第七屆亞太醫用超音波新進展國際論壇
7th Asia Pacific International Symposium on Advances in Medical Ultrasound

October 18, 2025 (Sat)
Room 102

Theme: Recent Advance in Ultrasonography of Liver Diseases

時間 Time	題目 Topic	演講者 Speaker
08:45-08:55	Opening Remarks	An-Shine Chao (趙安祥) President, TSUM
		Yung-Liang Wan (萬永亮) Chair, 7th APISAMU
Moderator:	Shu-Huei Shen (沈書慧) 臺北榮民總醫院 Chih-Horng Wu (吳志宏) 臺大醫院	
09:00-09:20 A-S01 Video	From Bench to Bedside: Histotripsy's Journey in Treating Liver Cancer	Tejaswi Worlikar Departments of Radiology, University of Michigan, Ann Arbor, Michigun, USA
09:25-09:45 A-S02	Quantitative Ultrasound Diagnosis of Liver Disease: From Hepatic Steatosis to Liver Fibrosis	Po-Hsiang Tsui (崔博翔) Department of Medical Imaging and Radiological Sciences, Chang Gung University, Taiwan
Moderator:	Dar-In Tai (戴達英) 林口長庚醫院 Yi-Hong Chou (周宜宏) 臺北榮民總醫院	
09:50-10:10 A-S03 Video	Elastography for Portal Hypertension: WFUMB 2024 Guidelines	Giovanna Ferraioli Department of Clinical, Surgical, Diagnostic and Pediatric Sciences, University of Pavia, Italy
10:15-10:35 A-S04	Microvascular Imaging and CEUS in Diagnosing Liver Tumors	Jae Young Lee Department of Radiology, Seoul National University College of Medicine, Korea
10:35-10:50	Coffee Break	
Moderator:	Yung-Liang Wan (萬永亮) 林口長庚醫院 Pei-Ming Yang (楊培銘) 臺大醫院	
10:55-11:15 A-S05	Ultrasound Multiparametric Assessment of Diffuse Liver Diseases	Bhupendra Ahuja Director & Chief Consultant Dr Ahuja Ultrasound Scan Centre, AGRA, India
11:20-11:40 A-S06 Video	Quantitative US on Metabolic Dysfunction-associated Steatotic Liver Disease (MASLD): An Updated International Prospective Study	Xiao-Yan Xie Institute of Diagnostic and Interventional Ultrasound, The First Affiliated Hospital of Sun Yat-sen University, China
Moderator:	San-Kan Lee (李三剛) Yi-Hong Chou (周宜宏) Yung-Liang Wan (萬永亮)	
11:40-12:10	Discussion, Q&A	All Speakers & Moderators
12:10-12:15	Closing Remarks by Program Director of CTSUM	Pei-Ming Yang (楊培銘) National Taiwan University Hospital, Taiwan

Organizers:

Chinese Taipei Society of Ultrasound in Medicine (CTSUM)

Asian Federation of Societies for Ultrasound in Medicine and Biology (AFSUMB)

APISAMU-01

From Bench to Bedside: Histotripsy's Journey in Treating Liver Cancer

Tejaswi Worlikar, Ph.D.

