Influence of Silicone Oil Tamponade after Vitrectomy on Intraocular Pressure

Thesis

Submitted for Partial Fulfilment of
Master Degree in **Ophthalmology**

Presented by

Amany Aboelmagd Mohamed Tawfik
M.B.B.CH
Faculty of Medicine, Cairo University

Supervised by

Prof. Dr. Negmeldin Helal Abdallah
Professor of Ophthalmology
Faculty of Medicine, Ain Shams University

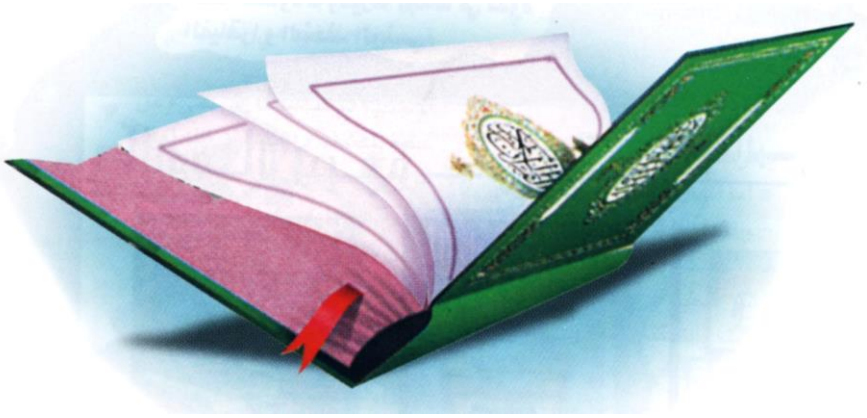
Prof. Dr. Lamia Salah Elewa
Professor of Ophthalmology
Faculty of Medicine, Ain Shams University

Dr. Noureldin Hussein
Lecturer of Ophthalmology
Faculty of Medicine, Ain Shams University

Faculty of Medicine - Ain Shams University
Cairo-Egypt
2019

بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ
عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ



صدق الله العظيم

[سورة: التوبة - الآية: ١٠٥]

Acknowledgments

First and foremost, I feel always indebted to ***Allah*** *the Most Beneficent and Merciful.*

I wish to express my deepest thanks, gratitude and appreciation to ***Prof. Dr. Negmeldin Helal Abdallah****, Professor of Ophthalmology, Faculty of Medicine, Ain Shams University, for his meticulous supervision, kind guidance, valuable instructions and generous help.*

Special thanks are due to ***Prof. Dr. Lamia Salah Elewa****, Professor of Ophthalmology, Faculty of Medicine, Ain Shams University, for her sincere efforts, fruitful encouragement.*

I am deeply thankful to ***Dr. Noureldin Hussein****, Lecturer of Ophthalmology, Faculty of Medicine, Ain Shams University, for his great help, outstanding support, active participation and guidance.*

I would like to express my hearty thanks to all my family for their support till this work was completed.

Amany Aboelmagd Mohamed Tawfik

List of Contents

List of Tables

List of Figures

List of Figures cont...

List of Figures cont...

List of Abbreviations

Abb.	Full term
AC	*Anterior chamber*
ADP	*Adenosine diphosphate*
ATP	*Adenosine triphosphate*
C3F8	*Perfluoropropane gas*
CCT	*Central corneal thickness*
CN II	*Second cranial nerve*
GAT	*Goldman applanation tonometer*
IOP	*Intraocular pressure*
IV	*Intravenous*
MVR	*Microvitreoretinal*
MW	*Molecular weight*
PDMS	*Polydimethyl siloxane*
PDR	*Proliferative diabetic retinopathy*
PFCLS	*Perfluorocarbon liquid*
PI	*Peripheral irodetomy*
PPV	*Pars plana vitrectomy*
PT	*Prothrombin time*
PVR	*Proliferative vitreoretinopathy*
ROSO	*Removal of silicone oil*
RPE	*Retinal pigment epithelium*
SD	*Standard deviation*
SF6	*Sulfur hexafluoride gas*
SG	*Specific gravity*
SI-O	*Silicon-oxygen bond*
SO	*Silicone oil*
SOI	*Silicone oil injection*
SVCT2	*Sodium dependant vitamin C transporter 2*
TM	*Trabecular meshwork*
VISC	*Vitreous infusion suction cutter*

INTRODUCTION

Glaucoma is a complicated disease in which damage to the optic nerve leads to progressive, irreversible vision loss. Glaucoma is the second leading cause of blindness ***(Weinreb et al., 2004)***.

Risk factor for glaucoma include increased IOP greater than 21 mmHg, family history, high blood pressure and obesity. However some may have high IOP for years and never develop damage ***(Mantravadi et al., 2015)***. Conversely, optic nerve damage may occur with normal pressure, known as normal tension glaucoma.

