Cryoablation of Goiter Irrespective of Thyroid Profile

Thesis

Submitted for Partial Fulfillment of M.D Degree in Endocrinology & Metabolism

By

Ashraf Zakaria Ali

M.B., B. Ch., M.Sc. M.sc - Endocrinology Ain-Shams Univeristy

Under Supervision of

Prof. Dr. Mohamed Saad Hamed

Professor of Internal Medicine & Endocrinology
Former Head of Endocrinology Unit, Ain-Shams University

Prof. Dr. Sherif Zaky Mansour

Professor of Ophthalmology
Former Head of Ophthalmology Dept. - Ain-Shams University

Prof. Dr. Mohamed Reda Halawa

Professor of Internal Medicine & Endocrinology
Head of Endocrinology Unit - Ain-Shams University

Dr. Ahmed Mohamed Bahaa El-Din

Lecturer of Internal Medicine & Endocrinology
Faculty of Medicine Ain-Shams University

Dr. Nesma Ali Ibrahim

Lecturer of Internal Medicine & Endocrinology
Faculty of Medicine Ain-Shams University

Faculty of Medicine
Ain Shams University
2018

ACKNOWLEDGEMENT

In the name of Allah the most gracious and most merciful who granted me the power to accomplish this work.

No words can describe my appreciation for ***Prof. Dr. Mohamed Saad Hamed,*** *Professor of Internal Medicine & Endocrinology, Former Head of Endocrinology Unit, Ain-Shams University, not only for his continuous encouragement and tremendous support, but also for believing in me and pushing me forward from my first steps in neurology, and for being a role model in helping and teaching the younger.*

I am profoundly grateful to ***Prof. Dr. Sherif Zaky Mansour,*** *Professor of Ophthalmology, Former Head of Ophthalmology Dept. - Ain-Shams University, for the enduring wisdom that this work retains from his invaluable years of expertise, for his determination to set this work straight from the beginning, and his relentless mentoring.*

I wish to express my genuine respect and gratefulness to ***Prof. Dr. Mohamed Reda Halawa,*** *Professor of Internal Medicine & Endocrinology, Head of Endocrinology Unit - Ain-Shams University, for his enormous help, his constructive criticism, meticulous revision and guidance, that enabled me to accomplish this work.*

My most sincere appreciation goes to ***Dr. Ahmed Mohamed Bahaa El-Din,*** *Lecturer of Internal Medicine & Endocrinology, Faculty of Medicine Ain-Shams University, for his generous help and valuable recommendations, his sincere effort and tolerance were inspiring.*

I owe much debt and admiration for ***Dr. Nesma Ali Ibrahim,*** *Lecturer of Internal Medicine & Endocrinology, Faculty of Medicine Ain-Shams University, for her everlasting support, continuous encouragement, for her dedication and genuine help, for being there every single step and his inspiring passion for this work.*

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List of Abbreviations

Abbrev.	Meaning
ACR	: American College of Radiology
ACTH	: Adrenocorticotropic hormone
ANS	: Autonomic nervous system
ARC	: Anterior retinal cryotherapy
ATA	**:** American Thyroid Association.
ATC	: Anaplastic Thyroid Cancer
AVNRT	: AV nodal reentrant tachycardia
cryo	: Cryoablation is a process that uses extreme cold
DIT	: Diiodotyrosine
DOMS	: Delayed Onset Muscle Soreness
EBRT	: External beam radiation therapy
FNB	: Fine needle biopsy
FTC	: Follicular Thyroid Cancer
GABA	: γ-aminobutyric acid
HIFU	: High-intensity focused ultrasound

IVB : Intravitreal bevacizumab

M : Monoiodotyrosine

MCT : Monocarboxylate transporter

MEN : Multiple Endocrine Neoplasia

MTC : Medullary Thyroid Cancer

NIS : Sodium-Iodide Symporter

PDR : Proliferate diabetic retinopathy

PEI : Percutaneous ethanol injection

POMC : Pro-opiomelanocortin

PTC : Papillary Thyroid Cancer

PTU : Propylthiouracil

RLNs : Recurrent laryngeal nerves

SVT : Supraventricular tachycardia

T4 : Thyroxine

T_4 : tetra-iodothyronine

TBG : Thyroxine-Binding Globulin

TBPA : Thyroxine-binding prealbumin

Tg : Thyroglobulin

TPO : Thyroid peroxidase

TREs : Thyroid hormone response elements

TRH : Thyrotropin-releasing hormone

TSH : Thyroid hormones. serumthyrotropin

TSHr : Thyroid stimulating hormone receptor

TTR : Transthyretin

VH : Vitreous hemorrhage

WBC : Whole body cryotherapy

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Introduction

Goiter (from the Latin *gutteria*, *struma*) is a swelling of the neck resulting from enlargement of the thyroid gland (thyromegaly). Goitre is treated according to the cause (***Abraham-Nordling, et al.,* 2005**).

Thyroid gland can be ablated by 4 different procedures, including; medical ablation, surgical removal, radiotherapy & chemical ablation (***Bonnema et al., 2002)***.

Antithyroid drugs are believed to work by inhibiting the iodination of thyroglobulin by thyroperoxidase, and, thus, the formation of tetra-iodothyronine (T_4) (***Tunbridge et al., 2007).***

A thyroidectomy is an operation that involves the surgical removal of all or part of the thyroid gland. It is a common surgical procedure that has several potential complications or sequela including: temporary or permanent change in voice, temporary or permanently low calcium, need for lifelong thyroid hormone replacement, bleeding, infection, and the remote possibility of airway obstruction due to bilateral vocal fold paralysis (***Cooper et al., 2006***).

Ablative approaches using radioiodine are increasingly proposed for the treatment of Graves′ disease & multinodulargoitre, but their ophthalmologic and biological

autoimmune responses remain controversial and data concerning clinical and biochemical outcomes are limited ***(Devereaux et al., 2014).***

Sonographically guided percutaneous ethanol injection for autonomously functioning thyroid nodules was first introduced in 1990 by ***Livraghi et al***. The sclerotic mechanism of ethanol is cellular dehydration and protein denaturation in tissue, followed by coagulative necrosis, small vessel thrombosis, hemorrhagic infarct, and reactive fibrosis ***(Verde et al., 2004).***

Cryoablation is a process that uses extreme cold (cryo) to destroy or damage tissue (ablation). Cryotherapy is the local or general use of low temperatures in medical therapy. Cryotherapy is used to treat a variety of benign and malignant tissue damage (***Costello et al., 2015***).

Ablation occurs in tissue that has been frozen by at least three mechanisms:

1. Formation of ice crystals within cells thereby disrupting membranes, and interrupting cellular metabolism among other processes;
2. Coagulation of blood thereby interrupting bloodflow to the tissue in turn causing ischemia and cell death; and
3. Induction of apoptosis, the so-called programmed cell death cascade.

(Storrs & Carina, 2015)