

Schilddrüsensonografie: Technik – Indikation – Durchführung – Befund

Georg Zettinig

Schilddrüsenpraxis Josefstadt 1080 Wien

Jahrestagung der Österreichischen Gesellschaft für
Nuklearmedizin, 23.1. 2015

Sonografie

- In den letzten Jahren durch die technische Entwicklung dramatische Verbesserung
- Einfluß auf die diagnostischen Algorithmen bei Schilddrüsenpatienten



2004



2014

Zettinig 2015



SCHILDDRÜSENPRAXIS
J O S E F S T A D T

American Thyroid Association Statement on Preoperative Imaging for Thyroid Cancer Surgery

Michael W. Yeh,¹ Andrew J. Bauer,² Victor A. Bernet,³ Robert L. Ferris,⁴ Laurie A. Loevner,⁵ Susan J. Mandel,⁵ Lisa A. Orloff,^{6,*} Gregory W. Randolph,⁷ and David L. Steward⁸

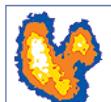
for the American Thyroid Association Surgical Affairs Committee Writing Task Force

Background: The success of surgery for thyroid cancer hinges on thorough and accurate preoperative imaging, which enables complete clearance of the primary tumor and affected lymph node compartments. This working group was charged by the Surgical Affairs Committee of the American Thyroid Association to examine the available literature and to review the most appropriate imaging studies for the planning of initial and revision surgery for thyroid cancer.

Summary: Ultrasound remains the most important imaging modality in the evaluation of thyroid cancer, and should be used routinely to assess both the primary tumor and all associated cervical lymph node basins preoperatively. Positive lymph nodes may be distinguished from normal nodes based upon size, shape, echogenicity, hypervascularity, loss of hilar architecture, and the presence of calcifications. Ultrasound-guided fine-needle aspiration of suspicious lymph nodes may be useful in guiding the extent of surgery. Cross-sectional imaging (computed tomography with contrast or magnetic resonance imaging) may be considered in select circumstances to better characterize tumor invasion and bulky, inferiorly located, or posteriorly located lymph nodes, or when ultrasound expertise is not available. The above recommendations are applicable to both initial and revision surgery. Functional imaging with positron emission tomography (PET) or PET-CT may be helpful in cases of recurrent cancer with positive tumor markers and negative anatomic imaging.

INTRODUCTION

lymph node compartments, and is thus an essential component in the planning of thyroid cancer surgery. As stated in



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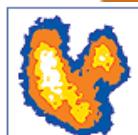
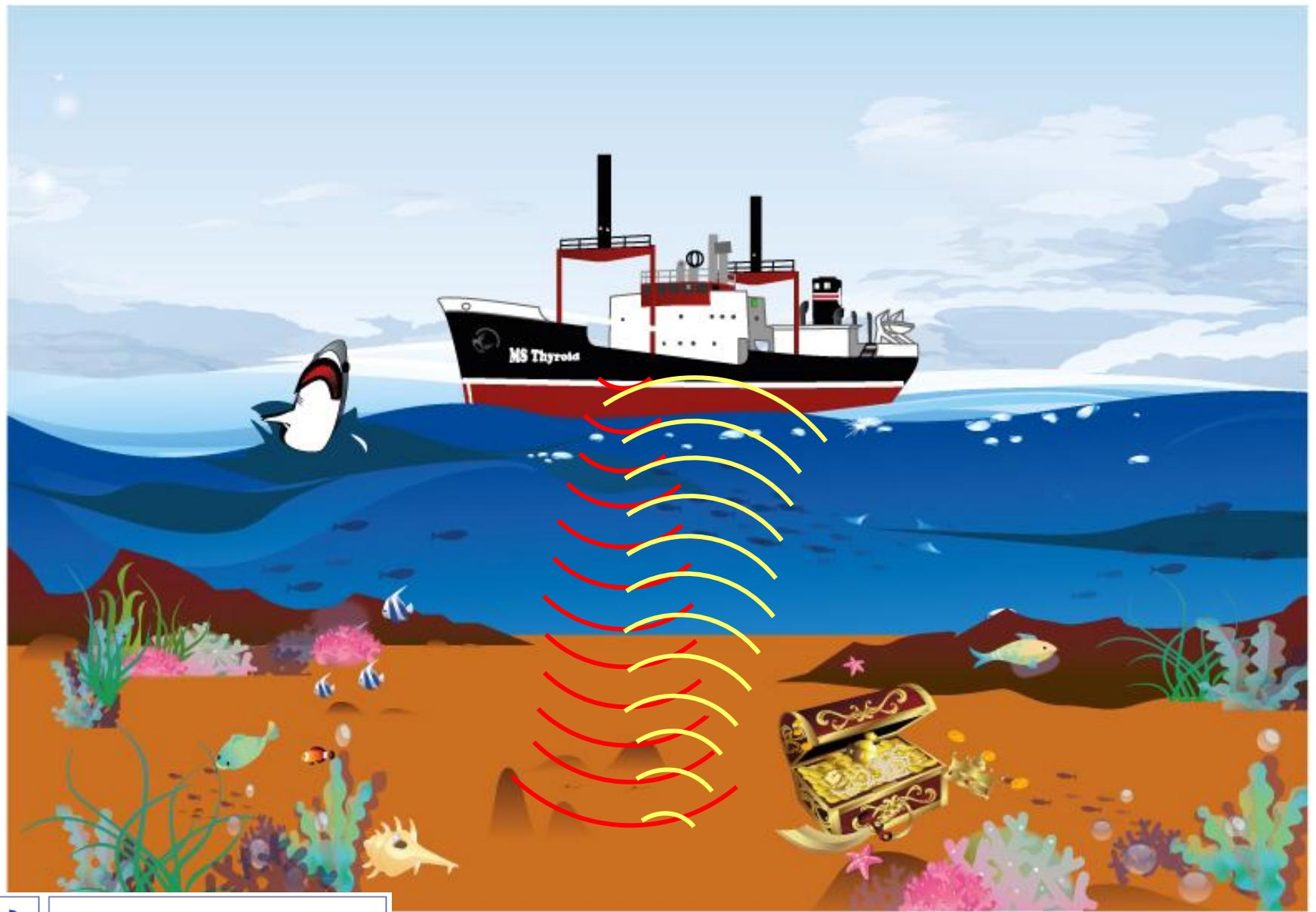
ATA Guidelines on Preoperative Imaging

- 2009: As US evaluation is uniquely operator dependent, alternative imaging procedures may be preferable in some clinical settings...
- 2014: Ultrasound is the first line imaging modality
 - 7/10 Seiten über Sonografie
 - 1/10 Seiten über CT / MRI
 - 1/10 Seiten über funktionelle Bildgebung



