The Efficacy of 360 Degree Laser Retinopexy in Preventing Retinal Re-detachment After 23-gauge Vitrectomy for Primary Repair of Rhegmatogenous Retinal Detachment

Thesis

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Ahmed Zakria El-Tayar

List of Contents

List of Tables

List of Figures

List of Figures Cont...

List of Figures Cont...

List of Figures Cont...

List of Abbreviations

Abb.	Full term
5-FU	5-fluorouracil
AUC	Area under curve
BCVA	Best corrected visual acuity
bFGF	Basic fibroblast growth factor
BRB	Blood retinal barrier
DD	Disc diameter
DLP	Demarcation Laser photocoagulation
ECCE	Extracapsular cataract extraction
EGF	Epidermal growth factor
HMGP	Hand Motion good projection
ICAM-1	Intercellular adhesion molecule 1
IFN-γ	Interferon γ
IGF-1	Insulin-like growth factor 1
IL-1	Interleukin 1
IOP	Intra ocular pressure
IQR	Inter-quartile range
LASIK	Laser in situ keratomileusis
LRRs	Leucine-rich repeats
NAC	N-acetylcysteine
NPV	Negative predictive value
NSR	Neurosensory retina
PDGF	Platelet derived growth factor
PFCL	Perfluorocarbon liquids
PPV	Pars plana vitrectomy
PR	Pneumatic retinopexy
PVD	Posterior vitreous detachment
PVR	Proliferative vitreoretinopathy
RA	Retinoic acid
ROC	Receiver operating characteristic curve
RPE	Retinal pigment epithelium

List of Abbreviations Cont...

Abb.	Full term
RRD	Rhegmatogenous retinal detachment
SB	scleral buckle
SD	Standard deviation
SiO	Silicone oil
SPSS	Statistical Package for Social Science
TGFß	Transforming growth factor ß
TNF-*a*	Tumour necrosis factor *a*
UCVA	Uncorrected visual acuity

INTRODUCTION

Retinal detachment (RD) refers to separation of the inner layers of the retina from the underlying retinal pigment epithelium (RPE) Symptoms of RD may include (photopsia, visual field defect, floaters).

Retinal detachment occurs by 3 basic mechanisms and thus is classified into the following three main types (Rhegmatogenous, tractional retinal detachment, exudative retinal detachment)[1-3].

Rhematogenous Retinal Detachment (RRD) is a serious, potentially sight threatening condition. If it does not promptly and effectively treated, it may leave the eye dysfunctional and atrophic. Retinal detachment occurs in 1 in 10,000-20,000 person/year. Successful repair of RRD has been reported since the 1930s, and numerous techniques have resulted in improving the surgical outcomes. Primary retinal detachment repair techniques include sclera buckling, pars plana vitrectomy, and pneumatic retinopexy. Although all techniques show high re-attachment rates, each procedure has its own drawbacks and complications [4-6].

Pars Plana Vitrectomy (PPV) was described by **Machemer et al**. in the early 1970s[3,4,7]. The first PPV involved a multifunction single-port device, 17-gauge (G) in diameter, which was introduced through a 2.3 mm sclerotomy

site. The quest to find ways to shorten operative time and to minimize trauma to the eye has led to considerable improvement in surgical techniques and equipment[8-10]. In **2002, Fujii et al.** presented a set of tools with a diameter of 25-G, followed by the 23-G system, which was introduced by **Eckardt et al. in 2005**. An important part of vitrectomy for RRDs entails performing retinopexy around all existing breaks in order to insure their long-term closure[11]. Laser retinopexy works by creating a chorioretinal scar that seals the break, preventing fluid from re-entering behind the retina causing it to re-detach. Vitreous substitutes, such as gas or oil, help in sealing any breaks and keeping the retina attached until the laser scar is strong enough, after which the presence of the tamponading agent is no longer necessary, and then its spontaneous absorption or surgical removal is recommended. Removal of silicone oil (SiO) is important, as most anterior segment complications associated with its use is related to the duration that oil is retained in the eye. After removal of SiO the main risk is the possibility of retinal re-detachment [12,13].

Surgical modalities such as placement of a supplementary sclera buckle, panretinal photocoagulation and 360° degree retinopexy are used in an attempt to decrease the rate of retinal re-detachment after removal of the tamponading agent. Intraoperative 360° degree laser application is quick and easy, and for a long time, has been regarded as useful in reducing re-detachment rates. Studies have shown that the

major causes of retinal re-detachment are missed breaks, opening of old breaks due to persistent or renewed traction or new break formation. Theoretically, application of laser retinopexy circumferentially may serve to reduce the rate of re-detachment by walling off any detachment that might occur anterior to the barrage. Also any missed breaks might be treated unintentionally sealing off [(14)].

AIM OF THE WORK

The aim of this study:

Primary outcome:

To asses the effect of 360° laser retinopexy on prevention of recurrence of detachment after SiO removal.

Secondary outcome:

1. To asses the success rate of surgery.
2. To asses the risk factors for recurrent retinal detachment.

Chapter 1

PATHOGENESIS OF RHEGMATOGENOUS RETINAL DETACHMENT

Rhegmatogenous retinal detachment (RRD) remains a significant cause of visual morbidity[15].

The diagnosis of RRD is based on a case definition of "a full thickness break in the neurosensory retina with a surrounding area of sub-retinal fluid extending greater than 2 disc diameters"[16].

Retinal detachment occurs when the neurosensory retina (NSR) separates from the retinal pigment epithelium (RPE) and fluid accumulates within this potential space. Although there are no anatomic junctions between the NSR and RPE, weak mechanical forces (e.g., fluid pressures, vitreous, inter-photoreceptor matrix, interdigitations between the microvilli and the photoreceptors) and metabolic forces (e.g., oxygenation) promote adhesions between these two layers. Once these forces of attachment are overwhelmed, a retinal detachment can occur[6].

Rhegmatogenous retinal detachment (RRD), the disease process **Gonin** studied in the early 20th century, remains the most common cause of retinal detachment. Three pre-requisites for the development of RRD are 1) liquefaction of the vitreous, 2) tractional forces that produce a retinal break, and 3) a retinal break through which fluid gains access into the subretinal space[17].