Canadian Society of Thoracic Radiology

High Resolution CT of the Chest Recommended Technique

Working group: Cameron Hague MD FRCPC[1], Michael McInnis MD FRCPC[2], Carolina Souza MD, PhD[3]

[1] St. Paul's Hospital, University of British Columbia, Vancouver, British Columbia, [2] Toronto General Hospital, University of Toronto, Toronto, Ontario, [3] The Ottawa Hospital, University of Ottawa, Ottawa, Ontario

Approved on February 10, 2020

Introduction

Endorsed by the CSTR, a Working Group comprised of three thoracic radiologists with expertise in interstitial lung disease (ILD) created a simplified high-resolution CT (HRCT) protocol to be used in community hospitals but can also be used in academic centers. Using clear language and simplified technical parameters, this proposed protocol aims to improve the quality of HRCT examinations performed in non-academic and non-tertiary centers across Canada. High quality imaging for the depiction of lung parenchymal detail is paramount in the diagnosis of ILD and adequate initial HRCT will ensure appropriate management and avoid diagnostic delays as well as additional costs of repeat examinations.

This protocol should be utilized in scenarios in which either the clinician or radiologist suspects interstitial lung disease and/or pulmonary fibrosis.

Conditions that should be performed with a HRCT protocol as opposed to a regular CT chest include, but are not limited to: idiopathic pulmonary fibrosis (IPF), usual interstitial pneumonia pattern (UIP), nonspecific interstitial pneumonia pattern (NSIP), hypersensitivity pneumonitis (HP), interstitial pneumonia with autoimmune features (IPAF), connective tissue disease-related interstitial lung disease (CTD-ILD), desquamative interstitial pneumonia (DIP), Langerhans-cell histiocytosis (LCH), lymphoid interstitial pneumonia (LIP) and asbestosis.

CT Technique

The main differences between a HRCT protocol and a routine non-contrast CT chest protocol are: a. slice thickness (HRCT ≤2mm), b. expiratory imaging, and c. prone imaging (in selected cases)

Thin Slices: To resolve subtle reticular and nodular changes, HRCT is obtained with thinner slices as compared to routine CT chest. This is the best way to identify honeycombing and to distinguish it from mimics.

Expiratory imaging, obtained either via a non-contiguous slice technique or contiguous low dose technique is suggested:

a. For ALL baseline CTs for assessment of ILD
b. For cases in which expiratory imaging was not done previously and uncertainty exists between a potential diagnosis of chronic HP, UIP and NSIP.

Prone imaging, obtained at full inspiration, is suggested to:

a. Assess subtle abnormalities in the posterior dependent portions of the lungs when uncertainty exists whether findings represent dependent atelectasis or early ILD on supine imaging.
b. Evaluate the lungs when the clinical question is possible asbestosis.

Required Components:

- Axial 1-1.25 mm slice thickness, contiguous. Lung or bone reconstruction algorithm. End inspiration.*
- Axial 2.5-5 mm slice thickness, contiguous. Soft tissue /mediastinal reconstruction algorithm. End inspiration.

*It is suggested that coronal and sagittal reformats of the axial lung or bone reconstruction algorithm be provided as well.

Radiation Dose Consideration: Technical parameters should consider the size of the patient to achieve diagnostic imaging quality using radiation that is as low as reasonably achievable (CTDI≤3.0 mGy).

If the purpose of the follow up CT chest is to monitor progression of an established diagnosis of ILD, especially in younger patients, then a low dose technique should be utilized. Often the goal of follow-up CT chest examinations is to monitor extent of disease rather than demonstrate features of disease and therefore low radiation dose technique is frequently sufficient.

Optional Components: (see indications above)

- Expiratory imaging: Axial 1-1.25 mm slice thickness, at 1cm intervals or contiguous low dose**. Lung/bone reconstruction algorithm. End expiration.
- Prone imaging: Axial 1-1.25 mm slice thickness, contiguous. Lung/bone reconstruction algorithm. End inspiration.

* 8 mm thick, contiguous, maximum intensity projection (MIP) reconstruction is optional to aid in lung nodule detection.

**Contiguous Expiratory imaging can be done with a low dose protocol (mAs 20, with no dose modulation)