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Medical Diagnostic Imaging

High Resolution Computed Tomographic Assessment of Airway Wall Thickness in COPD Diseases

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Abstract	Original Research Article

Background: The relevance of particular abnormalities to the clinical condition needs to be assessed objectively and, in particular, the relationship of airway wall thickening to other clinical parameters of air way disease severity. However, the reliability of airway wall measurements needs to be studied. On this Descriptive analytic study to assess of airway wall thickness in COPD Diseases. *Method*: data were collect from CT scan work station about 50 patients male and female on deferent age from 20 years to 80years. We selected five levels from trachea to diaphragm then measured the trachea and bronchial wall thickness *Conclusion:* The male patients within age from 60years to 80years are high risk to COPD more than female. The mean of trachea wall thickness 3.4660m.over all sections bronchial wall thickness on the right lung are more thickened than bronchial on left lung by 0.8 mm to 1.10mm.
Keywords: COPD, HRCT, CT chest, ILD, trachea, bronchial thickness.

INTRODUCTION

The lungs are a pair of spongy, air-filled organs located on either side of the chest (thorax). The trachea (windpipe) conducts inhaled air into the lungs through its tubular branches, called bronchi, the bronchi then divide into smaller and smaller branches (bronchioles), finally becoming microscopic. The bronchioles eventually end in clusters of microscopic air sacs called alveoli. In the alveoli, oxygen from the air is absorbed into the blood. Carbon dioxide, a waste product of metabolism, travels from the blood to the alveoli [1], where it can be exhaled. Between the alveoli is a thin layer of cells called the interstitial, which contains blood vessels and cells that help support the alveoli, Interstitial lung disease (ILD) are group of pulmonary disorders characterized by inflammation and fibrosis of gas exchanging portion of the lung and diffuse abnormalities on lung radiograph [2].

CT images of internal organs, bones, soft tissue and blood vessels provide greater detail than traditional x-rays, particularly of soft tissues and blood vessels Using a variety of techniques, including adjusting the radiation dose based on patient size and new software technology, There are many protocol used in CT to answer clinical task, High resolution computed tomography (HRCT). It is used in the diagnosis of various lung diseases, by assessing the lung parenchyma, HRCT is performed using a conventional CT scanner [2, 3]. However, imaging parameters are chosen so as to maximize spatial resolution, a narrow slice width is used (usually 1–2 mm), a high spatial resolution image reconstruction algorithm is used, Field of view is minimized, so as to minimize the size of each pixel, other scan factors (e.g. focal spot) may be optimized for resolution at the expense of scan speed, the scan may be performed in inspiration with supine Patient position and may generate three-dimensional images, these images can be viewed on a computer monitor, printed on film or transferred to a CD or DVD [4, 5].

MATERIAL AND METHOD

CT scan machine 16 slices and Patients .Patients recruited from the COPD Patient who undergoes HRCT study. All had a diagnosis of COPD according to the chest physician criteria, for at least 5 years and had no acute exacerbation within the preceding month. All were non-smokers or, if ex-smokers, had stopped a minimum of 5 years earlier all volunteers gave informed consent.

On this Descriptive analytic study which 50 Sudanese population, this study were conduct by

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experienced technologist working independently, data were collect from three hospitals. This study included male and female patients with deferent age group from 20years to 80 years on three groups: group A from 20 to 39, group B from 40 to 59 and group C from 60 to 80. Samples which studied include patients from deferent geographic area on Sudan. start from personal patient details like age, gender and clinical history any data where saved in CT scan computer then take measurement as discuss below ,data were dump into Microsoft excel work sheet and analyzed by static program SPSS version 2.0.

Measurements

In this study we selected Five sections were obtained from an initial "scanogram": top of the aortic arch, main carina, 1 cm below the main carina, level of the pulmonary veins, and 2 cm above the right hemi-diaphragm. Data were collected at full inspiration with additional scans at the five levels on expiration for assessment of air trapping and mosaic perfusion. The images were viewed on a work station and measurements of overall diameter (D) and internal lumen (L) diameter of the bronchi were made using electronic calipers, with wall thickness (T) being derived from these measurements (T = (D – L)/2).

A mean value was calculated for each section level for each patient from all the bronchi .started by measured a mean value of the tracheal wall thickness, a mean value of the right bronchial wall thickness compared by the left bronchial on left lung side on the top of aortic arch. A mean value of bronchial wall thickness of the mean carina level ,a mean value of bronchial wall thickness of 1 cm below level of the main carina, a mean value of bronchial wall thickness level of the pulmonary veins, a mean value of bronchial wall thickness of the level 2 cm above the right hemi-diaphragm. Over all patients calculate maximum value of wall thickness bronchi, minimum value of wall thickness bronchi and a mean value of wall thickness for section which the most thickened and the helpful to

describe disease, the relationship between age and gender with high incidence of COPD diseases.

