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Scientific Publications 2022

Aplio -series

General Imaging

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Liver

2D SWE Fibrosis

- Comparison of liver stiffness measurements by a 2D shear wave technique and transient elastography Results from a European prospective multi-centre study (2020)
- Performance and cutoffs for liver fibrosis staging of a two-dimensional shear wave elastography technique (2020)
- Liver stiffness assessed with the help of the propagation map of a latest software for 2D shear wave elastography: Preliminary results (2016)
- Accuracy of the lastest release of a 2D Shear Wave elastography method for staging liver fibrosis in patients with chronic hepatitis C: Preliminary results (2016)
- Variability of Liver Shear Wave Measurements Using a New Ultrasound Elastographic Technique (2017)
- Concordance of transient elastography and shear wave elastography for measurement of liver stiffness (2017)
- Post-COVID-19 Liver Injury Comprehensive Imaging With Multi parametric Ultrasound (2021)
- Two-Dimensional-Shear Wave Elastography with a Propagation Map: Prospective Evaluation of Liver Fibrosis Using Histopathology as the Reference Standard (2020)
- Two-dimensional Shear Wave Elastography with Propagation Maps for the Assessment of Liver Fibrosis and Clinically Significant Portal Hypertension in Patients with Chronic Liver Disease: A Prospective Study (2019)

Pediatrics

- Elastography for Pediatric Chronic Liver Disease A Review and Expert Opinion (2020)
- Liver Shear Wave Speed and Other Quantitative Ultrasound Measures of Liver Parenchyma: Prospective Evaluation in Healthy Children and Adults (2020)
- Liver Shear Wave Elastography and Attenuation Imaging Coefficient Measures: Prospective Evaluation in Healthy Children (2021)
- Shear Wave Elastography in the Differentiation of Nonfibrotic Versus Fibrotic Liver Disease (2021)

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Liver

SW Dispersion
Viscosity

- Accuracy of 2-dimensional Shear Wave Elastography and Attenuation Imaging for Evaluation of Patients With Nonalcoholic Steatohepatitis (2020)
- The Role of Multiparametric US of the Liver for the Nonalcoholic Steatohepatitis (2020)
- Clinical utilization of shear wave dispersion imaging in diffuse liver disease (2019)
- Shear-Wave Dispersion Slope from US Shear Wave Elastography: Detection of Allograft Damage after Liver Transplantation (2019)

ATI
Steatosis

- Detection of Liver Steatosis With a Novel Ultrasound-Based Technique: A Pilot Study Using MRI-Derived Proton Density Fat Fraction as the Gold Standard (2019)
- Assessment of hepatic steatosis by using attenuation imaging: A quantitative, easy-to-perform ultrasound technique (2019)
- Prospective Evaluation of Hepatic Steatosis using Ultrasound Attenuation Imaging in Patients with Chronic Liver Disease with Magnetic Resonance Imaging Proton Density Fat Fraction as the Reference Standard (2019)
- Quantification of hepatic steatosis with ultrasound: promising role of attenuation imaging coefficient in a biopsy-proven cohort (2019)
- Performance of the Attenuation Imaging Technology in the Detection of Liver Steatosis (2020)
- Reproducibility of ultrasound attenuation imaging for the noninvasive evaluation of hepatic steatosis (2019)
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- Quantitative shear wave ultrasound elastography: initial experience in solid breast masses (2010)
- Clinical Application of Shear Wave Elastography in Breast Masses (2016)
- Combination of Quantitative Parameters of Shear Wave Elastography and SMI to Evaluate Breast Masses (2020)

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- Prostate Cancer: Diagnostic Performance of Real-time Shear-Wave Elastography (2015)

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- Prospective Evaluation of Semi-quantitative Strain Ratio and Quantitative 2D Ultrasound Shear Wave Elastography (SWE) in Association with TIRADS Classification for Thyroid Nodule Characterization (2019)
- Strain US Elastography for the Characterization of Thyroid Nodules: Advantages and Limitation (2015)
- The Utility of Ultrasound Elastography and MicroPure Imaging in the Differentiation of Benign and Malignant Thyroid Nodules (2012)
- The diagnostic performance of shear wave speed (SWS) imaging for thyroid nodules with elasticity modulus and SWS measurement (2016)

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Guidelines Shear Wave

LIVER

- WFUMB Guidelines and Recommendations for Clinical Use of Ultrasound Elastography: Part 3: LIVER **(2018)**

  http://dx.doi.org/10.1016/j.ultrasmedbio.2015.03.007

- EFSUMB Guidelines and Recommendations on the Clinical Use of Liver Ultrasound Elastography, Update 2017**(2017)**

  http://dx.doi.org/10.1055/s-0043-103952

BREAST

- WFUMB Guidelines and Recommendations for Clinical Use of Ultrasound Elastography: Part 2: BREAST **(2015)**

  http://dx.doi.org/10.1016/j.ultrasmedbio.2015.03.008

THYROID

- WFUMB Guidelines and Recommendations for Clinical Use of Ultrasound Elastography: Part 4. THYROID **(2017)**

  http://dx.doi.org/10.1016/j.ultrasmedbio.2016.06.022

PROSTATE

- WFUMB Guidelines and Recommendations for Clinical Use of Ultrasound Elastography: Part 5. PROSTATE **(2017)**

  http://dx.doi.org/10.1016/j.ultrasmedbio.2016.06.020

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- Application of a Novel Microvascular Technique in Breast Lesion Evaluation (2016)
- Superb Microvascular Imaging: A new vascular detecting ultrasonographic technique for avascular breast masses: A preliminary study (2016)
- An Innovative Ultrasound Technique for Evaluation of Tumor Vascularity in Breast Cancers: Superb Micro-Vascular Imaging (2016)
- The Diagnostic Value of Superb Microvascular Imaging (SMI) in Detzecting Blood Flow Signals of Breast Lesions (2015)

MSK

- Microflow Imaging: New Doppler technology to detect low-grade inflammation in patients with arthritis (2017)
- Diagnostic Performance of Superb Microvascular Imaging and Other Sonographic Modalities in the Assessment of Lateral Epicondylosis (2017)
- Carpal tunnel syndrome: selection of patients and assessment of the response to ecoguidated infiltration therapy with steroids of the median nerve by cSMI sampling (2018)
- Value of superb microvascular imaging ultrasonography in the diagnosis of carpal tunnel syndrome. Compared with color Doppler and power Doppler (2017)

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PEDIATRICS

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- Feasibility of superb microvascular imaging to detect high-grade vesicoureteral reflux in children with urinary tract infection (2017)
- Comparison of the superb microvascular imaging technique and the color Doppler techniques for evaluating children's Testicular blood flow (2016)
- Superb microvascular imaging for the detection of parenchymal perfusion in normal and undescended testes in young children (2016)

THYROID

- Superb microvascular imaging (SMI) compared with conventional ultrasound for evaluating thyroid nodules (2017)
- The value of TI-RADS combined with superb microvascular imagine in distinguishing benign and malignant thyroid nodules: a meta-analysis (2020)
- A Prospective Study to Compare Superb Microvascular Imaging with Grayscale Ultrasound and Color Doppler Flow Imaging of Vascular Distribution and Morphology in Thyroid Nodules (2018)
- Role of Superb Micro-Vascular Imaging in the Preoperative Evaluation of Thyroid Nodules (2017)

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Fusion

Interventional

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- New frontiers in ultrasound-guided percutaneous interventions: combination of Smart Fusion and Smart Navigation techniques (2016)

MSK

- Evaluation of MRI-US Fusion Technology in Sports-Related Musculoskeletal Injuries (2015)

Prostate

- Prostate cancer diagnosis: Efficacy of a simple electromagnetic MRI-TRUS fusion method to target biopsies (2017)
- Clinical value of multi-parametric ultrasound and MRI/US fusion-guided biopsy for prostate cancer detection and visualization (2016)
- Transperineal MRI-US Fusion-Guided Target Biopsy of the Prostate after Abdominoperineal Resection: A Case Report (2021)

Breast

- Breast Ultrasound/MRI Fusion May Helps Reduce the need for MRI Guided Biopsies (2021)

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SMI Breast 1

Application of a Novel Microvascular Technique in Breast Lesion Evaluation

Compared with PDI, SMI detected more flow signals and details of microvessels.

Further, when a centrally distributed branching or diffusing mode was used as a criterion for diagnosing malignancy, SMI improved diagnosis of breast masses.

Ultrasound in Medicine & Biology

Original Contribution

Application of a Novel Microvascular Imaging Technique in Breast Lesion Evaluation

Abstract

Conventional power Doppler imaging (PDI) and the novel Superb Microvascular Imaging (SMI) technique were applied to observe the distribution of microvessels in 135 breast lesions, using semi-quantitative grading, penetrating vessel evaluation and flow distribution pattern to evaluate diagnostic efficacy. Compared with PDI, SMI detected more flow signals and details of microvessels. Further, when a centrally distributed branching or diffusing mode was used as a criterion for diagnosing malignancy, SMI improved diagnosis of breast masses. Sensitivity, specificity, positive predictive value and negative predictive value of SMI-assessed flow distribution were 86.4%, 92.6%, 83.3% and 93.5%, respectively, compared with 70.7%, 92.6%, 80.5% and 87.9% for PDI. We also found that flow distribution pattern analysis is superior to semi-quantitative grading and the penetrating vessel method in differentiating malignant breast lesions. Our work here further supports SMI as a novel and promising technique in visualizing microvasculature in breast lesions that may be of paramount use in initial diagnosis as well as follow-up assessment in various treatment regimes.

Journal Info	Ultrasound in Medicine & Biology https://doi.org/10.1016/j.ultrasmedbio.2016.05.010
Year	**2016**
Authors	Zhao Yongfeng, Zhou Ping , Liu Wengang, Shao Yang, Tian Shuangming (China)
System used	Aplio

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SMI Breast 2

Superb Microvascular Imaging: A new vascular detecting ultrasonographic technique for avascular breast masses: A preliminary study

SMI was helpful in the differential diagnosis of benign versus malignant in avascular breast lesions, especially those in BI-RADS category 4.

European Journal of Radiology

Superb Microvascular Imaging—A new vascular detecting ultrasonographic technique for avascular breast masses: A preliminary study

Abstract

Objectives

Methods

Results

Conclusions

Journal Info	European Journal of radiology https://doi.org/10.1016/j.ejrad.2015.12.011
Year	**2016**
Authors	Jia Zhan , Xue-Hong Diao , Jia-Mei Jin , Lin Chen , Yue Chen (China)
System used	Aplio

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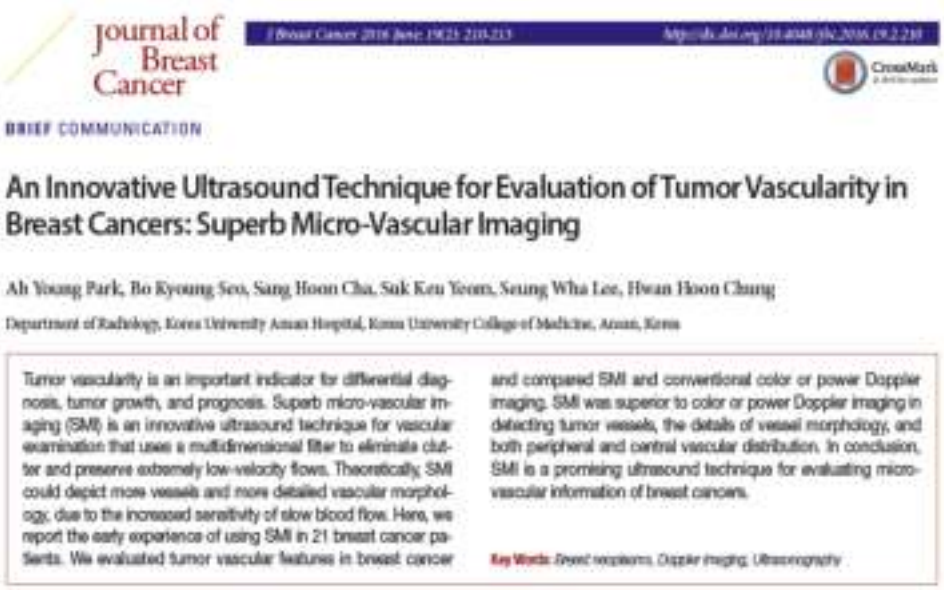
SMI Breast 3

An Innovative Ultrasound Technique for Evaluation of Tumor Vascularity in Breast Cancers: Superb Micro-Vascular Imaging

SMI shows superiority in terms of sensitivity to low velocity flow and ability to depict detailed vessel morphology and distribution.
SMI clearly demonstrated penetrating vessels and intratumoral vascular shunts that could reflect histological feature of tumor neoangiogenesis as the immature capillary overgrowth from surrounding vessels to the center of the tumor



Journal of Breast Cancer

BRIEF COMMUNICATION

An Innovative Ultrasound Technique for Evaluation of Tumor Vascularity in Breast Cancers: Superb Micro-Vascular Imaging

Ah Young Park, Bo Kyoung Seo, Sang Hoon Cha, Suk Keu Yeom, Seung Wha Lee, Hwan Hoon Chung

Department of Radiology, Korea University Ansan Hospital, Korea University College of Medicine, Ansan, Korea

Tumor vascularity is an important indicator for differential diagnosis, tumor growth, and prognosis. Superb micro-vascular imaging (SMI) is an innovative ultrasound technique for vascular examination that uses a multidimensional filter to eliminate clutter and preserve extremely low-velocity flows. Theoretically, SMI could depict more vessels and more detailed vascular morphology, due to the increased sensitivity of slow blood flow. Here, we report the early experience of using SMI in 21 breast cancer patients. We evaluated tumor vascular features in breast cancer and compared SMI and conventional color or power Doppler imaging. SMI was superior to color or power Doppler imaging in detecting tumor vessels, the details of vessel morphology, and both peripheral and central vascular distribution. In conclusion, SMI is a promising ultrasound technique for evaluating microvascular information of breast cancers.

