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Anatomical and Functional Outcome of Scleral Buckling and Primary Vitrectomy in Rhegmatogenous Retinal Detachment

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Abstract

Retinal detachment is a serious sight-threatening condition, which needs a prompt treatment. Recently, pars plana vitrectomy (PPV) has been frequently used than scleral buckling (SB) although the advantages of PPV over SB had never been proven. To compare anatomical and functional outcomes, as well as complications of SB vs. primary PPV as the initial surgery in rhegmatogenous retinal detachment, a literature study was carried out for journal articles indexed by the PubMed. We included studies (interventional or observational) that reported the use of primary PPV vs. SB in retinal detachment. We did not restrict the search by the lens status. We excluded studies that were not reported in English and could not be accessed. Out of 44 articles identified, only seven articles were eligible. In most studies, the rates of retinal attachment after the first surgery of both techniques were similar ($p > 0.05$). Only two studies reported significantly better primary anatomical success in PPV than SB ($p = 0.0002$ and $p = 0.037$). Both techniques also showed functional success based on the best corrected visual acuity (BCVA) results, with three studies found that PPV had a significantly better final BCVA ($p = 0.03$, $p = 0.0005$, $p < 0.05$). The complication of these two techniques could not be compared. Retinal re-detachment, choroidal detachment, proliferative vitreoretinopathy (PVR) progression and infection were reported in SB group. Meanwhile, higher intraocular pressure, retinal re-detachment, PVR, epiretinal membrane (ERM), macula pucker, and iatrogenic break were reported in PPV group. Both surgical techniques gave good results in visual function (LogMar < 1.00) and quite the same in primary anatomical success.

Key words: pars plana vitrectomy, rhegmatogenous retinal detachment, scleral buckling.

Keberhasilan Anatomis dan Fungsional Metode *Scleral Buckling* dan Vitrektomi Primer pada Ablasio Retina Regmatogenosa

Abstrak

Ablasio retina merupakan suatu kedaruratan mata yang membutuhkan tata laksana segera. Dewasa ini, vitrektomi pars plana (*pars plana vitrectomy*/PPV) lebih sering digunakan dibandingkan *scleral buckling* (SB), meskipun kelebihan PPV dari SB belum pernah dibuktikan. Untuk membandingkan luaran anatomi dan fungsi, serta komplikasi SB dan PPV primer sebagai tata laksana bedah inisial pada ablasio retina regmatogenosa, dilakukan pencarian literatur menggunakan database PubMed. Kriteria inklusi adalah artikel yang melaporkan hasil PPV primer vs. SB pada ablasio retina. Seleksi tidak dibatasi oleh status lensa. Kriteria eksklusi adalah artikel yang tidak menggunakan Bahasa Inggris dan tidak dapat diakses. Dari 44 artikel yang teridentifikasi, tujuh artikel memenuhi kriteria. Tingkat perlekatan retina setelah operasi pertama pada kedua teknik setara hampir pada semua studi ($p > 0,05$). Hanya dua studi melaporkan keberhasilan anatomis primer yang secara signifikan lebih baik pada PPV ($p = 0,0002$ and $p = 0,037$). Kedua teknik juga menunjukkan keberhasilan fungsional dilihat dari *best corrected visual acuity* (BCVA), dengan tiga studi melaporkan BCVA yang secara signifikan lebih baik pada PPV ($p = 0,03$, $p = 0,0005$, $p < 0,05$). Komplikasi kedua teknik tidak dapat dibandingkan. Pada kelompok SB dilaporkan terjadinya *retinal re-detachment*, *choroidal detachment*, *proliferative vitreoretinopathy* progresif (PVR) dan infeksi. Sementara itu, dilaporkan peningkatan tekanan intraokular, retinal re-detachment, PVR, epiretinal membrane (ERM), *macula pucker*, dan robekan iatrogenik pada kelompok PPV. Kedua teknik bedah memberikan hasil akhir tajam penglihatan yang baik (LogMar < 1.00) dan keberhasilan anatomis primer yang relatif sama.

