

主 題： 彈性超音波在胸腔醫學的應用

Application of Ultrasound Elastography in the Field of Pneumology

內容簡述： Ultrasound elastography, encompassing both strain elastography and shear wave elastography, has become an important imaging modality in pulmonology for evaluating lung lesions, lymphadenopathies, pleural tissue, and respiratory muscle stiffness. This non-invasive technique measures tissue elasticity, offering both qualitative and quantitative insights that can assist in differentiating benign from malignant lung lesions, assessing mediastinal and neck lymphadenopathies, diagnosing pleural diseases, evaluating respiratory muscle function, and evaluating lung fibrosis.

Moderator: 郭耀文 Yao-Wen Kuo 臺大醫院

| 時間 Time                  | 演講題目 Topic   | 演講者 Speaker                    |
|--------------------------|--|--------------------------------|
| 13:30-14:00<br>Chest-S01 | Subpleural Lung Lesions                                      | 郭耀文 Yao-Wen Kuo<br>臺大醫院        |
| 14:00-14:40<br>Chest-S02 | Application of Ultrasound Elastography:<br>Lymphadenopathies | 陳彥霖 Yen-Lin Chen<br>臺大醫院       |
| 14:40-15:20<br>Chest-S03 | The Pleurae: Visceral and Parietal                           | 周君穎 Chun-Ying Chou<br>臺大醫院雲林分院 |
| 15:20-15:40              | Coffee Break   |                                |

Moderator: 徐武輝 Wu-Huei Hsu 中國醫藥大學附設醫院

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|--------------------------|--|----------------------------------|
| 15:40-16:10<br>Chest-S04 | Application of Ultrasound Elastography in<br>the Diaphragm   | 勇浩群 Kenneth Yung<br>亞東醫院         |
| 16:10-16:40<br>Chest-S05 | Application of Ultrasound Elastography in<br>the Field of Pneumology: Mediastinal<br>Lymphadenopathies | 陳家弘 Chia-Hung Chen<br>中國醫藥大學附設醫院 |
| 16:40-17:10<br>Chest-S06 | Central Lung Lesions   | 于鎧綸 Kai-Lun Yu<br>臺大醫院           |

### CHEST-S01

#### Subpleural Lung Lesions

*Yao-Wen Kuo*

*Department of Integrated Diagnostics & Therapeutics, National Taiwan University Hospital*

This talk will focus on ultrasound elastography, an emerging imaging modality in pulmonology that includes both strain elastography and shear wave elastography. It has shown value in the assessment of subpleural lung lesions by non-invasively measuring tissue elasticity. The technique provides both qualitative and quantitative data, assisting in the differentiation between benign and malignant lesions. In particular, shear wave elastography shows possible promise in differentiating specific types of benign lesions, a subject of ongoing investigation that may further expand its diagnostic potential.

### CHEST-S02

#### Application of Ultrasound Elastography: Lymphadenopathies

*Yen-Lin Chen*

*Department of Internal Medicine, National Taiwan University Hospital, Taipei, Taiwan*

Cervical lymphadenopathies may present in patients with various pulmonary disease as the lymphatic drainage originated from lung travel through the supraclavicular region. To differentiate between reactive and metastatic lymphadenopathies, ultrasonography remains a convenient tool to evaluate the structural changes of lymph nodes with their surrounding tissue. Besides the morphological descriptions, tissue stiffness, or elasticity, can be a pivotal discriminator between malignant and benign lymph nodes. Elastography, a novel ultrasound technique, measures the tissue deformity after sound wave stimulation. Sound wave travels fast in hard tissue, suggesting the tight junction in cellular level of the tissue, which is associated with malignancy. Applying elastography as an adjunct

tool can enhance the diagnostic yield of cervical lymphadenopathies.

### CHEST-S03

#### The Pleurae: Visceral and Parietal

*Chun-Ying Chou, MD*

*Attending Physician, Division of Chest Medicine, Department of Internal Medicine, National Taiwan University Hospital, Yunlin Branch*

Advances in imaging have greatly improved the diagnosis and management of pleural diseases. Thoracic ultrasound (TUS) is a portable, cost-effective, and radiation-free alternative to chest X-ray and CT, enabling real-time evaluation of pleural effusion, safe procedural planning, and image-guided biopsy. However, its diagnostic yield decreases in the absence of pleural nodules or thickening.

