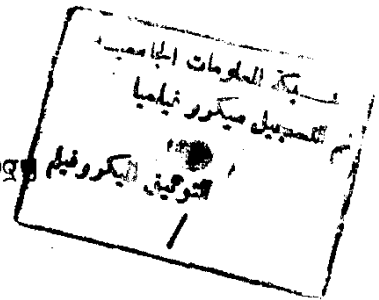


# STUDY OF DIODE LASER (USES & APPLICATIONS)

*Essay*

Submitted in partial fulfilment  
of the Master degree in Ophthalmology



by

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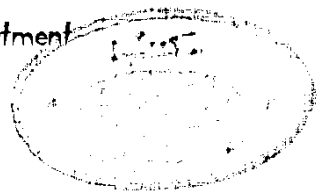
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1994

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



صالح كبريت  
محمد محمد الدين محمد سليم  
محمد الدين



To  
my  
family

## Acknowledgments

*I would like to express my sincerest gratitude to Prof. Dr. M. Omar Rashed, Professor and Chairman of Ophthalmology Department, Faculty of Medicine, Ain Shams University for proposing the topic of this essay. He was a constant source of guidance, constructive criticism and invaluable encouragement through out development of this work.*

*I do appreciate the hard effort he did to harmonise and homogenise the different parts of this essay.*

*I am really indebted to Dr. Ahmad Abu El Naga, Assistant Prof. of Ophthalmology, Ain Shams University, for his valuable assistance, generous help, useful contribution, kind supervision and continuous encouragement through out the whole work.*

*I would like also to express my deep gratitude to Dr. Ahmed Darwish lecturer of ophthalmology Ain Sams University & Dr. Alla Fathy for thier great help in this work.*

*Lastly, I wish to extend my gratitude and thanks to all professors and staff members of the Ophthalmology Department, Ain Shams University, who contritribeted in deepening my knowledge in ophthalmology.*

# Contents

## I. Acknowledgements

## II. List of tables & Figures

## III. Introduction

### Page

|   |              |
|---|--------------|
| <i>1- Historical aspects of laser.....</i>                | <i>1-9</i>   |
| <i>2- General principles of laser .....</i>               | <i>10-24</i> |
| <i>3- Effects of laser on ocular tissues.....</i>         | <i>26-31</i> |
| <i>4- Structure &amp; Biophysics of diode laser .....</i> | <i>32-46</i> |
| <i>5- Diode laser convergence angle.....</i>              | <i>47-52</i> |

## IV. Diode laser & glaucoma

|   |              |
|---|--------------|
| <i>• Diode laser trabeculoplasty in treatment of primary<br/>open angle glaucoma and ocular hypertension.....</i> | <i>54-70</i> |
| <i>• Diode laser iridectomy.....</i>  | <i>71-76</i> |
| <i>• Diode laser cyclophotocoagulation.....</i>   | <i>77-78</i> |

## V . Diode laser & Retinal disorders

|  |                |
|--|----------------|
| <i>• Introduction .....</i>  | <i>79-86</i>   |
| <i>• Mode of delivery of diode laser through ocular media.....</i> | <i>84-86</i>   |
| <i>• Diode laser lesion.....</i>                                   | <i>91-99</i>   |
| <i>• Mode of laser application in various disorders.....</i>       | <i>99-100</i>  |
| <i>• Mchugh's study .....</i>                                      | <i>100-105</i> |

|  | <b>Page</b> |
|--|-------------|
| • <i>William simmedy's study</i> .....   | 105-107     |
| • <i>Diode laser for retinitis of prematurity</i> .....                                | 108-110     |
| • <i>Diode laser &amp; malignant tumours</i> .....                                     | 111-112     |
| • <i>Comparison between diode, argon, and Krypton<br/>laser photocoagulation</i> ..... | 113-119     |

