Clinical Hemorheology and Microcirculation 86 (2024) 3–7
DOI 10.3233/CH-238110
IOS Press

Editorial

New aspects of high-resolution ultrasound for tumor detection and treatments: M-Elite Program

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The concept of bringing together physicians with ultrasound expertise worldwide and ultrasound technology developers in terms of planning, design, and production would offer extensive opportunities for advancing ultrasound diagnostics. By taking part in initiatives based on this concept, physicians would have the chance to directly explore and evaluate the most up-to-date ultrasound technology for both diagnostic purposes and ultrasound-guided interventions during patient examinations at university ultrasound centres in China. The exchange of knowledge with fellow professionals and system developers would also be a significant component of this experience [1–11].

This concept was deliberated in small group discussions and individual meetings, focusing on forthcoming advancements in technology. Subsequently, there was an in-depth exploration of standards for scientific publications and environmentally conscious aspects of science and technology. Finally, an individual-focused survey was conducted to assess the potential for fostering comprehensive exchanges and the possibility of engaging in important, future-proof ultrasound developments via social media platforms, specifically through case discussions.

The prolonged duration of the pandemic has underscored the significance of direct interpersonal exchanges among ultrasound technology developers, investigators, users, learners, teachers, and researchers worldwide. Among this community, a notable segment actively participates in the M-Elite initiative, which facilitates on-site interactions at research and development centres across China. It is from these interactions that the current "M-Elite Program" format originated. Regarding the latest advancements in ultrasound technology, it is essential to conduct multi-centre evaluations on each imaging modality to assess their suitability for future clinical applications. This approach will allow for defining the threshold values for tissue properties (such as fibrosis and inflammation) in correlation with various diseases.

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ISSN 1386-0291/$35.00

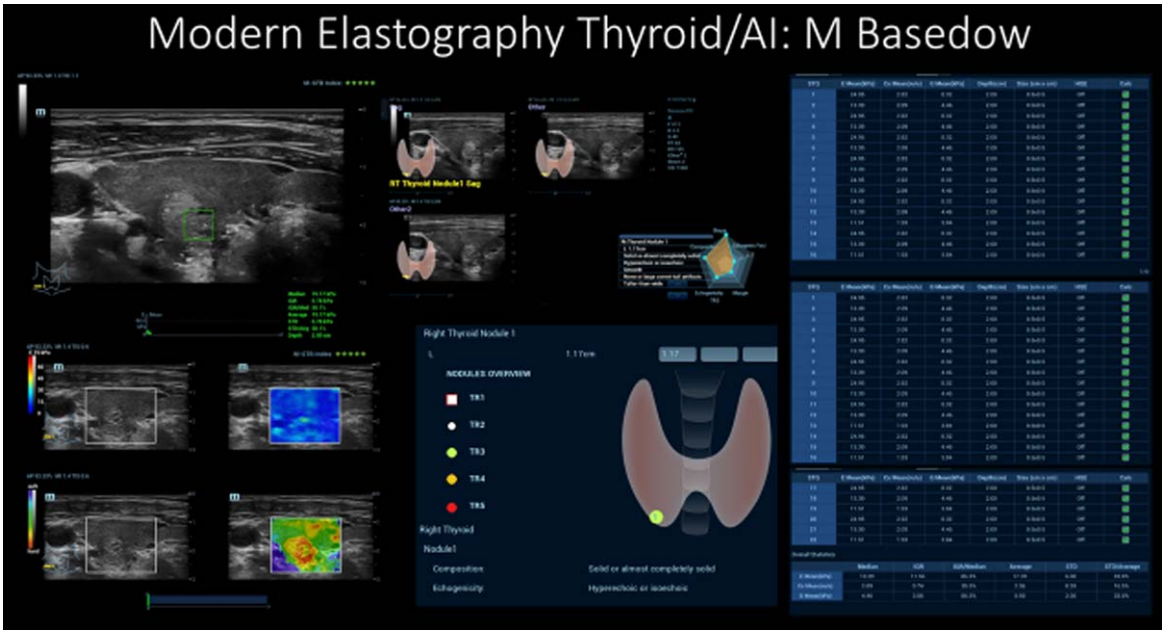

Fig. 1. Modern multimodal thyroid diagnostics with artificial intelligence (AI).