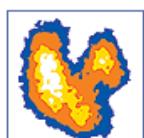
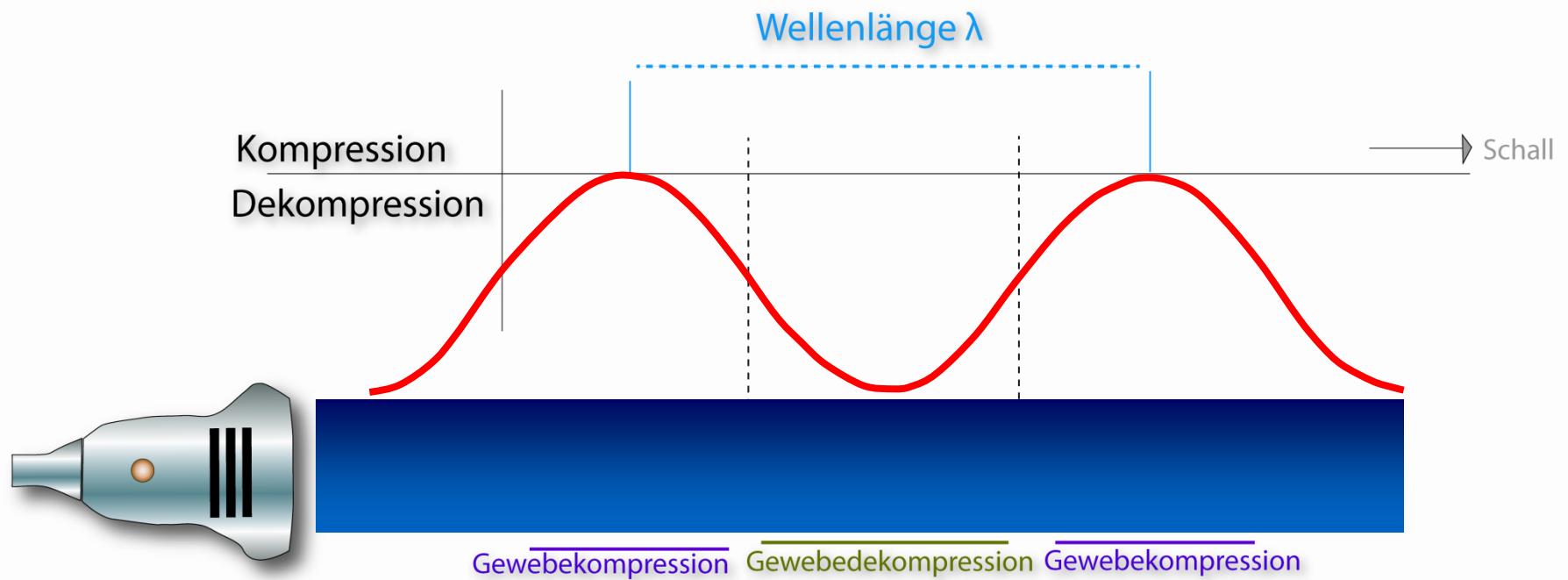
Apparative Voraussetzungen

- B-Mode Ultraschallgerät
- Schallfrequenz 7,5 - 12 MHz variierbar
- Farbdoppler
- Focus (zumindest 2 Zonen), einstellbar auf Untersuchungstiefe
- Gain, TGC
- Kleiner Sektorschallkopf für große Strumen und LK im oberen Mediastinum



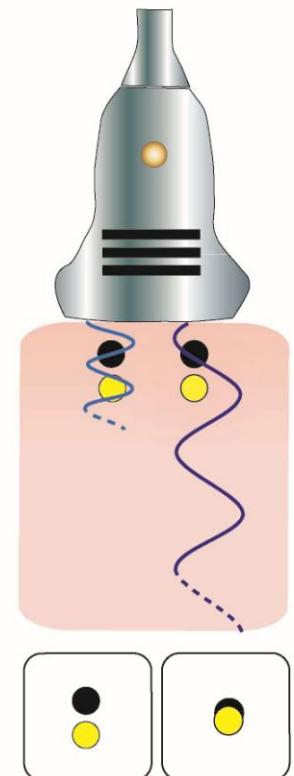
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J O S E F S T A D T

Zettinig 2015



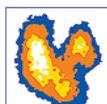
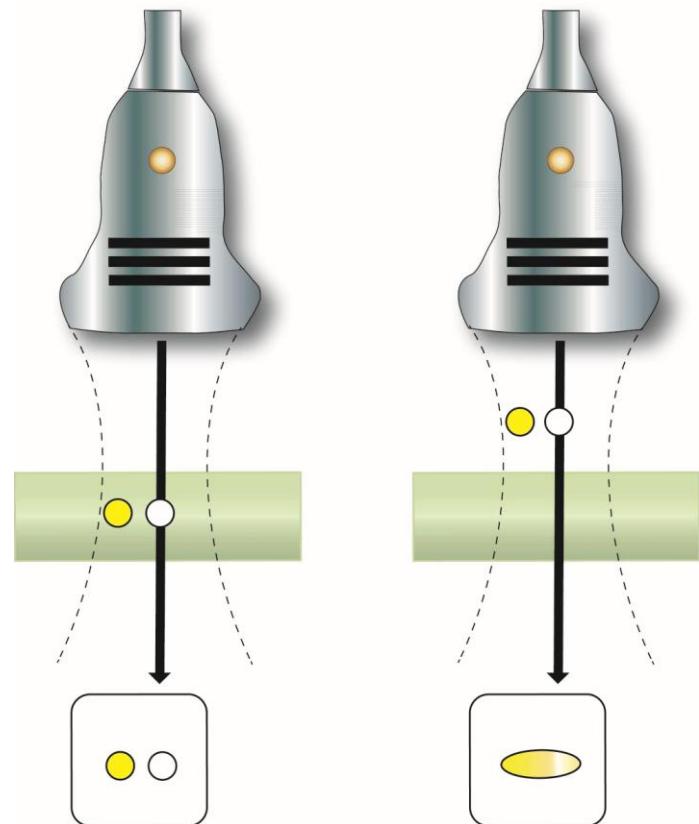
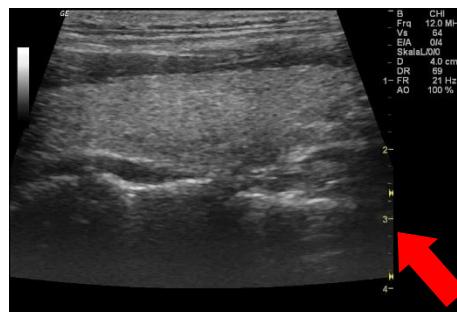
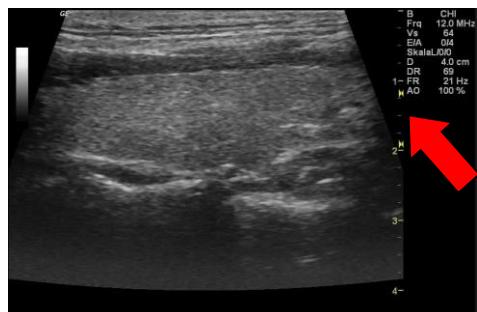
Axiale Auflösung

- Impuls reicht maximal 2-3 Wellenlängen in die Tiefe (axiale Richtung)
- Hohe Frequenz = niedrige Wellenlänge:
 - Höhere axiale Auflösung
 - Geringere Eindringtiefe
- Schilddrüse ideal gelegen für hohe Frequenzen > 7.5 MHz



Laterale Auflösung

- Laterale Auflösung
 - taillenförmige Schallkeule
 - konvergierende Fokuszone
- Fokussierung
 - Schallkeule auf Höhe der zu untersuchenden Struktur fokussieren