Journal Info	Journal of Breast Cancer http://dx.doi.org/10.4048/jbc.2016.19.2.210
Year	**2016**
Authors	Ah Young Park, Bo Kyoung Seo, Sang Hoon Cha, Suk Keu Yeom, Seung Wha Lee, Hwan Hoon Chung (Korea)
System used	Aplio

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SMI Breast 4

The Diagnostic Value of Superb Micro-Vascular Imaging (SMI) in Detecting Blood Flow Signals of Breast Lesions

Blood flow was better visualized with SMI (83.7%) than with CDFI (74.8%), and some tumor vessels could be detected only with SMI. Moreover, SMI presented higher resolution than CDFI in revealing microvascular flow signals and the vascularization of malignant breast tumors
Therefore, as a non enhanced imaging technique, SMI is a promising option for differentiating breast tumors.

Medicine

Diagnostic Accuracy Study

OPEN

The Diagnostic Value of Superb Microvascular Imaging (SMI) in Detecting Blood Flow Signals of Breast Lesions

A Preliminary Study Comparing SMI to Color Doppler Flow Imaging

Yan Ma, MD, Gang Li, MD, Jing Li, MD, and Wei-dong Ren, MD

Abstract: The correlation between color Doppler flow imaging (CDFI) and Superb Microvascular Imaging (SMI) for detecting blood flow in breast lesions was investigated, as was the diagnostic value of SMI in differentiating benign from malignant breast lesions.

INTRODUCTION

A major cause of morbidity and mortality in women, breast cancer, has been found to be highly dependent on angiogenesis of its microvessels for their growth, invasion, and survival. Furthermore, there is a significant difference in microvascular architecture between benign and malignant tumors.[1] Therefore, the characteristics of tumor microvessels are of paramount importance in differentiating between benign and malignant lesions.[2] Currently, breast tumor vascularity can be assessed by non-contrast-enhanced ultrasonography, such as color Doppler flow imaging (CDFI), and contrast-enhanced imaging techniques, such as dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI), contrast-enhanced ultrasound (CEUS), and dynamic contrast-enhanced computed tomography.[3–5] CDFI can provide information on tumor vascularity associated with breast malignancy; however, it has been proven to be unreliable in differentiating benign from malignant breast lesions when compared with the invasive imaging modalities listed above.[6,7] The number of vessels seen with CDFI often indicates the macrovascularity of breast cancers, but not the microvascularity. The vessels which can be observable by pathology such as microvessel density (MVD) but cannot be measured by CDFI are known as microvascularity.[8] Imaging technologies with contrast media have been used as an additional imaging modality when the combination of x-ray mammography and conven-

Journal Info	Medicine Volume 94, Number 36, September 2015 www.md-journal.com
Year	**2015**
Authors	Ma et al (China)
System used	Aplio 400

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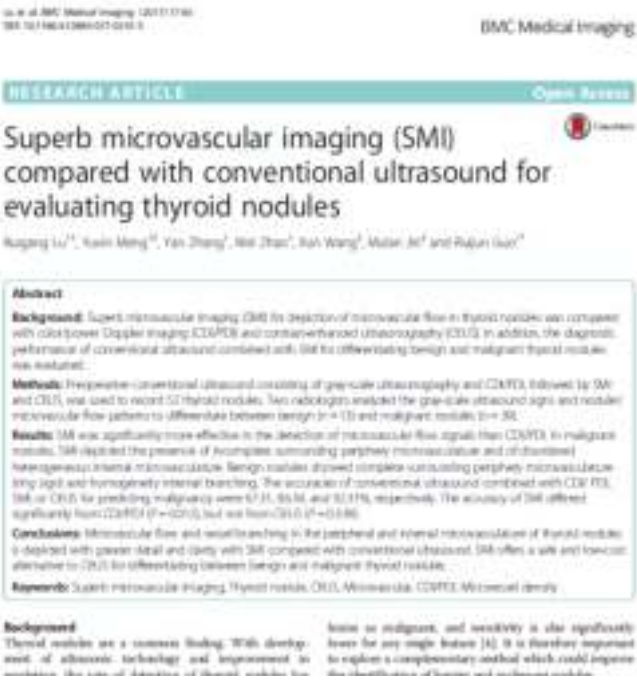
SMI Thyroid 1

Superb microvascular imaging (SMI) compared with conventional ultrasound for evaluating thyroid nodules

Microvascular flow and vessel branching in the peripheral and internal microvasculature of thyroid nodules
is depicted with greater detail and clarity with SMI compared with conventional ultrasound. SMI offers a safe and low-cost alternative to CEUS for differentiating between benign and malignant thyroid nodules



BMC Medical Imaging

RESEARCH ARTICLE Open Access

Superb microvascular imaging (SMI) compared with conventional ultrasound for evaluating thyroid nodules

Abstract

Background

Conclusions

Keywords

Background

Journal Info	BMC Medical Imaging (2017) 17:65 https://doi.org/10.1186/s12880-017-0241-5
Year	**2017**
Authors	Ruigang Lu, Yuxin Meng, Yan Zhang, Wei Zhao, Xun Wang, Mulan Jin and Ruijun Guo (China)
System used	Aplio 500

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SMI Thyroid 2

The value of TI-RADS combined with superb microvascular imagine in distinguishing benign and malignant thyroid nodules: a meta-analysis

TI-RADS combined with SMI may have high diagnostic accuracy, and is more effective than single TI-RADS in distinguishing benign and malignant thyroid nodules.

Research Square

The value of TI-RADS combined with superb micro-vascular imagine in distinguishing benign and malignant thyroid nodules:a meta-analysis

Cong Wang
Dalian Medical University
Xiukun Hou (fytgzy@163.com)
Dalian Medical University

Research article

Keywords: TI-RADS classification, Superb Microvascular Imaging, Thyroid nodule, Ultrasonography, meta-analysis

DOI: https://doi.org/10.21203/rs.3.rs-16146/v1

Journal Info	https://www.researchsquare.com/article/rs-16146/v1 https://doi.org/10.21203/rs.3.rs-16146/v1
Year	**2020**
Authors	Cong Wang, Xiukun Hou (China)
System used	Aplio 500

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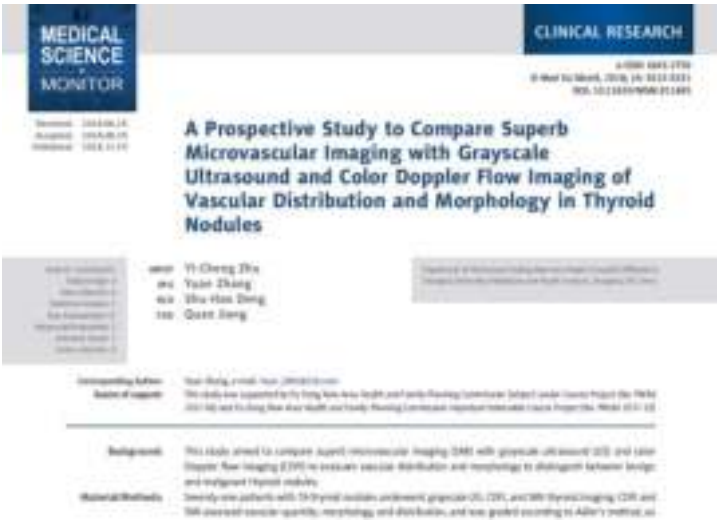
SMI Thyroid 3

A Prospective Study to Compare Superb Microvascular Imaging with Grayscale Ultrasound and Color Doppler Flow Imaging of Vascular Distribution and Morphology in Thyroid Nodules

SMI was significantly more accurate in identifying malignant thyroid nodules compared with color doppler. In malignant thyroid nodules, penetrating blood vessels were identified by SMI in 62.1% and by CDFI in 41.4%. Grayscale US with SMI resulted in the greatest diagnostic sensitivity, accuracy, and specificity compared with grayscale US with CDFI. SMI as an adjunct to grayscale US provided significantly more information on vascularity associated with malignancy in thyroid nodules, when compared with grayscale US or with US and CDFI.


MEDICAL SCIENCE MONITOR

CLINICAL RESEARCH

A Prospective Study to Compare Superb Microvascular Imaging with Grayscale Ultrasound and Color Doppler Flow Imaging of Vascular Distribution and Morphology in Thyroid Nodules

Journal Info	Med Sci Monit, 2018; 24: 9223-9231 https://www.medscimonit.com/abstract/index/idArt/911695 DOI: 10.12659/MSM.911695
Year	**2018**
Authors	Yi-Cheng Zhu, Yuan Zhang, Shu-Hao Deng, Quan Jiang (China)
System used	Aplio 500

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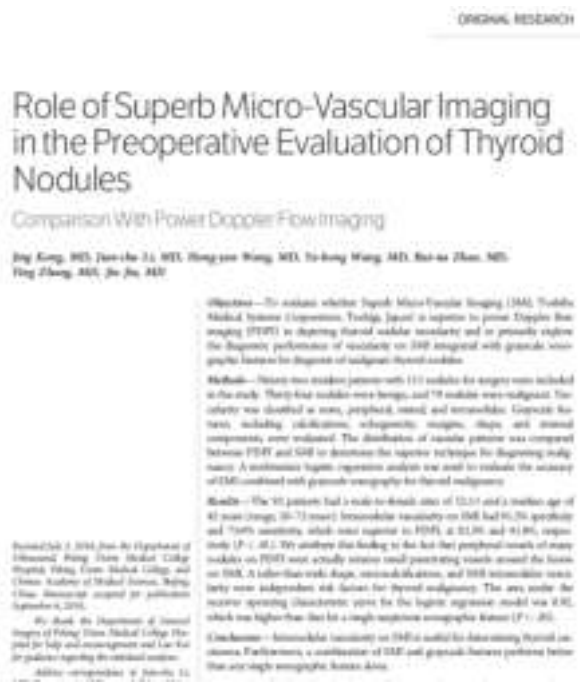
SMI Thyroid 4

Role of Superb Micro-Vascular Imaging in the Preoperative Evaluation of Thyroid Nodules

Intranodular vascularity on SMI is useful for determining thyroid carcinoma.
Furthermore, a combination of SMI and grayscale features performs better than any single sonographic feature alone



ORIGINAL RESEARCH

Role of Superb Micro-Vascular Imaging in the Preoperative Evaluation of Thyroid Nodules

Comparison With Power Doppler Flow Imaging

Journal Info	J UltrasoundMed 2017; 36:1329–1337 | 0278-4297 doi:10.7863/ultra.16.07004
Year	**2017**
Authors	Jing Kong, Jian-chu Li, Hong-yan Wang, Ya-hong Wang, Rui-na Zhao, Ying Zhang, Jin Jin (China)
System used	Aplio 400

Back

Shear Wave Breast 1

Use of shear wave elastography to differentiate benign and malignant breast lesions

The mean elasticity cutoff value yielding the maximum sum of specificity and sensitivity is **45.70 kPa**

2 mm ROI placed on the area of greatest stiffness

BREAST IMAGING
ORIGINAL ARTICLE

Use of shear wave elastography to differentiate benign and malignant breast lesions

Deniz Çebi Olgun, Bora Korkmazer, Fahrettin Kılıç, Atilla Süleyman Dikici, Mehmet Velidedeoğlu, Fatih Aydoğan, Fatih Kantarcı, Mehmet Halit Yılmaz

Journal Info	Diagnostic and Interventional Radiology 2014; 20:239-244 DOI 10.5152/dir.2014.13306
Year	**2014**
Authors	Deiz Çebi Olgun, Bora Korkmazer, Fahrettin Kılıç, Atilla Süleyman Dikici, Mehmet Velidedeoğlu, Fatih Aydoğan, Fatih Kantarcı, Mehmet Halit Yılmaz (Turkey)
System used	SSI Aixplorer

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Shear Wave Breast 2

Qualitative and quantitative analysis with a novel shear wave speed imaging for differential diagnosis of breast lesions

Emean showed the highest AUC in this study with cut-off value of 36.05 Kpa

One ROI was placed and adjusted to the size of the target lesion and the other in the breast fatty tissue.

SCIENTIFIC REPORTS

OPEN

Qualitative and quantitative analysis with a novel shear wave speed imaging for differential diagnosis of breast lesions

Journal Info	www.nature.com/scientificreports DOI: 10.1038/srep40964
Year	**2017**
Authors	Yu-Ping Yang, Xiao-Hong Xu, Le-Hang Guo, Ya-Ping He, Dan Wang, Bo-Ji Liu, Chong-Ke Zhao, Bao-Ding Chen & Hui-Xiong Xu (China)
System used	Aplio 500

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Shear Wave Breast 3

Quantitative shear wave ultrasound elastography: initial experience in solid breast masses

Shear wave elastography gives quantitative and reproducible information on solid breast lesions with diagnostic accuracy at least as good as greyscale ultrasound with BI-RADS.

