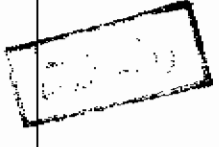
MANAGEMENT OF SURGICALLY PRODUCED ASTIGMATISM

Thesis
Submited For Partial Fulfilment
Of the Master Degree in
Ophthalmology

By

Dr. MOHAMED SEDKY NOUR EL DIEN
M.B., B.Ch.

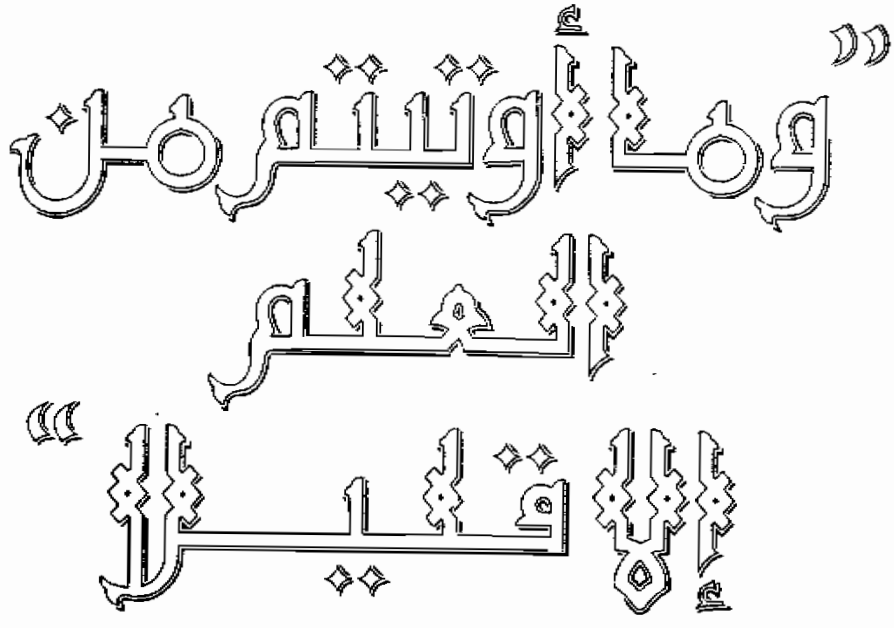


Supervised By
Prof. Dr. MOHAMED OMAR RASHED
Prof. of Ophthalmology
Ain Shams University

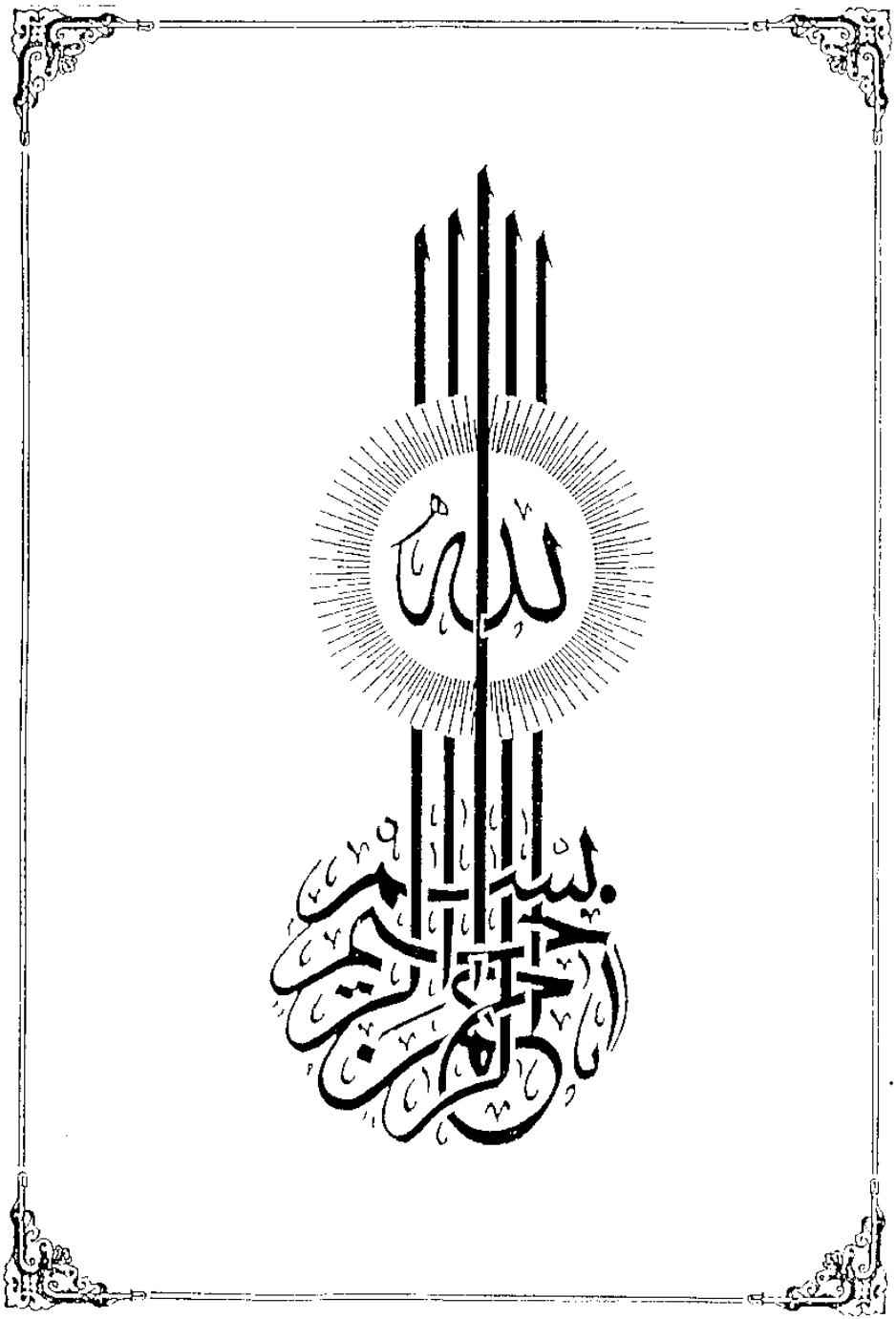
Faculty of Medicine
Ain Shams University

