

# **Ultrasound and Translational Pulmonary Medicine**

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Ultrasound technology is a powerful diagnostic and therapeutic tool in clinical medicine. Here I summarize the progress of ultrasound technology in translational pulmonary medicine in the past decades. Air-containing lung is not a good ultrasound-transmitting medium. By scanning through the acoustic window created by consolidated disease lung, ultrasound is a very useful and reliable tool to evaluate the nature of the lesions of the chest wall, pleural cavity, diaphragm, mediastinum, hilum, and peripheral lungs. A precise puncture transducer can be used to perform ultrasound-guided transthoracic needle biopsy (TNB) with real-time visualization of the biopsy needle and the lesion. The accuracy of ultrasound-guided TNB for peripheral pulmonary nodules, chest wall lesions, and mediastinal tumors is 88% to 100%. ultrasound-guided TNB is also useful for histologic diagnosis of tumors causing superior vena cava syndrome, Pancoast's tumors, pulmonary consolidation of unknown etiology, and tumors with obstructive pneumonitis. Moreover, transthoracic needle aspiration under ultrasound guidance can provide adequate specimens for microbiologic diagnosis of lung abscesses, necrotizing pneumonia, and parapneumonic effusions. Color Doppler imaging further extends the diagnostic spectrum of ultrasound, allowing the hemodynamics and neovascularization of a pulmonary lesion to be assessed noninvasively. Pulmonary arteriovenous malformations, pulmonary sequestration, and pulmonary infarctions can be diagnosed easily with color Doppler ultrasound. The color Doppler ultrasound puncture guiding device can improve the safety of ultrasound-guided TNB by simultaneously displaying blood vessel information, the needle shaft, and the puncture route. The recent development of endobronchial ultrasound (EBUS) further extends the accessibility of ultrasound for evaluating and sampling of lesions adjacent to the airways and mediastinum and improves the staging of lung cancer. In combination of "Omic technology", ultrasound has become indispensable diagnostic and therapeutic tool for translational pulmonary medicine.