Acquisition protocol uses **2 orthogonal elastography images were obtained of each lesion. Cut off 50 kPa based on mean elasticity**

2 mm ROI placed on the area of greatest stiffness

Breast Cancer Research

RESEARCH ARTICLE Open Access

Quantitative shear wave ultrasound elastography: initial experience in solid breast masses

Andrew Evans*, Patsy Whelehan, Kim Thomson, Denis McLean, Katrin Brauer, Colin Purdie, Lee Jordan, Lee Baker, Alastair Thompson

Abstract

Journal Info	Breast Cancer Research 2010, 12:R104 http://breast-cancer-research.com/content/12/6/R104
Year	**2010**
Authors	Andrew Evans, Patsy Whelehan, Kim Thomson, Denis McLean, Katrin Brauer, Colin Purdie, Lee Jordan, Lee Baker , Alastair Thompson (UK)
System used	Aixplorer

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Shear Wave Breast 4

Clinical Application of Shear Wave Elastography in Breast Masses

The additional use of SWE to conventional US resulted in marked improvements in specificity, PPV, and accuracy and slight diminutions in sensitivity and NPV for the differentiation benign and malignant breast lesions;

Optimal Cut off is 60,7 kPa based on mean elasticity

2 mm ROI placed on the area of greatest stiffness

WOMEN'S IMAGING

Research Article

Clinical Application of Shear Wave Elastography in Breast Masses

Jin Young Chang, Jin Hee Moon, Sung Hye Koh, Sun-Young Park, and Kwan Seop Lee

Abstract

Journal Info	Iran J Radiol. 2017 January; 14(1):e39585. http://iranjradiol.com/en/articles/13486.html
Year	**2016**
Authors	Jin Young Chang, Jin Hee Moon, Sung Hye Koh, Sun-Young Park, Kwan Seop Lee (Korea)
System used	Aixplorer

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Shear Wave Breast 5

Combination of Quantitative Parameters of Shear Wave Elastography and SMI to Evaluate Breast Masses

Combining all quantitative values of SWE and SMI with B-mode US improved the diagnostic performance in differentiating between benign and malignant breast lesions

Cutoff values: **86.45 kPa**

Eratio of 3.57

SMIVI of 3.35%.

2 mm ROI placed on the area of greatest stiffness

Original Article | Breast Imaging

KJR

Combination of Quantitative Parameters of Shear Wave Elastography and Superb Microvascular Imaging to Evaluate Breast Masses

Eun Ji Lee, MD, Yun-Woo Chang, MD, PhD

Journal Info	Korean J Radiol 2020;21(9):1045-1054 https://doi.org/10.3348/kjr.2019.0765
Year	**2020**
Authors	Eun Ji Lee, Yun-Woo Chang (Korea)
System used	Aplio i800

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SMI MSK 1

Microflow imaging: New Doppler technology to detect low-grade inflammation in patients with arthritis

SMI is a new Doppler technique that increases conspicuity of Doppler vascularity in symptomatic joints when compared to PDUS. This allows detection of low-grade inflammation not visualized with Power Doppler in patients with arthritis.
In 30 % of joints analyzed, Doppler signals were detected using SMI but not with Power Doppler.

Eur Radiol
DOI 10.1007/s00330-017-5016-4

ULTRASOUND

Microflow imaging: New Doppler technology to detect low-grade inflammation in patients with arthritis

A. K. P. Lim[1,2,3] · K. Satchithananda[3] · E. A. Dick[3] · S. Abraham[3,4] · D. O. Cosgrove[3]

Received: 1 September 2016 / Revised: 4 June 2017 / Accepted: 3 August 2017
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Abstract

Aim To assess the efficacy of microvascular imaging in detecting low-grade inflammation in arthritis compared with Power Doppler ultrasound (PDUS).

Method and materials Patients presenting for ultrasound with arthralgia were assessed with grey-scale, PDUS and Superb Microvascular Imaging (SMI). Videoclips were stored for analysis at a later date. Three musculoskeletal radiologists scored grey-scale changes, signal on PDUS and/or SMI within these joints. If a signal was detected on both PDUS and SMI, the readers graded the conspicuity of vascular signal from the two Doppler techniques using a visual analogue scale.

Results Eighty-three patients were recruited with 134 small joints assessed. Eighty-nine of these demonstrated vascular flow with both PD and SMI, whilst in five no flow was detected. In 40 joints, vascularity was detected with SMI but not with PDUS ($p = 0.007$). Out of the 89 joints with vascularity on both SMI and PDUS, 23 were rated as being equal, while SMI scored moderately or markedly better in 45 cases ($p<0.001$).

Conclusion SMI is a new Doppler technique that increases conspicuity of Doppler vascularity in symptomatic joints when compared to PDUS. This allows detection of low grade inflammation not visualised with Power Doppler in patients with arthritis.

Key Points

- *SMI detects vascularity with improved resolution and sensitivity compared to Power Doppler.*
- *SMI can detect low-grade inflammation not seen with Power Doppler.*
- *Earlier detection of active inflammation could have significant impact on treatment paradigms.*

Journal Info	Eur Radiol DOI 10.1007/s00330-017-5016-4
Year	**2017**
Authors	A. K. P. Lim, K. Satchithananda, E. A. Dick, S. Abraham & D. O. Cosgrove (UK)
System used	Aplio 500

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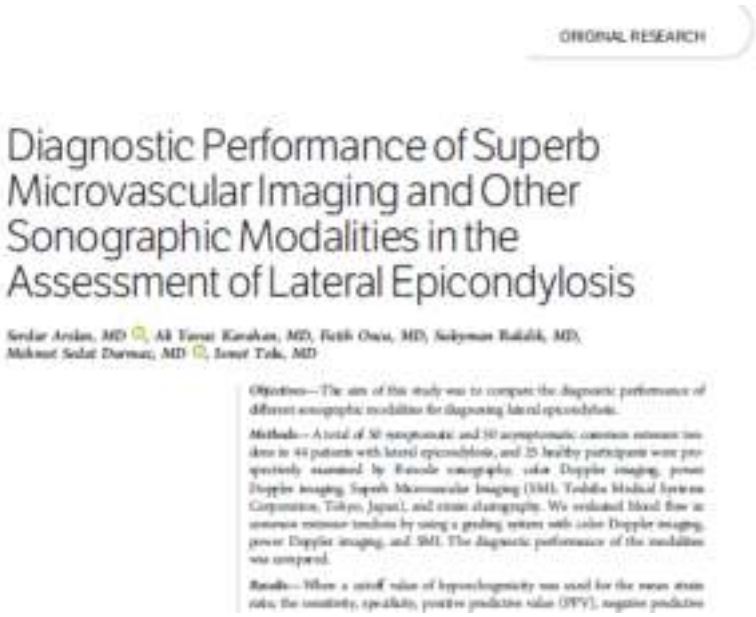
SMI MSK 2

Diagnostic Performance of Superb Microvascular Imaging and Other Sonographic Modalities in the Assessment of Lateral Epicondylosis

The combination of SMI and B-mode sonography was found to have excellent diagnostic performance for lateral epicondylosis. Neovascularzation in patients' tendons with lateral epicondylosis was identified much better with SMI compared to color or power Doppler imaging.



ORIGINAL RESEARCH

Diagnostic Performance of Superb Microvascular Imaging and Other Sonographic Modalities in the Assessment of Lateral Epicondylosis

Serdar Arslan, MD, Ali Yavuz Karahan, MD, Fatih Oncu, MD, Suleyman Bakdik, MD, Mehmet Sedat Durmaz, MD, Ismet Tolu, MD

Journal Info	American Institute of Ultrasound in Medicine | J UltrasoundMed 2017; 00:00–00 | 0278-4297 http://dx.doi.org/10.1002/jum.14369
Year	**2017**
Authors	Serdar Arslan, Ali Yavuz Karahan, Fatih Oncu, Suleyman Bakdik, Mehmet Sedat Durmaz, Ismet Tolu, (Turkey)
System used	Aplio

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SMI MSK 3

Carpal tunnel syndrome: selection of patients and assessment of the response to ecoguidated infiltration therapy with steroids of the median nerve by cSMI sampling

cSMI can be used in the selection of patients with carpal tunnel syndrome candidates for infiltrating therapy. It discriminates patients with acute inflammation from patients with fibrosis from chronic inflammation in which infiltrating therapy, does not yield satisfactory results in the medium to long term.

It has also been shown to be effective in evaluating the response to treatment, which corresponds to the clinical response.

EPOS™ Electronic Presentation Online System

ESR

Carpal tunnel syndrome: selection of patients and assessment of the response to ecoguidated infiltration therapy with steroids of the median nerve by cSMI sampling.

Poster No.: C-2023
Congress: ECR 2018
Type: Scientific Exhibit
Authors: A. Meli[1], V. Incarbone[1], C. Lupo[2], N. Casamassima[3], L. Callegari[1]
[1]Varese/IT, [2]Palermo/IT, [3]Varese, IT/IT
Keywords: Ultrasound, Extremities, Interventional non-vascular, Musculoskeletal system, Ultrasound-Power Doppler, Puncture, Inflammation
DOI: 10.1594/ecr2018/C-2023

Journal Info	ECR 2018 Poster C-2023 https://posterng.netkey.at/esr/viewing/index.php?module=viewing_poster&doi=10.1594/ecr2018/C-2023
Year	**2018**
Authors	A. Meli, V. Incarbone, C. Lupo, N. Casamassima, L. Callegari (Italy)
System used	Aplio

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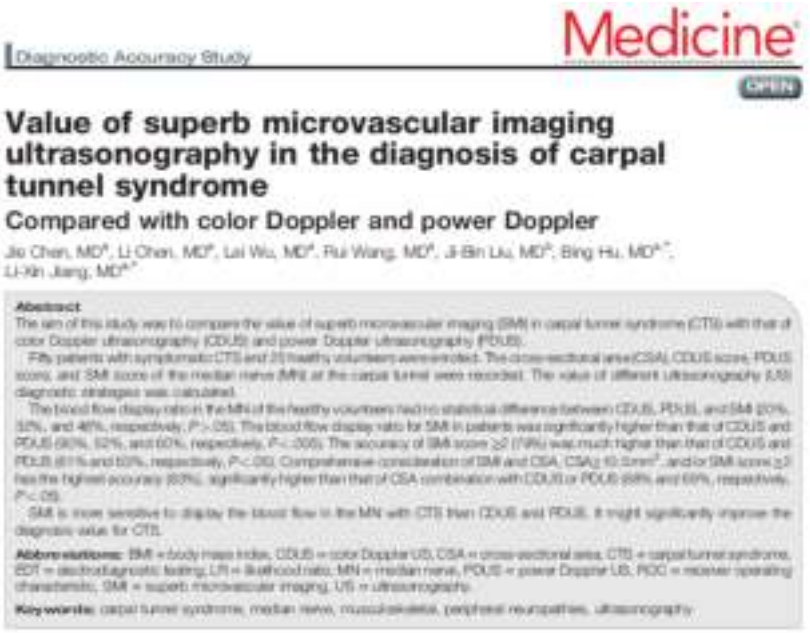
SMI MSK 4

Value of superb microvascular imaging ultrasonography in the diagnosis of carpal tunnel syndrome

Compared with color Doppler and power Doppler

SMI is more sensitive to display the blood flow in the Mediqn Nzerve with Carpal Tunnel Syndrome (CTS) than Color and Power doppler. It might significantly improve the diagnosis value for CTS.



Diagnostic Accuracy Study

Medicine

OPEN

Value of superb microvascular imaging ultrasonography in the diagnosis of carpal tunnel syndrome

Compared with color Doppler and power Doppler

Jie Chen, MD[a], Li Chen, MD[a], Lei Wu, MD[a], Rui Wang, MD[a], Ji-Bin Liu, MD[b], Bing Hu, MD[a,*], Li-Xin Jiang, MD[a,*]

Abstract

The aim of this study was to compare the value of superb microvascular imaging (SMI) in carpal tunnel syndrome (CTS) with that of color Doppler ultrasonography (CDUS) and power Doppler ultrasonography (PDUS).

Fifty patients with symptomatic CTS and 25 healthy volunteers were enrolled. The cross-sectional area (CSA), CDUS score, PDUS score, and SMI score of the median nerve (MN) at the carpal tunnel were recorded. The value of different ultrasonography (US) diagnostic strategies was calculated.

The blood flow display ratio in the MN of the healthy volunteers had no statistical difference between CDUS, PDUS, and SMI (20%, 32%, and 48%, respectively, $P > .05$). The blood flow display ratio for SMI in patients was significantly higher than that of CDUS and PDUS (80%, 52%, and 60%, respectively, $P < .005$). The accuracy of SMI score ≥2 (78%) was much higher than that of CDUS and PDUS (61% and 63%, respectively, $P < .05$). Comprehensive consideration of SMI and CSA, CSA≥10.5 mm^2, and/or SMI score ≥3 has the highest accuracy (93%), significantly higher than that of CSA combination with CDUS or PDUS (68% and 69%, respectively, $P < .05$).

SMI is more sensitive to display the blood flow in the MN with CTS than CDUS and PDUS. It might significantly improve the diagnosis value for CTS.

Abbreviations: BMI = body mass index, CDUS = color Doppler US, CSA = cross-sectional area, CTS = carpal tunnel syndrome, EDT = electrodiagnostic testing, LR = likelihood ratio, MN = median nerve, PDUS = power Doppler US, ROC = receiver operating characteristic, SMI = superb microvascular imaging, US = ultrasonography.

Keywords: carpal tunnel syndrome, median nerve, musculoskeletal, peripheral neuropathies, ultrasonography

Journal Info	Medicine (2017) 96:21(e6862) http://dx.doi.org/10.1097/MD.0000000000006862
Year	**2017**
Authors	Jie Chen, Li Chen, Lei Wu, Rui Wang, Ji-Bin Liu, Bing Hu, Li-Xin Jiang (China)
System used	Aplio 500

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Fusion MSK

Evaluation of MRI-US Fusion Technology in Sports-Related Musculoskeletal Injuries

The combination of real-time MRI and US image fusion and navigation is relatively easy to perform and is helping to improve understanding of MSK injuries.

This technology allows to examine muscle and tendon injuries simultaneously in US and MRI, and the correlation of both techniques, especially low-grade muscular injuries. This has also helped compensate for the limited field of view with US. It improves spatial orientation of cartilage, labrum and meniscal injuries.

