Original Research Article

The value of minimum intensity projection technique in the assessment of interstitial lung disease and asthma

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Abstract

CT produces a volume of data which can be manipulated, through a process known as windowing, in order to demonstrate various structures based on their ability to block the X-ray/Rontgen beam. Although image collimation is prospectively fixed in axial and older scanners, collimation can also be retrospectively changed on newer generation of MDCT. A single Centre prospective study was conducted among patients who came for CT chest to our clinic, who were showing features of interstitial lung disease and bronchial asthma. Out of 50 patients 27 are males and 23 are females. The patient's age range is from 21years to 88years; with mean age is 52-53years. Most common symptom of presentation is dyspnea on exertion, cough, seasonal attacks of breathlessness and fever.

Key Word: Minimum Intensity Projection Technique, Interstitial Lung Disease, Asthma

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INTRODUCTION

Computed tomography (CT) is a medical imaging method employing tomography. Digital geometry processing is used to generate a three-dimensional image of the inside of an object from a large series of two-dimensional X-ray images taken around a single axis of rotation. The word "tomography" is derived from the Greek*tomos* (slice) and *graphein* (to write).[1] The imaging of chest has changed dramatically in the last two decades. Since the introduction of first commercial scanner in 1973 the availability of monoslice CT to diagnose chest diseases has emerged. The introduction of helical CT in 1989 and subsequently multidetector row CT began to further change the approach. CT has played a major role in diagnosis, management and follow up of patients with chest diseases. The diagnostic power of Computed tomography is so definitive that its use as a primary diagnostic imaging procedure is justified and other studies are not required. Further contrast studies helps in characterizing the lesions.[2] Before advent of helical CT, there was few limitation of conventional CT. Inconsistent patient breathing may result in misregistration artifact which can cause small lesions to be missed during acquisition it can cause significant artifact and degrade images. Helical CT offers several potential advantages over conventional axial CT. Helically obtained images can be reconstructed retrospectively at any table position and also reduced volume averaged artifacts.[3] CT produces a volume of data which can be manipulated, through a process known as windowing, in order to demonstrate various structures based on their ability to block the X-ray/Rontgen beam. Although image collimation is prospectively fixed in axial and older scanners, collimation can also be retrospectively changed on newer generation of MDCT. MDCT offers a unique capability over traditional spiral scanners by allowing for slice thickness to be selected after study has been completed. With thin collimation available, small lesions can be

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clearly visualized.[4] The recent proliferation of multi detector row computed tomography (CT) has led to an increase in the creation and interpretation of images in planes other than the axial images traditionally viewed with CT. Powerful three-dimensional (3D) applications improve the utility of detailed CT data but also create confusion among radiologists, technologists, and referring clinicians when trying to describe a particular method or type of image. Parallel advances that have been made in the areas of CT acquisition and image processing software are of comparable importance, since post processing cannot improve on the finite constraints of the acquired CT data and innovative imaging paradigms are needed to optimize the use of exquisite and voluminous data.[5,6]

METHODOLOGY

Study Settings: A single Centre prospective study was conducted among patients who came for CT chest to our clinic, who were showing features of interstitial lung disease and bronchial asthma.

Inclusion Criteria: Patients who are showing features either of interstitial lung disease or bronchial asthma.

Exclusion Criteria: Patients with CT findings other than interstitial lung disease and bronchial asthma like with features of pulmonary tuberculosis, lung malignancy and pneumonia.

Methodology: Patient selection was based on previous inclusion-exclusion criteria. Informed consent was taken from all the subjects.

On HRCT and MinIP images of chest, presence of following findings was noted: Air trapping, Bronchial dilatation, Cysts, Emphysematous changes, Ground-glass opacity.

RESULTS

Our study includes 50 patients, who came for the CT scan of thorax, who had the CT features of interstitial lung disease and bronchial asthma. Out of 50 patients 27 are males and 23 are females. The patient's age range is from 21years to 88years; with mean age is 52-53years. Most common symptom of presentation is dyspnea on exertion, cough, seasonal attacks of breathlessness and fever. Other symptoms were joints pain. Some of the patients in our study were previously diagnosed with interstitial lung disease or bronchial asthma either radiologically and/or clinically. In our study of 50 patients with features of interstitial lung disease and bronchial asthma, we have included the features which are better seen in MinIP images like low attenuation areas (cysts, air trapping, airway dilatation, emphysematous changes and ground-glass opacity).

