

# بسم الله الرحمن الرحيم





# شبكة المعلومات الجامعية

## التوثيق الالكتروني والميكروفيلم





# جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

## قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



## يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار





# بعض الوثائق الأصلية تالفة







بالرسالة صفحات  
لم ترد بالأصل





# **Ultrasound predictive criteria for short term benign thyroid nodular volume reduction after ultrasound guided radiofrequency ablation**

A THESIS SUBMITTED FOR PARTIAL FULFILMENT OF  
MASTER DEGREE IN RADIOLOGY

---

**Presented by**

**Khaled Fikry Tawfik Shehab ELDin**

M.B.B.CH. – Ain Shams University

**Supervised by**

**Assist.Prof.Dr.Ahmed Mohamed Hussein**

Assistant Professor of Radiodiagnosis

Faculty of Medicine, Ain Shams University

**Dr. Rasha Tolba Khattab**

Lecturer of Radiodiagnosis

Faculty of Medicine, Ain Shams University

**Faculty of Medicine Ain Shams University**

**2020**

# ACKNOWLEDGEMENT

---

*First, I thank **God** for blessing me more than I deserve and for his uncountable gifts which are exceeding abundantly above all what we ask or think.*

*I would like to express my deepest appreciation and gratitude to **Assistant Prof. Dr. Ahmed Mohamed Hussein**, for his sincere encouragement, constant advice and valuable guidance throughout the performance of this work.*

*I owe special thanks, gratitude and appreciation to **Lecturer. Dr. Rasha Tolba Khattab**, for her close supervision, continuous advice and support which gave me the best guidance during different stages of this work.*

*Finally, I cannot forget to thank my professors, my family, and my colleagues, for their support and encouragement.*

## **List of Contents**

<i><b>Subject</b></i>	<i><b>Page No.</b></i>
<b>List of Abbreviations.....</b>	<b>i</b>
<b>List of Tables.....</b>	<b>ii</b>
<b>List of Figures .....</b>	<b>iv</b>
<b>List of Cases .....</b>	<b>vii</b>
<b>Introduction .....</b>	<b>1</b>
<b>Aim of the Work.....</b>	<b>4</b>
<b>Review of Literature</b>	
Anatomy and Sonographic Anatomy of The Thyroid Gland .....	5
Ultrasound Features of Thyroid Nodules.....	20
Role of Interventional Radiology in Treatment of Benign Thyroid Nodules .....	43
<b>Patients and Methods.....</b>	<b>49</b>
<b>Results.....</b>	<b>61</b>
<b>Illustrative Cases .....</b>	<b>72</b>
<b>Discussion .....</b>	<b>82</b>
<b>Summary and Conclusion .....</b>	<b>88</b>
<b>References .....</b>	<b>90</b>
<b>Arabic Summary .....</b>	<b>—</b>

---





## **List of Abbreviations**

<i>Abbr.</i>	<i>Full-term</i>
<b>ACR</b>	: American college of radiology
<b>AFTN</b>	: Autonomously functioning thyroid nodules
<b>ANOVA</b>	: A one-way analysis of variance
<b>ATA</b>	: American Thyroid Association
<b>BI-RADS</b>	: Breast Imaging, Reporting and Data System
<b>CBC</b>	: Complete blood count
<b>CNB</b>	: Core-needle biopsy
<b>E</b>	: Echostructure
<b>FNA</b>	: Fine-needle aspiration biopsy
<b>LSD</b>	: Least Significant Difference
<b>M</b>	: Macrocalcifications
<b>RF</b>	: Radiofrequency
<b>RFA</b>	: Radiofrequency ablation
<b>RLN</b>	: Recurrent Laryngeal Nerve
<b>SD</b>	: Standard deviation
<b>SLN</b>	: Superior Laryngeal Nerve
<b>SPSS</b>	: Statistical package for social sciences
<b>TI-RADS</b>	: Thyroid Imaging, Reporting and Data System
<b>TSH</b>	: Thyroid stimulating hormone
<b>US</b>	: Ultrasound
<b>V</b>	: Vascularity

## List of Tables

<b>Table No.</b>	<b>Title</b>	<b>Page No.</b>
<b>Table (1):</b>	Lists of sonographic characteristics and summary of their published median sensitivities and specificities for detection of malignancy summarized from 14 published reports .....	22
<b>Table (2):</b>	Thyroid Imaging, Reporting and Data System (TI-RADS): Scoring and classification .....	41
<b>Table (3):</b>	Distribution of benign thyroid nodule volume cases according to their demographic data regarding gender and age .....	61
<b>Table (4):</b>	The extent of the difference over the periods through symptoms in the study group.....	63
<b>Table (5):</b>	The extent of the difference over the periods through cosmetic in the study group.....	64
<b>Table (6):</b>	Distribution of benign thyroid nodule volume cases according to their vascularity . .....	65
<b>Table (7):</b>	Distribution of benign thyroid nodule volume cases according to their echostructure . .....	66
<b>Table (8):</b>	Distribution of benign thyroid nodule volume cases according to their calcifications .....	67