Kata kunci: ablasio retina regmatogenosa, scleral buckling, vitrektomi pars plana.

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Introduction

Retinal detachment (RD) is a condition where the neurosensory retina is detached from the retinal pigmented epithelial. Physiologically, the neurosensory retina is kept attached by many factors, but the most important is by continued physiologic outward movement of fluid across the retinal pigment epithelium into the choroid.¹

Retinal detachment is a typically acute event. Posterior vitreous detachment is a consequence of lifelong vitreous liquefaction and is highly age-dependent. It occurs in less than 10% of patients younger than 60 years, in 27% of patients in the seventh decade of life, and 63% in the eighth decade of life, but it may also occur earlier in myopia patients.¹ Population-based studies show that the annual incidence is approximately 12.6 cases per 100.000 people or 17.9 per 100.000 if detachments after cataract extraction are included. Rowe and associates² calculated that in 10 years, the risk of RD was 5,5 times higher in patients who underwent cataract surgery than those who did not go through this surgical procedure.

Retinal detachment is a serious sight-threatening condition which needs a prompt treatment. Increasing the time interval between the diagnosis and treatment of RD is a trend reported in many recent studies. A case series of 114 patients with acute maculaon rhegmatogenous shows that there are no statistically significant differences between time to surgery (1-120 hours) initial and final visual acuity.³ Although 87% of eyes with RD sparing the macula recover visual acuity of 20/50 or better, only one third to one half with a detached macula attain that level.⁴ Kim *et al*,⁵ reported that patients with symptom of RD with macula-off with duration of 6 days or less achieved better final best corrected visual acuity (BCVA) than those with longer symptom duration. Over six days of macular detachment symptom,

no significant difference was seen in final BCVA.

There are three principal methods to reattach the retina: scleral buckling (SB), vitrectomy, and pneumatic retinopexy. For the next following section, this literature review will compare SB vs. pars plana vitrectomy (PPV). SB surgery will create some indentation to the eyeball to restore contact with the detached retina. It results in high successful rates of reattachment and vision recovery. In a recent study, the success rate for a single SB operation was 81% of 672 phakic eyes and 73% of 318 pseudophakic or aphakic eyes. Final visual acuity was 20/40 or better in 51.3% of all eyes, 20/50 to 20/100 in 17.3%, and 20/200 or worse in 31.4%.⁶

Pars plana vitrectomy (PPV) surgery is an invasive technique that relieves traction by removing the vitreus attached to the retinal breaks inside vitreus cavity, allowing re-approximation closed with retinopexy. The surgeon will place the bubble containing sulfur hexafluoride gas, perfluoropropane gas, or silicon oil in the vitreus cavity.¹ Medrinos *et al*⁷ reported a single operation success rate of 92% of 100 patients with pseudofakic eyes; the mean visual acuity was magnificently increased from 20/200 to 20/50.

Anesthesia modalities have also a role in this condition. The earlier vitreoretinal surgeries were performed under general anesthesia, which now is being used primarily for pediatric surgeries or for uncooperative patients. With improvements in techniques and technology, local anesthesia is used for majority of vitreoretinal surgical procedures.⁸ Most vitreoretinal surgeries in Cipto Mangunkusumo Hospital use general anesthesia. Performing vitrectomy for retinal detachment can be done with local anesthesia, including retrobulbar and parabolbar anesthesia, subtenon anesthesia, peribulbar anesthesia, and even topical anesthesia.⁸

There are several randomized control

trials that compared SB vs. PPV where the selection technique for retinal detachment is based on surgeon preference and condition. In Indonesia, as a developing country, there are only a few vitreoretinal surgeons but a tremendous numbers of retinal cases. Since prompt treatment for RD is really important, surgeons need to consider which technique is best to be applied in our national referral hospital, the Cipto Mangunkusumo Hospital.

