

Diagnosis of Lung Diseases on Coronal thin Section Reformats of HRCT Scan on Multidetector Computed Tomography

UMMARA SIDDIQUE UMER¹, ALI ASGHAR², AMAN NAWAZ KHAN³, MAHWISH JABEEN⁴, HADIA ABID⁵, MADIHA PERVAIZ⁶, SHAHJEHAN ALAM⁷, MUHAMMAD ASIF⁸, SYED GHULAM GHAUS⁹, ABDULLAH SAFI¹⁰, ANISA SUNDAL¹¹

¹Associate Professor, Radiology Department, RMI, Peshawar

^{2,6,8} Radiology Trainee, Radiology Department, RMI, Peshawar

³Consultant Interventional Radiologist, Radiology Department, RMI, Peshawar

^{4,5,10,11} Assistant Professor, Radiology Department, RMI, Peshawar

^{7,9} Professor Of Radiology, RMI, Peshawar

Correspondence to: Dr Ummara Siddique Umer, Associate Professor, Radiology, Rehman Medical Institute, Peshawar

ABSTRACT

Aim: To find out the added value of reformatted coronal thin sections of HRCT scans in diagnosis of lung diseases.

Methodology: Prospective study of 100 patients underwent CT chest with suspicion of lung disease. All scans were performed on 128 slice MDCT scanner. Two sets of lung images were made. **Group 1** having 0.5 mm thick axial CT images **Group 2** having 0.5 mm thick coronal images

Results: There was presence of abnormal lung infiltration in 48 cases in group 2 and same was in group 1. In identifying the CT features of lung disease between group 2 and group 1, there was no significant difference in both groups. In group 2, lung abnormalities in central, peripheral, anterior or posterior segments were better seen. Vertical dominance of lung changes was clearly evaluated in group 2 than in group 1.

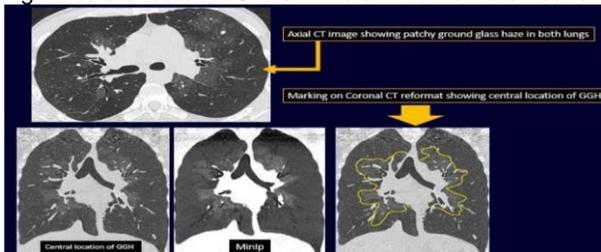
Conclusion: Coronal reformats of CT scan shows lung disease more clearly as compared to axial sections.

Key words: Axial section, CT scan, Lung disease

INTRODUCTION

The diagnosis of lung diseases like interstitial diseases, perilymphatic diseases, infective processes may be challenging, especially in atypical diseases. Reporting CT chest can be challenging when viewed only the axial images^{1,2}. Technical aspects in post processing of images play an important role including reconstruction parameters. Not reformatting the volume axial images can cause inaccurate description of predominant features, potentially leading to false-positive results and characterization of lung diseases.

Fig 1: Role of coronal CT reformats in vertical distribution



Coronal reformations of CT chest have been studied in the detection of diaphragmatic injury³. Their usefulness has been reported in the diagnosis of lung lesions by two studies^{3,4}. Coronal sections of CT scan shows better results as compared to axial imaging. When comparing coronal reformatted images with the axial images, it can give additional info with zonal location of pathology and also tell the nature of certain abnormalities.

METHODOLOGY

The study was done in the Radiology department of Rehman medical Institute, Peshawar. All patients whose HRCT was done on 128 slice MDCT scan were included in the study while patient of post op CT scans were excluded.. One hundred cases were selected, who underwent HRCT with suspicion of lung disease between 1st January 2018 and 1st January 2020.

Imaging Procedure: All scans were done on 128 slice MDCT scanner. Two sets of lung images were done:

Group 1 with 0.5 mm thick axial CT section

Group 2 with 0.5 mm thick coronal section

Both series of sections were obtained by using multiplanar reconstruction (MPR) on vitrea workstations and PACS viewers.

RESULTS

In 48 cases, lung infiltration is seen in group 2 as well as in group 1 also. When comparing group1 and group2 regarding CT features, there is no significant difference; i.e. nodules (better visualized on axials than on coronal, ax > cor); atelectatic bands (ax < cor); ground glass increased attenuation (ax < cor); fibrotic tractional bronchiectasis: (ax < cor); interstitial distortion likely honeycombing (ax = cor) and cystic or cavitating lesions (ax = cor).

Presence of lung lesions in central, peripheral, anterior or posterior lung segments was better seen in group 2 i.e. on coronal reformats while vertical dominance of lung changes was clearly evaluated in group 2 (26 cases) as compared to group 1(14 cases) and difference was statistically significant (P < 0.01).