Michigan Medicine, Department of Radiology, University of Michigan

Histotripsy is a novel noninvasive, nonthermal, and nonionizing focused ultrasound ablation therapy that uses precisely controlled cavitation to destroy targeted tissue. Histotripsy research began two decades ago and underwent extensive small- and large-animal preclinical testing to ensure safe clinical translation to human use. Preclinical studies have demonstrated histotripsy's safety, efficacy, and tissue selectivity (tissues of different structural composition have different thresholds for cavitation-induced destruction), with relative sparing of collagenous structures such as vessels and bile ducts. Following promising results from preclinical studies and clinical trials, histotripsy was approved by FDA for treatment of liver tumors in October 2023. The #HOPE4LIVER histotripsy clinical trial reported a 73.3% overall 1-year survival rate in patients with hepatocellular carcinoma (HCC), and 63.4% and 90% 1-year local control rate by primary and ad-hoc assessment respectively. However, the current histotripsy dose (defined by the number of histotripsy pulses) used clinically is fixed. It has not been optimized to maximize immune pr abscopal response based on the type of cancer. Additionally, liver tumor stiffness can differ based on tumor size, presence of tumor capsule, and microvascular invasion. Consequently, due to tissue selectivity, the susceptibility of liver tumors to histotripsy-induced damage may vary suggesting that using fixed histotripsy doses may not be the most optimal treatment strategy. Our recent work aims to non-invasively quantify the impact of varying histotripsy doses on tumor cellular damage using shear wave elastography (SWE) and study the subsequent impact on treatment outcomes in a preclinical orthotopic HCC tumor model. Low-to-high histotripsy doses demonstrated different levels of tumor cellular damage representing undertreatment, substantial to complete treatment, or overtreatment on acute histology, and correlated with the change in lesion stiffness which could be non-invasively evaluated with SWE. Histotripsy dose also impacted treatment outcomes including immune response, tumor progression, inhibition of metastasis, and survival, with the complete ablation dose outperforming undertreatment and overtreatment doses. Future investigations are needed to optimize histotripsy dosing protocols to maximize clinical outcomes.

APISAMU-02

Quantitative Ultrasound Diagnosis of Liver Disease: From Hepatic Steatosis to Liver Fibrosis

Po-Hsiang Tsui

Department of Medical Imaging and Radiological Sciences, Chang Gung University, Taiwan

This presentation centers on quantitative ultrasound (QUS), reviewing its historical development and highlighting future directions in clinical applications and technological innovation. Unlike conventional grayscale ultrasound imaging, QUS extracts tissue microstructural characteristics through statistical modeling of backscattered signals, using parameters such as Rayleigh, Nakagami, and Homodyned-K distributions, as well as entropy measures. These quantitative methods have already shown strong diagnostic value, particularly in liver disease staging. Advances in QUS have enabled diverse imaging techniques, including statistical and entropy imaging, attenuation coefficient mapping, fat quantification, and shear wave elastography. Integrated with radiomics and scatteromics approaches, QUS leverages feature extraction and machine learning to enhance diagnostic precision. More recently, artificial intelligence and generative models have accelerated QUS innovation—deep learning enables synthetic elastography, image enhancement, and portable handheld applications, while industry

leaders and startups are actively investing in new solutions. Looking forward, QUS is expected to evolve toward multiparametric integration, high-dimensional -omics analysis, and deep learning–driven imaging, paving the way for higher-quality diagnostics and the advancement of precision medicine

APISAMU-03

Elastography for Portal Hypertension: WFUMB 2024 Guidelines

Giovanna Ferraioli, MD, FAIUM
Department of Clinical, Surgical, Diagnostic and Pediatric Sciences, University of Pavia, Pavia, Italy

The spectrum of severe fibrosis (F3) and cirrhosis (F4) is a continuum in asymptomatic patients, and distinguishing between the two is often not possible on clinical grounds. Therefore, the term “compensated advanced chronic liver disease” (cACLD) has been proposed by the Baveno VI consensus on portal hypertension in 2015.

The measurement of hepatic venous pressure gradient (HVPG) is the reference standard to diagnose sinusoidal PH in ACLD. PH is diagnosed as ‘subclinical’ for HVPG values above 5 mmHg and as clinically significant portal hypertension (CSPH) for values ≥10 mmHg. CSPH, which can be present in around 40-60% of patients with cACLD, is the main risk factor for complications such as gastroesophageal varices and decompensation. Elastography can identify patients with cACLD, i.e. the target population for screening CSPH.