The surgical technique for retinal detachment depends on the severity of the disease. Recently PPV is used more frequently than SB although the advantages of PPV over SB had never been proven. Overall, relatively high anatomical success rates can be achieved with both techniques. How are the anatomical and functional outcomes of scleral buckling or primary PPV in the management of retinal detachment? Which procedure is more suitable to be applied in Cipto Mangunkusumo Hospital?

This literature review is conducted to compare anatomical, and functional outcomes, also the complications of scleral buckling and primary pars plana vitrectomy procedure as the initial surgery in rhegmatogenous retinal detachment. It is also aimed to analyze which procedure is the most appropriate in Cipto Mangunkusumo hospital for the management of rhegmatogenous retinal detachment (RRD).

Material and Methods

Data Source

Literature searching was obtained from the Pubmed database for journal articles published and related to rhegmatogenous retinal detachment, using the keywords: primary vitrectomy versus scleral buckling. The search was limited to articles published in English. Reference list from the included studies were also checked for potentially relevant articles.

Study selection and criteria

The initial screening, articles were reviewed to specify the relationship to the study. Full article were obtained, then screened based on the inclusion and exclusion criteria. Inclusion criteria are all studies (interventional or observational) that reported the use of primary vitrectomy versus scleral buckling in retinal detachment, and are not restricted by the lens status. The studies that were not reported in English and could not be accessed are excluded. The included studies should also provide the information of surgical techniques, anatomical success, and best visual acuity.

All studies that met the inclusion criteria were rated according to the level of evidence

Table 1. Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence ⁹

Level	Therapy studies
I	Systematic review of randomized trial or n-of-1 trial
II	Randomized trial or observational study with dramatic effect
III	Non-randomized controlled cohort/follow up study
IV	Case-series, case control studies or historically controlled study
V	Mechanism based reasoning

developed by Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence.⁹

Data Processing and Presentation

The data collected includes a number of eyes treated, mean age, follow up period, preoperative proliferative vitreo-retinopathy (PVR), macular detachment, lens status, and complication. The primary outcomes of this review are primary anatomical success rate and preoperative and postoperative visual acuity. The secondary outcome is complication that occurred after the surgery. All information will be presented in forms.

Operational Definition

The following are the operational definition of the terms used in this literature review.

- Rhegmatogenous retinal detachment is the condition where the fluid from vitreous cavity passes and accumulates in the subretinal space because of the presence of a retinal full-thickness break or hole.¹⁰
- Primary vitrectomy defined as the pars plana vitrectomy is the first surgical intervention for rhegmatogenous retinal detachment.
- Scleral buckling involves using a piece of silicone to indent ('buckle') the eye to approximate the retina to the underlying retinal pigmented epithelium. The material, consisting either of soft silicone sponges or harder solid silicone pieces or bands, is sutured directly onto the sclera to create the buckling effect.¹¹
- Retinopathy of the break is performed using cryopexy or endolaser for pars plana vitrectomy.
- Proliferative vitreoretinopathy (PVR) is characterized by the formation of surface membranes in the posterior segment. It could be graded into: (A). vitreous haze, pigment clumps, decreased mobility

of PHF, (B). inner retinal wrinkling, stiffness, rolled edges of retinal breaks, (C). full-thickness retinal folds, anterior/posterior extent in clock hours.¹²

- Retinal reattachment was defined as the attachment of the retina central to the equator at the final follow-up visit without any retina affecting the procedure.
- Primary anatomic success: complete retinal reapplication after the first surgery.¹³
- Functional success: if the presurgery MSVC is maintained or improved or if a final BCVA of $\geq 20/200$ is obtained.¹³

Procedure of each treatment

Primary pars plana vitrectomy usually utilized a 3-port approach, with the release of vitreous traction, internal drainage of subretinal fluid (SRF), cryotherapy or endolaser retinopexy of breaks, peripheral circumferential endolaser photocoagulation, and internal tamponade by injection of sulfur hexafluoride or perfluoropropane at the end of the procedure.