There are several different types of glaucoma, including open angle glaucoma and acute angle closure glaucoma. The treatment of glaucoma may include medication, surgery or laser surgery ***(Mi et al., 2014)***.

Vitrectomy is an operation to remove the vitreous gel from the eye. Common indications include retinal detachment, vitreous hemorrhage, macular hole and intraocular foreign body ***(Duker et al., 2013)***.

Silicone oil is a synthetic polymer made of repetitive (Si-O units) and is chemically similar to silicone rubber, except that silicone oil polymer chains are not cross-linked and are shorter than those of silicone rubber ***(Krumpfer et al., 2011)***. Silicone

oil was first introduced by Cibis in 1962 for vitreoretinal surgery ***(Jabbour et al., 2018)***.

Today silicone oil is an important adjunct for internal tamponade in a wide variety of vitreoretinal surgeries. Silicone oil injected in the vitreous cavity ensures stability of the eye ball, restores the initial intraocular anatomical relations and slows down further proliferation, it is well tolerated and because of its transparency it enables easier postoperative visualization of the posterior segment ***(Rhodes et al., 2002)***. Apart from the possible development of band keratopathy and corneal decompensation one of the major side effects of the silicone oil is secondary IOP elevation ***(Güngel et al., 2005)***.

Secondary glaucoma can occur at any time in the postoperative period and may range from mild and transient to severe and sustained IOP spikes, resulting in loss of vision ***(Jindal et al., 2009)***.

Mechanisms responsible for developing secondary glaucoma are pupillary block ***(Tarongoy et al., 2009)***, emulsified silicone oil bubbles in the chamber angle ***(LA HEIJ et al., 2001)***, angle closure by anterior synechial, inflammation, rubeosis iridis and idiopathic IOP rise after silicone oil instillation. The most of these cases are well controlled by anti-glaucoma therapy, whereas the minority of patients require evacuation of the silicone oil to normalize IOP and the most refractory cases mandate penetrating filtration surgery in order to stabilize the IOP in the long term ***(Al-Jazzaf et al., 2005)***.

Aim of the Work

The aim of this study is to determine the possible influence of the silicone oil (1000 cs) tamponade after vitrectomy on the intraocular pressure which is a major risk factor for developing secondary glaucoma and the effect of starting with anti-glaucoma therapy during the first 6 months postoperatively.

Chapter 1

ANATOMY

Anatomy of angle of anterior chamber of the eye:

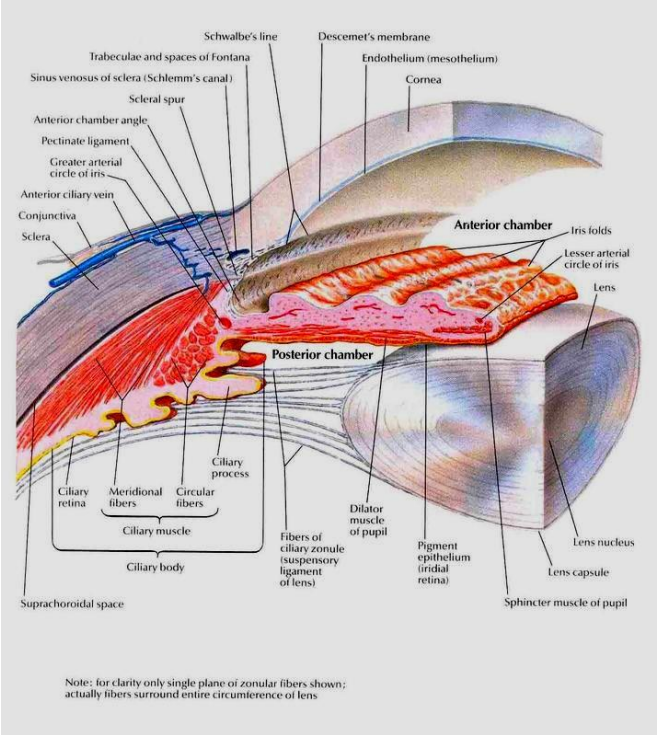


Fig. (1): Anatomy of anterior and posterior chamber ***(www.sciencedirect.com)***.

The anterior chamber of the eyeball is a small cavity lying between the cornea and the iris. It is filled with aqueous humor. Its volume is about 0.2 ml. Anterior chamber bounded anteriorly by the cornea and a small part of the sclera, posteriorly bounded by the anterior surface of the iris, anterior surface of the lens through the pupil and a part of the ciliary body ***(McKinney et al., 2018)***.

At the peripheral margin of the anterior chamber is the angle where the trabecular meshwork is located with its channels for the drainage of the aqueous humor ***(Goel et al., 2010)***.