1986

بسم الله الرحمن الرحيم



صدق الله العظيم



TO

MY PARENTS

&

MY WIFE

ACKNOWLEDGEMENT

I would like to express my deepest gratitude and appreciation to my esteemed Prof. Dr. Mohamed Omar Rashed, Professor of Ophthalmology, Faculty of Medicine, Ain Shams University, for giving me the privilege to work under his supervision and for his guidance, encouragement and patience throughout the whole work.

Lastly, I would like to thank all who participated in one way or another to allow this work to come to this final form.

CONTENTS

INTRODUCTION

INTRODUCTION

Postoperative astigmatism has demanded the attention of eye surgeons for decades. There has been much confusion in explaining the pathophysiology of the postoperative changes in corneal curvature.

Recently, consideration of the postoperative astigmatism after cataract surgery was renewed in minds of ophthalmologists, particularly with the increased use of intraocular lenses, as well as the extended wear contact lenses, an intraocular lens could be inserted to correct an aphakic situation, still if in doing so a large astigmatic error was created, this might become a chief complication of cataract surgery.

On the other hand and despite the improvement in microsurgical technique, finer suture materials, and needles, the use of the operative microscopes, the ability to recognize and to treat immunological graft rejection, also the development of new drugs to control the intraocular pressure, or protecting the corneal endothelium, all these factors have led to a very high success ratio in obtaining a clear corneal graft. Still a major problem today after keratoplasty is the postoperative astigmatism.

So, this work will entail a review of some literatures concerning the factors which are believed to play a critical role in producing this sort of astigmatism, and different methods used to minimize it.

AIM OF THE WORK

This introduced thesis aims to review the literature which handles the causes and management of astigmatism as being a surgical problem, since it is now considered one of the major operative problems following mostly the anterior segment eye surgery.

So one of the goals to achieve good results after eye surgery is to manage to control this operative problem.

ANATOMY OF THE CORNEA

The cornea forms the anterior sixth of the outer tunic of the eye. The main refraction of light occurs of the anterior surface of the cornea. The diapeteric power of the cornea ranges between 42 and 48 D., while the radius or curvature between 7.9 and 6.9 mm., therefore each 0.1 mm. decrease in radius of curvature corresponds to 0.6 D. increase in power of the cornea.

When viewed anteriorly, the cornea has a slightly elliptical shape because the greater extension of limbal tissue onto the cornea superiorly and inferiorly, the vertical diameter is about 10.6 mm. while the horizontal diameter is about 11.7 mm., when viewed posteriorly, the cornea is circular with a diameter of 11.7 (Rice et al, 1984).

SURGICAL ANATOMY OF LIMBUS

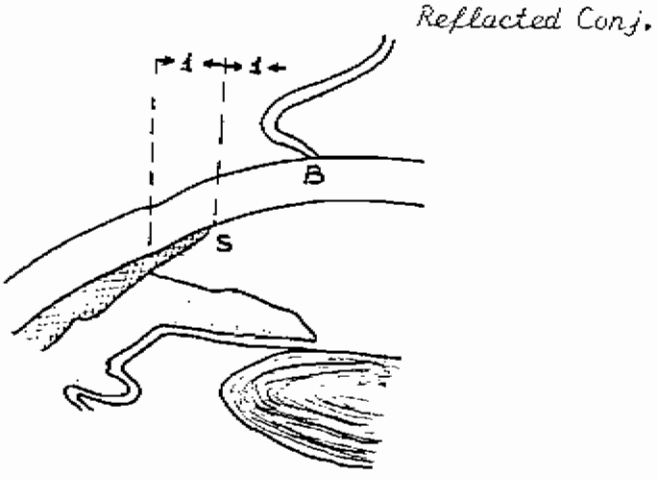
Surgical limbus is approximately 2 mm. wide (Fig. A, B). The anterior boundary of the limbus is located at the most anterior point where a limbus based conjunctival flap can be reflected, this anterior border of surgical limbus overlies

