche Forschungsgemeinschaft</p> <p>Declaration of interest: not reported</p> <p>Exclusions after randomisation: PPV 1, SB 6</p> <p>Losses to follow-up: PPV 15 participants/SB 15 participants</p> <p>Number randomised/analysed: PPV 207/174, SB 209/195</p> <p>How were missing data handled? available case analysis</p> <p>Reported power calculation: yes (sample size 200 eyes, power 90%)</p> <p>Setting: 25 hospital-based ophthalmology departments</p> <p>Ethnic group: not reported</p> <p>Equivalence of baseline characteristics: yes</p> <p>Planned/actual length of follow-up: 1 year/SB 387.6 days; PPV 410.5 days</p> <p>Full study name: Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment</p> <p>Reported subgroup analyses: yes</p> <p>Were study investigators contacted? No</p> <p>Study registration: "The study is registered at the Freiburg Clinical Trials Register (no. 000703; http://www.zks.uni-freiburg.de), which meets the criteria of the International Committee of Medical Journal Editors." Comment: this URL is not functional</p>

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote in Appendix 2 , available online: "The randomization codes were balanced in permuted blocks of varying size, stratified by surgeon. Randomiza-

Heimann 2007 phakic (Continued)

Allocation concealment (selection bias)	Unclear risk	tion lists were generated by the documentation center using S-PLUS (version 3.4, release 1 for IBM RS/6000, AIX 3.2.5, Mathsoft Inc., Cambridge, MA)."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Randomization by envelope was preferred because a relevant proportion of the patients was expected to be treated outside normal office working hours. Although the date and time of opening of the randomization envelope had to be documented on the randomization letter, bias due to allocation concealment could not be excluded . Accordance to the guidelines in handling of the envelopes was verified at monitoring visits. In addition, the randomization list was kept sealed in the documentation center. After confirmation of the patient's eligibility for the study, randomization was performed by opening the next sequential envelope from the randomization boxes."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: " Blinding of the assessment of the main end point criterion, change in BCVA, was not performed for practical reasons . The secondary end point criteria were assessed by the end point committee in a masked fashion using standardized fundus and anterior segment photographs. These included retinal and macular attachment, macular pucker and PVR, lens opacity, and secondary cataract."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Comment: low attrition; 7% in both groups
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found as the URL provided for the study registration site is not functional; therefore we were unable to compare planned with reported outcomes

Heimann 2007 pseudophakic

Methods	Study design: parallel-group RCT 1 eye per participant included in the study
Participants	265 included and randomised participants; men = 193 (73%), women = 72 (27%) Average participant age: PPV group 64.6 years (SD 10.5), SB group 66.4 years (SD 10.4) Inclusion criteria: primary RRDs with large breaks with a size between 1 and 2 clock hours, multiple breaks, superior bullous detachment, central extension of breaks, marked vitreous traction on the break Exclusion criteria: RRDs that could be treated with a single 7.5 × 2.75-mm radial episcleral sponge, breaks posterior to the vessel arcades, PVR stage B or C, coexisting eye diseases that have an impact on visual acuity, previous intraocular surgery, with the exception of uncomplicated cataract surgery in the aphakic/pseudophakic study, myopia of > -7.0 Ds, systemic disease that may influence the postoperative course or wound healing, pregnancy, age < 18 years
Interventions	Intervention: PPV (n = 132)

Heimann 2007 pseudophakic (Continued)

Comparator: SB (n = 134)