## **VI. Other uses of diode laser**

|   |         |
|---|---------|
| <i>1- Measurment of axial length of the eye</i> ..... | 120-123 |
| <i>2- Photoablation of the cornea</i> .....           | 124     |
| <b>VI English summary</b> .....                       | 125-131 |
| <b>VII References</b> .....                           | 132-141 |
| <b>VIII Arabic summary</b> .....                      | 142     |

# List of tables & Figures

## I. Figures :

### 1- Introduction

|   | Page |
|---|------|
| <i>Fig 1-1 : Spontaneous emission of radiation.....</i>               | 12   |
| <i>Fig 1-2 : Fluorescence.....</i>                                    | 13   |
| <i>Fig 1-3 : Laser emission.....</i>                                  | 14   |
| <i>Fig 1-4 : Typical laser cavity.....</i>                            | 17   |
| <i>Fig 1-5 : Continuous wave laser.....</i>                           | 21   |
| <i>Fig 1-6 : Q switched mode.....</i>                                 | 22   |
| <i>Fig 1-7 : Mode locked laser.....</i>                               | 23   |
| <i>Fig 1-8 : Mechanism of stimulated light emission.....</i>          | 34   |
| <i>Fig 1-9 : Double heterojunction diode laser.....</i>               | 36   |
| <i>Fig 1-10 : Band structure detail.....</i>                          | 40   |
| <i>Fig 1-11 : Fabry - Perot resonator cavity for diode laser.....</i> | 43   |
| <i>Fig 1-12 : a - typical diode laser 40 emitter array.....</i>       | 46   |
| <i>b- Simplified diagram of :</i>                                     |      |
| <i>Semiconductor diode laser.....</i>                                 | 46   |
| <i>Diode laser array.....</i>   | 46   |
| <i>Fig 1-13 : Position of laser focus relative to fundus.....</i>     | 49   |



## **Tables**

### **A. Introduction**

|  | <b>Page</b> |
|--|-------------|
| <i>1- Table 1-1 : Mile stone of photocoagulation .....</i> | <i>3</i>    |
| <i>2- Table 2-1 : Procedure landmarks .....</i>            | <i>9</i>    |
| <i>Table 1-3 : Laser tissue interaction .....</i>          | <i>27</i>   |
| <i>Table 1-4 : CW diode laser wave length.....</i>         | <i>37</i>   |

### **B- Diode laser & glaucoma**

|   |           |
|---|-----------|
| <i>Table 2-1 : Changes in IOP induced by DLT.....</i> | <i>63</i> |
| <i>Table 2-2 : Reduction in IOP by DLT.....</i>       | <i>64</i> |

### **C- Diode laser & Retinal disorders**

|   |            |
|---|------------|
| <i>Table 3-1 : Comparison between diode laser &amp; cryotherapy<br/>in IOP.....</i> | <i>109</i> |
| <i>Table 3-2 : Comparison between argon, Krypton &amp; Diode<br/>laser .....</i>    | <i>117</i> |

### **D- Other uses of diode laser**

|   |            |
|---|------------|
| <i>Fig 4-1 : Optical principle of measurment of axial length of<br/>the eye .....</i> | <i>123</i> |
|---|------------|