Pre-Processing

- Axiale und laterale Auflösung
- Einstellung von Frequenz und Fokus

Post Processing

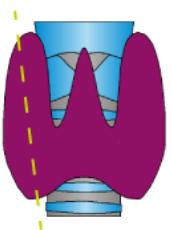
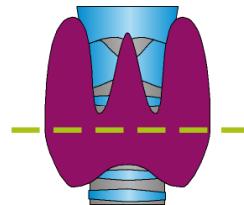
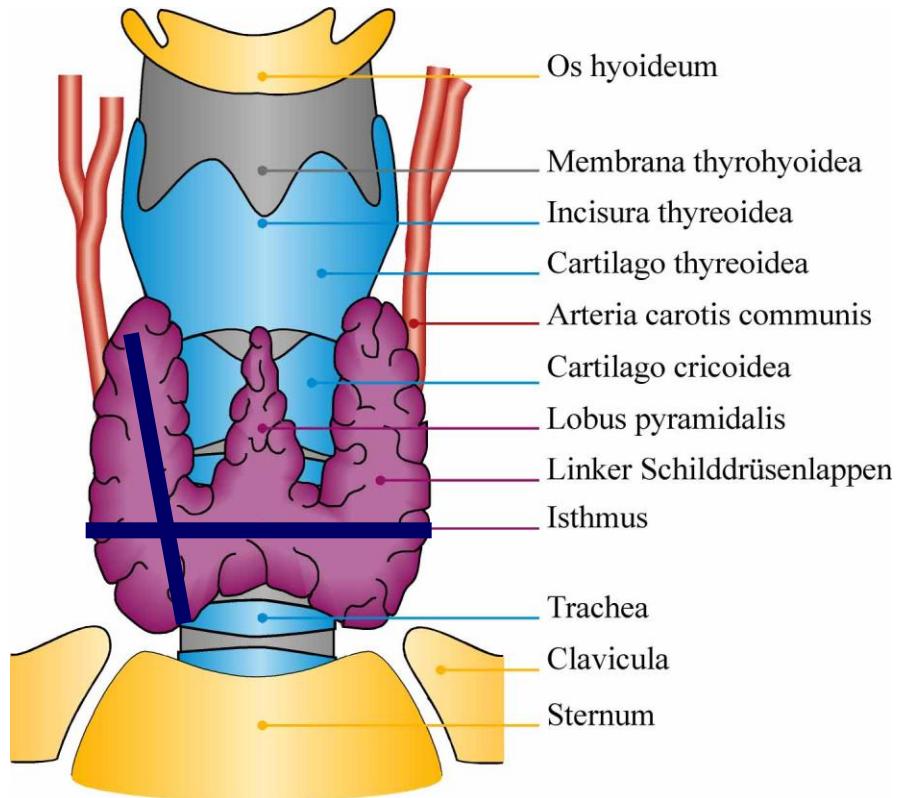
- Bearbeitung durch Änderung der Graustufenskala: TGC
- Kontrastverstärkung zwischen Weichteilen und Kalk/Knochen: Gain

Indikation

- Primäres Bildgebendes Verfahren
- Volumsbestimmung
- Autoimmunerkrankung, Thyreoiditis
- Herdbefunde: Angabe von Größe und Lokalisation sowie Stellungnahme zur Dignität
- Beurteilung benachbarter Strukturen



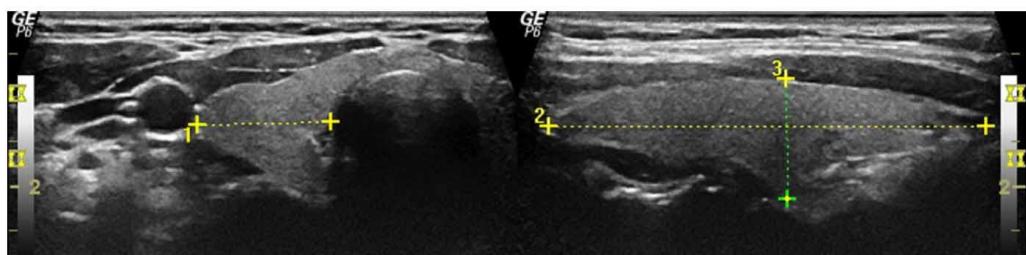
Rückenlage, überstreckter Hals



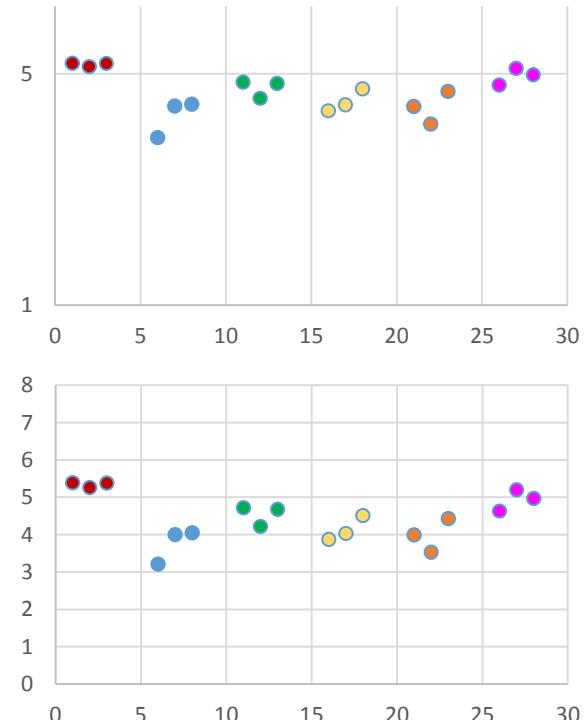
Aus: Zettinig, Buchinger: *Schilddrüse – kurz und bündig*, 3. Auflage 2014.

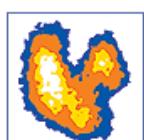
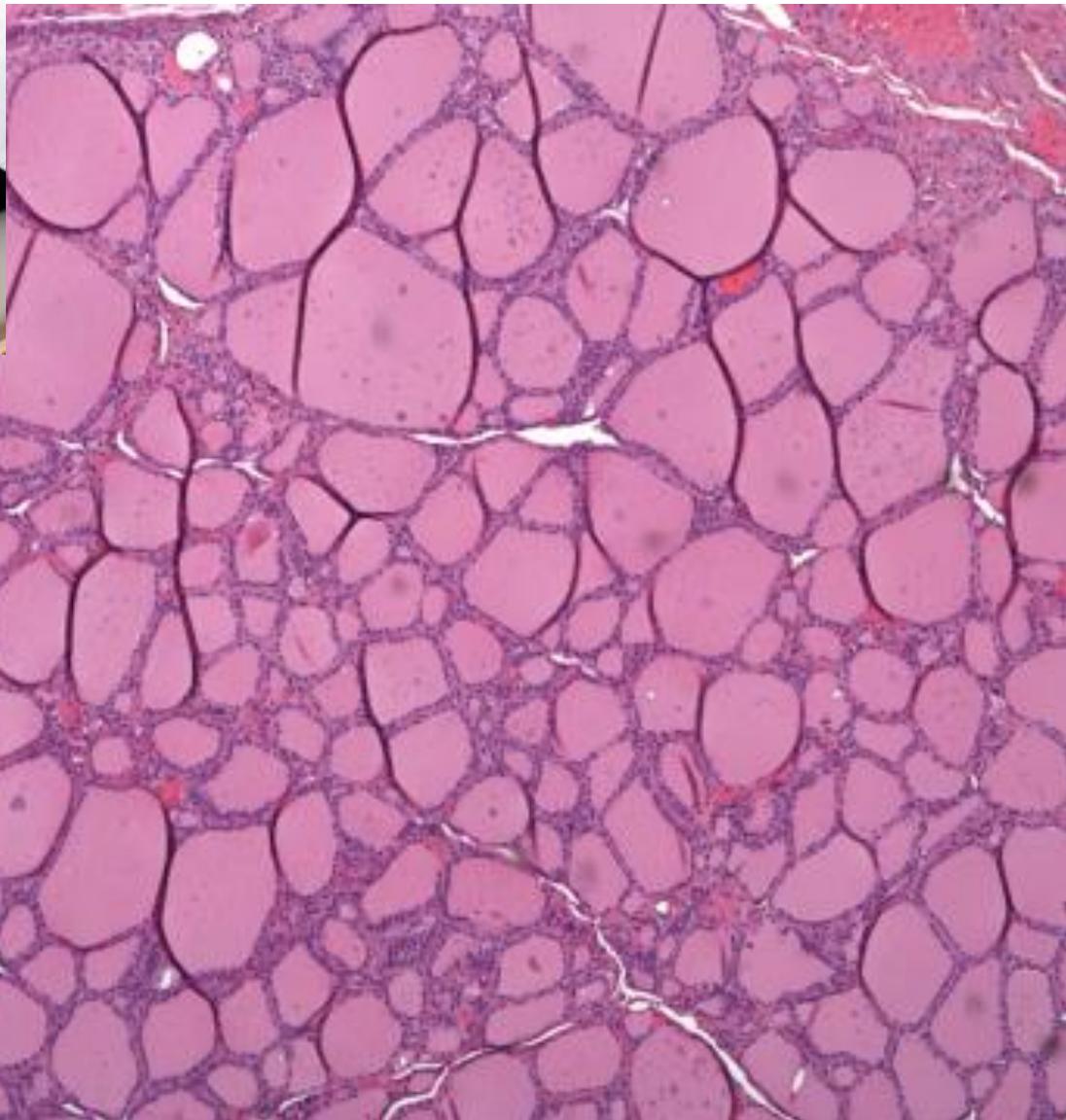
Volumen

