Thyroid Imaging, Reporting and Data System (TI-RADS) in differentiation between benign and malignant thyroid nodules

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Presented by

Mikel Naguib Melad Abdo

M.B.B.CH. – Ain Shams University

Supervised by

Assistant Prof. Dr. Enas Ahmed Azab

Assistant Professor of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Dr. Ahmed Samy Abdelrahman

Lecturer of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
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List of abbreviations	
ACR	American College of Radiology
ATA	American Thyroid Association
AUC	Area under curve
BIRADS	Breast Imaging, Reporting and Data System
CCA	Common carotid artery
CFD	Color Flow Doppler
FNA	Fine-needle aspiration
IJV	Internal jugular vein
NPV	Negative Predictive Value
PPV	Positive Predictive Value
PD	Power Doppler
ROC	Receiver operating characteristic curve
RLN	Recurrent Laryngeal Nerve
SCM	Sternocleidomastoid muscle
SLN	Superior Laryngeal Nerve
TI-RADS	Thyroid Imaging , Reporting and Data System
US	Ultrasonography

INTRODUCTION

Thyroid nodules are exceedingly common, with a reported prevalence of up to 68% in adults on high-resolution ultrasound. **(Guth et al., 2009).**

Thyroid nodules have been defined by the American Thyroid Association (ATA) as "discrete lesions within the thyroid gland, radiologically distinct from surrounding thyroid parenchyma". **(Cooper et al., 2009).**

Thyroid nodules are clinically important for several reasons. They may cause thyroid dysfunction and, rarely, compressive symptoms, but they are primarily important because of the need to exclude thyroid cancer. **(Lin et al., 2005).**

Thyroid ultrasound is an important technique widely used in the detection and evaluation of thyroid nodules. It is a non-invasive and inexpensive procedure that provides information with regard to nodule dimensions, structure and thyroid parenchymal changes. Nowadays, the use of brightness-mode US and high-frequency transducers may detect lesions as small as 2 to 3 mm. **(Geanina and Jacqueline, 2012).**

Several authors have recently described a standardized risk stratification system called the Thyroid Imaging, Reporting and Data System (TI-RADS). **(Grant et al., 2015).**

Much of this shift toward data - driven and linked outcomes based reporting templates comes from the success of the BI-RADS system for standardizing mammography reports. BI-RADS improved interpretation of imaging findings, and management recommendations guidance. Similar templates have been developed for hepatocellular carcinoma, thyroid nodules, and prostate cancer. **(Dodd et al., 2015).**

TI-RADS is a reporting system for thyroid nodules on ultrasound proposed by the American College of Radiology (ACR) .The ultrasound features in the ACR TI-RADS are categorized as benign, minimally suspicious, moderately suspicious, or highly suspicious for malignancy. Points are given for all the ultrasound features in a nodule, with more suspicious features being awarded additional points. **(Tessler et al., 2017).**

Scoring is determined from five categories of ultrasound findings (composition, echogenicity, shape, margin and presence of echogenic foci). The higher the cumulative score, the higher the TI-RADS level and likelihood of malignancy. **(Grant et al., 2015)**.

The total point determines the nodule's ACR TI-RADS level, which ranges from TR1 (benign) to TR5 (high suspicion of malignancy). **(Park et al., 2016).**

AIM OF WORK

The objective of this study is evaluate the role of Thyroid Imaging, Reporting and Data System (TI-RADS), recently created by the American College of Radiology (ACR) Committee in differentiation between benign and malignant thyroid nodules.

ANATOMY AND SONOGRAPHIC ANATOMY OF THE THYROID GLAND

NORMAL THYROID GLAND ANATOMY

The thyroid is a highly vascular, brownish-red gland located anteriorly in the lower neck at the level of the thoracic inlet, extending from the level of the fifth cervical vertebra down to the first thoracic vertebra. **(Dominique, 2017).**

The gland varies from an H to a U shape and is formed by 2 elongated lateral lobes with superior and inferior poles connected by a median isthmus, with an average height of 12-15 mm, overlying the second to fourth tracheal rings. **(Figure 1) (Dominique, 2017).**

Each lobe is approximately 4 cm in length, 2 cm in width, and 2 to 3 cm in thickness. The isthmus measures about 2 cm in width, 2 cm in height, and 2 to 6 mm in thickness. **(Lai et al., 2005).**

Occasionally, the isthmus is absent, and the gland exists as two distinct lobes. **(Dominique, 2017).**

Although thyroid weight varies, it averages 25-30 grams in adults (it is slightly heavier in women). The gland enlarges during menstruation and pregnancy. **(Dominique, 2017).**