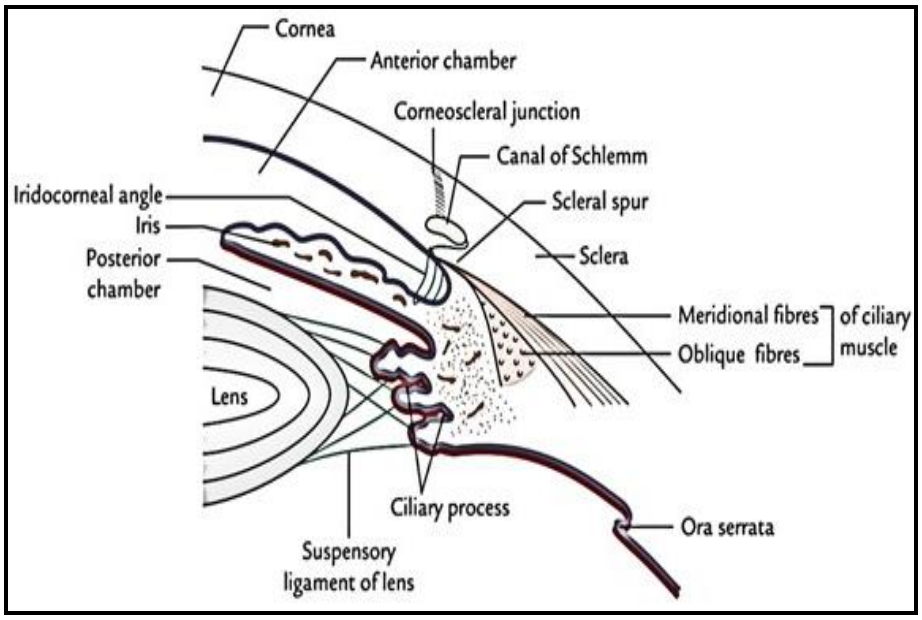


Fig. (2): Anatomy of angle of anterior chamber ***(www.earthslab.com)***.

The angle of the anterior chamber cannot be seen by direct inspection because of the opaque sclera and the corneoscleral limbus. Also light rays arising from the angle undergo total internal reflection ***(Pavan-Langston, 2008)***. Gonioscopy eliminates the corneal curve and allow light to be reflected from the angle ***(Quek et al., 2011)***.

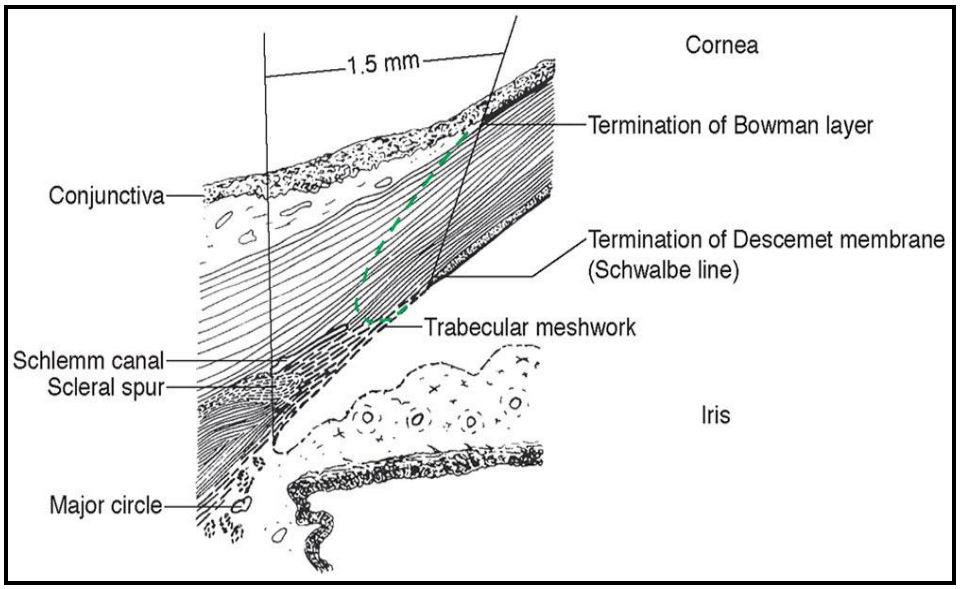


Fig. (3): Anterior chamber angle and limbus, depicting the concept of the limbus. *Solid lines* represent the limbus as viewed by pathologists; the *green dotted line* represents the limbus as viewed by anatomists ***(Hogan et al., 1971)***.

Anatomical structure of the angle by Gonioscopy:

Scleral sulcus and scleral spur:

Limbus is the transition zone between the cornea & sclera. On the inner surface of the limbus, there is an indentation or groove, which is known as the scleral sulcus. This scleral sulcus has a sharp posterior margin- the scleral spur & a sloping anterior wall which extends to the peripheral cornea. The ciliary body is attached to the scleral spur and there exists a potential space, the supra ciliary space, between ciliary body and the sclera. Iris inserts into the anterior side of the ciliary body and the part of the ciliary body between root of iris & scleral spur is known as ciliary band.