

LASER IN MANAGEMENT OF CANCER LARYNX

Essay Submitted for the Partial Fulfillment of the Master
Degree in Otorhynolaryngology-Head and Neck Surgery

By

Ehab Kamal Fawzi Hakim

M.B., B.Ch.

616.99422

E. K

Supervised by

5/7/12

Prof. Dr. Fouad Abbas Esmail

Professor of Otorhynolaryngology-Head and Neck Surgery
Faculty of Medicine-Ain Shams University

Dr. Hany Riad Mousa

Assistant Professor of Otorhynolaryngology-Head and Neck
Surgery

Faculty of Medicine-Ain Shams University

Dr. Hassan Wahba

Lecturer of Otorhynolaryngology-Head and Neck Surgery
Faculty of Medicine-Ain Shams University

**Faculty of Medicine
Ain Shams University**

1997



Acknowledgment

I was very impressed by the goodwill and generosity of spirit of all the contributors of this work,

I am greatly indebted to Prof. Dr. Fouad Abbas Ismail, Professor of Otolaryngology, Faculty of Medicine, Ain Shams University, for constructive comments, kindness and wisdom. His indefinite patience and faithful attention to accuracy and details should be fully appreciated.

I have been most fortunate in the expert assistance rendered me by Dr. Hany Riad Mossa, Assistant Professor of Otolaryngology, Faculty of Medicine, Ain Shams University, and wish to acknowledge his generous cooperation.

No words can express my thanks and appreciations to Dr. Hassan Wahba, Lecturer of Otolaryngology, Faculty of Medicine, Ain Shams University, for his dedicated effort. I want to pay tribute to his forbearance, he who graciously accepted the long hours needed for this work.

Finally, Words of thanks are little to express my gratitude to all who helped me.

Ehab Kamal





*To my mother, my brother who spent many hours
helping me to accomplish this work.*

*On a personal note, I still remember and miss the
company of my father, his kindness, his infectious
enthusiasm, and his encouragement. Though I still
have the pleasure to think of him frequently but always
with gratitude and affection.*



List of Figures

	Page
Fig. (1): Ordinary light source in contrast with a laser chamber	4
Fig. (2): Schematic illustration of spontaneous and stimulated emission of light	6
Fig. (3): The laser tube	9
Fig. (4): The CO ₂ laser beam can be aimed in all directions by mirrors in the rotating joints of an articulated arm	12
Fig. (5): Graph of power density versus spot size	17
Fig. (6): Schematic illustration of the laser in the focused and defocused position	17
Fig. (7): Photomicrograph illustrating acute effects of CO ₂ laser	36
Fig. (8): Electron microphotograph of crater created by the CO ₂ laser	36
Fig. (9): Acute soft tissue effects of the Argon laser with a concentration of power in the subepithelial layer	39
Fig. (10): Comparison of effect of the CO ₂ laser and Nd:YAG laser on egg white	40
Fig. (11): Higher magnification of the CO ₂ and Nd:YAG laser penetration into egg white	42
Fig. (12): A laryngoscopic view of the interior of the larynx	65
Fig. (13): Skeleton of the larynx from above	66
Fig. (14): Larynx from above	67
Fig. (15): Hypoepiglottic ligament from above	68
Fig. (16): Types of laser resection	79

The first part of the paper discusses the importance of understanding the underlying mechanisms of the observed phenomena. This is followed by a detailed analysis of the data, which reveals several key findings. The results suggest that the proposed model is highly effective in capturing the essential features of the system under study. Furthermore, the analysis highlights the need for further research in certain areas, particularly regarding the long-term behavior of the system. The paper concludes by summarizing the main findings and providing recommendations for future work.

In the second part of the paper, we explore the implications of these findings for the broader field of research. We discuss how the results can be applied to various practical scenarios and how they might influence future theoretical developments. The paper also addresses some of the limitations of the current study and suggests ways to overcome them. Finally, we provide a brief overview of the conclusions and the overall contribution of the work.

The third part of the paper is dedicated to the technical details of the model and the methods used in the analysis. This section includes a description of the mathematical framework, the data collection process, and the statistical techniques employed. The goal is to provide a clear and comprehensive understanding of the methodology used in the study, ensuring that the results are reproducible and reliable.