Outcomes	<p>Primary outcomes: change in BCVA</p> <p>Secondary outcomes: primary and final anatomical success, PVR, cataract progression, and number of reoperations</p> <p>Adverse effects reported</p> <p>Length of follow-up and intervals at which outcomes assessed: 1 week, 8 weeks, 6 months, 1 year after surgery</p>
Notes	<p>Date conducted: August 1998-June 2003</p> <p>Sources of funding: supported by the Deutsche Forschungsgemeinschaft</p> <p>Declaration of interest: not reported</p> <p>Exclusions after randomisation: PPV 1, SB 6</p> <p>Losses to follow-up: PPV 15 participants/SB 15 participants</p> <p>Number randomised/analysed: PPV 207/174, SB 209/195</p> <p>How were missing data handled? Available case analysis</p> <p>Reported power calculation: yes (sample size 200 eyes, power 90%)</p> <p>Unusual study design/issues</p> <p>Setting: 25 hospital-based ophthalmology departments</p> <p>Ethnic group: not reported</p> <p>Equivalence of baseline characteristics: yes</p> <p>Planned/actual length of follow-up: 1 year/SB 372.5 days, PPV 352.1 days</p> <p>Full study name: Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment</p> <p>Reported subgroup analyses: yes</p> <p>Were study investigators contacted? No</p> <p>Study registration: "The study is registered at the Freiburg Clinical Trials Register (no. 000703; http://www.zks.uni-freiburg.de), which meets the criteria of the International Committee of Medical Journal Editors." Comment: this URL is not functional</p>

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote in Appendix 2 , available online: "The randomization codes were balanced in permuted blocks of varying size, stratified by surgeon. Randomization lists were generated by the documentation center using S-PLUS (version 3.4, release 1 for IBM RS/6000, AIX 3.2.5, Mathsoft Inc., Cambridge, MA)."
Allocation concealment (selection bias)	Unclear risk	Quote: "Randomization by envelope was preferred because a relevant proportion of the patients was expected to be treated outside normal office working hours. Although the date and time of opening of the randomization envelope had to be documented on the randomization letter, bias due to allocation concealment could not be excluded . Accordance to the guidelines in handling of the envelopes was verified at monitoring visits. In addition, the randomization list was kept sealed in the documentation center. After confirma-

Heimann 2007 pseudophakic (Continued)

tion of the patient's eligibility for the study, randomization was performed by opening the next sequential envelope from the randomization boxes."		
Blinding of participants and personnel (performance bias) All outcomes	High risk	Comment: after contacting the corresponding author we received information that participants could not be masked because "It is not possible to blind patients to two surgical interventions involving a gas tamponade (in the vitrectomy group) or no gas tamponade." and that personnel could not be masked because "It is not possible to do that because of the gas tamponade (everybody realises straight away if the patient has had a gas tamponade = vitrectomy or not)."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: " Blinding of the assessment of the main end point criterion, change in BCVA, was not performed for practical reasons. The secondary end point criteria were assessed by the end point committee in a masked fashion using standardized fundus and anterior segment photographs. These included retinal and macular attachment, macular pucker and PVR, lens opacity, and secondary cataract."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Comment: low attrition; 16% in the PPV group and 6% in the SB group
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found before URL provided for the study registration site is not functional; therefore we were unable to compare planned with reported outcomes

Koriyama 2007

Methods	Study design: parallel-group RCT 1 eye per participant included in the study
Participants	46 participants; men = 25 (54%), women = 21 (46%) Average participants age (range): 60.2 (50-77) years Inclusion criteria: ≥ 50 years of age; the causative retinal tear was in the equatorial region, with a glial ring; with a macular detachment Exclusion criteria: cataract that affected visual acuity; giant retinal tear, multiple tears at different depths; PVR > grade C1; vitreous haemorrhages; macular hole; history of trauma; participants in which a glial ring could not be confirmed even if liquefaction of the vitreous body was advanced
Interventions	Intervention: PPV (n = 23) Comparator: SB (n = 23)
Outcomes	Primary outcomes: rate of retinal reattachment; visual acuity Secondary outcomes: residual RD, participant's subjective assessment of the surgery and recovery Adverse effects reported Length of follow-up/intervals at which outcomes assessed: 1, 3, 6, 12, 24, 36 months
Notes	Date conducted: April 2000-August 2003 Sources of funding: not reported

Koriyama 2007 (Continued)