Journal Info	Advances in Therapy June 2015, Volume 32, Issue 6, pp 580-594 http://dx.doi.org/10.1007/s12325-015-0217-1
Year	2015
Authors	M Wong-On, L Til-Pérez, R Balius (Spain)
System used	Aplio 500

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Fusion Interventional 1

Ultrasound-Guided Biopsies of Bone Lesions Without Cortical Disruption Using Fusion Imaging and Needle Tracking: Proof of Concept

Explain value and clinical confidence of fusion and smart navigation in application where UL is not generally used (mainly CT)

CIRSE

TECHNICAL NOTE

Ultrasound-Guided Biopsies of Bone Lesions Without Cortical Disruption Using Fusion Imaging and Needle Tracking: Proof of Concept

Julien Garnon[1] · Guillaume Koch[1] · Georgia Tsoumakidou[1] · Jean Caudrelier[1] · Rasoanaj Chen[1] · Roberto Luigi Cazzato[1] · Afshin Gangi[1]

Abstract

Objective To assess the technical feasibility and safety of combined fusion imaging and needle tracking under ultrasound guidance to target bone lesions without cortical disruption.

Materials and Methods Between January 2016 and March 2016, seven patients underwent US-guided biopsy of bone lesions without cortical disruption. Targeted bone lesions were measuring more than 1.5 cm with a thin cortex, a trans-cortical pathway not exceeding 2 cm and without any adjacent vulnerable structures. First three procedures were performed in the CT suite to aid the needle tracking when necessary (group 1), the remaining four procedures were performed in the US suite (group 2). In group 1, deviation from the real position of the bone tissue (estimated on CT) was compared to the virtual position (estimated on the fusion CT–US images). In both groups, procedure data and histopathological results were collected, and compared to the suspected diagnosis and follow-up.

Results Mean procedure duration was 44 min. Total number of synchronization points for combined fusion imaging were 3.3 on average. In group 1, mean deviation between the virtual and real CT coordinates was 5.3 mm on average. All biopsies yielded adequate quality analysable bone sample. Histopathological analysis revealed malignancy in three cases, non-specific inflammation in two cases, and normal bone in two cases. The four benign results were confirmed as true negative results. There were

Journal Info	CardioVascular and Interventional Radiology August 2017, Volume 40, Issue 8, pp 1267–1273
Year	2017
Authors	**Julien Garnon**, Guillaume Koch, Georgia Tsoumakidou, Roberto Luigi Cazzato, **Pr Afshin Gangi** (France)
System used	Aplio 500 / Aplio i800

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Fusion Interventional 2

New frontiers in ultrasound-guided percutaneous interventions: combination of Smart Fusion and Smart Navigation techniques

Smart Navigation and Smart Fusion devices are easy to use and can be positioned rapidly. They broaden the scope of application of ultrasound-guided Interventional radiology by making visible lesions that are poorly identified on standard ultrasound imaging. Due to radiologists confidence in this technology, practice has been changed, so that it is now preferable to perform certain procedures using ultrasound fusion imaging instead of CT or MRI guidance.

Link	
Year	2016
Authors	Dr. Marie-Aude Thenint, Dr. Julien Garnon, Dr. Iulian Enescu, Dr. Fabrice Bing,, **Pr Afshin Gangi** (France)
System used	Aplio 500 / Aplio i800

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Fusion Breast 1

Breast Ultrasound/MRI Fusion May Helps Reduce the need for MRI Guided Biopsies

- The ultrasound/MRI fusion technology will reduce the need for MRI guided biopsies and improve patients experience and save costs.
- The ultrasound/ MRI fusion system obviated the need for MRI guided biopsy in a significant number of cases: Ultrasound/MRI fusion was needed to identify the lesion in 17 cases on 30 patients in total
- The ultrasound/MRI fusion was quick and easy to use with improved image registration when there was another identifiable lesion (e.g., a cyst), in addition to the nipple to provide accurate synchronization.
- The system allows fusion with up to three sequences at once and a color-coded option to help denote the lesion of interest.

Journal Info	Radiological Society of North America (RSNA) 2021 Annual Meeting **(BR01-A7)**
Year	**2021**
Authors	Adrian Kuok Pheng Lim, H. Purushothaman, K. Satchithananda, V. Stewart, S. Flais , D. Cunningham, Imperial College, Charing Cross Hospital in London (UK)
System used	Aplio i800

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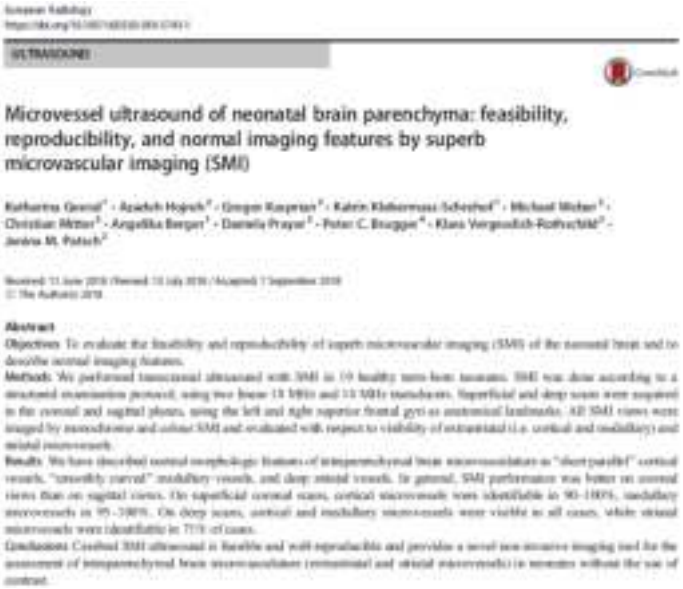
SMI PEDIATRY 1

Microvessel ultrasound of neonatal brain parenchyma: feasibility, reproducibility and normal imaging feature by Superb Microvascular Imaging (SMI)

Cerebral SMI ultrasound provides a novel non-invasive imaging tool for the assessment of intraparenchymal brain microvasculature in neonates without the use of contrast.

- Superb microvascular imaging (SMI) of the neonatal brain is feasible and reproducible.
- SMI depicts extrastriatal and striatal microvessels.
- SMI detects two types of extrastriatal microvessels: cortical and medullary



ULTRASOUND

Microvessel ultrasound of neonatal brain parenchyma: feasibility, reproducibility, and normal imaging features by superb microvascular imaging (SMI)

Journal Info	European Radiology https://doi.org/10.1007/s00330-018-5743-1
Year	**2018**
Authors	Katharina Goeral, Azadeh Hojreh, Gregor Kasprian, Katrin Klebermass-Schrehof, M. Weber, C. Mitter, Angelika Berger, D. Prayer, P. C. Brugger, K. Vergesslich-Rothschild, J. M. Patsch (Austria)
System used	Aplio 400

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SMI PEDIATRY 2

Feasibility of superb microvascular imaging to detect high-grade vesicoureteral reflux in children with urinary tract infection

Using SMI, the direction of urinary movement could be determined, and the presence of reversed flow at the distal ureter and/or renal pelvis or swirling at the renal pelvis Correctly identified high-grade VUR in all cases. It suggests that this new technique can potentially decrease the requirement for imaging modalities that require bladder catheterization and radiation exposure.

Feasibility of superb microvascular imaging to detect high-grade vesicoureteral reflux in children with urinary tract infection

Journal Info	European Society of Radiology DOI 10.1007/s00330-017-4974-x *http://dx.doi.org/*10.1007/s00330-017-4974-x *http://dx.doi.org/*
Year	**2017**
Authors	Hee Kyung Kim, Sara O'Hara, Bo-Kyung Je, Steven J. Kraus & Paul Horn (USA)
System used	Aplio 500

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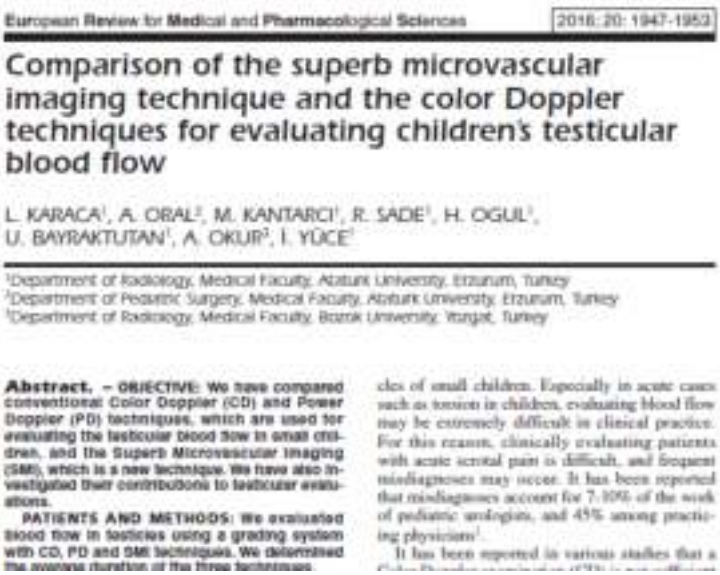
SMI PEDIATRY 3

Comparison of the superb microvascular imaging technique and the color Doppler techniques for evaluating children's Testicular blood flow

SMI yields more detailed vascular information in blood flow in testicles in small children, than either Color or Power Doppler . Furthermore, this technique



European Review for Medical and Pharmacological Sciences 2016; 20: 1947-1953

Comparison of the superb microvascular imaging technique and the color Doppler techniques for evaluating children's testicular blood flow

L. KARACA[1], A. ORAL[2], M. KANTARCI[1], R. SADE[1], H. OGUL[1], U. BAYRAKTUTAN[1], A. OKUR[2], I. YUCE[3]

[1]Department of Radiology, Medical Faculty, Ataturk University, Erzurum, Turkey
[2]Department of Pediatric Surgery, Medical Faculty, Ataturk University, Erzurum, Turkey
[3]Department of Radiology, Medical Faculty, Bozok University, Yozgat, Turkey

Abstract. – OBJECTIVE: We have compared conventional Color Doppler (CD) and Power Doppler (PD) techniques, which are used for evaluating the testicular blood flow in small children, and the Superb Microvascular Imaging (SMI), which is a new technique. We have also investigated their contributions to testicular evaluations.

PATIENTS AND METHODS: We evaluated blood flow in testicles using a grading system with CD, PD and SMI techniques. We determined the average duration of the three techniques

cles of small children. Especially in acute cases such as torsion in children, evaluating blood flow may be extremely difficult in clinical practice. For this reason, clinically evaluating patients with acute scrotal pain is difficult, and frequent misdiagnoses may occur. It has been reported that misdiagnoses account for 7-10% of the work of pediatric urologists, and 45% among practicing physicians[1].

It has been reported in various studies that a

Journal Info	European Radiology https://doi.org/10.1007/s00330-018-5743-1
Year	**2018**
Authors	Katharina Goeral, Azadeh Hojreh, Gregor Kasprian, Katrin Klebermass-Schrehof, M. Weber, C. Mitter, Angelika Berger, D. Prayer, P. C. Brugger, K. Vergesslich-Rothschild, J. M. Patsch (Austria)
System used	Aplio 400

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SMI PEDIATRY 4

Superb microvascular imaging for the detection of parenchymal perfusion in normal and undescended testes in young children

SMI can detect perfusion difference between normal and undescended (UDT) testis in young children better than Power doppler.

European Journal of Radiology

Superb microvascular imaging for the detection of parenchymal perfusion in normal and undescended testes in young children

Abstract

Journal Info	European Journal of Radiology Volume 85, Issue 3, March 2016, Pages 649-656 https://doi.org/10.1016/j.ejrad.2015.12.023
Year	**2015**
Authors	Yong Seung Lee , Myung-Joon Kim , Sang Won Han , Hye Sun Lee , Young-Jae Im , Hyun Joo Shin , Mi-Jung Lee (Korea)
System used	Aplio 500

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Shear Wave Liver 1

Comparison of liver stiffness measurements by a 2D shear wave technique and transient elastography Results from a European prospective multi-centre study

2D SWE correlates well with TE

2D SWE can distinguish patients with Normal/Mild Fibrosis and Cirrhosis

2D SWE deliver than TE for similar results thereby reducing examination times: **3 measurements is sufficient**.

Stage	Fibrosis Stage	2D SWE cutoff (m/s)	2D SWE cutoff (kPa)
F0-F1	Non significant	< 1,54	**< 7.0**
≥ F2	Significant	1,54 - 1,78	**> 7.0**
≥ F3	Advanced	1,78 – 1,87	**> 8.0**
F4	Cirrhosis	> 1,87	**> 10.5**

Journal Info	European Radiology september 2020 https://doi.org/10.1007/s00330-020-07212-x)
Year	**2020**
Authors	Maxime Ronot, Giovanna Ferraioli, Hans-Peter Müller, Mireen Friedrich-Rust, Carlo Filice, Valérie Vilgrain, David Cosgrove & Adrian K. Lim
System used	Aplio 500

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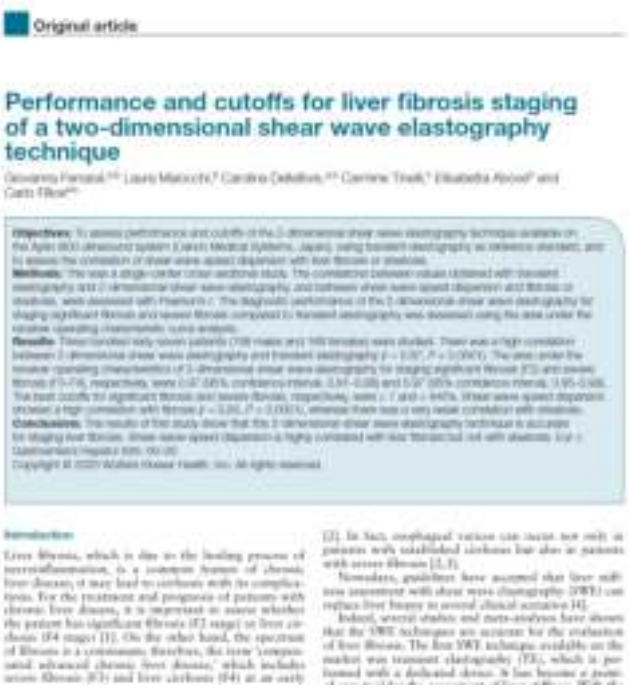
Shear Wave Liver 2

Performance and cutoffs for liver fibrosis staging of a two-dimensional shear wave elastography technique

The results of this study show that this 2D-shear wave elastography technique is accurate for staging liver fibrosis.