A standard scleral buckling technique consisted of the placement of either an encircling band, transscleral cryopexy or indirect laser retinopexy of tears, external drainage of SRF, and relief of hypotony by air or gas on completion of surgery. Study-to-study variations in these steps within each technique were not taken into consideration during this review.

Results

Forty-four articles were retrieved using the intended keywords. Seven articles met the inclusion criteria and 37 articles did not, including four articles which were not published in English. The studies which did not compare the scleral buckling head to head with primary pars plana vitrectomy

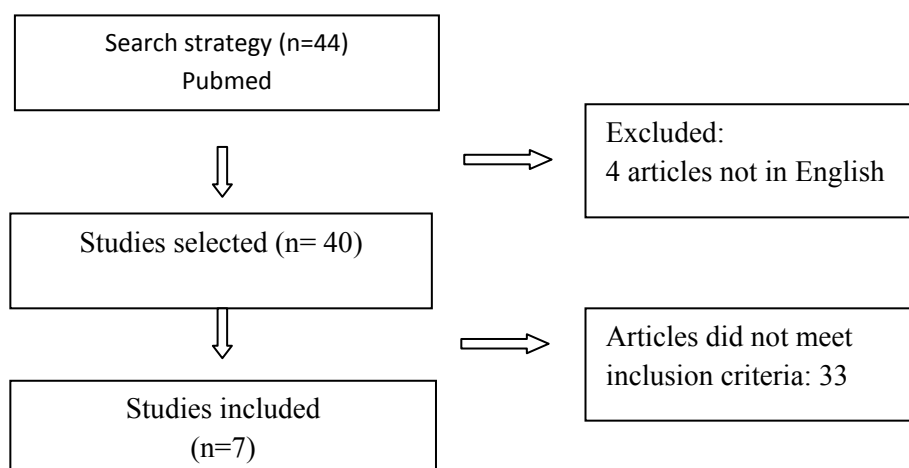


Figure 1. Flow chart demonstrating the study selection process.

Table 2. Data Characteristics of Reviewed Articles.

Author	Year pub.	Level of evidence	Subjects	Mean of age		FU time (months)
				SB	PPV	
Sharma <i>et al</i> ¹⁴	2005	2	50	56.8 ± 12	58.28 ± 9.14	6
Koriyama <i>et al</i> ¹⁵	2006	2	46	NA	NA	36
Ahmadiéh <i>et al</i> ¹⁶	2005	2	225	NA	NA	6
Azad <i>et al</i> ¹⁷	2007	2	61	36 ± 16	41 ± 15	6
Heimann <i>et al</i> ¹⁸	2007	2	416	61	59	12
subgroup a subgroup b		2	265	66	64	12
Brazitikos <i>et al</i> ¹⁹	2005	2	150	71.01 ± 8.13	73.01±8.57	12
Huang <i>et al</i> ²⁰	2013	4	58	36.4±13.3	44.7±14.4	2

NA, not available; PVR, proliferative vitreo-retinopathy; SB, scleral buckling, PPV, pars plana vitrectomy; FU, Follow-up

were also excluded. Steps leading to the final selection are outlined in Figure 1.

The six of seven reviewed articles are prospective randomized clinical trial. Huang *et al*²⁰ found out that retrospective observational case series study has a level of evidence IV. Reviewed articles were published during the last ten years (on 2005 to 2014). All of the RCT studies follow up the subjects in a minimum of six months.

