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● *WFUMB Guidelines and Recommendations on the Clinical Use of Ultrasound Elastography*

FOREWORD TO THE SECOND SET OF WFUMB GUIDELINES AND RECOMMENDATIONS ON THE CLINICAL USE OF ULTRASOUND ELASTOGRAPHY

With the increased number of publications on elastography, the World Federation for Ultrasound in Medicine and Biology (WFUMB) leadership decided to take initiative to create guidelines in August 2011. The first consensus meeting was held in March 2013 and led to the development of guidelines for basic science (Shiina et al. 2015), breast (Barr et al. 2015) and liver (Ferraioli et al. 2015) elastography. With the increasing number of publications and interest in thyroid and prostate elastography, WFUMB convened a panel of worldwide experts to provide guidelines for these applications of elastography.

It is anticipated that additional guidelines will be forthcoming as elastography technology evolves and more clinical studies and new applications are developed. With this set of guidelines, a standardized format including grading of recommendations was instituted, which will be used for forthcoming guidelines. Guidelines for individual organ systems will be updated as additional literature and technology dictate. These guidelines provide guidance to both novice and expert uses in performing elastography.

METHODOLOGY

A steering committee was appointed to define the general content of the guidelines, with subsequent invitation of experts from each of the member organizations of WFUMB, based on their publications records and expertise in the different fields, to partake in guideline development. Two author subgroups (thyroid and prostate) were established with specific responsibility for each section of the WFUMB guidelines. Section leaders were selected from the steering committee; the section leaders defined the subsections and key topics of the 2 new guideline sections (thyroid and prostate).

A literature search was performed systematically in PubMed using predefined key words and MeSH terms and, in addition, by a complimentary "hand search" using reference lists of articles retrieved by systematic searches, books and reviews. The literature search was in principle restricted to English language papers, and in particular to guidelines, meta-analyses and systematic reviews; original research articles (randomized controlled trials, prospective studies, retrospective studies, case series of more than 6 cases); and results of clinical registries and surveys. English abstracts and single case studies were included only in selected circumstances.

Evidence tables were generated for each key topic. The Oxford Centre for Evidence-Based Medicine Levels of Evidence (March 2009 edition) was used to judge the level of evidence (LoE) and grade of recommendations (GoR) (Burns et al. 2011). Drafts of the overview, recommendations and comments were provided by three authors for each section and revised by the members of the steering committee. After approval by the steering committee, the revised drafts were submitted to the whole expert group approximately 2 weeks before the expert meeting, held in Chicago, IL, USA on December 3 and 4, 2016. Vendors were asked to participate in the meeting and were allowed to comment, but they did not write or edit the guidelines. At the expert meeting, each of the three authors presented their overviews to the entire organ-specific group. All recommendations were discussed and improved, and a draft document was developed. The steering committee reviewed and revised the draft document for consistency and accuracy. The draft document was distributed to each member of the expert panels subject to a vote for each of the recommendations by the expert panel. Consensus was graded using a simple system: strong consensus, >95% of experts' votes; broad agreement, >75%–95% of experts' votes; majority consensus, 50%–75% of experts' votes; dissent, <50% of experts' votes in favor of the respective recommendation. Only recommendations with strong consensus or broad agreement were included in the final version of the guidelines. Following the consensus meeting, comments were adapted to the final recommendations and shortened. The LoE and GoR were checked by the authors and steering committee.

For many important recommendations reported in these guidelines, the strength of evidence may appear relatively weak in comparison to the value of the recommendation based on clinical expert judgment. Often new and valid methods are so obviously of benefit that randomized controlled trials comparing older technology are not performed. Investigators can use the LoE to identify areas in need of additional studies.

Vendors were asked to provide a listing of the types elastography they provide and which transducers are available for each type of elastography they provide. The results are presented in Table 1.

As with the first set of guidelines, this international cooperative project lends more strength to these documents. The publications of these documents underscores the worldwide recognition of the use of elastography, both strain and shear wave techniques, in the evaluation of thyroid and prostate pathology. These guidelines expand on the guidelines published by the European Federation for Ultrasound in Medicine and Biology (EFSUMB) published in 2013 (Cosgrove et al. 2013). These guidelines should be a major reference for both novices and experts performing elastography of the thyroid and prostate.

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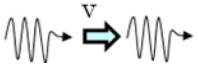
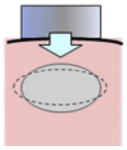
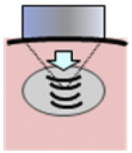
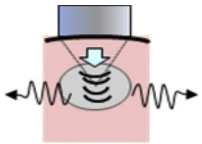
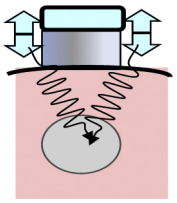
Table 1. Elastography methods. Each column shows methods and measured parameters for elastography. Each row shows a method for inducing displacement. Each cell shows a type of elastography

Measured Physical quantity	Strain or displacement 	Shear wave speed 
Methods Excitation method	Strain imaging	Shear wave imaging
(A) Manual compression - Palpation - Cardiovascular - Pulsation - Respiration	**Strain elastography** -eSieTouch™ Elasticity Imaging — Siemens -Real-time tissue elastography™ — Hitachi Aloka -Elastography — GE, Philips, Toshiba, Zonare -ElastoScan™ — Samsung, BK Ultrasound, CareStream 	
(B) Acoustic Radiation Force	**Acoustic Radiation Force Impulse (ARFI) Imaging** -Virtual Touch™ Imaging (VTI) — Siemens 	**Point Shear Wave Elastography** (Average shear wave speed in local region) -Virtual Touch™ Quantification (VTQ) — Siemens -ElastPQ™ — Philips -QelaXto™ — Esaote -S-Shearwave (RS80A with Prestige) — Samsung  **Shear wave elastography** (Shear wave speed imaging) -ShearWave™ Elastography:SWE — SSI -Virtual Touch™ Image Quantification (VTIQ) — Siemens, GE, Toshiba
(C) Mechanical Impulse		**Transient Elastography** (Average shear wave speed measurement) -FibroScan™ — Echosens 

"Point" measurement denotes the fact that measurements are performed in a small region of interest, typically 1 cm^2, compared to the field of view in the image.

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