Cutoff values:

- **7 kPa significant fibrosis F2**
- **9 kPa Severe Fibrosis F3-F4**



Original article

Performance and cutoffs for liver fibrosis staging of a two-dimensional shear wave elastography technique

Journal Info	European Journal of Gastroenterology & Hepatology Feb 2020 https://doi.org/10.1097/MEG.0000000000001702
Year	**2020**
Authors	G. Ferraioli, L. Maiocchi, C. Dellafiore, C. Tinelli, C. Filice (Italy)
System used	Aplio i800

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Shear Wave Liver 3

Liver stiffness assessed with the help of the propagation map of a latest software for 2D shear wave elastography: Preliminary results

Propagation map of the latest software for 2D shear wave elastography implemented in the Aplio 500 system is a useful tool for the assessment of liver stiffness because it helps in choosing the area of liver parenchyma where measurements are likely more reliable.

Liver stiffness assessed with the help of the propagation map of a latest software for 2D shear wave elastography: preliminary results

Poster No.:	C-0754
Congress:	ECR 2016
Type:	Scientific Exhibit
Authors:	G. Ferraioli, L. Maiocchi, R. Lissandrin, C. Tinelli, C. Filice; Pavia/IT
Keywords:	Cirrhosis, Diagnostic procedure, Ultrasound, Elastography, Liver
DOI:	10.1594/ecr2016/C-0754

Journal Info	ECR 2016 Poster C-0754 http://dx.doi.org/10.1594/ecr2016/C-0754
Year	**2016**
Authors	G. Ferraioli, L. Maiocchi, R. Lissandrin, C. Tinelli, C. Filice (Italy)
System used	Aplio

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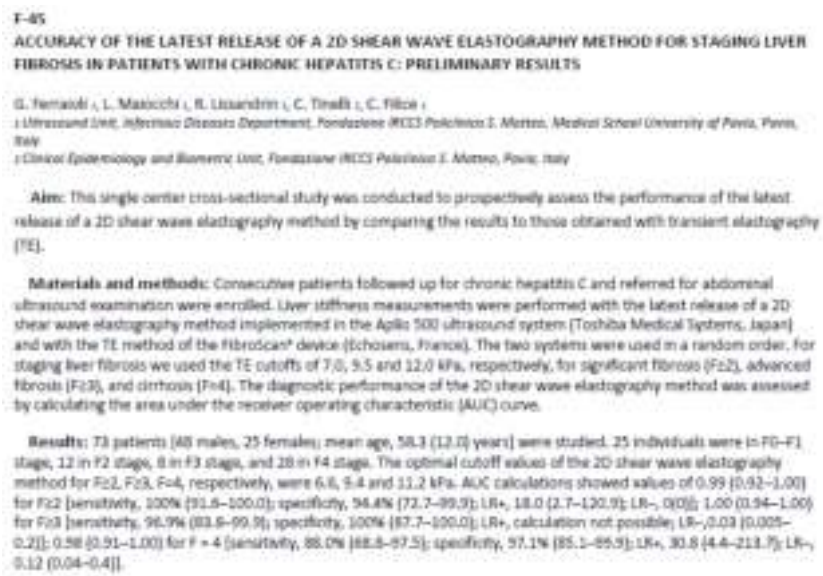
Shear Wave Liver 4

Accuracy of the lastest release of a 2D Shear Wave elastography method for staging liver fibrosis in patients with chronic hepatitis C: Preliminary results

The optimal cutoff values of the 2D shear wave elastography method:

- F≥2: 6.6 kPa
- F≥3 9.4 kPa
- F=4 11.2 kPa.



F-45

ACCURACY OF THE LATEST RELEASE OF A 2D SHEAR WAVE ELASTOGRAPHY METHOD FOR STAGING LIVER FIBROSIS IN PATIENTS WITH CHRONIC HEPATITIS C: PRELIMINARY RESULTS

G. Ferraioli [1], L. Maiocchi [1], R. Lissandrin [1], C. Tinelli [2], C. Filice [1]

[1] Ultrasound Unit, Infectious Diseases Department, Fondazione IRCCS Policlinico S. Matteo, Medical School University of Pavia, Pavia, Italy

[2] Clinical Epidemiology and Biometric Unit, Fondazione IRCCS Policlinico S. Matteo, Pavia, Italy

Aim: This single center cross-sectional study was conducted to prospectively assess the performance of the latest release of a 2D shear wave elastography method by comparing the results to those obtained with transient elastography (TE).

Materials and methods: Consecutive patients followed up for chronic hepatitis C and referred for abdominal ultrasound examination were enrolled. Liver stiffness measurements were performed with the latest release of a 2D shear wave elastography method implemented in the Aplio 500 ultrasound system (Toshiba Medical Systems, Japan) and with the TE method of the FibroScan® device (Echosens, France). The two systems were used in a random order. For staging liver fibrosis we used the TE cutoffs of 7.0, 9.5 and 12.0 kPa, respectively, for significant fibrosis (F≥2), advanced fibrosis (F≥3), and cirrhosis (F=4). The diagnostic performance of the 2D shear wave elastography method was assessed by calculating the area under the receiver operating characteristic (AUC) curve.

Results: 73 patients [48 males, 25 females; mean age, 58.3 (12.0) years] were studied. 25 individuals were in F0–F1 stage, 12 in F2 stage, 8 in F3 stage, and 28 in F4 stage. The optimal cutoff values of the 2D shear wave elastography method for F≥2, F≥3, F=4, respectively, were 6.6, 9.4 and 11.2 kPa. AUC calculations showed values of 0.99 (0.92–1.00) for F≥2 [sensitivity, 100% (91.8–100.0); specificity, 94.4% (72.7–99.9); LR+, 18.0 (2.7–120.9); LR–, 0(0)]; 1.00 (0.94–1.00) for F≥3 [sensitivity, 96.9% (83.8–99.9); specificity, 100% (87.7–100.0); LR+, calculation not possible; LR–,0.03 (0.005–0.2)]; 0.98 (0.91–1.00) for F = 4 [sensitivity, 88.0% (68.8–97.5); specificity, 97.1% (85.1–99.9); LR+, 30.8 (4.4–213.7); LR–, 0.12 (0.04–0.4)].

Journal Info	Digestive and Liver Disease 48S (2016) e62 http://dx.doi.org/10.1016/j.dld.2015.12.143
Year	**2016**
Authors	G. Ferraioli, L. Maiocchi, R. Lissandrin, C. Tinelli, C. Filice (Italy)
System used	Aplio 500

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Shear Wave Liver 5

Variability of Liver Shear Wave Measurements Using a New Ultrasound Elastographic Technique

2D SWE showed low overall measurement variability, with a **minimum of 5 readings providing equivalent precision to the existing method using 10 samples**.

Original Research

Variability of Liver Shear Wave Measurements Using a New Ultrasound Elastographic Technique

David P. Nadebaum MBBS, BMedSci, Amanda J. Nicoll MBBS, FRACP, PhD, Siddharth Sood MBBS, FRACP, PhD, Alexandra Gorelik MSc, ... See all authors

First published: 29 September 2017 | https://doi.org/10.1002/jum.14375

Toshiba Healthcare loaned the ultrasound device used for shear wave measurements. Toshiba did not have influence over study design, data collection, data analysis, or manuscript preparation. ... Less

Journal Info	Journal of Ultrasound in Medicine, vol 37 https://doi.org/10.1002/jum.14375
Year	**2017**
Authors	David P. Nadebaum, Amanda J. Nicoll, Siddharth Sood, Alexandra Gorelik, Robert N. Gibson (Australia)
System used	Aplio 500

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Shear Wave Liver 6

Concordance of transient elastography and shear wave elastography for measurement of liver stiffness

SWE obtained using the Toshiba Aplio 500 and TE provides similar measurements for liver stiffness measurements of liver diseases. SWE has good inter-operator reliability and may be advantageous over TE owing to the availability of B-mode interrogation simultaneously and the reliability indicators this technology provides.

SONOGRAPHY

ORIGINAL ARTICLE

Concordance of transient elastography and shear wave elastography for measurement of liver stiffness

Sandra O'Hara[1,2], Susan Hodson[3], Chandelle Hernaman[1], Nick Wambeek[1], John Olynyk[3,4]

1 SKG Radiology, Western Australia, Australia
2 Department of Medical Radiation Sciences, Curtin University, Western Australia, Australia
3 Department of Gastroenterology and Hepatology, Fiona Stanley and Fremantle Hospital Group, Western Australia, Australia
4 School of Medical and Health Sciences, Edith Cowan University, Western Australia, Australia

Keywords
elastography, shear wave, transient, liver, fibrosis, cirrhosis.

Correspondence
Sandra O'Hara, SKG Radiology, West Perth, Perth, Western Australia.
E-mail: sandra.ohara@skg.com.au

Received: 17 June 2017; revised 28 July 2017; accepted 28 July 2017

doi:10.1002/sono.12122

Abstract

Introduction: Transient elastography is commonly utilised in liver clinics as a non-invasive method of assessing the degree of fibrosis or presence of cirrhosis in the human liver. Many ultrasound vendors are now providing ultrasound shear wave elastography on commercial ultrasound units. There is limited published data evaluating the performance of ultrasound elastography compared to transient elastography.

Methods: This study compared the performance of ultrasound shear wave elastography, on an ultrasound unit with transient elastography in 29 participants with liver diseases of varying aetiologies.

Results: The mean shear wave pressure for transient elastography and ultrasound shear wave elastography was 7.58 kPa (SD 3.29) and 7.26 (SD 2.02), respectively, with 18 cases having a less than 30% deviation of shear wave elastography from transient elastography.

Conclusion: Both methods provide similar measurements of fibrosis and may be useful non-invasive measures of hepatic fibrosis and cirrhosis.

Journal Info	Sonography 4 141–145 © 2017 Australasian Sonographers Association https://onlinelibrary.wiley.com/doi/pdf/10.1002/sono.12122
Year	**2017**
Authors	Sandra O'Hara, Susan Hodson, Chandelle Hernaman, Nick Wambeek, John Olynyk (Australia)
System used	Aplio 500

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Shear Wave Liver 7

Post-COVID-19 Liver Injury Comprehensive Imaging With Multi parametric Ultrasound

Liver elasticity, viscosity, and steatosis values were significantly altered in patients after COVID-19, with particularly higher fibrosis scores compared to the control group

ORIGINAL RESEARCH

Post-COVID-19 Liver Injury

Comprehensive Imaging With Multiparametric Ultrasound

Maija Radzina, Davis Simanis Putrins, Arta Micena, Ieva Vanaga, Oksana Kolesova, Ardis Platkajis, Ludmila Viksna

Journal Info	J Ultrasound Med 2021; 9999:1–15 doi:10.1002/jum.15778 Post-COVID-19 Liver Injury (wiley.com)
Year	**2021**
Authors	Maija Radzina, Davis Simanis Putrins , Arta Micena, Ieva Vanaga, Oksana Kolesova, Ardis Platkajis, Ludmila Viksna (Latvia)
System used	Aplio i800

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Canon
CANON MEDICAL

Shear Wave Liver 8

Two-Dimensional-Shear Wave Elastography with a Propagation Map: Prospective Evaluation of Liver Fibrosis Using Histopathology as the Reference Standard

The LS value obtained from 2D-SWE with a propagation map provides excellent diagnostic performance in evaluating liver fibrosis stage, determined by histopathology

The optimal cut-off LS values were 5.4, **7.8**, **9.4**, and **12.2 kPa** for F ≥ 1, **F ≥ 2, F ≥ 3,** and **F = 4**, respectively. The corresponding sensitivity and specificity of the LS value for detecting cirrhosis were 90.9% and 88.4%, respectively.