The longest period of clinical follow up lasted 36 months after surgery. The subjects were varied from 46 to 416 subjects. It also reported case series with the shortest follow up period of two months. The characteristic data of the reviewed articles are presented in Table 2. The RCT study by Heimann *et al*¹⁸ was divided into subgroups, phakic and pseudophakic. It analyzed the outcome based on those subgroups. Then this literature

review used the results of Heimann *et al*¹⁸ as two studies, Heimann *et al*¹⁸ (1) using phakic and Heimann *et al*¹⁸ (2) using pseudophakic subjects.

Almost all of the studies used the same severity level of PVR grade B. This review did not differ the lens characteristic by pseudophakic, aphakic, or phakic. All lens status that had been used in the literature was concluded. Huang *et al*²⁰ did not report the inclusion criteria about lens status. Sharma *et al*¹⁴ and Brazitikos *et al*¹⁹ has limited the studies for pseudophakic subjects and the study by Azad¹⁷ and Koriyama *et al*¹⁵ were phakic subjects.

The condition of the macula was also reported. Most of all the maculas were detached. Only Koriyama *et al*¹⁵ used macula-on criteria with PVR grade C-1 as inclusion criteria. Sharma *et al*¹⁴ and Huang *et al*²⁰ had the opposite condition that all of the subjects were macula detached. Only three articles reported the technique of anesthesia while the others did not. All literature reported local anesthesia as the most common anesthesia technique used in uncomplicated RRD surgery.

All of the best corrected visual acuity (BCVA) result of both techniques could be considered as functional success. Both of surgical techniques also had a good result of anatomical success. The mean visual acuity was better than ≤ 1.00 LogMar or $> 6/60$ after surgery. The primary outcomes of both techniques were listed on Table 4.

Heimann *et al*¹⁸ and Brazitikos *et al*¹⁹ reported that vitrectomy had a statistically significant better primary anatomical success than SB (p=0.0002 and p=0.037). Both of them were RCT study with pseudophakic subject. The rates of retinal attachment after the first surgery of both techniques are equal in most of the studies (p>0.05). Huang *et al*²⁰, did not have the primary anatomical success as the primary outcome.

Sharma *et al*¹⁴ also used pseudophakic subject had no difference statistically between SB and PPV. Sharma *et al*¹⁴, Heimann *et al*¹⁸ and Huang *et al*²⁰ found out PPV was better than SB, in final BCVA (p=0.03, p=0.0005, p<0.05). Three of them were using different lens status. Sharma *et al*^{13, 17, 19} did not give the lens status inclusion criteria.

Table 3. Characteristics of Retinal Detachments in Reviewed Articles.

Author	Eyes (n)	Inclusion criteria	Local Anesthesia (%)	Lens status	Macula on (%)
Sharma <i>et al</i> ¹⁴	50	PVR grade B	100	Pseudophakic	0
Koriyama <i>et al</i> ¹⁵	46	PVR grade C-1	NA	Phakic	100
Ahmadih <i>et al</i> ¹⁶	225	PVR grade B	NA	Pseudofakic / aphakic	2.2
Azad <i>et al</i> ¹⁷	61	PVR grade B	100	Phakic	14.75
Heimann <i>et al</i> ¹⁸					
subgroup a	416	PVR grade B	NA	Phakic	37
subgroup b	265	PVR grade B	NA	Pseudophakic	35
Brazitikos <i>et al</i> ¹⁹	150	PVR grade B	85	Pseudophakic	24.7
Huang <i>et al</i> ²⁰	58	PVR grade B	NA	NA	0

NA, not available; PVR, proliferative vitreo-retinopathy

Table 4. Primary Outcomes of the Reviewed Articles.