---

*List of Tables*

---

<b>Table (9):</b>	The extent of the difference over the periods through volume (ml) in the study group.....	68
<b>Table (10):</b>	Comparison between Vascularity (V1, V2 and V3) according to volume (ml). ....	69
<b>Table (11):</b>	Comparison between Echo-structure (E1, E2 and E3) according to volume (ml). ....	70
<b>Table (12):</b>	Comparison between Calcifications (M1, M2 and M3) according to volume (ml). ....	71

## List of Figures

<i>Figure No.</i>	<i>Title</i>	<i>Page No.</i>
<b>Figure (1):</b>	Thyroid gland anatomy.....	6
<b>Figure (2):</b>	Transverse section of the neck at the level of C6 showing relationships of the thyroid gland.....	9
<b>Figure (3):</b>	Blood supply and venous drainage of the thyroid gland.....	11
<b>Figure (4):</b>	Nerve supply of the thyroid gland.....	12
<b>Figure (5):</b>	Various relations between external branch of the superior laryngeal nerve and superior thyroidal vessels .....	14
<b>Figure (6):</b>	Classification of neck lymph nodes .....	15
<b>Figure (7):</b>	Lymph nodes of importance in thyroid carcinoma .....	16
<b>Figure (8):</b>	Normal thyroid ultrasound in transverse view .....	17
<b>Figure (9):</b>	Normal sonographic appearance of thyroid gland .....	18
<b>Figure (10):</b>	Pyramidal lobe of the thyroid gland .....	19
<b>Figure (11):</b>	Hypoechoic nodule .....	24
<b>Figure (12):</b>	Hyperechoic nodule.....	24
<b>Figure (13):</b>	Isoechoic nodule.....	24
<b>Figure (14):</b>	Mixed cystic solid nodule with hypoechoic solid component.....	24
<b>Figure (15):</b>	Marked hypo-echogenicity of a pathologically proven papillary thyroid carcinoma .....	25
<b>Figure (16):</b>	Solid nodule .....	27

---

*List of Figures*

---

<b>Figure (17):</b>	A predominantly solid nodule with scattered cystic spaces .....	27
<b>Figure (18):</b>	A predominantly cystic nodule.....	27
<b>Figure (19):</b>	An entirely cystic nodule with comet-tail artifact.....	27
<b>Figure (20):</b>	Cystic papillary carcinoma .....	29
<b>Figure (21):</b>	Two benign hyperplastic nodules (N1 and N2) .....	29
<b>Figure (22):</b>	Spongiform appearance of thyroid nodule. ....	31
<b>Figure (23):</b>	Two types of echogenic foci are seen in the nodule .....	31
<b>Figure (24):</b>	Microcalcifications within thyroid nodule .....	32
<b>Figure (25):</b>	Entirely cystic nodule shows multiple comet- tail artifacts .....	32
<b>Figure (26):</b>	Hypoechoic solid nodule with both micro and macrocalcifications .....	33
<b>Figure (27):</b>	Hypoechoic solid nodule with a lobulated margin.....	35
<b>Figure (28):</b>	Isoechoic nodule with thin regular halo .....	36
<b>Figure (29):</b>	Taller-than-wide nodule in the left lobe of thyroid.....	37
<b>Figure (30):</b>	Peripheral vascularity in a spongiform nodule. ....	38
<b>Figure (31):</b>	Peipheral and intranodular vascularity in a hypoechoic nodule .....	38
<b>Figure (32):</b>	Metastatic lymph nodes.....	40
<b>Figure (33):</b>	Chart showing five categories on the basis of the ACR Thyroid Imaging, Reporting and Data System (TI-RADS) lexicon.....	42



<b>Figure (34):</b>	Moving shot technique of RF ablation .....	59
<b>Figure (35):</b>	RF needle.....	59
<b>Figure (36):</b>	Distribution of benign thyroid nodule volume cases according to their demographic data regarding gender. ....	62
<b>Figure (37):</b>	Histogram distribution of benign thyroid nodule volume cases according to their age (years). ....	62
<b>Figure (38):</b>	Line shows the extent of the difference over the periods through symptoms in the study group. ....	63
<b>Figure (39):</b>	Line shows the extent of the difference over the periods through cosmetic in the study group. ....	64
<b>Figure (40):</b>	Bar chart distribution of benign thyroid nodule volume cases according to their vascularity.....	65
<b>Figure (41):</b>	Bar chart distribution of benign thyroid nodule volume cases according to their echostructure.....	66
<b>Figure (42):</b>	Bar chart distribution of benign thyroid nodule volume cases according to their calcifications.....	67
<b>Figure (43):</b>	Line shows the extent of the difference over the periods through volume (ml) in the study group. ....	68
<b>Figure (44):</b>	Bar chart between Vascularity (V1, V2 and V3) according to volume (ml). ....	69
<b>Figure (45):</b>	Bar chart between Echo-structure (E1, E2 and E3) according to volume (ml).....	70
<b>Figure (46):</b>	Bar chart between Calcifications (M1, M2 and M3) according to volume (ml).....	71