## **List of Abbreviations**

|                       |  |
|-----------------------|--|
| <i>AD</i>             | : <i>Since the Christ was born</i>           |
| <i>ALT</i>            | : <i>Argon laser trabeculoplasty.</i>        |
| <i>BC</i>             | : <i>Before christ was born.</i>             |
| <i>BRVO</i>           | : <i>Branch retinal vein occlusion.</i>      |
| <i>CRVO</i>           | : <i>Central retinal vein occlusion</i>      |
| <i>CNVM</i>           | : <i>Choroidal neovascular membrane</i>      |
| <i>CW</i>             | : <i>Continuous wave.</i>                    |
| <i>DLT</i>            | : <i>Diode laser trabeculoplasty.</i>        |
| <i>Ga. Ai. As</i>     | : <i>Gallium. aluminum. arsenide.</i>        |
| <i>H<sub>2</sub>O</i> | : <i>water.</i>                              |
| <i>ILM</i>            | : <i>Internal limiting membrane</i>          |
| <i>IOP</i>            | : <i>Intraocular pressure</i>                |
| <i>IV</i>             | : <i>Intra venous.</i>                       |
| <i>nm</i>             | : <i>nano meter</i>                          |
| <i>PAS</i>            | : <i>Peripheral anterior synechia.</i>       |
| <i>PDR</i>            | : <i>Proliferative diabetic retinopathy.</i> |
| <i>POAG</i>           | : <i>Primary open angle glaucoma.</i>        |
| <i>PVR</i>            | : <i>Proliferative vitreoretinopathy.</i>    |
| <i>ROP</i>            | : <i>Retinitis of prematurity</i>            |
| <i>RPE</i>            | : <i>Retinal pigment epithelium</i>          |
| <i>SL</i>             | : <i>Slit lamp.</i>                          |
| <i>um</i>             | : <i>micrometer</i>                          |
| <i>W</i>              | : <i>Watt.</i>                               |



# I - Introduction

## **Introduction**

*The historical aspects of ophthalmic lasers are fascinating and exciting. The eyes, because of its precise structure, has been the recipient of a large amount of the transfer of technology from the physical to the biological science.*

*The effects of solar radiations was well known to the ancient, as the first description of central scotoma following solar burn of the retina was reported by **Theophilus Bonetus** (1620 - 1689) AD.*

***Czerny, Deutcmmann** investigated the use of either sun or carbon arc to produce lesion in the retina. **Maggior** focused sun light on two enucleated eyes and then examined the eyes histologically.*

*In 1940, **Moran Salas** performed numerous experiments on human and rabbits eyes, to use light coagulation therapeutically and it was published in 1950.*

*Concurrently **Meyer Schwickerath** published his first experience with light photo coagulation in 1949.*

*Between 1945 - 1956, beek arc was used as a photocoagulation source.*

*In 1965, the high pressure xenon lamp was used as a photocoagulation source and the xenon arc photocoagulation instrument pioneered by **Meyer Schwickerath**, was made commercially by **Ziess**.*

**"L'esperance'., 1989".**

*In 1960, **Maiman** constructed the first working laser, using ruby crystal with a mono chromatic emission of red light "693.4 nm", and it was used to treat a number of retinal conditions but less successful in treating proliferative diabetic retinopathy "PDR" .*

**"Mchugh et al., 1988".**

| Mile Stone of Photo Coagulation |  |
|---------------------------------|--|
| 400 BC                          | Plato recognized ocular damage by sun. |
| 1640 AD                         | Bontus warns of eclips blindness.      |
| 1845                            | Atomic bomb blindness.                 |
| 1946                            | Atomic bomb blindness research.        |
| 1948                            | Meyer-Schwickerath experiment          |
| 1956                            | Xenon- arc photocoagulation            |
| 1960                            | Advent of laser                        |

**Table I-I**

" quoted from L'esperance F.A. Ophthalmic laser, St. louis,  
the C.V. Mosby Company, Vol. 1:14. 1989"

*In 1968, Aiello and coworkers described the use of the ruby laser in treating PDR. Difficulty in producing a full thickness retinal coagulation, and the risk of subretinal haemorrhage with ruby laser, attributed to the short pulse duration "2 milliseconds", and the emitted red wave length, helped to stimulate the development of continuous wave "CW" gas ion laser to be used in ophthalmology.*

**"Mark and carmen., 1990"**

*The relative importance of wave length led to development of blue green CW argon laser photocoagulation by L'esperance in 1986, which became commercially available in 1971 and was in wide spread clinical use by 1975.*

*The early argon photocoagulator emitted more than 70% of their radiation in the blue "488 nm", which is close to the peak absorption of luteal pigments "460nm". Many early treatments of macular region using such system*