

*Effect of Argon Laser Trabeculoplasty
on Subsequent Trabeculectomy*

Thesis

Submitted in Partial Fulfillment of the
M.D. Degree in Ophthalmology



By

Khaled Hanafy Faheem
M.B., B.ch.

Under Supervision of

617.741
H. H.
Prof. Dr. Gamal Ahmed Barhoma
Professor of Ophthalmology,
Cairo University

612-5
Prof. Dr. Mostafa Mostafa Bahgat
Professor of Ophthalmology,
Cairo University

Prof. Dr. Ezz-Eldin Helmy Helaiel
Professor of Anatomy,
Electron Microscopic Unit
Ain-Shams University

Faculty of Medicine
Cairo University
1996

617.741
H. H.

Acknowledgments

I would like to express my deepest gratitude to Prof. Dr. *Gamal Ahmed Barhoma*, Professor of Ophthalmology, Cairo University. for giving me the honor to work under his supervision, for his valuable support, constructive criticism and guidance.

I am very grateful to Prof. Dr. *Mostafa Mostafa Bahgat* Professor of Ophthalmology, Cairo University, for his continuous encouragement. Indeed, The idea of the work was suggested by him.

My greatest thanks to Prof. Dr. *Ezz Eldin Helmy Helaiei* Professor of Anatomy, Electron Microscopic Unit, Ain- Shams University, for his support and valuable advice.

Many thanks to Dr. *Ibrahim Hegazy*, Professor of Public Health, Cairo University for his guidance and help in Performing the statistical part of this study.

My deep thanks to all members of Ophthalmology department, *Mataria teaching hospital* for their active share and participation that make this work possible.



To My Parents

To My Wife

To My Children

Mahmoud, Ahmed and Salma

List of abbreviations

| | |
|------|--------------------------------|
| TM | Trabecular meshwork. |
| AM | Electron microscope. |
| ALT | Argon laser trabeculoplasty. |
| IOP | Intraocular pressure. |
| POAG | Primary open-angle glaucoma. |
| PAS | Peripheral anterior synechiae |
| CME | Cystoid macular edema. |
| ATM | Anterior trabecular meshwork. |
| PTM | Posterior trabecular meshwork. |

List of Plates

| | Page |
|---|-------------|
| 1 Moderate disc cupping. | 74 |
| 2 Moderate disc cupping. | 75 |
| 3 Severe disc cupping . | 76 |
| 4 Severe disc cupping. | 77 |
| 5 Moderate field defect. | 79 |
| 6 Moderate field defect. | 80 |
| 7 Moderate field defect. | 81 |
| 8 Severe field defect. | 82 |
| 9 Severe field defect. | 83 |
| 10 Severe field defect. | 84 |
| 11 Diffuse bleb. | 93 |
| 12 Localized Bleb. | 94 |
| 13 Localized encysted bleb. | 95 |
| 14 Postoperative iritis. | 102 |
| 15 Postoperative complicated cataract.. | 104 |

List of Tables

| | page |
|--|------|
| 1 Mean age among the examined groups. | 65 |
| 2 Age distribution among the examined groups | 66 |
| 3 Sex distribution among the examined groups | 68 |
| 4 Age and sex distribution among the examined groups. | 68 |
| 5 Types of combination of preoperative medications . | 69 |
| 6 Duration of preoperative medications. | 70 |
| 7 Preoperative intraocular pressure. | 71 |
| 8 Grades of angle width. | 72 |
| 9 Preoperative state of the optic disc. | 73 |
| 10 Field changes among the examined groups. | 78 |
| 11 Summary of preoperative data. | 85 |
| 12 Summary of follow up of IOP over 6 months. | 88 |
| 13 The condition of postoperative bleb. | 91 |
| 14 Shallow anterior chamber in early postoperative period. | 98 |
| 15 Postoperative iritis among the examined groups. | 101 |
| 16 Postoperative development of cataract. | 103 |
| 17 Early failure among the examined groups. | 105 |
| 18 Frequency of late failure among the examined groups. | 106 |
| 19 Summary of published effects of ALT on TM. | 140 |