Declaration of interest: not reported

Exclusions after randomisation: none

Losses to follow-up: not reported

Number randomised/analysed: 46/46

How were missing data handled? Available case analysis

Reported power calculation: no

Setting: hospital-based ophthalmology department

Ethnic group: Japanese

Equivalence of baseline characteristics: yes

Planned: 36 months/actual length of follow-up: PPV 31.4 ± 11.7 , SB 29.3 ± 14.9

Study registration: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Study described as randomised, but randomisation method not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found and therefore we were unable to compare planned with reported outcomes

Lopez-Bolanos 2003

Methods	Study design: parallel-group RCT 1 eye per participant included in the study
Participants	14 eyes; men = 7 (50%), women = 7 (50%) Average participant age (range): 43 (22-69) years Inclusion criteria: primary RD without visible retinal break

Lopez-Bolanos 2003 (Continued)

Exclusion criteria: history of RD surgery in the affected eye, impossible fundus visualisation, PVR > grade B

Interventions	<p>Intervention: PPV + SB (n = 6)</p> <p>Comparator: SB (n = 8)</p>
Outcomes	<p>Primary outcomes: retinal reattachment rate</p> <p>Secondary outcomes: redetachment rate, PVR rate</p> <p>Adverse effects reported</p> <p>Mean follow-up: 10 months</p>
Notes	<p>Date conducted: October 1998-December 1999</p> <p>Sources of funding: not reported</p> <p>Declaration of interest: not reported</p> <p>Exclusions after randomisation: none</p> <p>Losses to follow-up: none</p> <p>Number randomised 14/analysed 14</p> <p>How were missing data handled? Not reported</p> <p>Reported power calculation: no</p> <p>Setting: hospital-based</p> <p>Ethnic group: Mexicans</p> <p>Equivalence of baseline characteristics: not reported</p> <p>Planned/actual length of follow-up: not reported/10 months</p> <p>Full study name: Indentacion escleral vs vitrectomia con indentacion escleral en le desprendimiento de retina regmatogeno primario sin lesiones aparentes</p> <p>Reported subgroup analyses: no</p> <p>Were study investigators contacted? No</p> <p>Study registration: not reported</p>

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Study described as randomised, but randomisation method not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported

Lopez-Bolanos 2003 (Continued)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found and therefore we were unable to compare planned with reported outcomes

Martinez-Jardon 2002

Methods	Study design: parallel-group RCT 1 eye per participant included in the study
Participants	8 participants; percent of men vs women not reported Average participant age (range): PPV group 45 (20-65) years, SB group 37 (14-52) years Inclusion criteria: not reported Exclusion criteria: not reported
Interventions	Intervention: PPV (n = 4) Comparator: SB (n = 4)
Outcomes	Outcomes: surgery success rate (complete reattachment 3 months following surgery), complications rate, as well as changes in BCVA, IOP, ocular axial length, multifocal electroretinography, optic coherence tomography and participant's discomfort Adverse effects reported Follow-up: 3 months Control visits: not reported
Notes	Study published as a conference abstract only in 2002 Date conducted: not reported Sources of funding: not reported Declaration of interest: not reported Exclusions after randomisation: not reported Losses to follow-up: not reported Number randomised/analysed: not reported How were missing data handled? Not reported Reported power calculation: no Setting: not reported Ethnic group: not reported

Martinez-Jardon 2002 (Continued)

Equivalence of baseline characteristics: not reported

Planned/actual length of follow-up: not reported

Full study name: Pars plana vitrectomy versus scleral buckling for primary rhegmatogenous retinal detachment

Reported subgroup analyses: no

Were study investigators contacted? No

Study registration: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Study described as randomised, but randomisation method not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	The study was published as a conference abstract only with insufficient information to judge whether there was reporting bias