- Volumsberechnung eines Rotationsellipsoids
 - $L \times B \times T \times \pi/6 (=0.524)$
- Formel nach Brunn
 - $L \times B \times T \times 0.476$



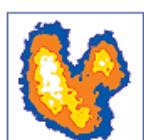
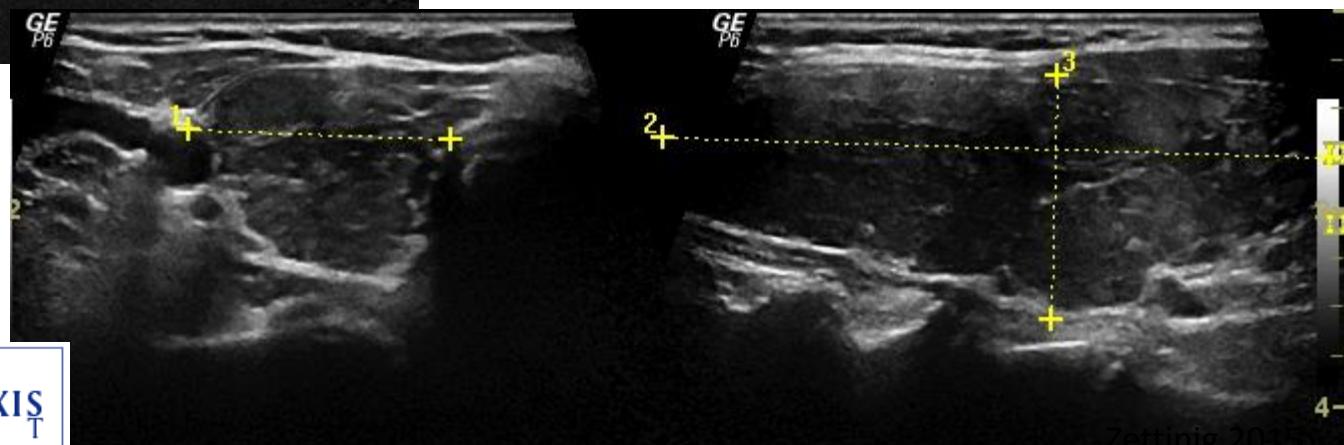
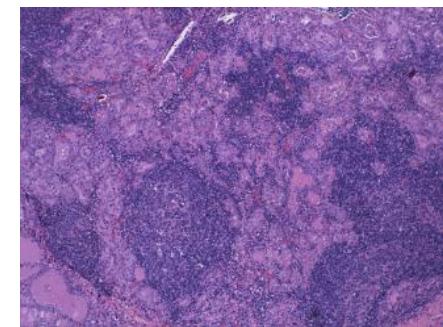
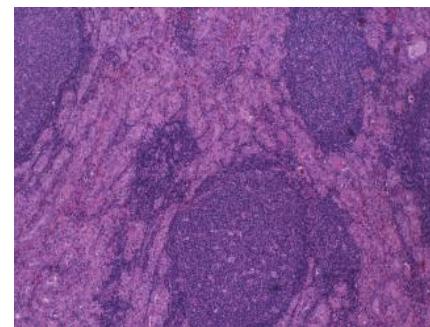
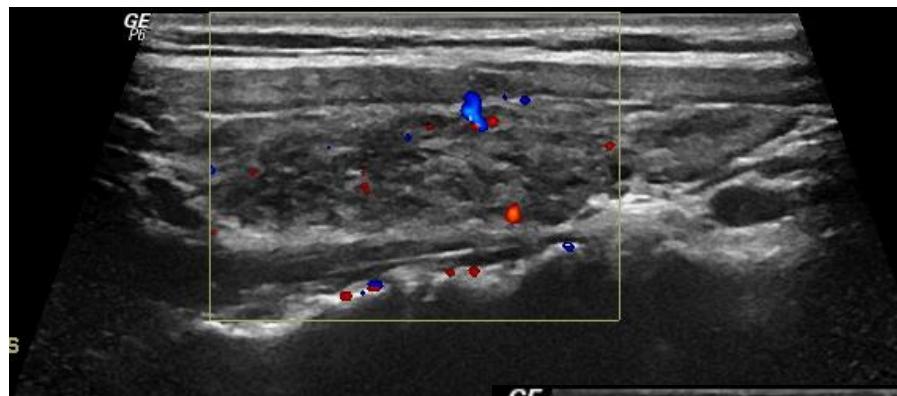
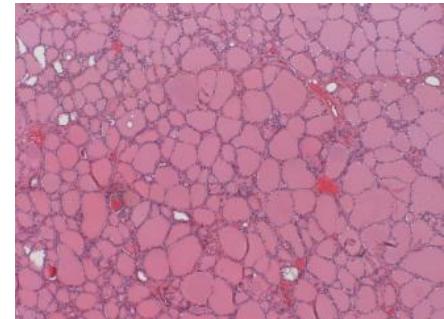
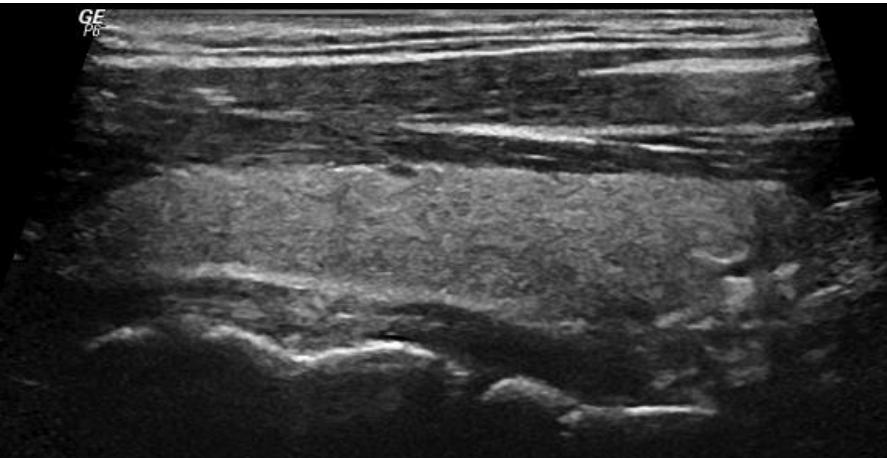
1	Re Schilddrüse L	1.51 cm
2	Re Schilddrüse H	4.95 cm
3	Re Schilddrüse B	1.36 cm
Re Schilddr. Vol 4.87 ml		