List of figures

| | | |
|-------|---|---------|
| 1 | Structure of the angle of the anterior chamber. | 6 |
| 2 | Different layers of the outflow system.. | 8 |
| 3 | Light micrograph of TM. | 9 |
| 4 | Electron micrograph of TM. | 10 |
| 5 | The walls of Schlemm's canal. | 13 |
| 6 | Electron micrograph of the endothelial lining of Schlemm's canal. | 14 |
| 7 | Trabeculocanalicular and Uveoscleral flow. | 17 |
| 8 | TM and Schlemm's canal at different level of IOP. | 21 |
| 9 | Giant vacuole in the endothelial lining Schlemm's canal. | 24 |
| 10 | Age distribution among the examined groups. | 67 |
| 11 | Follow up of IOP over 6 months. | 89 |
| 12 | Follow up of IOP over 6 months. | 90 |
| 13 | Condition of postoperative bleb. | 92 |
| 14:15 | Shallow anterior chamber in early postoperative period. | 99:100 |
| 16 | Early and late failure. | 107 |
| 17 | Postoperative complications. | 108 |
| 18:22 | TM examined by light microscope after ALT. | 111:115 |
| 23:32 | TM examined by electron microscope after ALT. | 116:125 |

Content

| | Page |
|-------------------------------------|--------|
| I Introduction. | (1) |
| II Aim of the work. | (3) |
| III Review of Literature. | |
| - Aqueous humor outflow. | (4) |
| . Anatomy. | (5) |
| . Physiology. | (16) |
| . Pathophysiology of POAG. | (25) |
| - ALT (mechanism of action). | (28) |
| - Technique of ALT. | (32) |
| - Complications of ALT. | (33) |
| - Trabecular meshwork cellularity. | (45) |
| - Electron microscopic studies. | (50) |
| IV Material and methods. | (57) |
| V Results. | (63) |
| VI Discussion. | (126) |
| VII Conclusion and Recommendations. | (141) |
| VIII Summary. | (144) |
| IX References. | (146) |
| X Arabic summary. | |

Introduction

Introduction

Despite the current modalities of medical and surgical therapy, patients still become blind from glaucoma, apparently due to the insufficient pressure reduction.

Argon laser trabeculoplasty (ALT) has been successful in treating cases with open-angle glaucoma when maximal tolerated medical therapy had been ineffective (Ticho and Nesher, 1989). It is clear that ALT reduces the need for invasive surgery (Thomas et al., 1982) or at least postpone it (Gilbert et al., 1986). The success rate of ALT as published in literature ranged between 46% and 94% over 5 years of follow-up (Ticho and Nesher, 1989). While these results are encouraging, a significant number of patients still require filtration surgery following ALT (Schoenleber et al., 1987).

The effect of ALT on subsequent filtration surgery is controversial. Some authors found no recognized difference in the response to filtration surgery following ALT (Schoenleber et al., 1987). While Perkins et al., (1986) found that the success rate of filtration surgery without prior ALT is higher than with prior ALT.

Post-laser inflammatory changes can have a devastating effect on filtration surgery as evidenced by the low success rate of filtration surgery in glaucoma due to uveitis (Krupin et al., 1982). Alteration of structural

anatomy with damage to the trabecular meshwork due to ALT may adversely affect the outcome of filtration surgery (Schoenleber et al., 1987).

Electron microscopic studies of trabeculectomy specimens from eyes that received laser photocoagulation of trabecular meshwork prior to trabeculectomy have shown several changes that may account for possible failure of subsequent filtration surgery.

Aim of the work

Aim of the work

The aim of this work was to study the possible effects of argon laser trabeculoplasty on the subsequent filtering surgery that may be required in case of failure of laser procedure. To demonstrate that effect it was our aim to compare the success rate and complications of initial filtering surgery and that following argon laser trabeculoplasty. The study included histopathological examination (in selected cases) of trabecular meshwork (TM) using light and electron microscopes.

Review of Literature