

# Complication of manual small incision cataract surgery and phacoemulsification in previously vitrectomized eyes with silicone oil tamponade

Arief S Kartasasmita<sup>1</sup>, Ohisa Harley<sup>2</sup>, Mareta Gustianingsih<sup>1</sup>, Erwin Iskandar<sup>1</sup>

<sup>1</sup>Department of Ophthalmology, Padjadjaran University/Cicendo National Eye Hospital, Bandung 40117, Indonesia

<sup>2</sup>Departement of Vitreoretina, Netra Eye Clinic, Bandung 40114, Indonesia

**Correspondence to:** Arief S Kartasasmita. Jl. Cicendo No 4, Bandung 40117, Indonesia. a.kartasasmita@unpad.ac.id

Received: 2017-06-29 Accepted: 2017-11-29

## 硅油填充眼手法小切口与超声乳化白内障手术的并发症

Arief S Kartasasmita<sup>1</sup>, Ohisa Harley<sup>2</sup>, Mareta Gustianingsih<sup>1</sup>, Erwin Iskandar<sup>1</sup>

(作者单位:<sup>1</sup>40117 印度尼西亚, 万隆, 万隆巴查查兰大学/Cicendo 国家眼科医院,眼科;<sup>2</sup>40114 印度尼西亚, 万隆, Netra 眼科诊所,玻璃体视网膜科)

通讯作者: Arief S Kartasasmita. a.kartasasmita@unpad.ac.id

### 摘要

**目的:**比较超声乳化联合硅油取出术与硅油填充眼手法小切口白内障手术(MSICS)的安全性。

**方法:**回顾性对比研究。162例患者162眼接受白内障手术,超声乳化联合硅油取出术与硅油填充眼手法小切口白内障手术均行玻璃体切除。

**结果:**超声乳化白内障手术组术后低眼压21眼(18.91%) MSICS组术后低眼压8眼(15.68%),两组间无明显统计学差异( $P=0.666$ )。术后1mo两组间视网膜复位率无明显统计学意义;超声乳化白内障手术组8例患者(7.2%)复发,硅油填充眼手法小切口白内障手术组9例(17.64%)复发,两组复发率比较,差异无统计学意义( $P=0.055$ )。

**结论:**硅油填充眼手法小切口白内障手术相较于超声乳化联合硅取出术在低眼压、渗漏、脉络膜脱离、视网膜复位率方面结果无劣效性。

**关键词:**手法小切口白内障手术;超声乳化白内障手术;玻璃体切除术后眼

**引用:**Kartasasmita AS, Harley O, Gustianingsih M, Iskandar E. 硅油填充眼手法小切口与超声乳化白内障手术的并发症. 国际眼科杂志 2018;18(2):203-206

### Abstract

• **AIM:** To compare the safety between phacoemulsification and manual small incision cataract surgery (MSICS) combined with silicone oil removal in previously vitrectomized eyes.

• **METHODS:** A retrospective comparative non-inferiority study to 162 patients (162 eyes) who undergone cataract surgery, either phacoemulsification or MSICS combined with silicone oil removal which had pars plana vitrectomy.

• **RESULTS:** There were no statistically significant different in hypotony between phacoemulsification group (21 patients; 18.91%) and MSICS group (8 patients; 15.68%) ( $P=0.666$ ). There was also no statistically significant different between two group in 1mo retinal reattachment rate; 8 patients (7.2%) in phacoemulsification group had redetachment compared with 9 patients (17.64%) in MSICS combined with silicone oil removal group ( $P=0.055$ ).

• **CONCLUSION:** MSICS combined with silicone oil removal has non-inferiority result to phacoemulsification combined with silicone oil removal in hypotony, leakage, choroidal detachment and retinal reattachment rate.