Liver stiffness measurements (LSM) provide an indirect assessment of sinusoidal portal hypertension, as it reflects the intrahepatic vascular resistance caused mainly by fibrosis, and liver stiffness has now become the backbone of non-invasive evaluation of suspected PH, while spleen stiffness is increasingly entering clinical practice. Notably, patients with clinical signs of decompensated liver cirrhosis have CSPH by definition and therefore do not need to undergo (non-invasive) screening for CSPH.

There is a large body of evidence that LSM by vibration-controlled transient elastography (VCTE) correlate well with the severity of portal hypertension and predict the presence of CSPH and the risk of liver-related events (LRE). Therefore, the Baveno VII consensus recommended the VCTE-LSM "rule of five" (5-10-15-20-25 kPa) that allows to rule out and rule in cACLD and to estimate the risk of CSPH and LRE in daily clinical practice. Screening endoscopy can be avoided in cACLD patients with VCTE-LSM <20 kPa and platelet count (PLT) ≥150 G/L. VCTE-LSM 15-20 kPa suggests CSPH in patients with PLT <110 G/L. VCTE-LSM ≥20-25 kPa suggests CSPH if PLT is <150 G/L. VCTE-LSM >25 kPa rules-in CSPH in patients with alcohol-related liver disease (ALD), viral hepatitis, and non-obese metabolic dysfunction-associated steatotic liver disease (MASLD).

For the acoustic radiation force impulse (ARFI) shear wave elastography (SWE) techniques a “rule of four” (5-9-13-17-21 kPa) has been proposed for clinical risk stratification, but the supporting evidence is not as strong as for VCTE-LSM. ARFI-SWE-LSM >17 kPa suggests CSPH, especially in patients with PLT <150 G/L. ARFI-SWE-LSM >21 kPa indicates a high risk of CSPH and LRE.

Several studies have demonstrated a correlation between spleen stiffness measurements (SSM) and the presence of CSPH or esophageal varices. SSM should be evaluated and interpreted along with LSM and is useful in assessing the risk of CSPH, varices, and future variceal bleeding. SSM may be indicated if the patient has cACLD or if clinical/radiologic features suggestive of CSPH are present.

The WFUMB 2024 guidelines utilized the Oxford Centre for Evidence-Based Medicine (2009) classification for grading recommendations, incorporating Level of Evidence (LoE), Grade of Recommendation (GoR), and the proportion of agreement among experts.

Reference:

Ferraioli G, Barr RG, Berzigotti A, Sporea I, Wong VW, Reiberger T, Karlas T, Thiele M, Cardoso AC,

Ayonrinde OT, Castera L, Dietrich CF, Iijima H, Lee DH, Kemp W, Oliveira CP, Sarin SK. WFUMB Guideline/Guidance on Liver Multi-parametric Ultrasound: Part 1. Update to 2018 Guidelines on Liver Ultrasound Elastography. Ultrasound Med Biol 2024; 50(8): 1071-1087.

APISAMU-04

Microvascular Imaging and CEUS in Diagnosing Liver Tumors

Jae Young Lee, MD,
Seoul National University Hospital

The accurate diagnosis and characterization of liver tumors remain critical challenges in clinical practice, particularly in regions with a high prevalence of chronic liver disease and hepatocellular carcinoma (HCC). Advances in ultrasound technology have provided new opportunities to improve detection, differentiation, and monitoring of focal liver lesions. Among these, contrast-enhanced ultrasound (CEUS) and microvascular imaging (MVI) have emerged as complementary, non-invasive modalities that enhance our ability to evaluate tumor vascularity in real time.

CEUS employs microbubble-based contrast agents to provide dynamic, real-time visualization of vascular phases, including arterial, portal venous, and late phases. Unlike CT or MRI, CEUS offers continuous scanning without radiation exposure or nephrotoxic contrast agents, making it particularly advantageous in patients with renal insufficiency or contraindications to iodinated or gadolinium-based agents. The ability to assess enhancement patterns such as rapid arterial uptake, washout timing, and washout intensity makes CEUS a valuable tool in differentiating malignant from benign liver lesions. Furthermore, Kupffer-phase imaging with Sonazoid extends the diagnostic window by allowing evaluation of post-vascular uptake, thereby enhancing sensitivity in detecting small or atypical lesions.