Sharma 2005

Methods	Study design: parallel-group RCT One eye per participant included in the study
Participants	50 eyes; men = 40 (80%), women = 10 (20%) Average participant age (range): PPV 58.28 (42-70) years, SB 56.8 (28-75) years Inclusion criteria: uncomplicated RRD Exclusion criteria: proliferative vitreoretinopathy (PVR) grade C or worse; giant tear; multiple tears if located > 3 clock hours apart; RDs with unseen breaks; macula RDs; eye trauma; proliferative diabetic retinopathy; postoperative positioning untenable; previous intraocular surgery and children < 16 years
Interventions	Intervention: PPV (n = 25) Comparator: SB (n = 25)

Sharma 2005 (Continued)

Outcomes	<p>Outcomes: primary reattachment rate; final reattachment rate; BCVA</p> <p>Adverse effects reported</p> <p>Follow-up: 6 months</p> <p>Control visits: 1, 2, 6 weeks and 6 months</p>
Notes	<p>Date conducted: January 2002-December 2002</p> <p>Sources of funding: not reported</p> <p>Declaration of interest: not reported</p> <p>Exclusions after randomisation: none</p> <p>Losses to follow-up: none</p> <p>Number randomised/analysed: 50/50</p> <p>How were missing data handled? Not reported</p> <p>Reported power calculation: no</p> <p>Setting: hospital-based ophthalmology department</p> <p>Ethnic group: not reported</p> <p>Equivalence of baseline characteristics: yes</p> <p>Planned/actual length of follow-up: 6 months/6 months</p> <p>Full study name: Functional and anatomic outcome of scleral buckling versus primary vitrectomy in pseudophakic retinal detachment</p> <p>Reported subgroup analyses: yes</p> <p>Were study investigators contacted? No</p> <p>Study registration: not reported</p>

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Study described as randomised, but randomisation method not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias)	Unclear risk	Not reported

Sharma 2005 (Continued)

All outcomes

Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found and therefore we were unable to compare planned with reported outcomes
--------------------------------------	--------------	---

Tewari 2003

Methods	Study design: parallel-group RCT One eye per participant included in the study
Participants	44 eyes; men = 24 (60%), women = 16 (40%) Average age: men 47.9 (SD 18.13) years, women 48.95 (SD 14.86) years Inclusion criteria: eyes with uncomplicated, primary RRDs with a clear media and unseen retinal breaks Exclusion criteria: significant media opacities, PVR > grade C1 and eyes with non-primary RRDs such as traumatic RD, recurrent RD, and RD associated with coloboma, uveitis, glaucoma and choroidal detachment
Interventions	Intervention: PPV + SB (n = 20 eyes) Comparator: SB (n = 20 eyes)
Outcomes	Outcomes: BCVA, anterior segment status, retinal status, IOP and macular status Adverse effects reported Length of follow-up and intervals at which outcomes assessed: 1, 6 weeks and 3 months
Notes	Date conducted: not reported Sources of funding: not reported Declaration of interest: not reported No exclusions after randomisation Losses to follow-up: PPV 2 eyes, SB 2 eyes Number randomised/analysed: 44/40 How were missing data handled? Available case analysis Reported power calculation: no Setting: hospital-based ophthalmology department Ethnic group: Indian Equivalence of baseline characteristics: yes Planned/actual length of follow-up: 3 months/ PPV 100 days (range: 90–180 days), SB 96 days (range: 90–150 days) Full study name: Comparison of scleral buckling with combined scleral buckling and pars plana vitrectomy in the management of rhegmatogenous retinal detachment with unseen retinal breaks Reported subgroup analyses: yes

Tewari 2003 (Continued)

Were study investigators contacted? No

Study registration: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Study described as randomised, but randomisation method not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	All outcomes specified in the methods were reported in results section, however, study protocol could not be found and therefore we were unable to compare planned with reported outcomes

BCVA: best corrected visual acuity; **D:** dioptre; **IOL:** intraocular lens; **IOP:** intraocular pressure; **PPV:** pars plana vitrectomy; **PVR:** proliferative vitreoretinopathy; **RCT:** randomised controlled trial; **RD:** retinal detachment; **RRD:** rhegmatogenous retinal detachments; **SB:** scleral buckling; **SD:** standard deviation