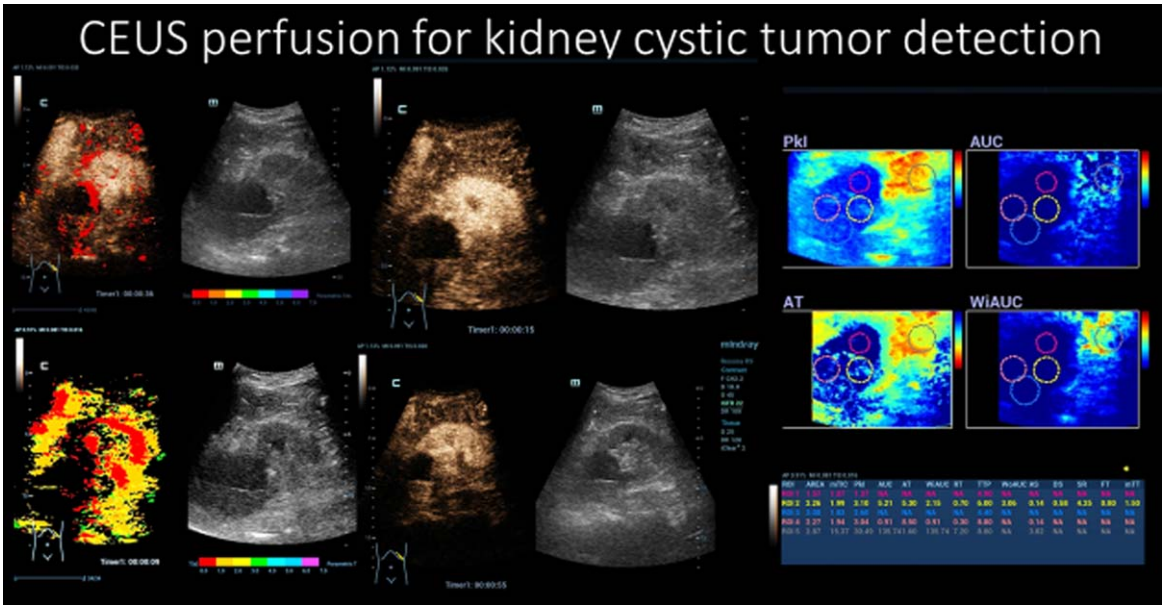

Fig. 2. CEUS perfusion for the detection of a small intracystic kidney tumor.

Recent elastography techniques, including Shear Wave, 2D, and STQ, liver texture analysis (LTI), and fat measurement through ultrasound attenuation analysis (USAT) enable comprehensive non-invasive parenchymal analyses using ultrasound. A variety of applications of contrast-enhanced ultrasonography (CEUS), combined with parametric imaging and perfusion analysis, which were previously performed in limited groups, provide a basis for better understanding changes in dynamic microvascularization