Original Article | Gastrointestinal Imaging

KJR

Two-Dimensional-Shear Wave Elastography with a Propagation Map: Prospective Evaluation of Liver Fibrosis Using Histopathology as the Reference Standard

Journal Info	Korean J Radiol 2020;21(12):1317-1325 https://doi.org/10.3348/kjr.2019.0978
Year	**2020**
Authors	Dong Ho Lee, Eun Sun Lee, Jae Young Lee, Jae Seok Bae, Haeryoung Kim, Kyung Bun Lee, Su Jong Yu, Eun Ju Cho, Jeong-Hoon Lee, Young Youn Cho, Joon Koo Han, Byung Ihn Choi (Korea)
System used	Aplio i800

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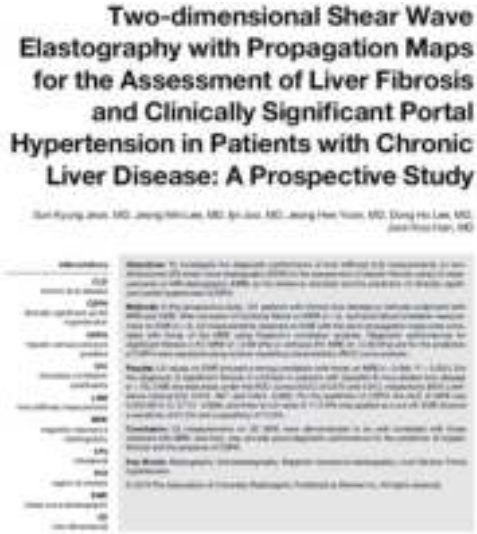
Shear Wave Liver 9

Two-dimensional Shear Wave Elastography with Propagation Maps for the Assessment of Liver Fibrosis and Clinically Significant Portal Hypertension in Patients with Chronic Liver Disease: A Prospective Study

LS measurements on 2D SWE were demonstrated to be well correlated with those obtained with MRE, and thus, may provide good diagnostic performance for the prediction of hepatic fibrosis and the presence of CSPH in HBV patients

Cutoff in HBV patients Cutoff :

- **F2 > 8,1 kPa**
- **F4 > 10,1 kPa**
- **CSPH > 11,5 kPa**


Two-dimensional Shear Wave Elastography with Propagation Maps for the Assessment of Liver Fibrosis and Clinically Significant Portal Hypertension in Patients with Chronic Liver Disease: A Prospective Study

Journal Info	Acad Radiol 2019:1–9 https://doi.org/10.1016/j.acra.2019.08.006
Year	**2019**
Authors	Sun Kyung Jeon, Jeong Min Lee, Ijin Joo, Jeong Hee Yoon, Dong Ho Lee, Joon Koo Han (Korea)
System used	Aplio i800

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Shear Wave Children Liver 1

Elastography for Pediatric Chronic Liver Disease: A Review and Expert Opinion

SWE, is feasible in children of all ages and has many pediatric applications in the setting of chronic liver disease. LS increases most often in response to increasing histologic fibrosis, although a variety of other pathologic and histologic changes may impact these measurements (eg, inflammation and congestion). At present, SWE techniques employed in children are based mostly on the adult literature and expert opinion as opposed to scientific evidence, and, thus, continued research is needed. Further studies also are needed to further evaluate the relationship between LS and meaningful clinical outcomes in a wide variety of pediatric chronic liver diseases and to determine exactly how these imaging techniques should be implemented in clinical practice.


Elastography for Pediatric Chronic Liver Disease: A Review and Expert Opinion

INTRODUCTION

Journal Info	Ultrasound Med 2020; 9999:1–20 https://doi.org/10.1002/jum.15482
Year	**2020**
Authors	Giovanna Ferraioli, MD , Richard G. Barr, MD, PhD, Jonathan R. Dillman, MD, MSc
System used	Multiple vendors including Aplio 800

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Shear Wave Children Liver 2

Liver Shear Wave Speed and Other Quantitative Ultrasound Measures of Liver Parenchyma: Prospective Evaluation in Healthy Children and Adults

For the pediatric participants:

- Mean median shear wave speed was 1.29 ± 0.13 m/s
- Mean median shear wave elasticity was 4,99 kPa ± 1.05 kPa
- Shear wave dispersion was 11.43 ± 1.75 (m/s)/kHz,

Liver Shear Wave Speed and Other Quantitative Ultrasound Measures of Liver Parenchyma: Prospective Evaluation in Healthy Children and Adults

Andrew T. Trout[1,2]
Stavra A. Xanthakos[3,4]
Paula S. Bennett[1]
Jonathan R. Dillman[1,2]

OBJECTIVE. The purpose of this study was to use 2D ultrasound shear wave elastography (SWE) to define expected ranges for liver shear wave speed and shear wave dispersion in children and adults without a known history of liver disease. The study also sought to define liver attenuation in adults.

SUBJECTS AND METHODS. This was an institutional review board–approved prospective study of 328 children (younger than 18 years old) and 32 adults without liver disease who underwent 2D SWE of the liver with a Canon Aplio i800 ultrasound system (i8CX2 transducer). Two shear wave speed and shear wave dispersion measurements were obtained. In adults, five attenuation measurements were also obtained. Pearson correlation and t tests were used to define relationships between shear wave speed and dispersion values and predictor variables. Multivariable logistic regression with forward selection was used to generate models.

RESULTS. Median age was 3.04 years old for the pediatric participants and 40.92 years old for the adult participants. Mean median shear wave speed and shear wave dispersion were 1.29 ± 0.13 m/s and 11.43 ± 1.75 (m/s)/kHz, respectively, for the pediatric participants and 1.21 ± 0.13 m/s and 10.24 ± 1.65 (m/s)/kHz, respectively, for the adults. Mean median attenuation in adults was 0.52 ± 0.11 dB/cm/MHz. On multivariable modeling, height was the only significant predictor of shear wave speed in children ($0.002 m/s per cm, $p < 0.0001$) and abdominal wall thickness was the only predictor of shear wave speed in adults ($1.17 m/s per cm, $p = 0.0006$).

CONCLUSION. Liver shear wave speed and shear wave dispersion data for children and adults without liver disease provides data against which results from patients with liver disease can be compared. Liver shear wave speed increases during childhood associated with increases in height and shear wave speed increases in adulthood with increasing abdominal wall thickness.

Keywords: dispersion, liver attenuation, shear wave elastography

doi.org/10.2214/AJR.19.21796

Received May 15, 2019; accepted after revision August 24, 2019.

Supported by Canon Medical Systems, USA.

Journal Info	American Journal of Roentgenology. 2020;214: 557-565. 10.2214/AJR.19.21796 https://www.ajronline.org/doi/10.2214/AJR.19.21796
Year	**2020**
Authors	Andrew T. Trout, Stavra A. Xanthakos, Paula S. Bennett, Jonathan R. Dillman (USA)
System used	Aplio i800

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Shear Wave Children Liver 3

Liver Shear Wave Elastography and Attenuation Imaging Coefficient Measures: Prospective Evaluation in Healthy Children

SWE and ATI liver values were provided in healthy children. The normative quantitative data might be useful to characterize liver parenchyma in children better

- Median median SWE is 4,6 kPa ± 0.6 kPa
- Median ATI coefficient is 0.65 ± 0.07 dB/cm/MHz

Abdominal Radiology
https://doi.org/10.1007/s00261-021-02960-w

HEPATOBILIARY

Liver shear wave elastography and attenuation imaging coefficient measures: prospective evaluation in healthy children

Romain Cailloce[1] · Elsa Tavernier[2] · Laurent Brunereau[3] · Adèle Fievet[1] · Céline Falip[1] · Fanny Dujardin[4] · Stéphanie Willot[1] · Frédéric Patat[1,5] · Baptiste Morel[1,6]

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Abstract

Purpose Ultrasonographic quantitative measurements enable characterizing the stiffness and viscosity of liver parenchyma. Normal Shear Wave Elastography (SWE) values have been reported in adults and children. The Attenuation Imaging (ATI) coefficient is a measure of local sound energy loss thought to reflect steatosis in adults. The aim of our study was to provide normal SWE and ATI liver values in healthy children.

Methods A prospective monocentric study was conducted recruiting 86 children (45 boys and 41 girls) from a single University Hospital between January 2019 and June 2020, having a clinically indicated ultrasound examination, without a known or documented history of liver disease. Examinations were performed using an Aplio i800 (Canon Medical Systems) ultrasound system with an i8CX1 transducer. SWE measurements were obtained using a color map showing an automated measurement area grid overlay. ATI coefficients were generated automatically for each region of interest in the right liver.

Results Overall median age for the pediatric population was 106 months (1–180 months; SD 49 months). Children were normal weighted. Liver SWE was available for all children. The median liver SWE was 4.6 kPa [3.3–6.6]. ATI yielded valid measurements in 77 patients. The median ATI coefficient was 0.65 [0.5–0.91] dB/cm/MHz. No impact of age, sex, weight and Body Mass Index was observed.

Conclusion SWE and ATI liver values were provided in healthy children. The normative quantitative data might be useful to characterize liver parenchyma in children better.

Journal Info	Abdominal Radiology https://doi.org/10.1007/s00261-021-02960-w
Year	**2021**
Authors	Romain Cailloce, Elsa Tavernier, Laurent Brunereau, Adèle Fievet, Céline Falip, Fanny Dujardin, Stéphanie Willot, Frédéric Patat, Baptiste Morel (France)
System used	Aplio i800

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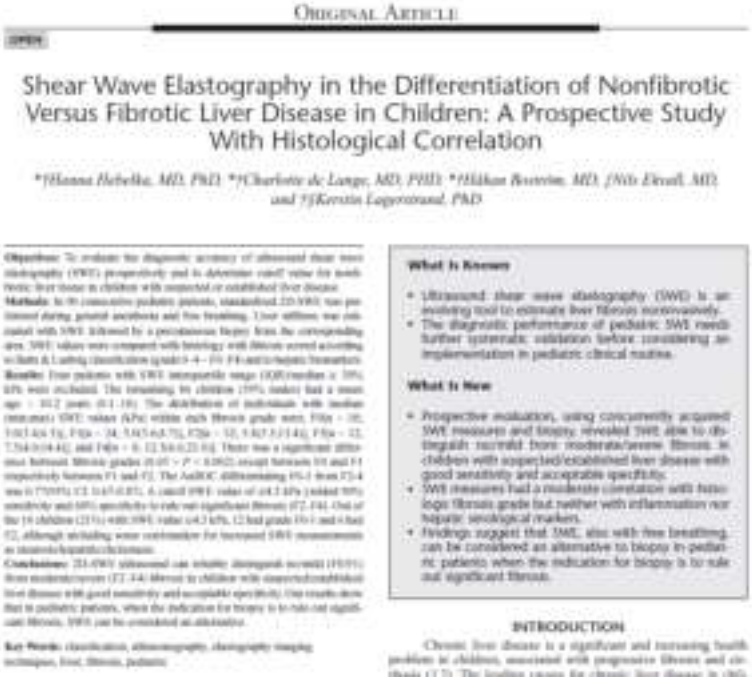
Shear Wave Children Liver 4

Shear Wave Elastography in the Differentiation of Nonfibrotic Versus Fibrotic Liver Disease

2D-SWE ultrasound can reliably distinguish no/mild (F0/F1) from moderate/severe (F2–F4) fibrosis in children with suspected/established liver disease with good sensitivity and acceptable specificity. Our results show that in pediatric patients, when the indication for biopsy is to rule out significant fibrosis, SWE can be considered an alternative



ORIGINAL ARTICLE

Shear Wave Elastography in the Differentiation of Nonfibrotic Versus Fibrotic Liver Disease in Children: A Prospective Study With Histological Correlation

*Hanna Hebelka, MD, PhD; *†Charlotte de Lange, MD, PhD; *Håkan Boström, MD; ‡Nils Ekvall, MD; and *§Kerstin Lagerstrand, PhD

What Is Known

- Ultrasound shear wave elastography (SWE) is an evolving tool to estimate liver fibrosis noninvasively.
- The diagnostic performance of pediatric SWE needs further systematic validation before considering an implementation in pediatric clinical routine.

What Is New

- Prospective evaluation, using concurrently acquired SWE measures and biopsy, revealed SWE able to distinguish normal from moderate/severe fibrosis in children with suspected/established liver disease with good sensitivity and acceptable specificity.
- SWE measures had a moderate correlation with histologic fibrosis grade but neither with inflammation nor hepatic serological markers.
- Findings suggest that SWE, also with free breathing, can be considered an alternative to biopsy in pediatric patients when the indication for biopsy is to rule out significant fibrosis.

INTRODUCTION

Journal Info	*JPGN Reports* (2021) 3:1(e156) https://journals.lww.com/jpgnr/Fulltext/2022/02000/Shear_Wave_Elastography_in_the_Differentiation_of.16.aspx
Year	**2021**
Authors	Hanna Hebelka, Charlotte de Lange, Håkan Boström, Nils Ekvall, Kerstin Lagerstrand (Sweden)
System used	Aplio i800

Back

ATI Liver 1

Detection of Liver Steatosis With a Novel Ultrasound-Based Technique: A Pilot Study Using MRI-Derived Proton Density Fat Fraction as the Gold Standard (2019)

Comparison of steatosis respective diagnostic performance between ATI and CAP vs MRI PDFF (“gold standard”)

ATI performed better than CAP, and this improvement was statistically significant for S > 1

ATI Cutoff values for steatosis grading (dB/cm/kHz):

S0	No steatosis	**< 0,63**
S1	Mild Steatosis	**0,63 – 0,72**
S2-S3	Significant & Severe Steatosis	**> 0,72**


Detection of Liver Steatosis With a Novel Ultrasound-Based Technique: A Pilot Study Using MRI-Derived Proton Density Fat Fraction as the Gold Standard

Journal Info	Clinical and Translational Gastroenterology 2019;00:e00081 https://doi.org/10.14309/ctg.0000000000000081
Year	**2019**
Authors	G. Ferraioli, L. Maiocchi, R. Lissandrin, C. Tinelli, F. Calliada, C. Filice (Italy)
System used	Aplio i800

Back

ATI Liver 2

Assessment of hepatic steatosis by using attenuation imaging: A quantitative, easy-to-perform ultrasound technique

The acoustic coefficient (AC) from ATI provided good diagnostic performance in detecting the varying degrees of hepatic steatosis. The degree of steatosis was the only significant factor affecting the AC, whereas fibrosis and inflammation were not.

Cutoff values for steatosis grading (dB/cm/kHz):

S0	S1	S2	S3
No Steatosis	Mild Steatosis	Moderate Steatosis	Severe Steatosis
< 0,63	**< 0,70**	**> 0,70**	**> 0,75**

European Radiology

HEPATOBILIARY-PANCREAS

Assessment of hepatic steatosis by using attenuation imaging: a quantitative, easy-to-perform ultrasound technique

Jae Seok Bae[1,2] · Dong Ho Lee[1,2] · Jae Young Lee[1,2,3] · Haeryoung Kim[4] · Su Jong Yu[5] · Jeong-Hoon Lee[5] · Eun Ju Cho[5] · Yun Bin Lee[5] · Joon Koo Han[1,2,3] · Byung Ihn Choi[6]

Received: 27 February 2019 / Revised: 2 May 2019 / Accepted: 10 May 2019

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Abstract

Objectives To evaluate the diagnostic performance of attenuation imaging (ATI) in the detection of hepatic steatosis compared with a histopathology gold standard.