• **KEYWORDS:** manual small incision cataract surgery; phacoemulsification; vitrectomized eyes

DOI:10.3980/j.issn.1672-5123.2018.2.01

**Citation:** Kartasasmita AS, Harley O, Gustianingsih M, Iskandar E. Complication of manual small incision cataract surgery and phacoemulsification in previously vitrectomized eyes with silicone oil tamponade. *Guoji Yanke Zazhi (Int Eye Sci)* 2018;18(2):203-206

### INTRODUCTION

Nuclear sclerotic cataract is the most common complication after vitrectomy<sup>[1-2]</sup>. Many surgeons do believe that small incision cataract extraction is the best technique for removing cataract in vitrectomized eyes. The smaller the incision, the safer the eyes will be. Phacoemulsification is the most popular method of cataract surgery nowadays especially in the developed world country. However, manual small incision cataract surgery (MSICS) first described by Blumenthal which has been a renewal of interest in developing countries due to it is considerably less costly to phacoemulsification but has comparable benefits of rapid visual recovery and astigmatic reduction<sup>[3-4]</sup>.

Cataract surgery in vitrectomized eyes could be technically challenging because of changing of anatomical structures, such as deeper anterior chambers, fragile lens capsules, plaque in the posterior capsule plaques, weakened zonula and the absent of vitreous support<sup>[5]</sup>. Wound leak in vitrectomized

eyes also considerably as a nightmare for every surgeon because hypotonic condition could be the trigger for more severe complication such as choroidal effusion and suprachoroidal hemorrhage. Study showed both phacoemulsification and MSICS achieved excellent visual outcomes with low complication rates<sup>[6-7]</sup>. Nevertheless, MSICS is significantly faster, less expensive, and less technology dependent than phacoemulsification<sup>[8-9]</sup>.

The aim of this study is to compare the safety between phacoemulsification and MSICS combined with silicone oil removal in previously vitrectomized eyes.

## SUBJECTS AND METHODS

It was retrospective comparative non - inferiority study, enrolled 162 patients (162 eyes) who undergone cataract surgery, either phacoemulsification or MSICS combined with silicone oil removal which had pars plana vitrectomy in Cicendo Eye Hospital, Bandung, Indonesia.

The ethical approval was obtained from the Universitas Padjadjaran Ethical Committee. The inclusion criteria were patients with previously vitrectomized eyes with silicone oil filled eyes who underwent cataract surgery combined with silicone oil removal. Silicone oil tamponade must be at least three months from the previous pars plana vitrectomy and the retinal condition must be attached. The exclusion criteria were eyes with a history of filtering surgery, patient underwent other surgical intervention besides cataract surgery and silicone oil removal, and eyes with silicone oil or gas tamponade at the end of the surgery. The main outcomes of this study are the ocular hypotony, wound leakage from cataract surgery incision, choroidal effusion, suprachoroidal hemorrhage and retina attachment rates. Ocular hypotony defined as intraocular pressure below 6 mmHg. Wound leak defined as any leakage from cataract surgery incision. Choroidal effusion defined as accumulation of fluids in suprachoroidal space, characterized by anterior chamber shallowing, low intraocular pressure; confirmed with B-scan ultrasound examinations as a dome - shaped appearance. Suprachoroidal hemorrhage defined as accumulation of blood in suprachoroidal space. Retina attachment defined as flat retina examined through dilated indirect funduscopy at 1d,7d and 1mo after the surgery.

Statistical analysis was performed using SPSS 19.0; hypotony, leakage, choroidal detachment and retinal redetachment variables were tested using Fisher's exact test.  $P < 0.05$  was taken as statistically significant.

**Surgery** All patient surgery was performed under monitored anesthesia care and retrobulbar block. Patients' skin and lashes and the ocular surface were prepared with 5% povidone-iodine solution. The surgery was performed using 23-gauge pars plana vitrectomy, started by creating three ports of sclerotomy 3.5-4 mm posterior to the limbus. The second step is cataract surgery either phacoemulsification or MSICS. Phacoemulsification was performed using either Constellation (Alcon) or Stellaris (Bausch & Lomb) through 2.75 clear corneal incision. Clear corneal incision was left

unsutured. MSICS was performed by making scleral tunnel in 1.5 - 2 mm from the superior limbus of the cornea. After performing cataract extraction, the surgery continued with vitreoretinal surgery. Intraocular lens implantation was done at the end of surgery, depends on its necessary. The corneal incision in post-phacoemulsification eyes was left unsutured, while the scleral incision in post-MSICS eyes was all sutured with 10.0 ethylon. In both groups, removal of the microcannulas was carried out without suture. Firm pressure was applied onto the sclerotomy sites with cotton tip applicator to enhance the sclerotomy sealing and to return the displaced conjunctiva to its normal position.

