
Thyroid Ultrasound

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Editors

Thyroid Ultrasound

From Simple to Complex

 Springer

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Preface

The book is based on our own research and experience in the application of modern multiparametric ultrasound for the diagnosis of thyroid disease. Special attention is paid to the technologies of modern ultrasound beginning with conventional gray-scale examination and Doppler imaging ending with elastography and contrast-enhanced technique. Complex analysis of the diagnostic value of basic and innovative technologies is provided. Ultrasound-guided fine needle puncture biopsy is also reviewed in detail.

Special focus is put on the practical aspects of echography. The characteristic features of the normal thyroid gland are highlighted. Diffuse changes and thyroid lesions are discussed in depth. Close attention is paid to their early detection with special accent to differential diagnosis of thyroid tumors. TIRADS classification as a practical approach to the stratification of the risk of thyroid malignancies is provided. The authors summarized their own experience in utilization of qualitative parameters of compression elastography and quantitative data of shear-wave elastography, and analyzed the possibilities, diagnostic significance, advantages and disadvantages of these methods in diagnosis of thyroid lesions. The role of contrast-enhanced ultrasound in differential diagnosis of thyroid neoplasms is comprehensively discussed based on clarification of tumoral neoangiogenesis. The place of various ultrasound options in algorithms and programs of diagnostic search and differentiation is disputed.

The material is well structured and presented in the form of reference information. It is succinct and comprehensive. The monograph pushes you to think, compare, and analyze. It aims to assist specialists of ultrasound diagnostics, radiologists, endocrinologists, oncologists, surgeons, and general practitioners to systematize their knowledge on the ultrasound diagnosis of thyroid diseases, the principles and techniques of multiparametric ultrasound imaging, contrast ultrasound, and ultrasound guided biopsy. The monograph will be of interest to the wide range of specialists from the beginners in ultrasound diagnostics, students, and residents to experienced radiologists and experts of postgraduate education.

The edition is well illustrated with a large number of echograms, schemes, figures, and tables.

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Introduction

The diagnostic capabilities for the diseases of the thyroid gland are constantly being improved due to the development of knowledge and technology. Over the past 20–30 years, ultrasound imaging became the leading modality in the early and differential diagnosis of thyroid abnormalities. Improvement of diagnostic equipment with the emergence of new technologies and modalities makes the work of the ultrasound diagnostician more automated and standardized, effective, and less subjective. However, the obtained results still largely depend on the timeliness and correct choice of effective imaging techniques, and a comprehensive analysis of their data. Adequate diagnostic tactics determine the volume and the cost for the following treatment. Rational sequence of manipulations is important: from simple and low-cost to more complex and less accessible, from non-invasive to minimally invasive, from outpatient to inpatient, from organ-preserving to radical.

In order to manage the diseases properly, it is not enough just to apply the ultrasound probe, but is important to understand the things you see, analyze, and make prognosis. The technology of automatic analysis is still imperfect and requires further technical and intellectual improvement. The physician needs fundamental and systemic knowledge of the indications and limitations of the ultrasound method, as well as the specific features of the thyroid gland and neck tissues in normal and diseased condition. Knowledge and experience with strict following the methodology of the examination are more important than ever. It determines the vector and the accuracy of the diagnostic search resulting in the correct and timely conclusion.

To make a “conventional” thyroid ultrasound is not a big issue today. It is much more important (and therefore more difficult) to perform the studies at such an expertly high level with constant and reproducible quality, which would be fully trusted by other colleagues, clinicians, and patients. It is even more difficult to work in continuous cooperation with colleagues-clinicians to follow-up the patients under the therapy to assess the tiny ultrasound changes. Many expectations are related to the improvement and standardization of ultrasound conclusions in connection with the implementation of TIRADS system. It facilitates the stratification of the risk of thyroid malignancies and determination of further management. In such a case, standards and algorithms that are clear for any doctor are of high importance.

The authors of this monograph attempted to summarize and analyze all issues and perspectives of ultrasound diagnostics of various thyroid diseases based on

literature and personal experience. They analyze the results of more than 100,000 exams of the thyroid gland with utilization of the whole spectrum of multiparametric ultrasound, more than 5000 ultrasound-guided biopsies, and more than 1200 contrast-enhanced ultrasound studies conducted in 2000–2018. This extensive experience permitted to form well-grounded opinion about the possibilities of ultrasound imaging at the current level of medicine.

Undoubtedly, all problems of ultrasound diagnostics of thyroid diseases have not been solved yet. As always, the reader is left with the opportunity for analysis, reflection, comments, further scientific search, and practical verification. We hope for favorable reader's comments and suggestions, which will be gratefully accepted and taken into consideration in further practical work and scientific research.

Dear friends and colleagues, we wish you further professional achievements! Knowledge is power. Be strong!

Abbreviations

3D	Three-dimensional image reconstruction
3DPD	Three-dimensional power Doppler imaging (3D-reconstruction of the image in the vascular mode)
4D	Real-time three-dimensional imaging
AIT	Autoimmune thyroiditis
AITD	Autoimmune thyroid disease
AJCC	American Joint Committee on Cancer
AT	Acute thyroiditis
ATA	American Thyroid Association
BI-RADS	Breast imaging reporting and data system
BSA	Body surface area
BSRTC	Bethesda system for reporting thyroid cytopathology
CCA	Common carotid artery
CDI	Color Doppler imaging
CEUS	Contrast-enhanced ultrasound
CPD	Color pixel density
CT	Computed tomography
EDV	End diastolic velocity
FNA	Fine needle aspiration
FNAB	Fine needle aspiration biopsy
hCG	Human chorionic gonadotropin
HPT	Hyperparathyroidism
IJV	Internal jugular vein
ITA	Inferior thyroid artery
IVF	In vitro fertilization
LN	Lymph node(s)
MEN	Multiple endocrine neoplasia
MRI	Magnetic resonance imaging
PDI	Power Doppler imaging
PET	Positron emission tomography
PI	Pulsatility index
PSV	Peak systolic velocity
PTH	Parathyroid hormone
PW	Pulsed-wave Doppler

RI	Resistive index
SAT	Subacute thyroiditis
SPECT	Single photon emission computed tomography
STA	Superior thyroid artery
SWE	Shear wave elastography (elastometry)
TIRADS	Thyroid imaging reporting and data system
TSH	Thyroid stimulating hormone
US	Ultrasound (echography)
USE	Ultrasound elastography