SCHILDDRÜSENPRAXIS
JOSSEFSTAAD

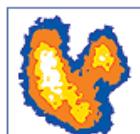
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SCHILDDRÜSENPRAXIS
JOSSEFSTADT

Herdbefunde

- Solid - Zystisch
- Größe (3 Ebenen!)
- Lage
- Echogenität
- Randbegrenzung
- Halo
- Kalk
- Durchblutung



SCHILDDRÜSENSONOGRAPHIE:

Kleine echoarme Schilddrüse. Das Echomuster inhomogen. Über dem Isthmus finden sich zwei Delphische Lymphknoten.

Ergebnis: Bild wie bei Autoimmunthyreopathie bzw. Autoimmunthyroiditis Typ Hashimoto.

Bei fehlenden Voruntersuchung sonographische Verlaufskontrolle in 9 – 12 Monaten inkl. Labor empfehlenswert.

TIRADS 3.

Mit bestem Dank für die Zuweisung
und freundlichen Grüßen



TIRADS: Thyroid Imaging Reporting And Documentation System

TIRADS 0: Nicht beurteilbar, Untersuchung unzureichend. TIRADS 1: Normale Schilddrüsensono graphie. TIRADS 2: Gutartiger Befund nahezu sicher benign. TIRADS 3: Wahrscheinlich gutartiger Befund. Malignitätswahrscheinlichkeit unter 2%.

TIRADS 4a: Malignitätswahrscheinlichkeit 5 – 10%. TIRADS 4b: Malignitätswahrscheinlichkeit 10 – 50%

TIRADS 4c: Malignitätswahrscheinlichkeit 50 – 80%. TIRADS 5: Wahrscheinlich maligner Befund, Malignitätswahrscheinlichkeit über 80%. TIRADS 6: gesichertes Schilddrüsen-Karzinom.



Thyroid Imaging Reporting and Data System for US Features of Nodules: A Step in Establishing Better Stratification of Cancer Risk¹

Jin Young Kwak, MD

Kyung Hwa Han, MS

Jung Hyun Yoon, MD

Hee Jung Moon, MD

Eun Ju Son, MD

So Hee Park, MD

Hyun Kyung Jung, MD

Ji Soo Choi, MD

Bo Mi Kim, MD

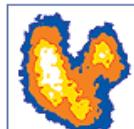
Eun-Kyung Kim, MD

Purpose:

To develop a practical thyroid imaging reporting and data system (TIRADS) with which to categorize thyroid nodules and stratify their malignant risk.

Materials and Methods:

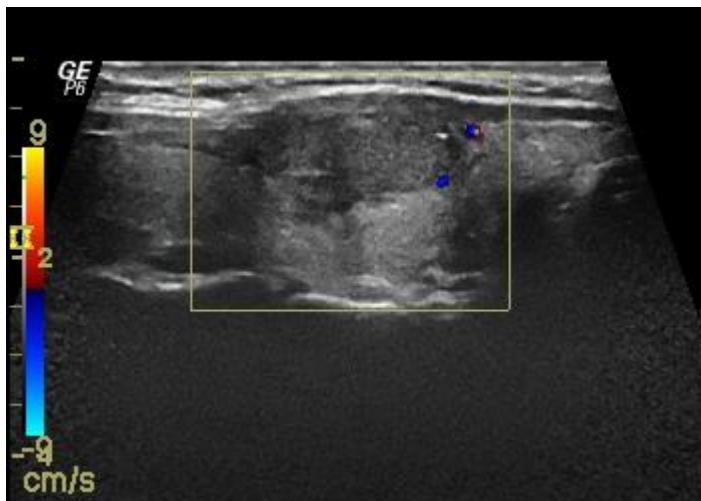
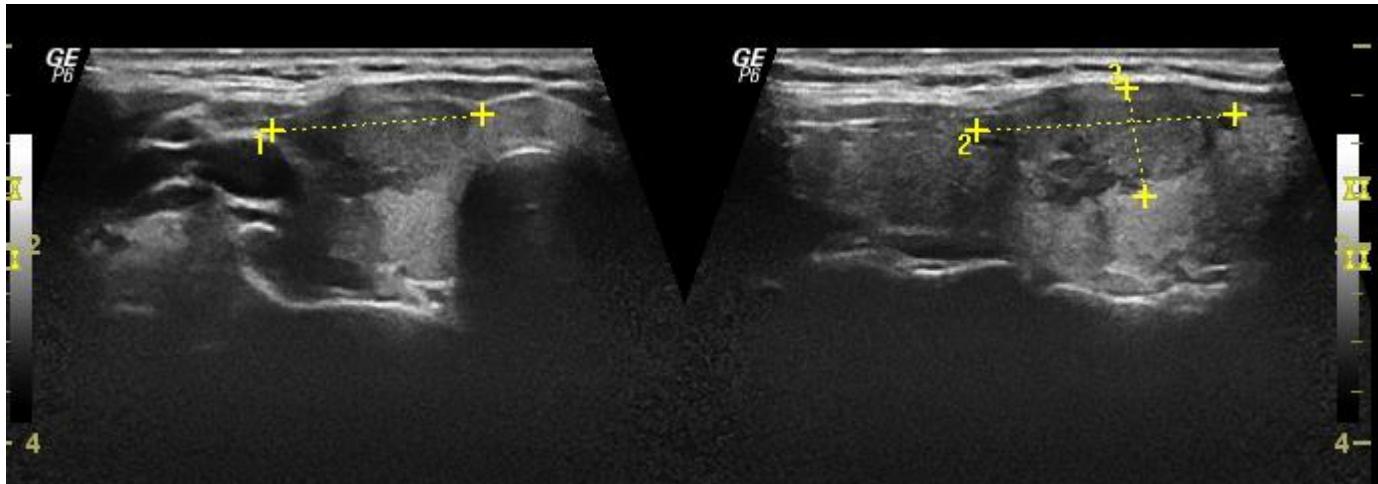
The institutional review board approved this retrospective study, and the requirement to obtain informed consent for the review of images and records was waived. From May to December 2008, ultrasonographically (US)-guided fine-needle aspiration biopsy (FNAB) was performed in 3674 focal thyroid nodules in 3414 consecutive patients. The study included the 1658 thyroid nodules (≥ 1 cm in maximum diameter at US) in 1638 patients (1373 women, 265 men) for which pathologic diagnosis or follow-up findings were available. Univariate and multivariate analyses with



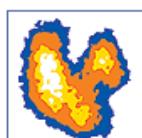
Identifikation von unabhängigen Faktoren

- Solide Komponente
 - Hypoechogenität
 - Deutliche Hypoechogenität
 - Mikrolobuli bzw. unregelmäßiger Rand
 - Mikrokalk
 - More tall than wide
-
- Prospektiv
 - 8 Monate
 - FNA in 3674 Knoten in 3414 Pat.