MVI, on the other hand, provides a non-contrast technique that sensitively depicts slow and fine blood flow signals within tumors. By suppressing motion artifacts and improving the visualization of microvessels, MVI enhances our understanding of intra-tumoral vascular architecture. This is particularly useful in cases where CEUS is unavailable or contraindicated, and it can serve as a complementary approach by highlighting vascular morphology that is not easily captured by conventional Doppler techniques.

The integration of CEUS and MVI provides synergistic diagnostic value. CEUS excels in demonstrating perfusion dynamics and characterizing lesions according to established guidelines such as CEUS LI-RADS, while MVI contributes detailed information on microvascular distribution. Together, these techniques improve diagnostic accuracy for HCC, intrahepatic cholangiocarcinoma, and metastatic liver tumors, while also offering clinical utility in guiding biopsies, planning locoregional therapies, and monitoring treatment response to interventions such as ablation, transarterial chemoembolization (TACE), or systemic therapy.

This lecture will provide a comprehensive review of the principles, technical aspects, and clinical applications of CEUS and MVI in the evaluation of liver tumors. Illustrative clinical cases and recent evidence from the literature will be presented to demonstrate the complementary roles of these modalities. Emphasis will be placed on how CEUS and MVI improve early diagnosis, facilitate accurate characterization, and support effective treatment monitoring, ultimately contributing to improved patient outcomes.

APISAMU-05

Ultrasound Multiparametric Assessment of Chronic Liver Diseases

Dr. Bhupendra Ahuja
MD Radiology, FICRI, FICMU Agra, India

Chronic liver disease is a major global health problem with different presentations. The spectrum of liver diseases extends from Steatosis, various types of Hepatitis, Fibrosis, Cirrhosis and Liver cancer (HCC). Earlier Liver Biopsy and Histopathological ex. was the only method to diagnose these diseases. In last two decades non-invasive modalities- Serological tests, Ultrasound Liver Elastography and MR Elastography, are also available to diagnose and to assess the severity of these liver diseases for better management of the patients.

Ultrasound Liver Elastography and MRI Elastography are quite useful modalities in qualitative & quantitative assessment of the liver diseases. With the help of newer techniques of ultrasound, we can assess the status and quantify the Fatty infiltration, Inflammation & Fibrosis in liver. To quantify the Liver steatosis, Attenuation imaging is used. For assessment of Liver fibrosis Shear wave Elastography is done. Lately with the introduction of Shear Wave Dispersion technique, more & more case work is being done to assess the necro- inflammation in the liver. Normal and Abnormal values of each modality are being assigned to understand the disease process more precisely.

Attenuation Imaging: Attenuation imaging (ATI) is a technique by which gradual weakening of the ultrasound signal can be measured as it travels through the liver tissue. The ultrasound waves in the body are attenuated by acoustic scattering, reflection, and absorption (heat). Every organ has specific Attenuation coefficient. Normal Liver tissue Attenuation coefficient is 0.45- 0.52 db/cm/MHz and the same of Fat is 0.6- 1.0 db/cm/MHz. Thus, in cases of Fatty liver the AI coefficient is higher depending upon the grade of Fatty liver. Ultrasound can realistically provide a quick, non-invasive, cost-effective and radiation-free method to diagnose liver steatosis, even the mild steatosis which is sometimes difficult to diagnose with CT scan.

Real Time Shear Wave Elastography: 2D SWE is a noninvasive u/s technique used to quantify the liver stiffness which indicates liver fibrosis. In this technique speed of Shear waves is measured which propagates through the liver tissue. As the speed of these waves is directly proportional to the stiffness of liver tissue, stiffer liver tissue shows faster wave propagation. The normal values are: < 5 kPa or < 1.3 m/sec. The values more than 6 kPa considered increased and then graded as per actual value. The confounding factors are Acute hepatitis, markedly increased SGOT/ SGPT, Congestive liver, Obstructive cholestasis and infiltrative liver diseases.

