Role of Transthoracic Sonography in Assessment of Interstitial Lung Diseases in comparison with High Resolution Chest Computed Tomography

Thesis

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Contents

List of Abbreviations

6MWD	: 6-minute walk distance
6MWT	: 6-minute walk test
AIP	: Acute Interstitial Pneumonia
AIS	: Alveolar-Interstitial Syndrome
ANA	: Anti-Nuclear Antibody
ANCA	: Anti-Nuclear Cytoplasmic Antibody
anti-CCP	: anticyclic Citrullinated peptide
ARDS	: Acute Respiratory Distress Syndrome
ASS	: Ant Synthetase Syndrome
ATS	: American Thoracic Society
BAL	: Broncho Alveolar Lavage
BLA	: B Line Artifact
BOS	: Bronchiolitis Obliterans Syndrome
COHb	: carboxy hemoglobin
COP	: Cryptogenic Organizing Pneumonia
COPD	: Chronic Obstructive Pulmonary Disease
CPK	: Creatine Phosphokinase
CTD	: Connective Tissue Disease
DAD	: Diffuse Alveolar Damage
DIP	: Desquamative Interstitial Pneumonia
DLco	: Diffuse Lung Capacity for Carbon Monoxide
DPLD	: Diffuse Parenchymatous Lung Disease
EBV	: Epstein-Barr virus
ECG	: Electro Cardio Graph
ELMOD2 gene	: ELMO Domain Containing 2 gene
ERS	: European Respiratory Society
ESR	: Erythrocyte Sedimentation Rate
EVLW	: Extra Vascular Lung Water
FEV1	: Forced Expiratory Volume during first second
FIo_2	: Fraction Inspired of oxygen
FVC	: Forced Vital Capacity
GER	: Gastro Esophageal Reflux
H&E	: Hemotoxin & Eosin
Hb	: Hemoglobin

HP	: Hypersensitivity Pneumonitis
HRCT	: High Resolution Computed Tomography
IIP	: Idiopathic Interstitial Pneumonia
IL	: Interleukin
ILD	: Interstitial Lung Disease
IPF	: Idiopathic Pulmonary Fibrosis
LAM	: Lymph-Angio-Leiomatosis
LCH	: Langerhans Cell Histiocytosis
LIP	: Lymphoid Interstitial Pneumonia
LIS	: Lung Intercostal Space
MCP joints	: Meta Carpo Phalangeal joints
MEF 25	: Mean Expiratory Flow 25
MEF 50	: Mean Expiratory Flow 50
MEF 75	: Mean Expiratory Flow 75
MMP	: Matrix Metalloproteinase
MMRC	: Modified Medical Research Council
NSIP	: Non-Specific Interstitial Pneumonia
OP	: Organizing Pneumonia
Pao_2	: Partial pressure of arterial oxygen
PEF	: Peak Expiratory Flow
PPFE	: Pleuro-parenchymal Fibro elastosis
RB	: Respiratory Bronchiolitis
RB-ILD	: Respiratory Bronchiolitis Interstitial Lung Disease
RF	: Rheumatoid Factor
RV	: Residual Volume
SFTPA2	: surfactant protein A2
SPo_2	: peripheral oxygen saturation
SSc	: Systemic Sclerosis
TLC	: Total Lung Capacity
UIP	: Usual Interstitial Pneumonia
ULCs	: Ultra-sound Lung Comets
US	: Ultra Sound
VC	: Vital Capacity

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ABSTRACT

Aim: This study was designed to recognize the sonographic features of interstitial lung diseases (ILD). And comparison of these features with the functional and radiological parameters of the disease were assessed.

Patients and methods: fifty-one patients with ILD were included; each patient underwent high resolution CT (HRCT), transthoracic sonography (TS), spirometry, DLco, 6-minute walk test with oxygen saturation assessment & MMRC dyspnea scale.