Shear wave elastography (SWE) is an emerging ultrasound-based technique that non-invasively quantifies tissue stiffness. It has been successfully applied to distinguish malignant from benign lesions in various organs. In the context of pleural disease, SWE enhances the ability to detect malignant pleural lesions by identifying areas of abnormal stiffness not apparent on conventional ultrasound. Studies demonstrate that ultrasound elastography-guided pleural biopsy achieves high diagnostic yield—even in challenging cases lacking nodularity or significant thickening—while maintaining a favorable safety profile.

Beyond the parietal pleura, TUS also plays an expanding role in interstitial lung disease (ILD) assessment by focusing on the visceral pleura and subpleural lung. Sonographic features such as B-lines, visceral pleura irregularities, and visceral pleural thickening are emerging as sensitive and specific markers for ILD detection and monitoring. Both the number and distance between two adjacent B-lines correlate with disease severity and lung function, whereas pleural irregularity scores and thickening are strongly associated with fibrosis extent on CT.

This presentation will highlight the complementary roles of 2D TUS and SWE in pleural disease, alongside their emerging applications in ILD evaluation. By integrating these radiation-free, cost-effective tools into clinical practice, clinicians can improve diagnostic accuracy, guide safe interventions, and enhance longitudinal disease monitoring in both pleural and interstitial lung disorders.

**CHEST-S04**

**Application of Ultrasound Elastography in the Diaphragm**

*Kenneth Yung*

*Far Eastern Memorial Hospital Department of Pulmonology*

This session provides a comprehensive introduction to the use of shear wave elastography (SWE) for evaluating the diaphragm.

Clinical applications will be highlighted, such as monitoring diaphragmatic function in critically ill patients and assessing neuromuscular disorders. The session will also explore current research uses of this technique.

By the end of the session, attendees will gain both theoretical knowledge and practical insights into diaphragm shear wave ultrasound.

**CHEST-S05**

**Application of Ultrasound Elastography in the Field of Pneumology: Mediastinal Lymphadenopathies**

*Chia-Hung Chen*

*Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, China Medical University Hospital*

Ultrasound elastography has emerged as a valuable adjunct to endobronchial ultrasound (EBUS) in the evaluation of mediastinal lymph-

adenopathies. This imaging technique provides a non-invasive assessment of tissue stiffness, offering complementary information beyond conventional B-mode sonography. In the field of pneumology, elastography assists in differentiating benign from malignant lymph nodes, thereby refining the diagnostic yield of EBUS-guided transbronchial needle aspiration (TBNA). Several studies have demonstrated that malignant lymph nodes often exhibit increased stiffness, whereas benign or inflammatory nodes tend to be softer and more heterogeneous. Elastographic scoring systems and strain ratio analysis further improve diagnostic accuracy and reduce unnecessary invasive procedures. Despite its promising role, elastography is not without limitations, including operator dependency, variability in image interpretation, and overlap in stiffness between certain benign and malignant conditions such as granulomatous diseases. Nevertheless, when integrated into routine EBUS evaluation, elastography enhances real-time decision-making during bronchoscopy, optimizes biopsy targeting, and potentially shortens procedure time. This lecture will provide an overview of the principles of ultrasound elastography, current evidence for its application in mediastinal lymphadenopathy, and future perspectives on its integration into clinical practice within interventional pulmonology.

**CHEST-S06**

**Central Lung Lesions**

*Kai-Lun Yu*

*Department of Internal Medicine, National Taiwan University Hospital*

Central Lung Lesions present diagnostic and therapeutic challenges due to their anatomical location, limited accessibility, and diverse etiologies. This talk will explore the role of ultrasound elastography—particularly endobronchial ultrasound (EBUS) elastography—in enhancing the evaluation of these lesions. By mapping tissue stiffness, elastography can help

differentiate malignant from benign mediastinal and hilar masses, improve biopsy targeting, and potentially reduce unnecessary sampling. Meta-analyses have demonstrated diagnostic sensitivities and specificities around 80–90%, outperforming CT size criteria and complementing PET-CT metabolic assessment. Strain elastography, currently the mainstay for EBUS applications, offers qualitative and semi-quantitative insights, while shear wave elastography provides quantitative stiffness values

for select accessible lesions. Limitations, including acoustic window dependency and interpretation variability, underscore the need for integration with conventional imaging and histopathology. Through clinical cases and evidence-based discussion, this presentation will highlight how elastography can refine diagnostic strategies and improve staging accuracy in central thoracic oncology.