Methods We prospectively enrolled 308 consecutive patients (35 males; median age, 54.0 years) who underwent percutaneous liver biopsy for evaluation of diffuse liver disease between January 2018 and November 2018 in a tertiary academic center. Grayscale ultrasound examination with ATI was performed just before biopsy, and an attenuation coefficient (AC) was obtained from each patient. The degree of hepatic steatosis, fibrosis stage, and steatoinflammatory activity were assessed on histopathologic examination. The significant factor associated with the AC was found by a linear regression analysis, and the diagnostic performance of the AC for the classification into each hepatic steatosis stage was evaluated by receiver operating characteristic (ROC) analysis.

Results The distribution of hepatic steatosis grade on histopathology was 53/11/22/16/6 for none/mild (< 10%)/moderate (10–33%)/severe (34–66%)/confluent (> 66%) steatosis, respectively. The mean value of the ROC area under the curve, sensitivity, specificity, and optimal cutoff AC value for

Journal Info	European radiology https://doi.org/10.1007/s00330-019-06272-y
Year	**2019**
Authors	Jae Seok Bae, Dong Ho Lee, Jae Young Lee, Haeryoung Kim, Su Jong Yu, Jeong-Hoon Lee, Eun Ju Cho & al
System used	Aplio i800

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ATI Liver 3

Prospective Evaluation of Hepatic Steatosis using Ultrasound Attenuation Imaging in Patients with Chronic Liver Disease with Magnetic Resonance Imaging Proton Density Fat Fraction as the Reference Standard

ATI attenuation coefficients are well correlated with MRI-PDFF and, thus, may provide good diagnostic performance in the assessment of hepatic steatosis, making these coefficients a promising tool for the non-invasive assessment and quantification of hepatic steatosis

Cutoff value for detection of steatosis

- **MRI-PDFF > 5%** **0,59 dB/cm/MHz**
- **MRI-PDFF > 10%** **0,65 dB/cm/MHz**

● *Original Contribution*

PROSPECTIVE EVALUATION OF HEPATIC STEATOSIS USING ULTRASOUND ATTENUATION IMAGING IN PATIENTS WITH CHRONIC LIVER DISEASE WITH MAGNETIC RESONANCE IMAGING PROTON DENSITY FAT FRACTION AS THE REFERENCE STANDARD

Journal Info	Ultrasound in Med. & Biol., Vol. 45, No. 6, pp. 14071416 https://doi.org/10.1016/j.ultrasmedbio.2019.02.008
Year	**2019**
Authors	Adegpst Un Kyung Jeon, Jeong Min Lee, Ijin Joo, Jeong Hee Yoon, Dong Ho Lee, Jae Young Lee, Joon Koo Han (Korea)
System used	Aplio i800

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ATI Liver 4

Quantification of hepatic steatosis with ultrasound: promising role of attenuation imaging coefficient in a biopsy-proven cohort

ATI coefficient has a significant positive correlation with the grade of steatosis and is a promising quantitative technique for the noninvasive diagnosis and quantification of hepatic steatosis.

Measurement of the attenuation coefficient is achieved with a very high rate of technical success.

Cutoff value for detection of steatosis

- **S0 vs S1-2-3** **0,69 dB/cm/MHz**
- **S0-1 vs S2-3** **0,72 dB/cm/MHz**

Quantification of hepatic steatosis with ultrasound: promising role of attenuation imaging coefficient in a biopsy-proven cohort

Journal Info	European Radiology https://doi.org/10.1007/s00330-019-06480-6
Year	**2019**
Authors	Marco Dioguardi Burgio, Maxime Ronot, Edouard Reizine, Pierre-Emmanuel Rautou, Laurent Castera, Valérie Paradis, Philippe Garteiser, Bernard Van Beers, Valérie Vilgrain (France)
System used	Aplio i800

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ATI Liver 5

Performance of the Attenuation Imaging Technology in the Detection of Liver Steatosis (2020)

Attenuation Imaging is a reliable tool for detecting liver steatosis, showing an excellent correlation with the MRI-PDFF and high performance with AUROCs of 0.90 or higher

ATI PEN Cutoff values for steatosis grading (dB/cm/kHz):

S0	No steatosis	**< 0,69**

The regression equation between ATI-Pen and ATI-Gen was **ATIPen = 0.88 ATI-Gen + 0.13**

Performance of the Attenuation Imaging Technology in the Detection of Liver Steatosis

Journal Info	Journal of Ultrasound in Medicine ; 9999:1–8 https://doi.org/10.1002/jum.15512
Year	**2020**
Authors	G. Ferraioli, L. Maiocchi, R. Lissandrin, C. Tinelli, F. Calliada, C. Filice (Italy)
System used	Aplio i800

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ATI Liver 6

Reproducibility of ultrasound attenuation imaging for the noninvasive evaluation of hepatic steatosis (2019)

ATI showed high intra- and inter-observer reproducibility in the assessment of hepatic steatosis.

The intra-observer reproducibility of each subgroup shown as CoV and **not to be influenced by sex, age, BMI, skin-to-capsule distance, or chronic liver disease**.


Reproducibility of ultrasound attenuation imaging for the noninvasive evaluation of hepatic steatosis

ULTRA SONO GRAPHY

ORIGINAL ARTICLE

Journal Info	Ultrasonography 2020;39:121-129 https://doi.org/10.14366/usg.19034
Year	**2019**
Authors	Jeongin Yoo, Jeong Min Lee, Ijin Joo, Dong Ho Lee, Jeong Hee Yoon, Hyo-Jin Kang, Su Joa Ahn (Korea)
System used	Aplio i800

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SWD-ATI Liver 1

Accuracy of 2-dimensional Shear Wave Elastography and Attenuation Imaging for Evaluation of Patients With Nonalcoholic Steatohepatitis

-**SWD was significantly associated with lobular inflammation.**

-Risk scoring system based on AC and SWD that might be used to detect steatohepatitis.

-In evaluation of patients with suspected NAFLD, attenuation coefficient can identify patients with steatosis and liver stiffness can accurately detect fibrosis.

-**Cutoff values for Fibrosis, Steatosis and inflammation**

Journal Info	*Clinical Gastroenterology and Hepatology May 2020* https://doi.org/10.1016/j.cgh.2020.05.034
Year	**2020**
Authors	Dong Ho Lee, Eun Ju Cho, Jae Seok Bae, Jae Young Lee, Su Jong Yu, Haeryoung Kim, Kyung Bun Lee, Joon Koo Han, Byung Ihn Choi (Korea)
System used	Aplio i800

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SWD Liver 2

The Role of Multiparametric US of the Liver for the Nonalcoholic Steatohepatitis

Patients with biopsy-proven nonalcoholic fatty liver disease:

Dispersion slope is useful for assessing lobular inflammation

Attenuation coefficient is useful for assessing steatosis

Shear-wave speed is useful for assessing fibrosis

Radiology

The Role of Multiparametric US of the Liver for the Evaluation of Nonalcoholic Steatohepatitis

Journal Info	Radiology 2020; 00:1–9 https://doi.org/10.1148/radiol.2020192665
Year	**2020**
Authors	Katsutoshi Sugimoto, Fuminori Moriyasu, Hisashi Oshiro, Hirohito Takeuchi, Yu Yoshimasu, Yoshitaka Kasai, Takao Itoi (Japan)
System used	Aplio i800

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SWD Liver 3

Clinical utilization of shear wave dispersion imaging in diffuse liver disease

SW dispersion slope is more useful than SW speed for predicting the degree of necro-inflammation.

Dispersion slope, which reflects viscosity, may provide additional pathophysiological insight into diffuse liver disease.


Clinical utilization of shear wave dispersion imaging in diffuse liver disease

ULTRA SONO GRAPHY

REVIEW ARTICLE

Journal Info	Ultrasonography. 2019 Jul 26 https://doi.org/10.14366/usg.19031
Year	**2019**
Authors	Katsutoshi Sugimoto, Fuminori Moriyasu, Hisashi Oshiro, Hirohito Takeuchi, Yu Yoshimasu, Yoshitaka Kasai, Takao Itoi (Japan)
System used	Aplio i800

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SWD Liver 4

Shear-Wave Dispersion Slope from US SWE: Detection of Allograft Damage after Liver Transplantation

Shear-wave dispersion slope is associated with both liver fibrosis and degree of necro-inflammatory activity (*P* , .01) after liver transplant and provided **better diagnostic performance than liver stiffness value in detection of allograft damage after liver transplant**.

Cutoff SWD (m/s/kHz)	Sensitivity	Specificity	PPV	NPV
10,8	97,8	62,1	67%	**97%**
12	80,4	67,2	66%	81%
14	56,5	86,2	**76%**	71%


Radiology

Shear-Wave Dispersion Slope from US Shear-Wave Elastography: Detection of Allograft Damage after Liver Transplantation

Journal Info	Radiology 2019; 00:1–8 https://doi.org/10.1148/radiol.2019190064
Year	**2019**
Authors	Jeong Hee Yoon, Dong Ho Lee, Jae Young Lee, Joon Koo Han (Korea)
System used	Aplio i800

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Elastography - SWE Thyroid 1

Prospective Evaluation of Semi-quantitative Strain Ratio and Quantitative 2D Ultrasound Shear Wave Elastography (SWE) in Association with TIRADS Classification for Thyroid Nodule Characterization

Semi-quantitative (Strain SRE) and quantitative elastography (2D-SWE) are promising diagnostic tools for discriminating malignant thyroid nodules since both techniques showed higher sensitivity than TIRADS. In particular, SRE also shows significantly higher specificity than TIRADS evaluation by Kwak

Optimal cut-off point: **- SRE 1.92**

- 2D-SWE 37.5 kPa

Prospective Evaluation of Semiquantitative Strain Ratio and Quantitative 2D Ultrasound Shear Wave Elastography (SWE) in Association with TIRADS Classification for Thyroid Nodule Characterization

Prospektive Evaluierung der semiquantitativen Kompressionselastografie und der quantitativen 2D-Scherwellenultraschallelastografie (SWE) in Verbindung mit der TIRADS-Klassifikation zur Charakterisierung von Schilddrüsenknoten

Journal Info	Ultraschall in Med 2019; 40: 1–9 https://doi.org/10.1055/a-0853-1821
Year	**2019**
Authors	Vito Cantisani, Emanuele David, Hektor Grazhdani, Antonello Rubini, Maija Radzina, Christoph F. Dietrich & al (Italy-Germany)
System used	Aplio 500

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Canon
CANON MEDICAL

Shear Wave Thyroid 2

The diagnostic performance of shear wave speed (SWS) imaging for thyroid nodules with elasticity modulus and SWS measurement

Cutoff values:

Nodules < 10 mm	Emax > 24 kPa	Emoy > 19 kPa
Nodules 11 to 20 mm	Emax > 47 kPa	Emoy > 23 kPa
Nodules > 20 mm	Emax > 52 kPa	Emoy > 28 kPa

(Emax: 2mm ROI on stiffest area / Emoy: ROI = Lesion size)

Research Paper

The diagnostic performance of shear wave speed (SWS) imaging for thyroid nodules with elasticity modulus and SWS measurement

Dan Wang, Ya-Ping He, Yi-Feng Zhang, Bo-Ji Liu, Chong-Ke Zhao, Hui-Jun Fu, Qing Wei, Hui-Xiong Xu

ABSTRACT

To evaluate the diagnostic performance of a new technique of shear wave speed (SWS) imaging for the diagnosis of thyroid nodule with elasticity modulus and SWS measurement. 322 thyroid nodules in 322 patients (216 benign nodules, 106 malignant nodules) were included in this study. All the nodules received conventional ultrasound (US) and SWS imaging (Aplio500, Toshiba Medical Systems, Japan) before fine-needle aspiration (FNA) and/or surgery. The values of E-max and E-mean with elastic modulus (61.27 ± 36.31 kPa and 31.89 ± 19.11 kPa) or SWS (4.45 ± 1.49 m/s and 3.26 ± 1.71 m/s) in malignant nodules were significantly higher than those in benign lesions (19.18 ± 18.62 kPa and 15.85 ± 8.98 kPa, or 2.58 ± 0.85 m/s and 2.18 ± 0.42 m/s, all $P < 0.001$). No significant differences in area under the curve (AUC) between the SWS imaging parameters were found (all $P > 0.05$). In multivariate logistic regression analysis, E-max (m/s) with SWS was identified to be the strongest independent predictor for malignant nodules (odds ratio [OR] = 16.760), followed by poorly-defined margin (OR = 7.792), taller-than-wide shape (OR = 3.188), micro-calcification (OR = 2.422), and E-max (kPa) with elastic modulus (OR = 0.914). The AUC was 0.813 for E-max with SWS (m/s) and 0.796 for E-max with elastic modulus (kPa). With cut-off SWS value of 3.32 m/s in E-max, sensitivity of 88.8%, specificity of 81.5%, and accuracy of 77.4% were achieved. SWS imaging is a valuable tool in predicting thyroid malignancy. E-max with SWS measurement is the strongest independent predictor for thyroid malignancy.

