CEUS
Contrast-Enhanced Ultrasound
The role of Contrast-Enhanced Ultrasound

The usage of second-generation microbubble ultrasound (US) contrast agents has considerably improved the diagnostic yield of US imaging in recent years because of its ability to very sensitively depict tumor vascularity.

Contrast-enhanced US (CEUS) has the advantages of the absence of ionizing radiation, widespread availability, even at the bedside, and the possibility to characterize a lesion as soon as it is detected on conventional B-mode US, commonly used as the first technique for exploration of the liver and other areas.

Understanding of the enhancement features provided by CEUS according to tumor type enables imaging specialists to make more accurate characterization as well as give better advice to oncologists or other clinicians.

Esaote Contrast-Enhanced Ultrasound Technology

CnTI™ (Contrast Tuned Imaging) is MyLab™Eight eXP’s (Esaote S.p.A., Genova, Italy) advanced technology for Contrast-Enhanced Ultrasound (CEUS) Imaging. Based on low mechanical index and real-time scanning, CnTI™ represents the best way to use second-generation contrast media (CM).

CnTI™ can be used for diagnosis and follow-up, as well as during interventional procedures. Thanks to its architecture based on linear pulser technology, the Esaote MyLab™Eight eXP Ultrasound system is capable of managing various typologies of pulsing techniques in order to optimize the beamforming management for a wide range of transducer types and clinical applications.

CEUS allows easy and accurate characterization of focal liver lesions. This not only identify the specific types of benign lesions, often with better accuracy than with CT,
Intended use and state of art

Esaote CnTI™ has so far been used for applications including, but not limited to, the following:
- Liver lesion detection and characterization\(^2\).
- Breast lesion detection and characterization\(^3\).
- Prostate cancer detection and characterization\(^4\).
- Assessment and management of joint disorders (arthritis)\(^5\) and nerve lesion detection and characterization\(^6\).
- Kidney functionality\(^7\).
- Gynecology: diagnosis and management of adnexal masses with solid components\(^8\).
- Left ventricular opacification (LVO)\(^9\).
- Guidance and treatment assessment of ablation procedures\(^10,11\).
- Neurosurgery for lesion characterization\(^12\).

Future perspectives of CEUS in Liver Lesions

(Prof. Fabio Piscaglia, S. Orsola-Malpighi Hospital, University of Bologna, Italy)

CEUS allows easy and accurate characterization of focal liver lesions. This not only implies a very high capacity to distinguish benign from malignant lesions, but also to identify the specific types of benign lesions (hemangioma, focal fatty infiltration/sparing, focal nodular hyperplasia, adenoma), often with better accuracy than with CT, taking advantage of the high temporal and spatial resolutions of ultrasonography. Furthermore, focal liver lesions discovered in patients with cirrhosis or advanced fibrosis can be assigned to one of the specific classes of the CEUS LI RADS system of the American College of Radiology (https://www.acr.org/Quality-Safety/Resources/LIRADS) (classes LR1 to LR5 and LR-M), also including the possibility to achieve a definitive and accurate diagnosis of hepatocellular carcinoma (LR5) or of benign lesions (e.g., hemangioma, LR1), with reduced need for biopsy and improved communications between ultrasound operators and hepatologists.
A further step in diagnosis and treatment with CEUS Fusion Imaging

CnTI™ can be used with Virtual Navigator Real-Time Multimodality Fusion Imaging Technology. Esaote Virtual Navigator offers the possibility to perform real-time fusion with multiple second modality imaging, making it possible to supplement the high anatomical definition volumes of MR/CT with the Doppler/real-time capabilities of Ultrasound. The same can be done to combine the functional/molecular capabilities of PET/CT with the real-time and hemodynamics evaluation offered by Ultrasound. CnTI™ data can be fused together with MRI, CT, PET, 3D Ultrasound and/or 3D CEUS volumes.

Real-time Thermal Ablation with CEUS Volume Fusion Imaging

Contrast Enhanced Ultrasound with PETCT Fusion Imaging

Bibliographic References