Shear Wave Dispersion Elastography: It is new technique which can assess the Visco-elasticity of liver tissue. The viscoelasticity of liver tissue increases in cases of necro- inflammation of liver tissue. Thus, in conditions where necro-inflammation is taking place, the values of SWD will be higher e.g., NASH, Hepatitis induced Cirrhosis. The Quantification values of Dispersion are shown in the form of m/s/kHz. Shear wave Dispersion is newer technique but it is proving its role in conditions where necro- inflammation is affecting liver tissue. In present era, it is very important to differentiate simple liver steatosis from NonAcolohic SteatoHepatitis (NASH) which may be possible with Shear Wave Dispersion Technique. It would require more research work and case study.

The various techniques of Ultrasound Elastography are quite widely used in assessment of Liver stiffness and fat Quantification because of noninvasive technique, widespread availability of equipment and uniform reporting protocols. With the frequent use of ultrasound, patients at risk of progression of liver diseases can be identified and managed accordingly. At the same time, it has also reduced the need for liver invasive testing.

APISAMU-06

Metabolic Dysfunction–associated Steatotic Liver Disease at Quantitative US: International Prospective Study

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Background:

Quantitative US is promising for assessing metabolic dysfunction–associated steatotic liver disease (MASLD), but prospective multicenter studies are lacking.

Purpose:

To evaluate the diagnostic performance of quantitative US in assessing MASLD and metabolic dysfunction–associated steatohepatitis (MASH).

Materials and Methods:

This prospective study included participants with MASLD from tertiary hospitals in China and Korea, undergoing multiparametric US from August 2021 to December 2023. Diagnostic performance of tissue attenuation imaging (TAI), tissue scatter-distribution imaging (TSI), and two-dimensional shear-wave elastography (SWE) parameters in assessing MASLD and MASH was evaluated using area under the receiver operating characteristic curve (AUC) analysis, with histopathologic analysis as reference. Univariable and multivariable analyses identifed clinical factors associated with each US parameter.

Results:

A total of 114 participants (median age, 40 years; IQR, 31–50 years; 67 female participants) were evaluated, 76 participants (67%) with MASH and 39 participants (34%) with high-risk MASH (fibrosis score ≥F2). Multivariable analysis indicated TAI and TSI were independently associated with steatosis and SWE was independently associated with ffbrosis (all $P < .001$). TAI and TSI showed excellent performance for assessing steatosis grades S1 or higher, S2 or higher, and S3 (AUCs for TAI: 0.90, 0.93, and 0.78, respectively; AUCs for TSI, 0.94, 0.89, and 0.80, respectively), with TSI demonstrating good performance for inffammation grade I1 or more (AUC, 0.84; 95% CI: 0.75, 0.92; sensitivity, 79%; speciffcity, 79%). SWE exhibited excellent performance for staging ffbrosis scores of F1 or higher, F2 or higher, F3 or higher, and F4 (AUCs: 0.81, 0.96, 0.89, and 0.97, respectively; sensitivities: 75%, 90%, 87%, and 100%, respectively; speciffcities: 80%, 93%, 83%, and 96%, respectively). TTe combined TSI and SWE model showed diagnostic advantages for MASH (AUC, 0.92; 95% CI: 0.85, 0.98) and high-risk MASH (AUC, 0.82; 95% CI: 0.74, 0.90) compared with TSI ($P = .72$ for MASH; $P = .002$ for high-risk MASH) and SWE ($P < .001$ for MASH; $P = .31$ for high-risk MASH).

Conclusion:

TAI, TSI, and SWE provided accurate assessment of MASLD, and combining TSI and SWE showed good discrimination for predicting MASH and high-risk MASH.