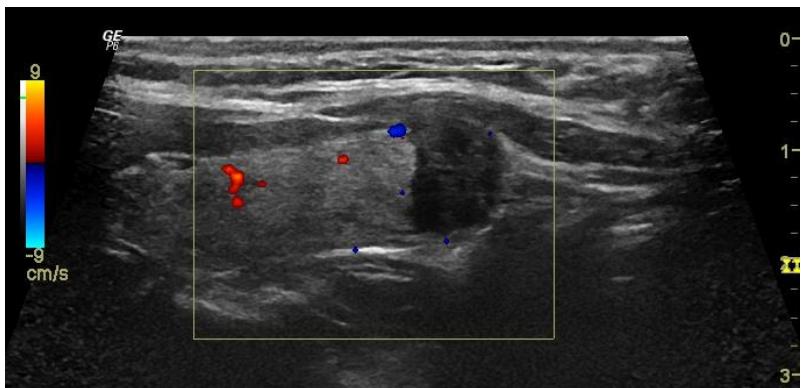
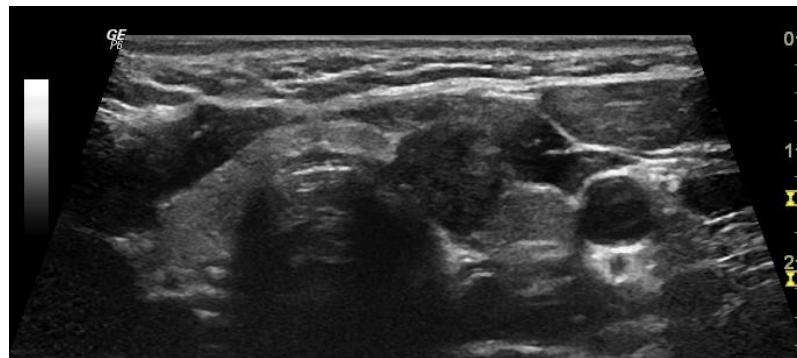
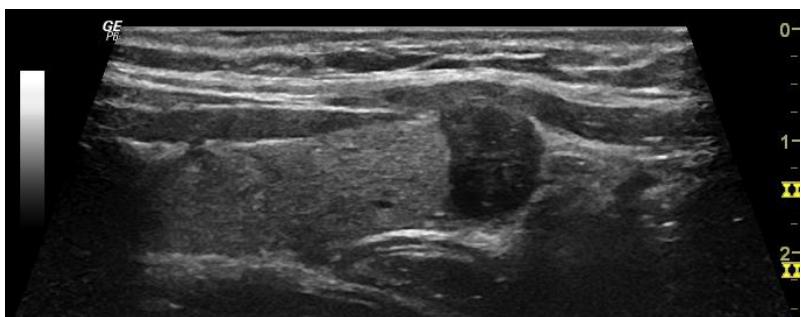
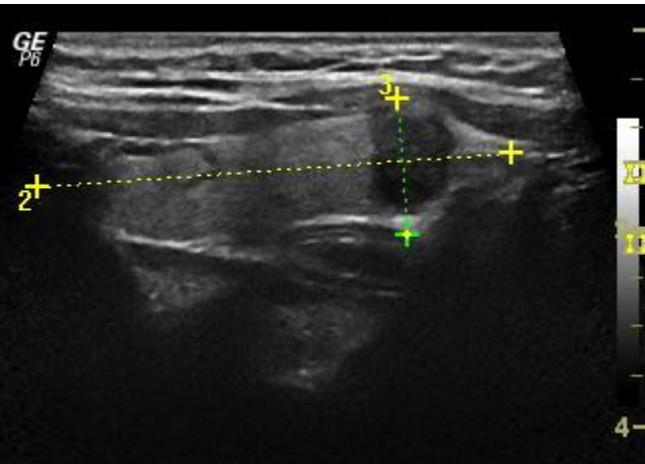
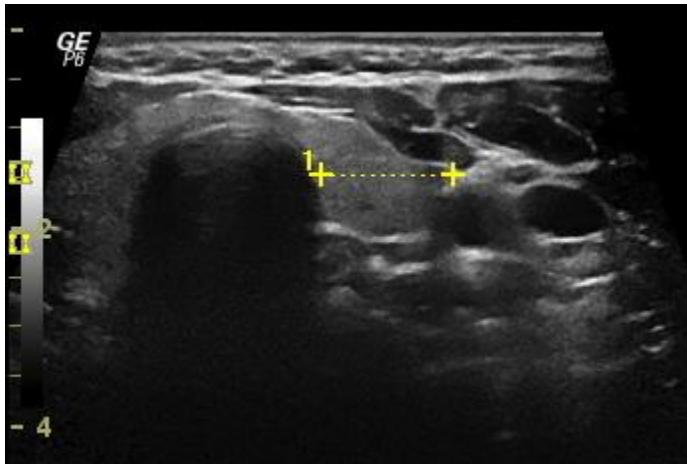




Pap. Sd Ca mit Infiltration des
perithyreoidalen Bindegewebes
pT3 N0 (0/30)