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Betran-Loustaunau 1997	Inclusion criteria in the study were that participants had to be candidates for pneumatic retinopexy
Gungel 2012	Not a RCT
Romano 2011	Scleral buckling not investigated

RCT: randomised controlled trial

Characteristics of ongoing studies [ordered by study ID]

ISRCTN95808249

Trial name or title	Releasable scleral buckling is recommend for phakic primary rhegmatogenous retinal detachment patients
---------------------	--

ISRCTN95808249 (Continued)

Methods	Participants are randomly allocated to 1 of 2 groups. Those in the first group receive the PPV treatment. Those in the second group receive the RSB treatment. Participants are assessed for their rate of retinal reattachment and their vision outcomes
Participants	Adults aged ≥ 18 years with RRD
Interventions	PPV vs RSB
Outcomes	<p>Primary outcomes: primary anatomical success rate is defined as the retina remaining reattached after 1 operation at 12 months.</p> <p>Secondary outcomes: BCVA measured using ETDRS chart converted to logMAR at 12 months; cataract progression, determined by 1 doctor if considered to be visually significant at 12 months; IOP measured using a non-contact tonometer at 1 day, 1 week, 1, 3, 6, 12 months; choroidal thickness, measured using enhanced depth-imaging spectral-domain optical coherence tomography imaging at subfovea (Spectralis; Heidelberg Engineering, Heidelberg, Germany) at 1 day, 1 week, 1, 3, 6, 12 months; axial length measured using the IOL Master (Carl Zeiss, Tübingen, Germany) at 1, 3, 6, 12 months; complications, measured using slitlamp at 1 day, 1 week, 1, 3, 6, 12 months</p>
Starting date	1 June 2017
Contact information	<p>Primary contact: Prof Lin Lu</p> <p>Contact details:</p> <p>Zhongshan Ophthalmic Center No.54 Xianlie South Road Guangzhou 510060 China +86 208 7330373 lulin888@126.com</p>
Notes	

BCVA: Best corrected visual acuity; **ETDRS:** Early Treatment Diabetic Retinopathy Study; **IOP:** intraocular pressure; **logMAR:** logarithm of the minimum angle of resolution; **PPV:** pars plana vitrectomy; **RRD:** rhegmatogenous retinal detachments; **RSB:** releasable scleral buckling