Received on 14-12-2020

Accepted on 24-04-2021

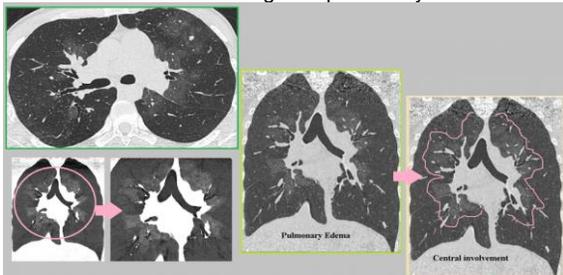
Table 1: CT plane to assess disease distribution in parenchyma

Diseases	n	To assess presence	To assess distribution of disease
		Axial, Coronal or both	Axial, Coronal, Both
UIP	6	Both	Coronal
Pulmonary Edema	2	Both	Coronal
Hypersensitivity Pneumonitis	2	Both	Coronal
Organizing Pneumonia	6	Both	Both
Tuberculosis	10	Both	Coronal
Sarcoidosis	4	Both	Coronal
Metastasis	2	Both	Both
Small Airway Disease	10	Both	Axial
ABPA	2	Both	Coronal
Pulmonary Mass	2	Both	Axial
Mesothelioma With Lung Involvement	2	Both	Axial

DISCUSSION

It is observed that there has been a change from histopathology to a multidisciplinary team (MDT) acquired diagnosis by use of MDCT. It gives us more diagnostic accuracy especially in diffuse interstitial lung disease. The 2002 ATS/ERS statement on classification of idiopathic interstitial pneumonias gave an important role of HRCT in the diagnosis of idiopathic interstitial pneumonias. The 2013 ERS/ATS statement shows that combined clinical data and radiological findings are necessary for a multidisciplinary diagnosis⁵. Certain diseases have predominant zonal preference e.g pulmonary edema is more central in location (Fig 2) and chronic hypersensitivity pneumonitis has more peripheral distribution.

Fig 2: CT axial and coronal images of pulmonary edema.



Some diseases have comparatively less involvement of lung bases or basal sparing like acute hypersensitivity pneumonitis whereas UIP pattern interstitial lung disease has basal predominance (Fig.3 and 4). This zonal preference is more evident on coronal reformatted images.

Fig.3: Hypersensitivity Pneumonitis. showing mosaic areas of air trapping with patchy ground glass haze.

Similarly organizing pneumonias and recent pandemic related COVID-19 pneumonia have peripheral predominance and ABPA (Allergic bronchopulmonary aspergillosis) has central predominance (Fig 5). Certain infiltrative diseases like Sarcoidosis has upper and mid lung preference as compared to post-primary tuberculosis having both endobronchial as well as infiltrative involvement, which has upper lung predominance.

Fig.3: Hypersensitivity Pneumonitis showing mosaic areas of air trapping with patchy ground glass haze.

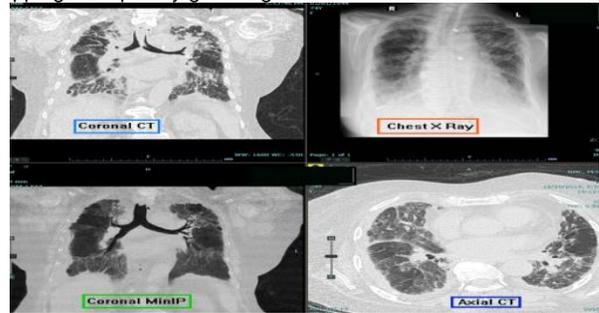


Fig 4: Comparison of axial and coronal HRCT images showing interstitial lung disease with UIP pattern. The basal gradient of UIP is well appreciated on coronal images.

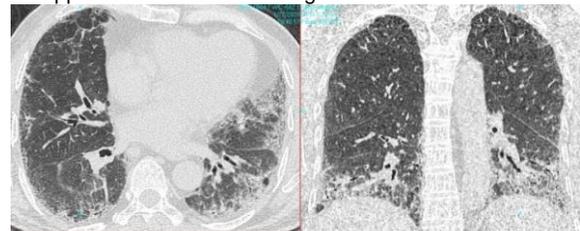
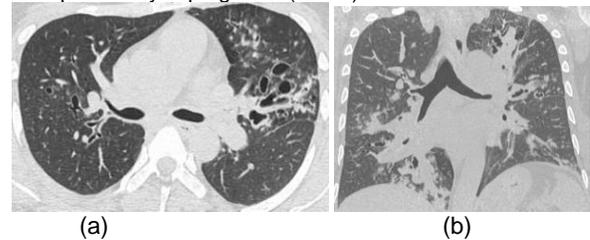


Fig 5: (a) Axial CT image of a young patient with hemoptysis showing bronchiectasis, nodules and patchy ground glass haze. (b) Coronal reformat of CT showing predominant central involvement of bronchiectasis, infiltrates and nodules suggesting Allergic bronchopulmonary aspergillosis (ABPA).



CONCLUSION

Coronal reformats of CT scan allow diagnostic approach to lung disease more precisely with better visualization of vertical extent as that provided with axial sections.

REFERENCES

1. Hovinga M, Sprengers R, Kauczor H et al. CT Imaging of Interstitial Lung Diseases. Multidetector-Row CT of the Thorax. 2016 Feb 27: 105–30.
2. Nishino M, Kuroki M, Boiselle PM et al. Coronal Reformations of Volumetric Expiratory High-Resolution CT of the Lung. American Journal of Roentgenology 2004 182:4, 979-82.
3. Israel RS, McDaniel PA, Primack SL et al. Diagnosis of diaphragmatic trauma with helical CT in a swine model. AJR 1996; 167:637 –41.
4. Remy-Jardin M, Campistron P, Amara A, et al. Usefulness of coronal reformations in the diagnostic evaluation of infiltrative lung disease. J Comput Assist Tomogr 2003; 27:266 –73.
5. Travis WD, Costabel U, Hansell DM. Committee on idiopathic Interstitial Pneumonias et al (2013) An official American Thoracic Society/European Respiratory Society statement: update of the international multidisciplinary classification of the idiopathic interstitial pneumonias. Am J Respir Crit Care Med 188(6):733–748.