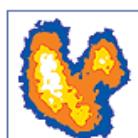


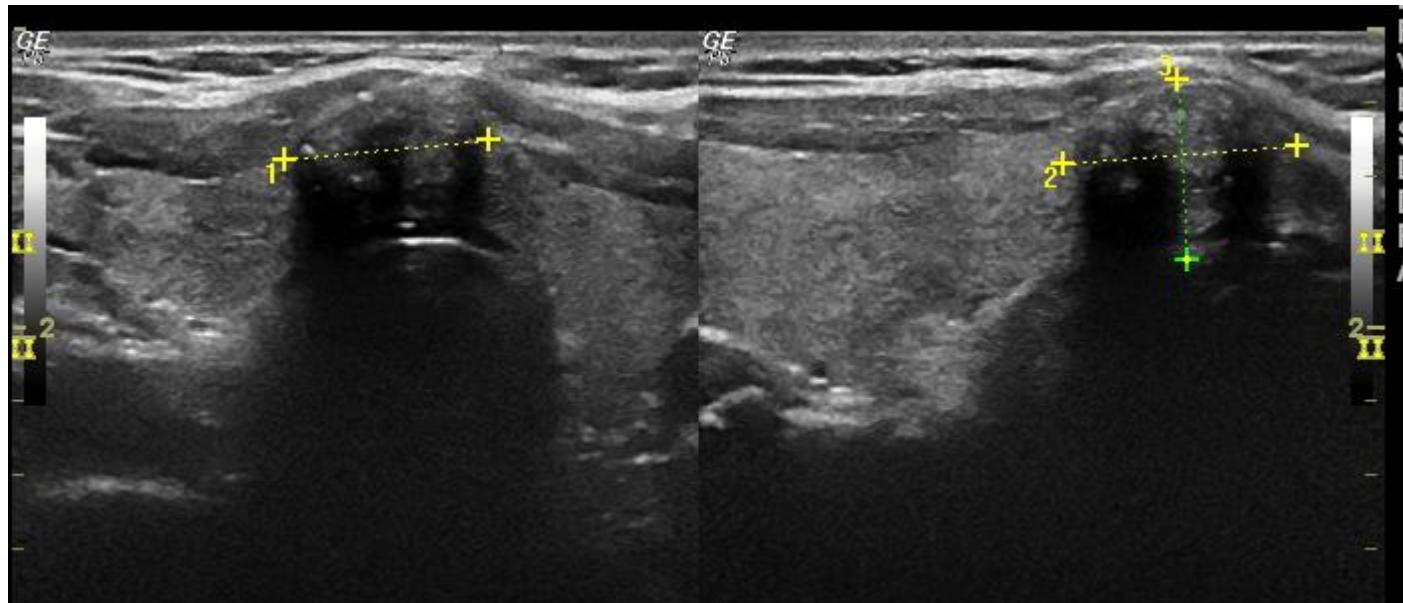
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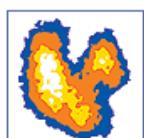
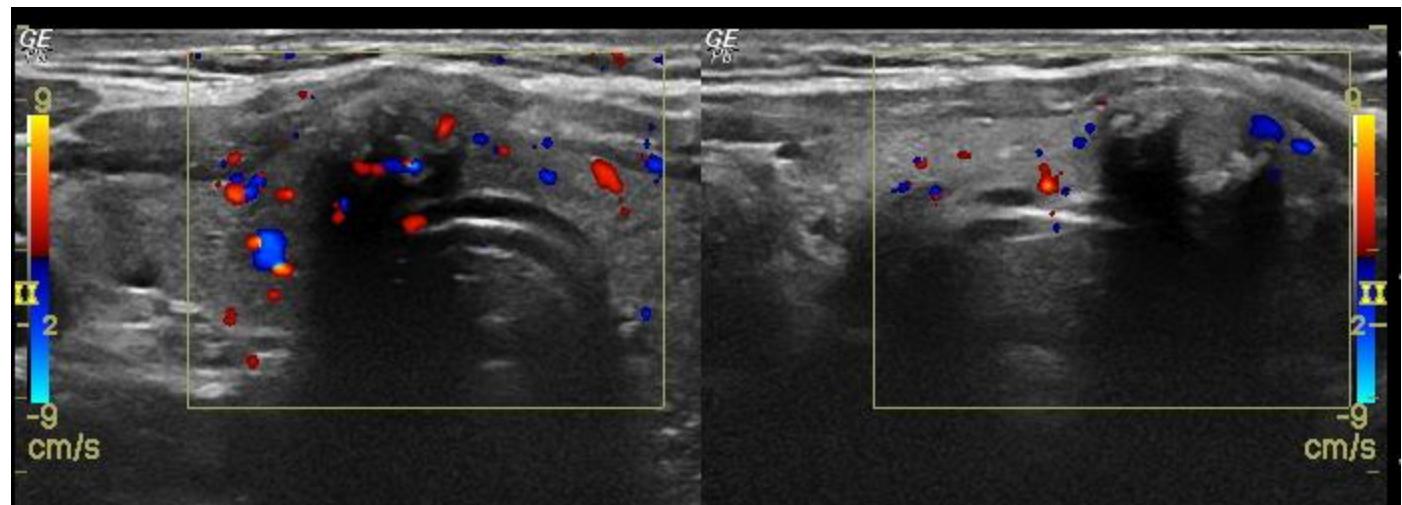
Linker Schilddrüsenlappen mit einem 1,1 cm im Dm haltenden, nur partiell gekapselten, oberflächlich gelegenen und stellenweise nicht scharf vom perithyreoidalen Fettgewebe abgrenzbarem papillärem Schilddrüsenkarzinom. Die Entfernung in toto. Mikrometastase in einem von 4 Lymphknoten. TNM-Schema: pT 3, pN1.

Rechter Schilddrüsenlappen: Tumorfreier, nodular gebauter Schilddrüsenanteil. Tumorfreie Lymphknoten. Tumorfreie Thymusanteile.





Pap. SD Ca
pT2 pN1 b



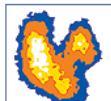
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Zettinig 2015

Interobserver Variation for Ultrasound Determination of Thyroid Nodule Volumes

V.F.H. Brauer,¹ P. Eder,¹ K. Miehle,¹ T.D. Wiesner,¹ H. Hasenclever,² and R. Paschke¹

Thyroid ultrasound is used in the routine clinical assessment and the follow-up of thyroid disorders. The follow-up of patients with thyroid nodules is mostly based on thyroid nodule volume determinations performed by different observers. However, for the judgment of treatment effects there is uncertainty about the interobserver variation of thyroid nodule volume measurements by ultrasound because there are no prospective blinded studies available comparing the interobserver variation in thyroid nodule volume measurement. The aim of our study was therefore to determine the variation of thyroid nodule volume determinations for different observers. We conducted a prospective blinded trial. Our study population consisted of 42 probands (8 men, 34 women) with an uniform distribution of thyroid nodule sizes (25 uninodular and 17 multinodular thyroid glands). We compared the results of 3 ultrasonographers with certified experience in thyroid ultrasound. The interobserver variation for the determination of thyroid nodule volume ($n = 38$) was 48.96% for the ellipsoid method and 48.64% for the planimetric method. The interobserver variation for determining thyroid volume ($n = 40$) was 23.69% for the ellipsoid method and 17.82% for the planimetric method. A regression analysis revealed that the probability for the identification of the same nodule in nodular thyroids by all sonographers is 90%, if the nodule is at least 15mm in greatest diameter. Future investigations should not describe changes in nodule volume less than 50% as therapy effects because only volume changes of at least 49% or more can be interpreted as nodule shrinkage or growth. Reporting of nodule volume modification 50% or more and lack of information for ultrasound procedures introduce a bias in studies evaluating the effects of nodule treatments. The clinical interpretation of a shrinking/growing thyroid nodule based on volume determinations by ultrasound is not well established because it is difficult to reproduce a two-dimensional image plane for follow-up studies.



Brauer et al., Thyroid 2005: Drei Untersucher, 40 Erwachsene

TABLE 1. INTEROBSERVER VARIATION FOR THE DETERMINATION OF THE THYROID VOLUME BY THE ELLIPSOID METHOD AND BY THE PLANIMETRIC METHOD

	<i>Interobserver variation by the ellipsoid method</i>	<i>Interobserver variation by the planimetric method</i>
Left lobe	27.73 (22.98, 32.65)	28.12 (23.24, 33.18)
Right lobe	35.63 (29.38, 42.17)	32.05 (26.42, 37.92)
Total thyroid volume	23.69 (19.69, 27.82)	17.82 (14.83, 20.88)

Thyroid volumes obtained by the ellipsoid method and by the planimetric method. Interobserver variations are given for each lobe and the total thyroid volume. Values for interobserver variation are percentages. Values in brackets denote the 95% confidence interval of the interobserver variation.