Journal Info	www.impactjournals.com/oncotarget/ Oncotarget, 2017, Vol. 8, (No. 8), pp: 13387-13399 https://doi.org/10.18632/oncotarget.14534
Year	**2016**
Authors	Dan Wang, Ya-Ping He, Yi-Feng Zhang, Bo-Ji Liu, Chong-Ke Zhao, Hui-Jun Fu, Qing Wei, Hui-Xiong Xu (China)
System used	Aplio 500

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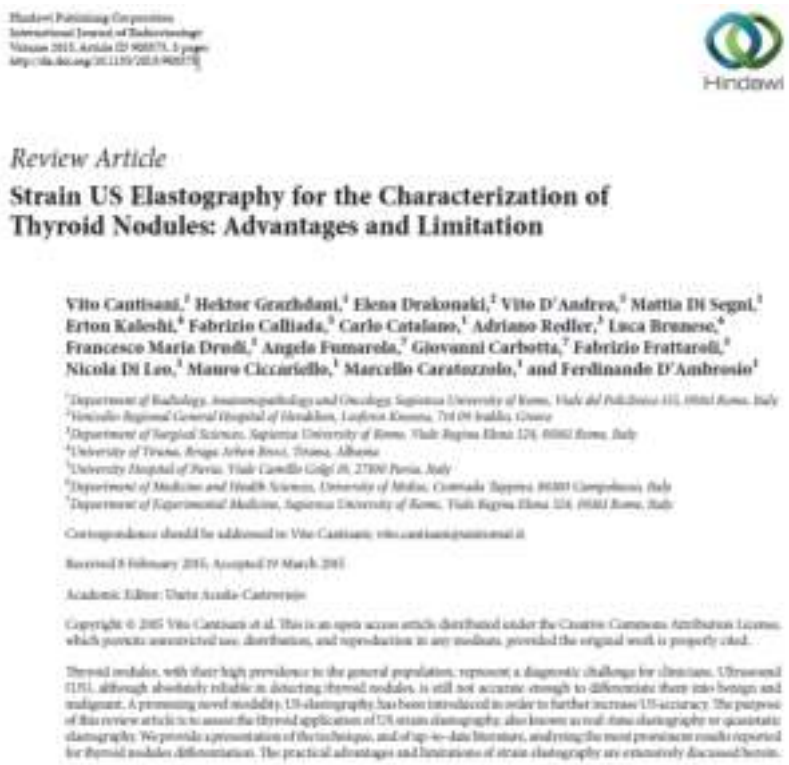
Elastography Thyroid 3

Strain US Elastography for the Characterization of Thyroid Nodules: Advantages and Limitation

Describes advantages and limitations of strain elastography



Hindawi Publishing Corporation
International Journal of Endocrinology
Volume 2015, Article ID 908575, 5 pages
http://dx.doi.org/10.1155/2015/908575

Hindawi

Review Article

Strain US Elastography for the Characterization of Thyroid Nodules: Advantages and Limitation

Vito Cantisani,[1] Hektor Grazhdani,[1] Elena Drakonaki,[2] Vito D'Andrea,[3] Mattia Di Segni,[1] Erton Kaleshi,[4] Fabrizio Calliada,[5] Carlo Catalano,[1] Adriano Redler,[1] Luca Brunese,[6] Francesco Maria Drudi,[1] Angela Fumarola,[7] Giovanni Carbotta,[7] Fabrizio Frattaroli,[3] Nicola Di Leo,[1] Mauro Ciccariello,[1] Marcello Caratozzolo,[1] and Ferdinando D'Ambrosio[1]

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Received 8 February 2015; Accepted 19 March 2015

Academic Editor: Dario Acuto-Caterenjo

Thyroid nodules, with their high prevalence in the general population, represent a diagnostic challenge for clinicians. Ultrasound (US), although absolutely reliable in detecting thyroid nodules, is still not accurate enough to differentiate them into benign and malignant. A promising novel modality, US-elastography, has been introduced in order to further increase US-accuracy. The purpose of this review article is to assess the thyroid application of US strain elastography, also known as real-time elastography or qualitative elastography. We provide a presentation of the technique, and of up-to-date literature, analyzing the most prominent results reported for thyroid nodules differentiation. The practical advantages and limitations of strain elastography are extensively discussed herein.

Journal Info	Hindawi Publishing Corporation International Journal of Endocrinology Volume 2015, Article ID 908575 http://dx.doi.org/10.1155/2015/908575
Year	**2015**
Authors	Vito Cantisani, Hektor Grazhdani, Elena Drakonaki, Vito D'Andrea, Mattia Di Segni, Erton Kaleshi, Fabrizio Calliada (Italy)
System used	Aplio 500 & other

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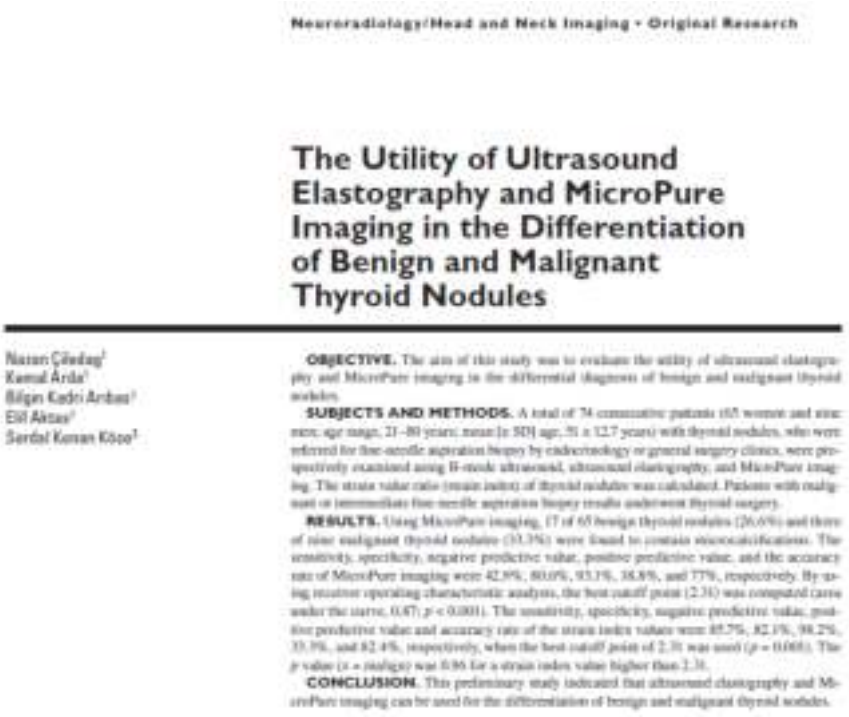
Elastography Thyroid 4

The Utility of Ultrasound Elastography and MicroPure Imaging in the Differentiation of Benign and Malignant Thyroid Nodules

This study indicates that ultrasound elastography and MicroPure imaging can be used for the differentiation of benign and malignant thyroid nodules.

The best cutoff point of strain elastography index ratio was 2.31 to differentiate benign and malignant nodules.



Neuroradiology/Head and Neck Imaging • Original Research

The Utility of Ultrasound Elastography and MicroPure Imaging in the Differentiation of Benign and Malignant Thyroid Nodules

Nazan Çiledag[1]
Kemal Arda[1]
Bilgin Kadri Arıbas[1]
Elif Aktas[1]
Serdal Kenan Köse[1]

OBJECTIVE. The aim of this study was to evaluate the utility of ultrasound elastography and MicroPure imaging in the differential diagnosis of benign and malignant thyroid nodules.

SUBJECTS AND METHODS. A total of 74 consecutive patients (65 women and one man; age range, 21–80 years; mean [± SD] age, 51 ± 12.7 years) with thyroid nodules, who were referred for fine-needle aspiration biopsy by endocrinology or general surgery clinics, were prospectively examined using B-mode ultrasound, ultrasound elastography, and MicroPure imaging. The strain value ratio (strain index) of thyroid nodules was calculated. Patients with malignant or intermediate fine-needle aspiration biopsy results underwent thyroid surgery.

RESULTS. Using MicroPure imaging, 17 of 65 benign thyroid nodules (26.6%) and three of nine malignant thyroid nodules (33.3%) were found to contain microcalcifications. The sensitivity, specificity, negative predictive value, positive predictive value, and the accuracy rate of MicroPure imaging were 42.8%, 80.0%, 93.1%, 16.8%, and 77%, respectively. By using receiver operating characteristic analysis, the best cutoff point (2.31) was computed (area under the curve, 0.67; $p < 0.001$). The sensitivity, specificity, negative predictive value, positive predictive value and accuracy rate of the strain index values were 85.7%, 82.1%, 98.2%, 33.3%, and 82.4%, respectively, when the best cutoff point of 2.31 was used ($p = 0.001$). The p value (t = malign) was 0.86 for a strain index value higher than 2.31.

CONCLUSION. This preliminary study indicated that ultrasound elastography and MicroPure imaging can be used for the differentiation of benign and malignant thyroid nodules.

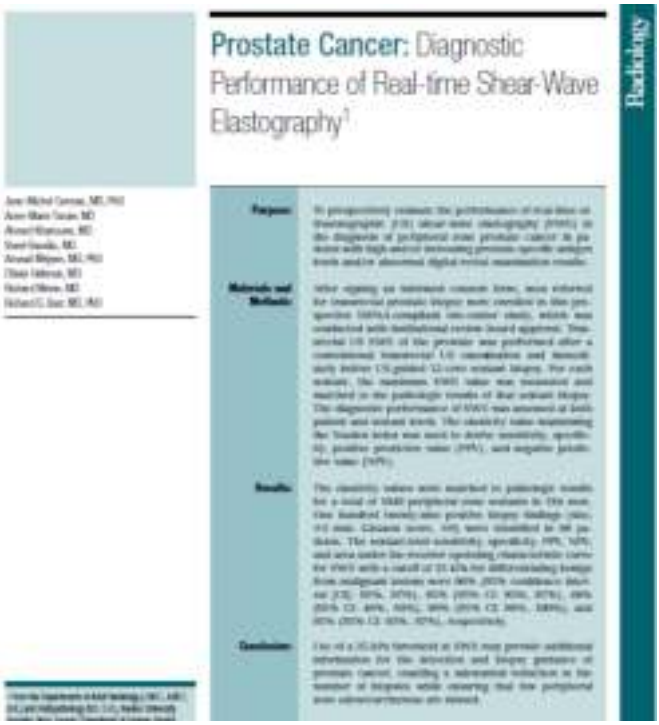
Journal Info	*American Journal of Radiology* 2012; 198:W244–W249 https://www.ajronline.org/doi/pdf/10.2214/AJR.11.6763
Year	**2012**
Authors	Nazan Çiledag, Kemal Arda, Bilgin Kadri Arıbas, Elif Aktas, Serdal Kenan Köse (Turkey)
System used	Aplio XG

Back

Shear Wave Prostate

Prostate Cancer: Diagnostic Performance of Real-time Shear-Wave Elastography

Use of a **35 kPa threshold at SWE** may provide additional information for the detection and biopsy guidance of prostate cancer, enabling a substantial reduction in the number of biopsies while ensuring that few peripheral zone adenocarcinomas are missed.


Prostate Cancer: Diagnostic Performance of Real-time Shear-Wave Elastography[1]

Radiology

Journal Info	Radiology http://pubs.rsna.org/doi/pdf/10.1148/radiol.14140567
Year	**2015**
Authors	Jean-Michel Correas (France)
System used	Supersonic Aixplorer

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Fusion Prostate 1

Prostate cancer diagnosis: Efficacy of a simple electromagnetic MRI-TRUS fusion method to target biopsies

- **Average additional time to standard biopsy procedure = 3.3 min**
- Targeted biopsies are more sensitive than standard biopsies (77 vs 31%)
- Targeted biopsies detect more significant cancer (No over detection of low grade tumors)
- Targeted biopsies is very efficient for anterior prostate where SB is often limited

European Journal of Radiology

Prostate cancer diagnosis: Efficacy of a simple electromagnetic MRI-TRUS fusion method to target biopsies

Journal Info	European journal of radiology https://doi.org/10.1016/j.ejrad.2016.11.016
Year	**2017**
Authors	Amina Jelidi, Mickael Ohana, Aissam Labani, Guillaume Aleman, Herve Lang, Pr Catherine Roy (France)
System used	Aplio 500 / Aplio i800

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Fusion Prostate 2

Clinical value of multi-parametric ultrasound and MRI/US fusion-guided biopsy for prostate cancer detection and visualization

MRI/US fusion-guided biopsy detects more clinically significant PCa than conventional TRUS-guided biopsy. Using a novel mpUS scoring system, PI-RADS predefined tumor aggressiveness can be confirmed and localization and biopsy planning can be significantly improved. Combination of MRI /US fusion and multiple US modes such as CEUS, strain elastography, shear wave elastography and SMI improve diagnostic confidence


Canon

Clinical value of multi-parametric ultrasound and MRI/US fusion-guided biopsy for prostate cancer detection and visualization

Link	
Year	**2016**
Authors	**Pr Thomas Fischer** (Department of Radiology) Andreas Maxeiner (Department of Urology) Charité – Universitätsmedizin Berlin (Germany)
System used	Aplio 500

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Fusion Prostate 3

Transperineal MRI-US Fusion-Guided Target Biopsy of the Prostate after Abdominoperineal Resection: A Case Report

In this report we present a feasible technique for MRI-US fusion-guided transperineal prostate biopsy in patients with a history of APR. The technique is able to detect clinically relevant prostate cancer with good quality core samples and could potentially also be used in other patient groups where the anal canal is absent or preferably avoided such as ileal pouch or distal anal anastomosis.

Link	*Journal of the Belgian Society of Radiology.* 2021; 105(1): 57, 1–5. DOI: https://doi.org/10.5334/jbsr.2583
Year	**2021**
Authors	**Nando de Vulder, K. Geldoff, F. Baekelandt, Katrien Gieraerts** (Belgium)
System used	Aplio i800

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