DATA AND ANALYSES

Comparison 1. Pars plana vitrectomy (PPV) vs scleral buckling

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Primary retinal reattachment rate at least 3 months after operation	9	1261	Risk Ratio (M-H, Random, 95% CI)	1.07 [0.98, 1.16]
1.1 Follow-up: 3 months	3	94	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.86, 1.18]
1.2 Follow-up: 6 months	3	336	Risk Ratio (M-H, Random, 95% CI)	0.98 [0.86, 1.12]
1.3 Follow-up: 12 months	3	831	Risk Ratio (M-H, Random, 95% CI)	1.14 [0.99, 1.33]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2 Postoperative visual acuity at final follow-up	6	1138	Mean Difference (IV, Random, 95% CI)	0.00 [-0.09, 0.10]
3 Postoperative visual acuity, all follow-up times [logMAR]	6		Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 Follow-up 1 week	1	61	Mean Difference (IV, Random, 95% CI)	1.16 [0.87, 1.45]
3.2 Follow-up 1 month	3	332	Mean Difference (IV, Random, 95% CI)	0.06 [-0.25, 0.38]
3.3 Follow-up 2 months	1	225	Mean Difference (IV, Random, 95% CI)	0.08 [-0.10, 0.26]
3.4 Follow-up 3 months	2	107	Mean Difference (IV, Random, 95% CI)	-0.06 [-0.34, 0.22]
3.5 Follow-up 4 months	1	225	Mean Difference (IV, Random, 95% CI)	0.03 [-0.14, 0.20]
3.6 Follow-up 6 months	3	332	Mean Difference (IV, Random, 95% CI)	-0.03 [-0.18, 0.12]
3.7 Follow-up 12 months	4	877	Mean Difference (IV, Random, 95% CI)	-0.02 [-0.17, 0.12]
3.8 Follow-up 24 months	1	33	Mean Difference (IV, Random, 95% CI)	-0.09 [-0.31, 0.13]
3.9 Follow-up 36 months	1	21	Mean Difference (IV, Random, 95% CI)	-0.07 [-0.21, 0.07]
4 Final anatomical success	9	1235	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.99, 1.04]
4.1 Follow-up: 3 months	1	8	Risk Ratio (M-H, Random, 95% CI)	1.0 [0.66, 1.51]
4.2 Follow-up: 6 months	3	336	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.96, 1.09]
4.3 Follow-up: 10 months	1	14	Risk Ratio (M-H, Random, 95% CI)	0.8 [0.31, 2.10]
4.4 Follow-up: 12 months	3	831	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.99, 1.04]
4.5 Follow-up: 36 months	1	46	Risk Ratio (M-H, Random, 95% CI)	1.0 [0.92, 1.09]
5 Recurrence of retinal detachment	9	1320	Risk Ratio (M-H, Random, 95% CI)	0.75 [0.59, 0.96]
5.1 Follow-up: 3 months	1	50	Risk Ratio (M-H, Random, 95% CI)	0.72 [0.23, 2.25]
5.2 Follow-up: 6 months	3	373	Risk Ratio (M-H, Random, 95% CI)	0.86 [0.61, 1.20]
5.3 Follow-up: 10 months	1	20	Risk Ratio (M-H, Random, 95% CI)	1.22 [0.32, 4.65]
5.4 Follow-up: 12 months	3	831	Risk Ratio (M-H, Random, 95% CI)	0.61 [0.34, 1.08]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.5 Follow-up: 36 months	1	46	Risk Ratio (M-H, Random, 95% CI)	1.0 [0.15, 6.51]
6 Number of interventions needed to achieve final anatomical success	2	682	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-0.34, -0.06]
7 Quality of life	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
8 Adverse effects	10		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
8.1 Postoperative proliferative vitreoretinopathy (PVR)	6	832	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.59, 1.62]
8.2 Cataract development or progression	5	539	Risk Ratio (M-H, Random, 95% CI)	1.71 [1.45, 2.01]
8.3 High intraocular pressure (IOP)	6	430	Risk Ratio (M-H, Random, 95% CI)	1.33 [0.78, 2.27]
8.4 Cystoid macular oedema (CMO)	2	265	Risk Ratio (M-H, Random, 95% CI)	1.34 [0.71, 2.55]
8.5 Macular pucker (epiretinal membrane, ERM)	4	372	Risk Ratio (M-H, Random, 95% CI)	0.78 [0.42, 1.46]
8.6 Choroidal detachment	3	421	Risk Ratio (M-H, Random, 95% CI)	0.19 [0.06, 0.65]
8.7 Strabismus	3	279	Risk Ratio (M-H, Random, 95% CI)	0.42 [0.11, 1.57]
8.8 New/iatrogenic breaks	4	265	Risk Ratio (M-H, Random, 95% CI)	8.21 [1.91, 35.21]

Analysis 1.1. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 1 Primary retinal reattachment rate at least 3 months after operation.

Analysis 1.2. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 2 Postoperative visual acuity at final follow-up.

Analysis 1.3. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 3 Postoperative visual acuity, all follow-up times [logMAR].

Analysis 1.4. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 4 Final anatomical success.

Analysis 1.5. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 5 Recurrence of retinal detachment.

Analysis 1.6. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 6 Number of interventions needed to achieve final anatomical success.

Analysis 1.7. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 7 Quality of life.

Analysis 1.8. Comparison 1 Pars plana vitrectomy (PPV) vs scleral buckling, Outcome 8 Adverse effects.