TABLE 2. INTEROBSERVER VARIATION OF SINGLE DIMENSIONS OF THYROID NODULES IN COMPARISON TO NODULE VOLUME VARIATION

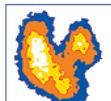
	<i>Interobserver variation</i>
Nodule volume	48.96 (39.83, 58.67)
Mediolateral diameter	21.21 (17.56, 24.96)
Anteroposterior diameter	20.99 (17.38, 24.70)
Craniocaudal diameter	19.89 (16.48, 23.38)

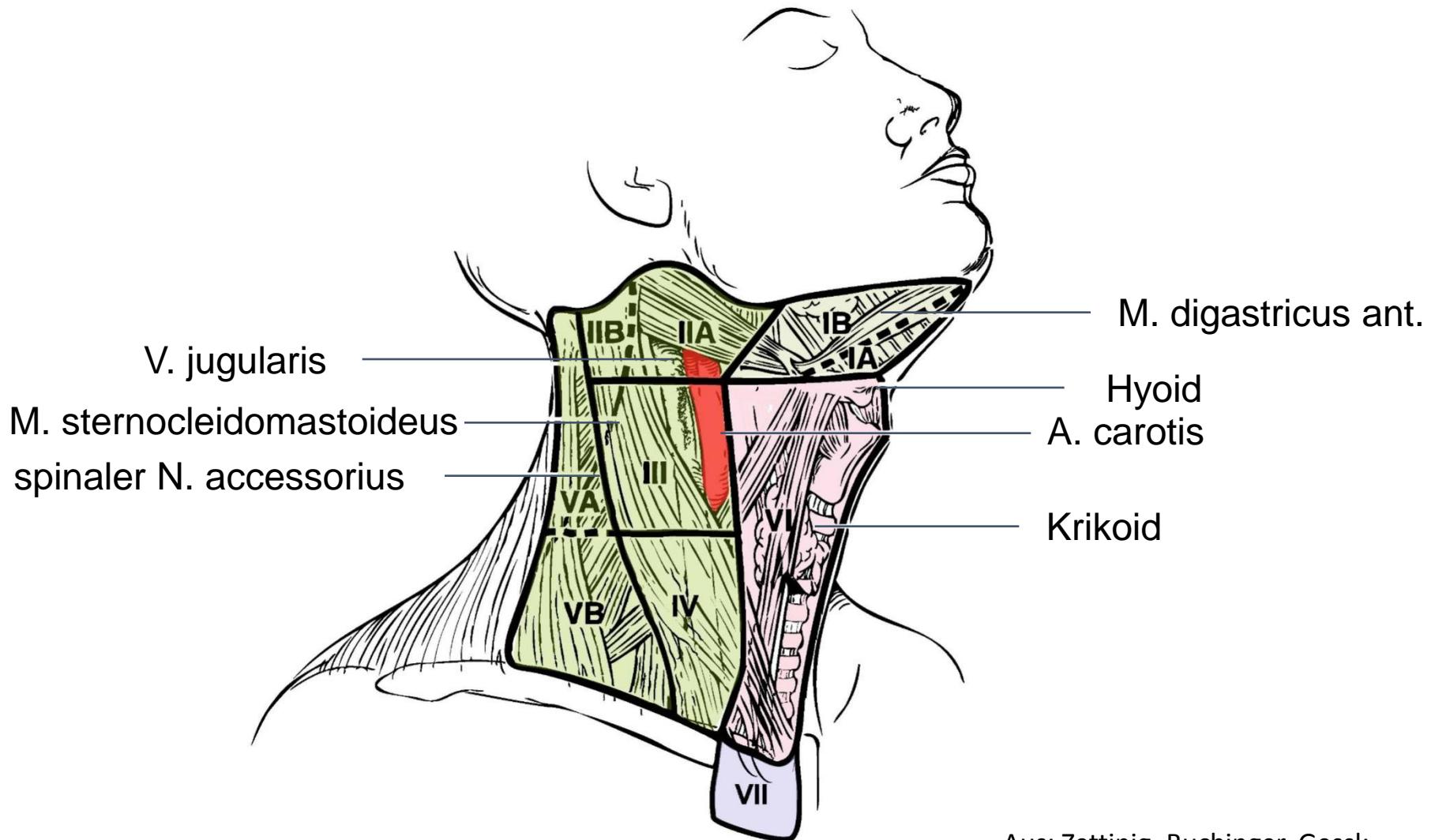
Dimensions obtained by using the ellipsoid method. Interobserver variations are given for each single dimension and for the total thyroid nodule volume. Values for interobserver variation are percentages. Values in brackets denote the 95% confidence interval of the interobserver variation.

Befund

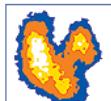
- Schilddrüse normal groß / vergrößert / atroph
- Volumen rechts, Volumen links
- Lage und Formbesonderheiten
- Echostruktur
- Beschreibung von Lokalisation, Größe, Echogenität, Begrenzung und Durchblutung von Herdbefunden
- Beurteilung benachbarter Strukturen

Level	Kompartiment	Chirurgie
VI	zentrales Kompartiment	zentrale Halsdissektion
(I), II-V	laterales Kompartiment	laterale Halsdissektion
VII	mediastinales Kompartiment	mediastinale LK-Dissektion





Aus: Zettinig, Buchinger, Gessl:
Schilddrüsen Ultraschall
Kursbuch. 1. Aufl. 2013



Hals-Sonografie für Schilddrüsenschaller

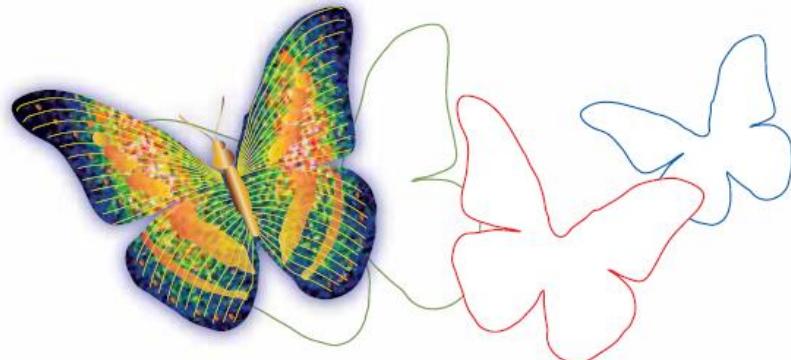
- 8 Stunden Kurs
- AK Kopf/Hals der ÖGUM
- Mi 17. 6. 15 15.00-18.30, Do 18. 6. 15 9.00-12.30
Anschliessend 5. Intensivkurs Klinische
Endokrinologie in Seggau
- Berger, Buchinger, Czerny, Gessl,
Meng, Scheuba, Zettinig
- Anmeldung unter www.oeges.at, max. 40 Teilnehmer



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ÖSTERREICHISCHE
SCHILDDRÜSENGESSELLSCHAFT
AUSTRIAN THYROID ASSOCIATION



EXPERTENGESPRÄCHE

Schilddrüse und FORTBILDUNG

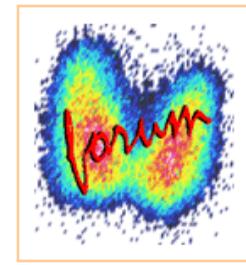
Autoimmunerkrankungen

Lehr-DVD mit den Vorträgen der Herbstfortbildung 2014
der Österreichischen Schilddrüsengesellschaft

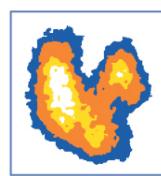
Georg ZETTINIG, Wolfgang BUCHINGER, Michael KREBS,
Österreichische Schilddrüsengesellschaft (Herausgeber) unter
Mitarbeit von Peter BLÜMEL, Guido DORNER, Markus EXNER,
Christina TUGENDSAM, Eva-Maria WENDT, Wolfgang ZECHMANN

facultas.wuv

Zettinig 2015



www.schilddruesenforum.at



**SCHILDDRÜSENPRAXIS
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Univ. Doz. Dr. Georg ZETTINIG
Facharzt für Nuklearmedizin
Arzt für Allgemeinmedizin
Laudongasse 12/8, 1080 Wien
Tel.: 01 403 29 20
termin@schilddruesenpraxis.at
www.schilddruesenpraxis.at