Author	SB				PPV						
	Symptom RD	BCVA pre-op (LogMar)	BCVA post-op (LogMar)	PAS (%)	Symptom RD	BCVA pre-op (LogMar)	BCVA post-op (LogMar)	PAS (%)	p PAS	p BCVA	
Sharma <i>et al</i> ¹⁴	27.8±17.7	>1.00	0.70	76	32.16 ±19.37	>1.00	0.55	84	0.48	0.03*	
Koriyama <i>et al</i> ¹⁵	NA	1.2±0.89	≤0.8 (60)	91	NA	1.3±0.98	≤0.8 (73)	91	>0.05	>0.05	
Ahmadiéh <i>et al</i> ¹⁶	20.7	2.21	0.96	68.2	22.3	2.37	0.96	62.6	>0.05	1	
Azad <i>et al</i> ¹⁷	19	1.43±0.92	0.60±0.36	80.6	20	1.74±0.9	0.68±0.35	80	0.213	0.37	
Heimann <i>et al</i> (a) ¹⁸	NA	1.04	0.33	63.6	NA	1.05	0.48	63.8	0.97	0.0005*	
Heimann <i>et al</i> (b) ¹⁸	NA	1.02	0.46	53.4	NA	1.02	0.38	72	0.002*	0.1	
Brazitikos <i>et al</i> ¹⁹	NA	1.09±0.46	0.40±0.48	83	NA	0.98±0.52	0.33±0.32	95	0.037*	0.26	
Huang <i>et al</i> ²⁰	12±4.5	1.2± 0.9	0.4±0.8	NA	15±6.5	1.3±1	0.7±0.9	NA	NA	<0.05*	

SB, scleral buckling; PPV, pars plana vitrectomy; NA, Not available; RD, retinal detachment; BCVA, Best-corrected visual acuity; LogMar, logarithm of minimum angle resolution; PAS, primary anatomical success *, P value stated in statistical analysis in articles with comparative study; statistically significant if p value < 0,05.

Complication in SB and PPV are also observed. The retina re-detachment were widely varied among each study (4-37 %). Vitrectomy and scleral buckling are two different techniques. The complication of these two techniques could not be equated. The complications of each study are different. In scleral buckling group, Sharma *et al*¹⁴ showed that the retinal redetachment was the most common complication while Koriyama *et al*¹⁵ said that the choroidal detachment was the most common complication that happened. Ahmadiéh *et al*¹⁶ reported redetachment and PVR progression quite the same. Other researchers mentioned that infection of the scleral buckling was reported in 3-4 % cases.^{14,17}

In PPV group there were significant complications of high IOP post operatively as mentioned by Sharma *et al*,¹⁴; Koriyama *et al*,¹⁵ and Ahmadiéh *et al*.¹⁶ They found the high number of complications, including re-detachment, PVR, ERM, and macula pucker. Huang *et al*²⁰ did not measure another complication than ERM. There was another

complication that could be found such as iatrogenic break, as stated by Sharma *et al*¹⁴ (24%) and Azad *et al*¹⁷ (10%). Ahmadiéh *et al*¹⁶ compared the complication between two groups while the others did not. They found no difference between SB and PPV.

Discussions

Symptomatic RRD is a clear indication for surgical intervention. However, there is no general consensus on the best surgical approach for uncomplicated RRD. Scleral buckling technique has been long considered the gold standard in treatment of uncomplicated RRD. Since 1983, the indication of primary vitrectomy in RRD have expanded to include less complication situations which had previously been treating by scleral buckling. In the last decade, PPV for RRD has rapidly gained popularity, which in contrast, decreasing the use of SB technique. With less traumatic sutureless smaller gauge, PPV technique has shorter time of operation, which lowered the inflammation of post operation.¹

Table 5. Redetachment Rate and Complications of SB Group

SB group	Sharma <i>et al</i> ¹⁴ (%)	Koryama <i>et al</i> ¹⁵ (%)	Ahmadiéh <i>et al</i> ¹⁶ (%)	Azad <i>et al</i> ¹⁷ (%)	Heimann <i>et al</i> ¹⁸ (%)	Brazitikos <i>et al</i> ¹⁹ (%)	Huang <i>et al</i> ²⁰ (%)
Redetachment	24	9	31	19.4	26	17	NA
PVR	20	4	30	NA	NA	5	NA
ERM	16	NA	22	3	NA	NA	15.6
IOP rises	4	13	6	6	NA	NA	NA
Buckle infection	4	NA	NA	3	NA	NA	NA
Choroidal-detachment	8	35	0	NA	NA	NA	NA
Macula pucker	NA	17	22	NA	NA	5	NA