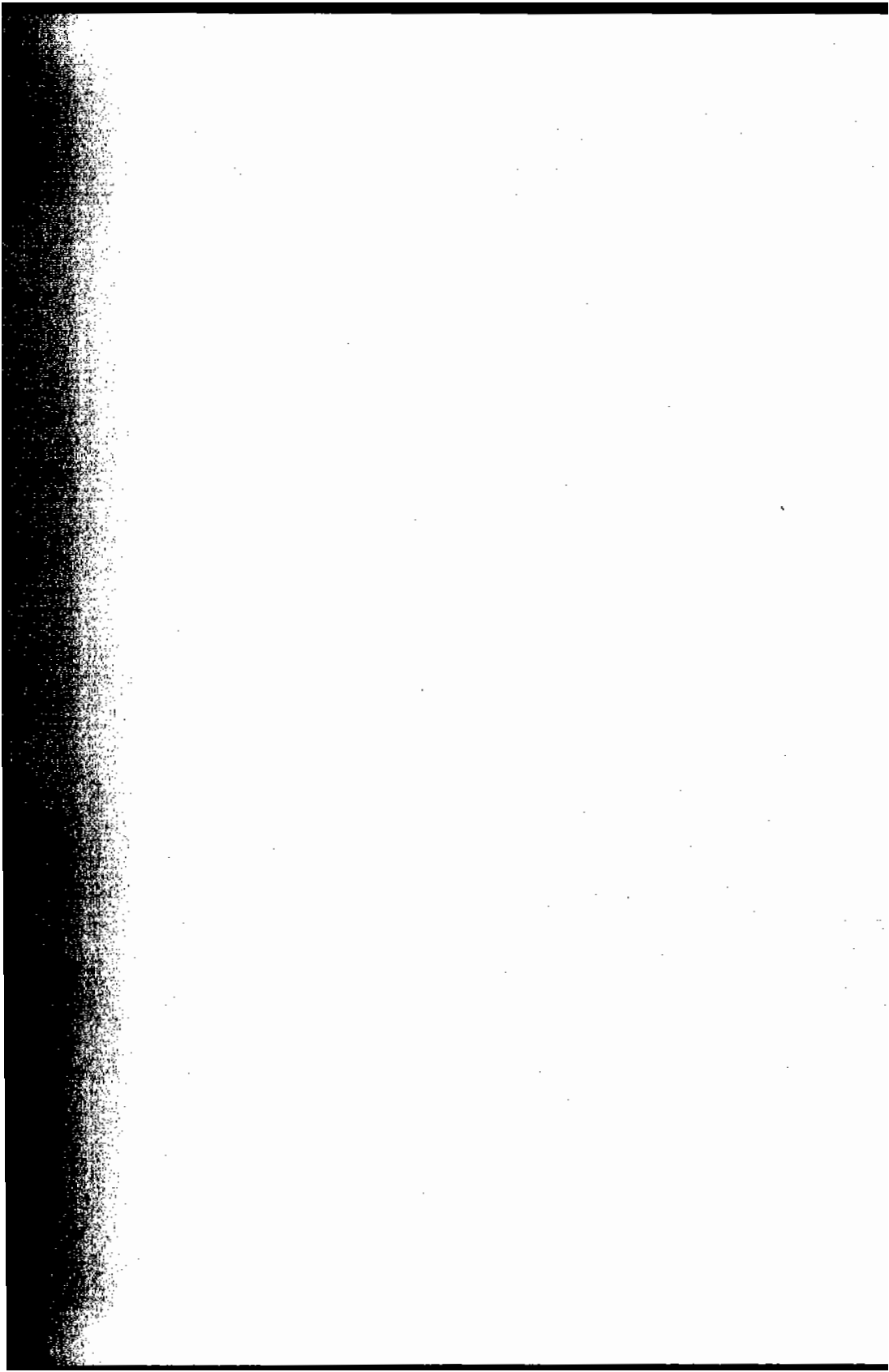
Overall, the paper presents a thorough and rigorous investigation of the topic at hand. The findings are well-supported by the data and provide valuable insights into the system being studied. The paper is a valuable contribution to the field and is highly recommended for researchers and practitioners alike.

List of contents

	Page
• Introduction	1
• Physics of laser	2
• Types of laser	18
• Effect of laser on tissues	30
• Soft tissue interactions to different types of laser	35
• Anatomy of the larynx	43
• Historical review of the use of laser in treatment of cancer larynx	69
• Surgical techniques commonly used for excision of cancer larynx	76
• Recent advances in the use of laser in treatment of cancer larynx	80
• A combined endoscopic laser and external approach for treatment of glottic cancer involving the anterior commissure	89
• Photodynamic therapy and its role in management of cancer larynx	95
• Summary	106
• References	108
• Arabic Summary	



Introduction



INTRODUCTION

The concept of endoscopic resection of early laryngeal carcinoma has gained considerable popularity since the introduction of the carbon dioxide laser over 20 years ago.

Successful use of the laser began experimentally with Jako (*Jako, 1972*). Subsequently Strong presented his early clinical results in 1975 (*Strong, 1975*).

This endoscopic approach for the treatment of vocal cord carcinoma is advantageous over conventional partial laryngectomy and radiotherapy (*McGruit and Kaufman, 1987*).

Although endoscopic laser excision has distinct limitations when used for the treatment of laryngeal carcinoma (*Krepsl and Meltzer, 1989*), yet it is an increasingly used treatment modality (*Stanely et al., 1994*).

Endoscopic laser treatment for selected glottic squamous cell carcinoma proved to be an excellent alternative to radiotherapy or open neck surgery (*Peretti et al., 1994*).

CO₂ laser in the treatment of laryngeal tumours gives marvelous results in terms of prognosis (*Motta et al., 1991*).

Moreover, CO₂ laser is considered a good treatment alternative for early glottic carcinoma in terms of oncological as well as functional results (*Mahieu and Patel, 1994*).

Phonatory results in patients treated with CO₂ laser were better than those found in patients treated with traditional cordectomy (*Pia et al., 1994*).

Finally, laser cordectomy is a modern and useful surgical method in the therapy of vocal fold carcinoma provided adequate follow up and the possibility of "salvage" surgery are available (*Czinger and Savay, 1994*).