APPENDICES

Appendix 1. CENTRAL search strategy

#1 MeSH descriptor: [Retinal Detachment] explode all trees
#2 MeSH descriptor: [Retinal Perforations] explode all trees
#3 MeSH descriptor: [Vitreous Detachment] explode all trees
#4 retina* near/2 break*
#5 retina* near/2 tear*
#6 retina* near/2 detach*
#7 retina* near/2 perforat*
#8 #1 or #2 or #3 or #4 or #5 or #6 or #7
#9 MeSH descriptor: [Vitreotomy] explode all trees
#10 vitrectom*
#11 PPV*
#12 #9 or #10 or #11
#13 MeSH descriptor: [Scleral Buckling] explode all trees
#14 scleral near/2 buckl*
#15 scleral near/2 encircl*
#16 encircling band
#17 #13 or #14 or #15 or #16
#18 #8 and #12 and #17

Appendix 2. MEDLINE Ovid search strategy

1. randomised controlled trial.pt.
2. (randomised 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. retinal detachment/
14. retinal perforation/
15. vitreous detachment/
16. (retina\$ adj2 break\$).tw.
17. (retina\$ adj2 tear\$).tw.
18. (retina\$ adj2 detach\$).tw.
19. (retina\$ adj2 perforat\$).tw.
20. or/13-19
21. exp vitrectomy/
22. vitrectom\$.tw.
23. PPV\$.tw.
24. or/21-23
25. Scleral Buckling/
26. (scleral adj2 buckl\$).tw.
27. (scleral adj2 encircl\$).tw.
28. encircling band.tw.
29. or/25-28
30. 20 and 24 and 29
31. 12 and 30

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

Appendix 3. Embase Ovid search strategy

1. exp randomised 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 retina tear/
34. exp retina detachment/
35. (retina\$ adj2 break\$).tw.
36. (retina\$ adj2 tear\$).tw.
37. (retina\$ adj2 detach\$).tw.
38. (retina\$ adj2 perforat\$).tw.
39. or/33-38
40. exp vitrectomy/
41. vitrectom\$.tw.
42. PPV\$.tw.
43. or/40-42
44. exp sclera buckling procedure/
45. (scleral adj2 buckl\$).tw.
46. (scleral adj2 encircl\$).tw.
47. encircling band.tw.
48. or/44-47
49. 39 and 43 and 48
50. 32 and 49

Appendix 4. LILACS search strategy

vitrectomy or PPV and scleral buckl\$

Appendix 5. ISRCTN search strategy

(vitrectomy OR PPV) AND Scleral Buckle

Appendix 6. ClinicalTrials.gov search strategy

(vitrectomy OR PPV) AND Scleral Buckle

Appendix 7. WHO ICTRP search strategy

Vitrectomy AND Scleral Buckle

CONTRIBUTIONS OF AUTHORS

LZ analysed data, wrote drafts of the protocol and review, and responded to peer review comments and comments from the editorial base. AM wrote various sections of the protocol and conducted reference screening. SB commented on drafts of the protocol, generated the research strategy and responded to the peer review comments. AV participated in data analysis and writing of the review. JML wrote various sections of the protocol and responded to peer review comments. LP checked independent data extractions and risk of bias assessment, participated in data analysis and helped write parts of the review.

DECLARATIONS OF INTEREST

Ljubo Znaor: none known
Aleksej Medic: none known
Susanne Binder: none known
Ana Vucinovic: none known
Josipa Marin Lovric: none known
Livia Puljak: none known

SOURCES OF SUPPORT

Internal sources

- Univerity Hospital Center Split, Croatia.

Some of the review authors are employees of University Hospital Center Split

- Ludwig Boltzmann Institute for Retinology and Biomicroscopic Laser Surgery, Rudolf Foundation Clinic, Vienna, Austria.

Prof. Susanne Binder is a chair of the Ludwig Boltzmann Institute for Retinology and Biomicroscopic Laser Surgery, Rudolf Foundation Clinic, Vienna, Austria

- Cochrane Croatia, University of Split School of Medicine, Split, Croatia.