NA, Not available; PVR ,Proliferative vitreo-retinopathy; IOP raise , Intraocular pressure (more than 22 mmHg) ;CME, Cystoid Macular Edema; ERM, Epiretinal membrane; Choroidal det., choroidal detachment

Table 6. Redetachment Rate and Complications of PPV Group

PPV group	Sharma <i>et al</i> ¹⁴ (%)	Koryama <i>et al</i> ¹⁵ (%)	Ahmadiéh <i>et al</i> ¹⁶ (%)	Azad <i>et al</i> ¹⁷ (%)	Heimann <i>et al</i> ¹⁸ (%)	Brazitikos <i>et al</i> ¹⁹ (%)	Huang <i>et al</i> ²⁰ (%)
Redetachment	16	9	37	20	25	4	NA
Iatrogenic break	24	NA	NA	10	NA	NA	NA
PVR	4	9	35	NA	NA	4	NA
ERM	12	NA	22	3	NA	3	42.3
IOP rises	32	17	6	7	NA	NA	NA
Macula pucker	NA	0	22	NA	NA	3	NA

NA, not available; PVR, proliferative vitreo-retinopathy; IOP raise, intraocular pressure (more than 22 mmHg); CME, cystoid macular edema; ERM, epiretinal membrane; Choroidal det., choroidal detachment

It remains unclear, however, which one has better anatomical and functional result in uncomplicated RRD. Only two articles showed that primary anatomical success were statistically different between PPV and SB ($p < 0.05$). Both studies used pseudophakic subjects. Primary PPV offers potential advantages over SB in pseudophakic RD. Break characteristics that differ in pseudophakic and phakic will explain about it. This may be due to several

factors, including better localization of the peripheral breaks and a greater release of traction during PPV.^{18, 19, 21}

Koriyama *et al*¹⁵ reported that the primary anatomical success of SB and PPV are not different statistically. Only Koriyama *et al*¹⁵ used the 100% macula-on and phakic eye in his trial. Azad *et al*¹⁷ also used the phakic eye in inclusion criteria and found the same result of SB and PPV, even though most of the subject had macula detachment.

It may suggest the surgeon can do scleral buckling or vitreous surgery in phakic eye with uncomplicated RRD.

Three out of eight (Sharma *et al*,¹⁴; Heimann *et al*¹⁸ and Huang *et al*²⁰) articles reported there were statistically significant difference of final BCVA following primary PPV or SB ($p < 0.05$). However, Sharma *et al*,¹⁴; Heiman *et al*,¹⁸ and Huang *et al*²⁰ used different inclusion criteria of lens status. The other five articles showed no significant difference statistically BCVA in this two groups.

Four out of seven articles reported the time duration of symptoms. However, this symptom cannot describe the macula condition. All articles noted the mean of duration RRD was over 10 days. This might lower the recruitment bias due to macula condition. Some study reported no difference in anatomical or visual outcome in eyes repaired anytime within seven days to 10 days of macular detachment. However, there were a progressive decreased in visual acuity when RRD was repaired after 10 days of macular detachment.⁵

Most of the studies were using local anesthesia when performing the surgery. Local anesthesia in retinal surgery may reduce the general anesthesia side effects and faster-duration operation. Brazilitikos *et al*¹⁹ compared the operation time between SB and PPV procedure. PPV had statistically significant faster time than SB (65.8 ± 9.34 and 54.69 ± 8.30 minutes).

Redetachment after SB and PPV had a range of 9 to 31% and 5 to 37%. Ahmadiéh *et al*¹⁶ compared the number of redetachment on SB and PPV and there were no statistically significant difference. The biggest percentage of redetachment was on Ahmadiéh *et al*¹⁶ (31% and 37%).