Results: significant statistical difference between patients with or without pleural line thickening in chest U/S as regard cystic changes in HRCT. statistical difference between patients with or without sub-pleural alterations as regard traction bronchiectasis in HRCT chest. significant statistical difference was found between patients with or without B lines with spacing less than 3 mm in chest U/S as regard ground glass in HRCT chest ($p<0.001$). significant statistical difference was found between patients with or without B lines with spacing less than 7 mm in chest U/S as regard ground glass ($p=0.002$), reticular infiltration ($p=0.012$) & traction bronchiectasis ($p=0.019$) in HRCT chest. As regard US chest findings & PFT: significant statistical difference between patients with or without pleural line thickening in chest U/S as regard the different severity grading of **DLco** (**p=0.008**); significant statistical difference between patients with or without pleural line thickening in chest U/S as regard **FEV1** (**p=0.015** & **FVC** (**p=0.009**).

Conclusion: TS can be used as an additional imaging method for assessment of ILD and as a marker to estimate the severity of disease.

Key words: interstitial lung disease, Transthoracic sonography, HRCT, pleural line, B lines

Introduction

Diffuse parenchymal lung disease (DPLD) represents a considerable challenge to physicians. According to the multidisciplinary consensus of the American Thoracic Society and the European Respiratory Society 2002, DPLD may be divided into DPLD of known cause (e.g., collagen vascular disease), idiopathic interstitial pneumonias (idiopathic and non-idiopathic pulmonary fibrosis), granulomatous DPLD (e.g., sarcoidosis), and other forms of DPLD ***(Reibig and Kroegel, 2003).***

Idiopathic Interstitial Pneumonias (IIPs) make up a heterogeneous group of diseases, which are collectively, included in the umbrella term "Interstitial Lung Diseases (ILDs)". In 2002, the ATS/ERS multidisciplinary panel proposed a classification of IIPs that comprises clinic-pathological entities such as Idiopathic Pulmonary Fibrosis (IPF), Nonspecific Interstitial Pneumonia (NSIP), Respiratory Bronchiolitis-associated Interstitial Lung Disease (RBILD), Cryptogenic Organizing Pneumonia (COP), Acute Interstitial Pneumonia (AIP), Desquamative Interstitial Pneumonia (DIP) and lymphoid interstitial pneumonia (LIP) ***(ATS/ERS, 2002).***

High-resolution computed tomography (HRCT) may substantially narrow the differential diagnosis for most cases with clinically suspected interstitial lung disease (ILD). Sometimes, HRCT may also provide a confident

diagnosis without the need of the surgical biopsy. Furthermore, HRCT can quantify the extent of lung abnormalities and be used to make up composite indexes that better estimate disease severity and prognosis ***(Sumikawa et al, 2008).***

The role of lung ultrasound (US) in the assessment of a variety of pulmonary conditions has been reported. Only recently has it been proposed as criterion validity for the assessment of ILD in patients compared with HRCT as the concurrent "gold standard". The US assessment of ILD is determined by the detection and quantification of B-lines, which consist of tails generated by the reflection of the US beam from thickened sub-pleural interlobar septa detectable in between the lung intercostal spaces (LIS) ***(Sperandeo et al, 2009)***.

Aim of the work

The objective of this work is to investigate the role of transthoracic sonography in assessment of Interstitial Lung Diseases in comparison with High Resolution Chest Computed Tomography.

Diffuse Parenchymal Lung Diseases

Diffuse parenchymal lung disease (DPLD) comprises a number of clinical disorders that affect the alveoli, alveolar septa, respiratory bronchioli, blood vessels, lymph vessels, i.e. the pulmonary parenchyma. These disorders are caused by known agents, idiopathic, granulomatous or rare ***(Peroš-Golubičić & Sharma, 2006).***

The known causes are diverse inorganic agents: leading to pneumoconiosis (asbestos, silica, etc.), organic: causing hypersensitivity pneumonitis (farmer's lung, bird fancier's lung, etc.), drugs, irradiation, toxic gases and fumes, bacteria, fungi, viruses, protozoa, and parasitic infections or infestations. When treating a patient with DPLD the clinician must carry out a detailed occupational and environmental history ***(Robalo et al, 2011).***

Idiopathic interstitial pneumonias according to new classification comprise of several entities, among them there is a new entity called pleuropulmonary fibro elastosis. Also, of great help to the practicing physicians is the inclusion of a category of unclassifiable group of DPLD. The everyday life experience resulted in this change, because almost 30% of these diseases even after the most complete and thorough examination, stay unclassifiable ***(William et al, 2013).***