Table1: Number of Male and Female Patients

Total patients	Number
Male	27
Female	23

Table 2: No. of Patients showing Features of Interstitial Lung Disease and Bronchial Asthma

Abnormal Findings	Number of patients
Interstitial lung disease	35
Bronchial asthma	15

Table 3: HRCT Findings with No. of Patients Showing It

HRCT findings	Number of patients
Air Trapping	15
Airway Dilatation	25
Cysts	11
Ground glass opacity	21
Emphysematous changes	09

Table4: MinIP Findings with No. of Patients Showing It

MinIP Findings	Number of Patients
Air Trapping	18
Airway Dilatation	25
Cysts	12
Ground glass opacity	22
Emphysematous changes	09

DISCUSSION

CT has revolutionized the imaging of thorax as compared to the era of conventional radiogram. Advent of the MDCT has further improved the imaging quality mainly by reducing the time required to scan, also enabling us to acquire volume data there by reducing motion artifacts, volume averaging artifacts and also enables us to do reconstruction / post processing in multiple ways. After acquiring we can view the image in different windows.[7] High-resolution CT (HRCT) has become a valuable tool for the evaluation of patients with diffuse pulmonary diseases. HRCT imaging, by use of narrow collimation and high spatial frequency reconstruction algorithms, seeks to maximize spatial resolution and there by approach a pathologic representation of a disease process.[8,9] However there is newer technique like Minimum Intensity Projection which allows better visualization of low attenuation areas as compared to HRCT images.[10] In our study we have included those 50 patients who were showing the features of interstitial lung disease and asthma in CT Chest. We have studied mainly low attenuation areas like cysts, airway dilatation, focal air trapping, emphysematous changes and also ground glass haze. We have compared MinIP images with HRCT images. HRCT showed focal air-trapping in 15 patients whereas MinIP images showed air-trapping in 18 patients, in 3 patients were HRCT missed air-trapping

MinIP images picked it and also in 6 patient's air trapping was better seen in MinIP images. HRCT and MinIP both showed airway dilatation in 25 patients each. But MinIP images showed airway lumen very well and airway can be traced to longer extent as compared to the HRCT. HRCT showed cysts in 11 patients whereas MinIP showed in 12 patients, in 1 patient were HRCT missed small cyst was picked up in MinIP images. HRCT showed ground-glass opacity in 21 patients whereas MinIP images showed in 22 patients, in 1 patient were HRCT was normal, MinIP showed ground-glass opacity and in 2 patients ground-glass opacity was more conspicuous in MinIP. Emphysematous changes were noted 9 patients in both HRCT and MinIP. In 1 case it was well delineated in MinIP images.

CONCLUSION

MinIP has further helped in the evaluation of low attenuation areas like cysts, air-trapping, airway dilatation, airway lumen and emphysematous changes and also ground-glass opacity.

REFERENCES

1. Neal C. Dalrymple *et al.* Introduction to the Language of Three-dimensional Imaging with Multidetector CT RadioGraphics 2005; 25:1409–1428.
2. Rankin SC. Spiral CT: vascular applications. Eur J Radiol 1998; 28:18–29.
3. Rubin GD, Napel S, Leung AN. Volumetric analysis of volumetric data: achieving a paradigm shift [editorial]. Radiology 1996; 200:312–317.
4. Calhoun PS, Kuszyk BS, Heath DG, Carley JC, Fishman EK. Three-dimensional volume rendering of spiral CT data: theory and method. Radio-Graphics 1999; 19 :745–764.
5. Keller PJ, Drayer BP, Fram EK, Williams KD, Dumoulin CL, Souza SP. MR angiography with two-dimensional acquisition and three-dimensional display: work in progress. Radiology 1989; 173:527–532.
6. Heath DG, Soyer PA, Kuszyk BS, *et al*. Threedimensional spiral CT during arterial portography: comparison of three rendering techniques. Radio-Graphics 1995; 15: 1001–1011.
7. Kim JK, Kim JH, Bae SJ, Cho KS. CT angiography for evaluation of living renal donors: comparison of four reconstruction methods. AJR Am J Roentgenol 2004; 183: 471–477.
8. Ravenel JG, McAdams HP. Multiplanar and three-dimensional imaging of the thorax. RadiolClin North Am 2003; 41: 475–489.
9. Fishman EK, Magid D, Ney DR, *et al.* Three dimensional imaging. Radiology 1991; 181: 321–337. [Published correction appears in Radiology 1992; 182(3):899.]
10. Magnusson M, Lenz R, Danielsson PE. Evaluation of methods for shaded surface display of CT volumes. Comput Med Imaging Graph 1991; 15: 247–256.

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