## RESULTS

Demographic and preoperative clinical data of all patients were summarized in Table 1. There was no significant difference in age and gender between the two groups.

In phacoemulsification combined with silicone oil removal group there were 21 patients (18.91%) had hypotony after surgery compare to 8 patients (15.68%) in MSICS combined with silicone oil removal group ( $P = 0.666$ ); this considerably is not statistically significant (Table 2). There was one patient (1.96%) with post surgery leakage ( $P = 0.314$ ) and one patient (1.96%) with choroidal detachment ( $P = 0.531$ ) in both phacoemulsification and MSICS combined with silicone oil removal group. Retinal reattachment rate on 1wk after surgery, there was 4 patients (7.48%) in MSICS combined with silicone oil removal group had retinal redetachment meanwhile in phacoemulsification combined with silicone oil removal group all patients were attached,  $P = 0.009$  which is statistically significant. In 1mo follow up after surgery we recorded 8 patients (7.20%) in phacoemulsification combined with silicone oil removal group had retinal redetachment compared with 9 patients (17.64%) in MSICS combined with silicone oil removal group,  $P = 0.055$  which is not statistically significant (Table 3).

## DISCUSSION

Hypotony after cataract surgery can be resulted from various reasons. Ocular hypotony can leads to several structural changes such as corneal edema, corneal Descemet's folds, shallow anterior chamber, retinal and optic disc edema, retinal folds, and choroidal detachment. After cataract surgery, persistent hypotony is most often the result of wound leak, occult cyclodialysis, or persistent inflammation<sup>[10]</sup>. Alexander *et al*<sup>[11]</sup> reported hypotony after pars plana vitrectomy can occur on day 1 after surgery. Shingleton *et al*<sup>[12]</sup> reported 6% of patients develop hypotony immediately after cataract surgery. This suggesting that better treatment of wound construction can improve the outcomes of surgery. The amount of hypotony is related to the wound construction and the size. The improper incision showed the tendency of lower postoperative intraocular pressures<sup>[13]</sup>. Eyes with hypotony after clear corneal cataract surgery may be at risk for gaping wound edges, thus may increase the risk of endophthalmitis resulted from the inoculation of organism into the aqueous<sup>[14]</sup>. It is estimated that 1.6% of cases required a suture due to a

**Table 1 Demographic data**

Demographic characteristic	N	%
Age (mean±SD)	51.92±8.37	
Sex		
F	76	46.91%
M	86	53.09%
Phacoemulsification + SO removal	111	68.51%
MSICS + SO removal	51	31.48%

SD; Standard deviations; MSICS; Manual small incision cataract surgery; SO; Silicone oil.

**Table 2 Hypotony, leakage and choroidal detachment as post surgery complications of phacoemulsification combined with silicone oil removal and MSICS combined with silicone oil removal**

Complication	Phacoemulsification+SO removal		MSICS+SO removal		P
	N	%	N	%	
Hypotony	21	18.91	8	15.68	0.666
Leakage	0	0	1	1.96	0.314
Choroidal detachment	1	0.90	1	1.96	0.531

MSICS; Manual small incision cataract surgery; SO; Silicone oil.

**Table 3 Retinal redetachment after silicone oil removal combined with phacoemulsification and MSICS 1wk after surgery and 1mo after surgery**

Retinal redetachment	Phacoemulsification+SO removal		MSICS+SO removal		P
	N	%	N	%	
1wk after surgery	0	0	4	7.84	0.009
1mo after surgery	8	7.20	9	17.64	0.055

MSICS; Manual small incision cataract surgery; SO; Silicone oil;  $P < 0.05$  considered as statistically significant.

wound leakage. The leak also may occur on scleral tunnel and limbal<sup>[15]</sup>. A prospective randomized clinical trial by Hayashi *et al*<sup>[16]</sup> reported that the self-sealing capability and water tightness are better in scleral tunnel incision than in clear corneal incision. In our study, there are 6 patients with hypotony in phacoemulsification combined with silicone oil removal, but no evidence of leakage. In MSICS combined with silicone oil removal group two patients had hypotony with one case had wound leakage and choroidal detachment occurred. No hemorrhagic choroidal detachment reported in this study. Wong *et al*<sup>[17]</sup> reported 5 cases of complications that occurred during vitrectomy surgery associated with leakages of intraocular fluid through a previously created clear corneal incision after cataract surgery. Choroidal detachments occurred in 4 of 5 eyes (80%), and a retinal detachment was found in 4 of 5 eyes (80%). Three cases (75%) resolved without further surgical intervention<sup>[17]</sup>. Rates of hypotony after silicone oil removal itself were reported between 7.3% and 19% in the literature<sup>[18]</sup>.