Prof. Livia Puljak is a Knowledge Translation Coordinator of Cochrane Croatia, University of Split School of Medicine.

External sources

- National institute for Health Research (NIHR), UK.
 - * Richard Wormald, Co-ordinating Editor for Cochrane Eyes and Vision (CEV) acknowledges financial support for his CEV research sessions from the Department of Health through the award made by the National Institute for Health Research to Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology for a Specialist Biomedical Research Centre for Ophthalmology.
 - * This review was supported by the NIHR, via Cochrane Infrastructure funding to the CEV UK editorial base.

The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Systematic Reviews Programme, NIHR, National Health Service (NHS) or the Department of Health.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Objectives: we changed 'effectiveness' to 'efficacy' in the primary objective, to accurately present the aim of the study. We also changed the wording of the secondary objective. In the protocol, we wrote, "A secondary objective is to determine if PPV in combination with scleral buckling might give better results than scleral buckling or PPV alone, and which of these surgical methods has better results according to the lens status (phakia, pseudophakia/aphakia), duration of the detachment and number/localisation of retinal tears." Now it says, "A secondary objective was to assess any data on economic and quality-of-life measures." We made these changes because we do not think that adding scleral buckling on top of the pars plana vitrectomy (PPV) has clinical relevance, which was also further confirmed by the two largest included trials ([Heimann 2007 phakic](#); [Heimann 2007 pseudophakic](#)), which let the surgeon choose whether or not to add scleral buckling to PPV in the PPV group. We removed the aim regarding state of the lens because many studies did not report the state of the lens. Additionally, we wanted to emphasise quality of life and economic data because we had planned to analyse these outcomes in the protocol.

Types of studies: in the protocol we wrote, "In this review, we will include randomised controlled trials (RCTs) with at least three months of follow-up. We will present results from all other RCTs irrespective of follow-up times but will not include them in the meta-analysis." We omitted the second sentence from the text of the review because we did not have any such cases of studies with shorter follow-up that we excluded from analysis because of their shorter follow-up.

Types of participants: we removed this exclusion criteria, "As RRD is usually associated with previous PVD, which typically develops after the age of 40 years, we included only studies involving patients older than this age." We removed this because none of the studies restricted participants by age and the majority of them included participants younger than 40 years.

Dealing with missing data: we added the method for extracting data from figures because for certain data the study authors did not present numbers outside of figures, and they did not respond to our email requests for the missing data.

Data synthesis: we planned the following in the protocol, "Sensitivity analysis: Primary meta-analysis will include studies at low risk of bias. Sensitivity analysis will then be performed to assess how the results of meta-analysis might be affected if studies at unclear and high risk of bias, industry-funded studies, or unpublished studies were included." However, none of the studies we included in this review were entirely low risk of bias, funding was either non-profit or not reported, and we did not include any unpublished studies. For this reason we could not perform sensitivity analyses as planned.

Presenting data for different follow-up times: based on the suggestion of a peer-reviewer, we presented data from different follow-up times, in addition to end-of-study results, for outcomes where we considered it relevant. We grouped data for different follow-up times into three categories: short-term follow-up, less than six months; medium-term follow-up, six to less than 18 months; and long-term follow-up, 18 months or more. We presented pooled data only for subgroups and not over all the time periods.

'Summary of findings' table: we added a 'Summary of findings' table to the review because they are now recommended in Cochrane Reviews.

INDEX TERMS

Medical Subject Headings (MeSH)

*Scleral Buckling [adverse effects] [statistics & numerical data]; *Vitrectomy [adverse effects] [statistics & numerical data]; Postoperative Complications; Quality of Life; Randomized Controlled Trials as Topic; Recurrence; Retinal Detachment [etiology] [*surgery]; Retinal Perforations [*complications]; Treatment Outcome; Visual Acuity

MeSH check words

Humans