the termination of Bowman's membrane just posterior to this, there is a slightly blue area, about 1 mm. wide, which will blend with a whitish area, that is also about 1 mm., wide. The junction of the blue and the white areas midlimbal line overlies the end of Descemet's membrane or Schwalbe's line. The blue portion overlies a clear cornea, while the whitish one overlies the trabecular meshwork.

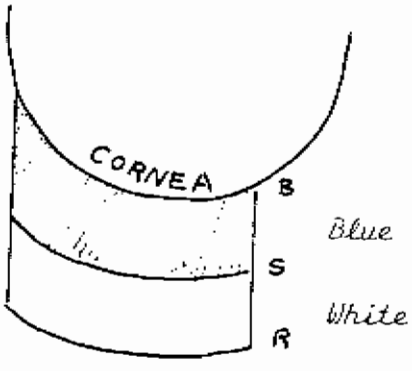
Finally the posterior border of the surgical limbus lies over the scleral spur or the root of the iris. (Rice et al, 1984).

The limbus is wider above and below and narrower horizontally. (Jaffe, 1976).

Thus a cataract incision may be posterior limbal, commencing over Schwalbe's line, or anterior limbal just posterior to the termination of Bowman's membrane. In addition, the incision may be scleral or corneal.



(Figure A.)



(Figure B.)

B = Bowman's membrane.
S = Schwalbe's line.
R = Root of iris.

(Jaffe, 1976).

SURGICAL INDUCED ASTIGMATISM

There have been a number of studies in the last few years evaluating the factors which influence post cataract astigmatism (White and Stern, 1971; Samples and Binder, 1984).

The most important factors are:-

Incision: type, length and location.

Suture : technique, length, elasticity and material.

While other factors include: cautery, wound slippage, biologic factors.

Jacobi and Strobel (1985) have tried many different procedures for incision and wound closure to obtain a safe and easy wound opening and closure and good functional results.

By safe is meant no bleeding intraoperatively and no wound dehiscence postoperatively. Easy means a technique which can be performed by the average cataract microsurgeon in reasonable time, good functional results mean a high percentage of cases without postoperative corneal astigmatism.

The pattern of surgically induced astigmatism and several methods to control it were started at the end of the last century (Colvard, et al., 1980), wound slide in a classical cataract

extraction section usually causes a fairly regular astigmatism against the rule. The nearer the wound to the centre of the cornea, the greater the astigmatism is. It follows that traumatic laceration near the corneal periphery usually cause regular astigmatism with flattening of the meridian at right angles to the scar. This is equivalent to a convex (+) cylindrical with its axis parallel to the wound.

Wound closure has become much more secure and accurate since the advant of microsurgery, this has greatly reduced the incidence of postoperative complications such as hyphaema, iris prolapse, wound leakage, and shallow anterior chamber, which are related to defective wound healing.

However, firm wound closure can induce astigmatism, and in cataract surgery, contrary to previous experience, this is usually with the rule, (Roper-Hall, 1982).

Many papers have been published on this surgically induced astigmatism and how to control it (Jaffe, 1971). Most of them consider ways in which it can be prevented by surgical technique and by intraoperative keratometry.

Careful realignment and opposition of the wound while suturing can make it watertight without being overtightened.

During closure judgement is assisted by the presence of an air bubble in the anterior chamber which highlights stress lines in the cornea if the suture is too tight or the wound misaligned.

In recent years various forms of keratometers have been designed for use with operating microscope in the hope of obtaining the desired firmness and regularity of wound closure so that an ideal postoperative refraction results. Accuracy is limited with simple keratometers, which utilise an illuminated ring reflecting a circle of light from the corneal surface, and up to 3 D., of astigmatism may be present even when the reflection appears to indicate a spherical form. This is litter or no better than surgical control under the microscope alone (Samples and Binder, 1984).

More accurate keratometers can be used during planned surgery (Colvard, et al., 1980), but even if the desired corneal curvature is obtained at the end of the operation the final postoperative refraction is still not fully predictable. Conditions at the end of surgery are abnormal, healing processes are subject to many variables, and these often lead to changing refraction.

So, the following opinion was reached by Roper-Hall (1982), since the final refractive error after full-thickness corneal