Wound leak may be happened either in wound site of cataract surgery or in sclerotomies due to vitreoretinal surgery. In previously vitrectomized eyes, prior scleral incision and the fibrous tissue formed during healing process might interfere scleral elasticity, thereby increasing leakage rate. Woo *et al*<sup>[19]</sup> also reported that vitrectomized eyes in people with age more than 50 have more risk to be hypotony. Repeat vitrectomy was usually done in advance cases of retinal redetachment. Vitreous base dissection and repeated manipulation in almost same or near sclerotomy site might also

increase the risk of wound leak<sup>[5]</sup>. In this study, there is no significant difference of age between the two groups. Eyes with repeat vitrectomy more than twice or with range less than 3mo were excluded. Variant of retinal condition and manipulation between two groups was also has no significant difference. Eyes with silicone oil exchange or gas injection at the end of surgery were also excluded due to difference surface tension.

In this study, there were 21 cases of hypotony, 15 of them happened after phacoemulsification, and the other 6 cases were after MSICS. There was no significant difference between eyes with phacoemulsification and MSICS ( $P > 0.05$ ). Hypotony might be happened due to undetectable small leakage at wound site. Clear corneal incision, when it was made correctly, supposed to be watertight even to high level of IOP. However, poor wound construction, prolonged surgery, and aggressive manipulation can interfere the anatomic site. All eyes that have been done cataract surgery in this study were continued with retinal surgery. Most cases were silicone oil evacuation with or without additional manipulation such as peeling of the pre-retinal membrane, endolaser, and fluid gas exchange. Some of the manipulations are done with high intraocular pressure. Wound heal may need several days to completely be sealed. In this study, almost all eyes were back to normal pressure in 1wk after surgery.

There were two cases of choroidal effusion. Choroidal effusion is an accumulation of fluid from choriocapillaries into suprachoroidal space by creating choroidal detachment<sup>[20]</sup>. Because of close apposition of the choroid to the sclera, in a

normal eye, the suprachoroidal space is not existed in the normal eye. However, in pathologic condition due to abnormal ocular fluid dynamics and also hydrostatic pressure gradients, fluid can move and accumulate to that potential space resulting in choroidal detachment. A decrease in IOP in hypotonic condition allows fluid to accumulate in the interstitial spaces, while inflammation increases the permeability of the choriocapillaries resulting accumulation of fluid in the potential space<sup>[21]</sup>. In this study, one case was happened in post - MSICS and the other in post - phacoemulsification. In eye post-MSICS group, there was a sign of wound leak at scleral tunnel incision. Additional sutures might need to be done. The other case happened in an eye post-phacoemulsification with there is no sign of wound leak. Severe inflammation might increase the permeability of choriocapillaries or induce ciliary shutdown.

Studies reported retinal redetachment developed in 20% of cases after silicone oil removal reported by Zafar *et al*<sup>[22]</sup>. Our study results find that number of retinal redetachment in 1wk post surgery was statistically significant ( $P=0.009$ ) between phacoemulsification and MSICS group, but not statistically significant in 1mo after surgery. Retinal redetachment after cataract surgery combined with silicone oil removal may not depend on the technique of cataract surgery itself.

There were some limitations of this study. The number of cases was too small to evaluate the incidence of rare case such as choroidal effusion and suprachoroidal hemorrhage. There was also no explanation in this retrospective data about which eyes need to be sutured due to wound leak at the sclerotomy sites. Larger number of cases in future studies would help to find the incidence of choroidal effusion and suprachoroidal hemorrhage after some different techniques of cataract surgery in vitrectomized eyes.

MSICS combined with silicone oil removal has non-inferiority result to phacoemulsification combined with silicone oil removal in hypotony, leakage, choroidal detachment and retinal reattachment rate. However, Proper surgical technique and wound construction in cataract surgery can minimize such complications.

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