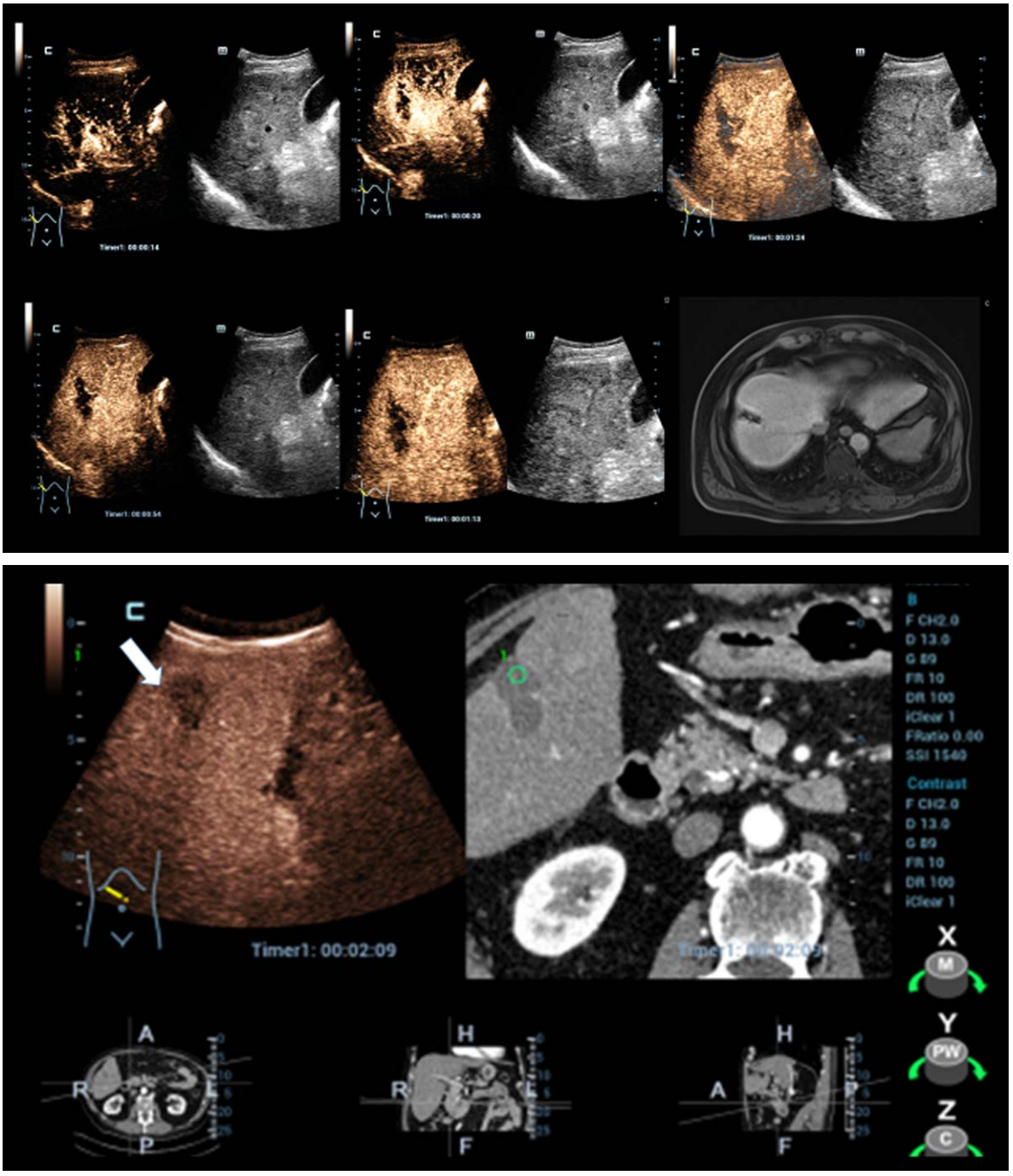

Fig. 3. a/b: Dynamic CEUS using HiFR mode in correlation to contrast-enhanced MRI and fusion CEUS with contrast-enhanced CT to control successful microwave ablation (MWA) of a liver tumor with complete devascularization.

down to the capillary level. Additionally, the integration of artificial intelligence (AI) can further refine the process and optimize reporting based on international standards (Fig. 1).

High-resolution ultrasound techniques, such as ZST and HiFR CEUS, offer significantly improved capabilities for early tumor detection and the ultrasound-guided treatment of tumors. In the future, fusion techniques will become increasingly accessible to enable the integration of different imaging

modalities. Moreover, the utilization of 3D techniques with fusion and navigation will elevate surgical and interventional tumor treatments using ultrasound-guided robotics to unparalleled standards (Fig. 2).

Improved mobility, fast data transfer, exceptional resolution, and customizable examination interfaces and operator tools make ultrasound training and patient-related applications much easier, particularly in emergencies and challenging environments. This is the point at which M-Elite Expertise comes to the forefront and demonstrates its full potential.

Cutting-edge ultrasound technology addresses the challenges posed by pandemics by offering fast and accurate imaging, maintaining superior hygiene standards, offering flexibility with extended battery life, and enabling more individualized treatments through advanced innovations (Fig. 3a/b).

The combination of our latest research findings on CEUS parametric and perfusion analysis, with a focus on the diagnosis and interventions of liver tumors, thyroid tumors, lymph nodes, and breast tumors, alongside the implementation of modern elastography techniques and pioneering use of AI, has opened up avenues for conducting multicentre studies. Therefore, the M-Elite program serves as a foundation for developing effective educational concepts for students, sonographers, and university research projects.

The strong partnership between M-Elite and microcirculation departments establishes a solid groundwork for an innovative, technology-driven approach to ultrasound, state-of-the-art intensive monitoring, and enhanced laboratory diagnostics for comprehensive blood cell analysis.

This time, M-Elite carried out an exchange program at the First Affiliated Hospital of Sun Yat-Sen University (FAH-SUMS), whose medical ultrasound department is known as one of the top four ultrasound centres in China. They place great emphasis on the research of ultrasound medical treatments, educational training, and scientific investigation. Each year, the College of Medical Ultrasonic Medicine at FAH-SUMS offers a wide range of teaching and training programs for residents, graduate students, and studying physicians. Furthermore, they organize English-language teaching and exchange activities for the international community.

During the exchange program, we engaged in discussions covering various topics such as high-resolution elastic ultrasound, CEUS, interventional ultrasound, new parametric imaging, and ultrasound medical education. We also had the opportunity to gain insights into their ongoing projects and advancements in areas of single-mode fusion navigation, AI, and ultrasonic technology.

Conclusion

This exchange experience has strongly reinforced the notion that ultrasound transcends national boundaries, enabling seamless communication through visual images across the world. Ultrasound knows no bounds, as it offers potential solutions to numerous challenging issues encountered in clinical practice, fostering invention and innovation in its utilization. The possibilities within ultrasound technology are limitless, and the continuous development and implementation of new technologies have encouraged doctors from different countries to continue exploring advancements for the betterment of human health.

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