CHEST-S01

Computer-aided Diagnosis of Endobronchial Ultrasound Images Using Convolutional Neural Network

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Lung cancer is one of the most common cancers diagnosed in the world, about 12.3% of the total number of new cancer cases diagnosed in 2018. The early diagnosis and treatment of lung cancer is the most significant way to reduce the death rate of the patient. Endobronchial ultrasonography (EBUS) is a well-established technique which uses ultrasound to scan beyond the airway and the structures adjacent to it. Moreover, it has a better performance than CT to identify lesions around the central airway and peripheral lung nodules. In order to differentiate benign and malignant lesions through the EBUS images, there are several works about subjective criteria summarized from the physician. However, it is still a challenge for a physician to diagnose a lesion as benign or malignant through the subjective criteria because it is dependent on the physician experiences on EBUS. Therefore, there is an interest in developing a computer-aided diagnosis (CAD) system to assist the physician in diagnosis on EBUS images. There was only a CAD system for EBUS images diagnosis which used grayscale texture analysis for diagnosis. However, it still required the experts to identify the region of interest (ROI) manually and spend time for designing the feature extraction. Recently, a kind of deep learning, the convolutional neural network (CNN), which extracts features automatically had been used in the field of computer vision in the past decades. The CNN models such as AlexNet, OverFeat can be used as the powerful generic feature extractors by extracting values from the fully connected layer as features. Moreover, it was successfully utilized in some computer vision works such as the classification and the object detection. The features from the CNN model combined with the support vector machine (SVM) can yield better performance compared to the original CNN. In this presentation, we will discuss a CAD system using the CNN to automatically differentiate benign and malignant lesions for early detecting lung cancer.

CHEST-S02

Recent Advance in Chest Echo

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Thoracic ultrasound (TUS) is becoming an indispensable tool in daily practice. With the advances in equipment renovation, TUS can be applied in a variety of clinical scenario. From the anatomical point of view, TUS can investigate not only the superficial regions, including airway, mediastinum, chest wall and pleural space, but also the deep parts, such as diaphragm and lung parenchyma. Mostly, the site-specific diagnosis can be made promptly upon TUS evaluation and TUS may serve as a convenient adjunct to guide treatment or procedure. Recent studies focused on the interstitial change on pleura broadens the horizons of TUS application. Through the combination of point-of-care examination on heart and vessels, clinicians may repeatedly gain clues to manage patient's respiratory symptoms. In the era of COVID-19, TUS provides the valuable information when direct contact is hindered by protective gowns and shields. Novel techniques, including elastography and contrast-enhanced ultrasound, have been under exploration and may serve as complementary roles in clinical diagnosis.

CHEST-S03

Radial Probe EBUS Application

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The value of bronchoscopy has grown in its diagnostic and therapeutic capacity with the evolution of technology, such as endobronchial ultrasound (EBUS), electromagnetic navigation, autofluorescence imaging, ultrathin bronchoscopy, and virtual bronchoscopic navigation. Among those, radial probe EBUS (RP-EBUS) is probably the most widely available tool to facilitate the detection and diagnosis of peripheral pulmonary lesions (PPLs). RP-EBUS employs a flexible catheter housing a miniature ultrasound probe to produce a 360 degree ultrasound image of the lung parenchyma. The small size of the probe allows it to be passed distally into the subsegmental bronchus to visualize the PPL. Subsequently, a transbronchial biopsy or other sampling methods are performed from the target bronchus.

RP-EBUS does not provide real-time biopsy visualization as the probe must be removed from the working channel in order to pass the biopsy instruments. In this regard, additional modalities, i.e., a guide-sheath or fluoroscopy, can be concomitantly applied to ensure the proper position of the biopsy forceps; however, mixed results exist as to whether this improves the diagnostic yield of a transbronchial biopsy for PPLs. Usually, RP-EBUS is more affordable for most large institutions dedicated to care for lung cancer patients, but a significant learning curve is required in the exploration of the target bronchus using the radial probe and in the interpretation of ultrasound images.

With the increasing use of low-dose computed tomography for lung cancer screening, the incidence of PPLs will likely be increasing in the near future. Reaching a diagnosis of PPLs remains a challenging problem in day-to-day pulmonology practice. RP-EBUS, with its fair diagnostic yield and a favorable safety profile in diagnosing PPLs, should be a must-learn technique for the pulmonologists performing diagnostic bronchoscopy.

CHEST-S04

The Clinical Application of Convex Probe Endobronchial Ultrasound in Lung Disease

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Bronchoscopy is a very important tool for a pulmonologist to diagnose and treat lung diseases. Bronchoscopy combined with sonography technology has been provided more possibilities to manage lung disease. Lung cancer has been the most common cause of death disease in the world. Adequate specimen collection is highly associated with the right diagnosis and precious molecular cancer therapy. Endobronchial ultrasound (EBUS) can evaluate the lesions behind or far away from the trachea. Bronchoscopy combined with EBUS provides excellent airway exploration and the acquisition of tumor specimens. There are two kinds of EBUS to apply in bronchoscopy, i.e. mini-probe EBUS and real-time EBUS. Many lung disease and lesions present at peripheral lung parenchymal that bronchoscopy could not reach and explore it. The mini probe EBUS helps clinicians to explore more peripheral lesions. Because tumors have some specific acoustic characteristics, the operator can use them to evaluate the malignant possibility of the lesion and modify the biopsy method. The evaluation of mediastinal lymph nodes is a standard procedure in the diagnosis and staging of lung cancer. The involvement of lymph nodes influences the stage of lung cancer and the possibility of complete surgical excision. Real-time EBUS can assess the mediastinal lymph nodes behind the trachea. Under the guidance of the ultrasound, an operator can use a specially designed needle to aspirate and get appropriate tissues for pathological and cytological diagnosis. The lymph node elastography has been used to increase the diagnostic rate.