Proliferative vitreo-retinopathy in both groups were different. The low of incidence of PVR in the PPV group compared to that in the SB group may possibly be due to

the removal of proliferative factors during vitrectomy. In Koriyama *et al*¹⁵, PVR happened more common in PPV groups. It was believed that it was because there were more severe cases included in his study.

Macular pucker is a common finding after RRD surgery. It has been reported in 2-17% cases after SB surgery. Two studies compared the macular pucker as the complication, and there were no difference between two groups,^{16,19} while Koriyama *et al*,¹⁵ reported that the macular happen only after SB surgery (17%).

The purpose of this literature review, which was to compare SB and PPV in RRD was still not conclusive. The result of this literature review corresponds with meta-analysis by Soni *et al*²² that examined the possible differences in clinical outcomes between PPV and SB for uncomplicated RRD. Soni *et al*²² divided the subjects into phakic and pseudophakic/aphakic group.

Soni *et al*²² reported no statistical difference was identified in the proportion of primary reattachment in phakic patients between the PPV and SB. The Phakic subgroup had a better BCVA at six months in SB group compared with the PPV group. In pseudophakic/aphakic group, there were no statistical differences identified in the proportion of primary reattachment and BCVA between the PPV and SB groups.

Qiao Sun *et al*²³ made a meta-analysis to compare the efficacy of PPV with SB in uncomplicated RRD. Phakic group had a better final visual result in SB than in the PPV group with no difference in anatomical success. In the other arm, pseudophakic/aphakic indicated that PPV was superior in final anatomical success.

The first meta-analysis was made by Sun *et al*²³ using six randomized controlled trials that this review used. Sun *et al*²³ also put a statement on the limitation of his meta-analysis, which was a relatively small sample size. Accordingly, Soni *et al*²²

made the updated of second meta-analysis with adding another recent study solve the problem.

The authors searched about RRD surgery in Cipto Mangunkusumo Hospital. This data was obtained to see the condition in local condition. The subjects were patients who had been diagnosed with RRD and done with the surgery during the period of February-March 2014 in Cipto Mangunkusumo Hospital. We found 26 cases with RRD. We excluded cases with macular hole, uveitis, total detachment and choroidal detachment. Most of the subjects (81%) underwent the surgery under general anesthesia, and 19% under local anesthesia. The period of the subjects' visit to the clinic until surgery were also collected. We divided them into two groups, under 10 days and over 10 days. There were 23% (6/26) subjects completed the surgery within 10 days since the diagnosis and 77% over 10 days. From those subjects, who had RRD with macula-on at first consult, only 3/26 (11.5%) had been operated in 10 days.

Seider *et al*²⁴ reported the cost comparison may be divided into two subgroups, phakic and pseudophakic or aphakic. In phakic subjects, SB may offer a modest cost saving over PPV, with approximately 10% saved per SB procedure. In pseudophakic or aphakic eyes, PPV seems to be less expensive than SB, about 12.1% saver per PPV. It may be resulted from the failure of the primary RRD repair.

Conclusions

Rhegmatogenous retinal detachment needs a prompt treatment. Both surgical techniques give good results in visual function (LogMar <1.00). In phakic subdivided group, scleral buckling superior on primary visual outcome in BCVA than PPV. Primary anatomical success was quite the same between all subgroups. The

SB had a lower cost than PPV in phakic group. On the other hand, PPV are cheaper than SB in pseudophakic/aphakic eye. Both surgical techniques were usually performed in Cipto Mangunkusumo hospital. All of the techniques could also be performed under local anesthesia, but it may need a further studies that compare the pain intra and post-operative in both techniques. Hopefully all patients with RRD could undergo the surgery as soon as possible to bring a good retina outcome, anatomically and functionally.

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