RESULT

Table No 1: Gender

	Frequency	Percent
Male	29	58.0
Female	21	42.0
Total	**50**	**100.0**
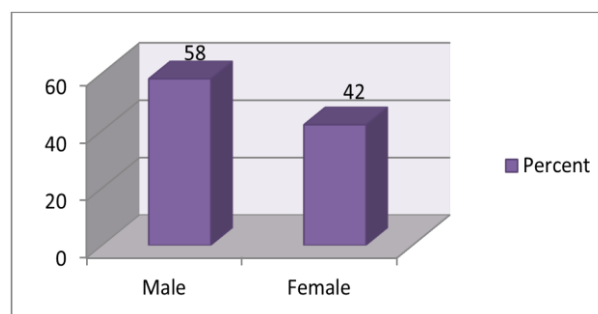
Table No (2): Age

	Frequency	Percent
A (20-39)	13	26.0
B(40 – 59)	14	28.0
C(60 – 80)	23	46.0
Total	**50**	**100.0**
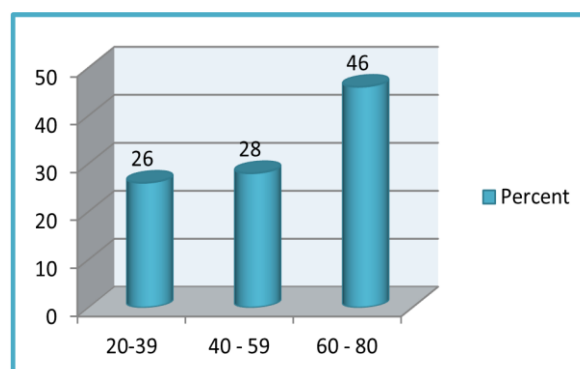
Table NO (3): Descriptive Statistics

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Trachea	50	4.40	1.90	6.30	3.4660	.11012	.77870
Section 2 R	43	2.90	1.90	4.80	2.9860	.09544	.62586
Section 2 L	46	2.30	1.70	4.00	2.6804	.07412	.50271
Section 3 R	50	1.60	1.50	3.10	2.3840	.06282	.44417
Section 3 L	43	2.40	1.40	3.80	2.3349	.07895	.51773
Section 4 R	47	2.70	1.30	4.00	2.3511	.07292	.49994
Section 4 L	38	1.70	1.20	2.90	2.2526	.08157	.50282
Section 5 R	31	1.10	1.00	2.10	1.4645	.05595	.31150
Section 5 L	29	1.20	.90	2.10	1.5207	.06780	.36511
Valid N (listwise)	5						

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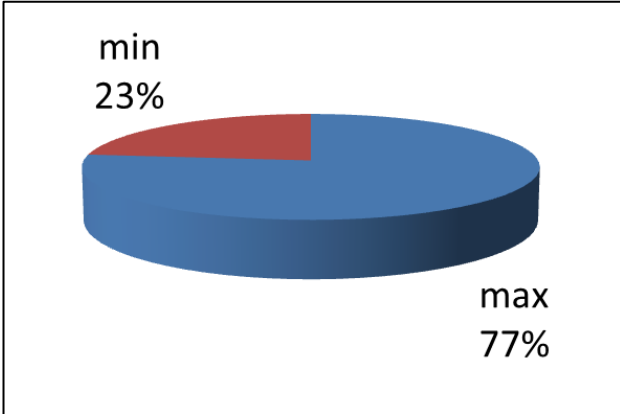
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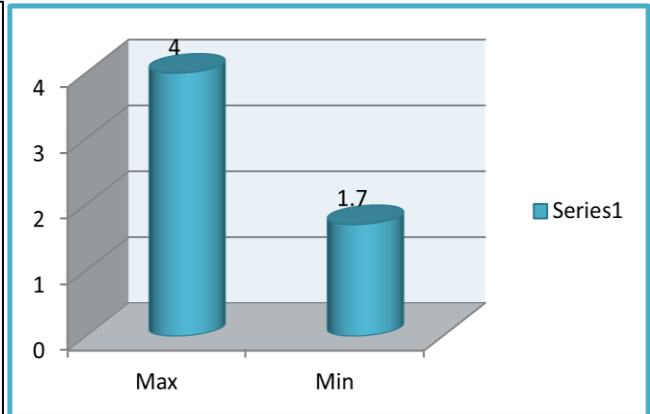
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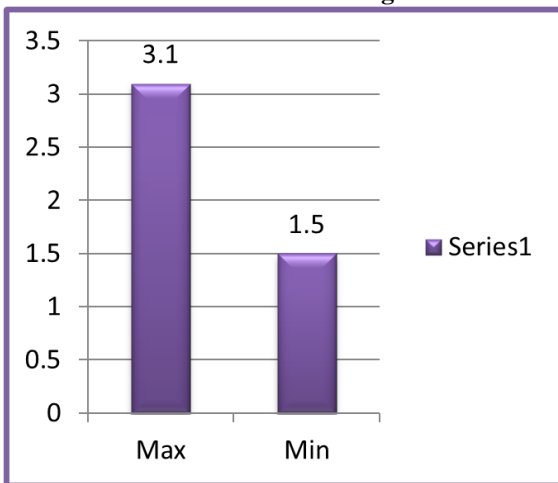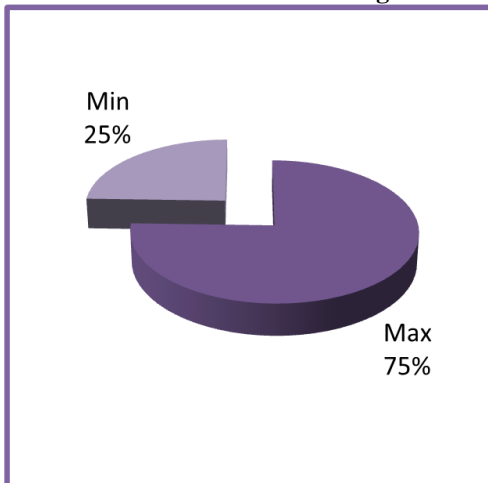

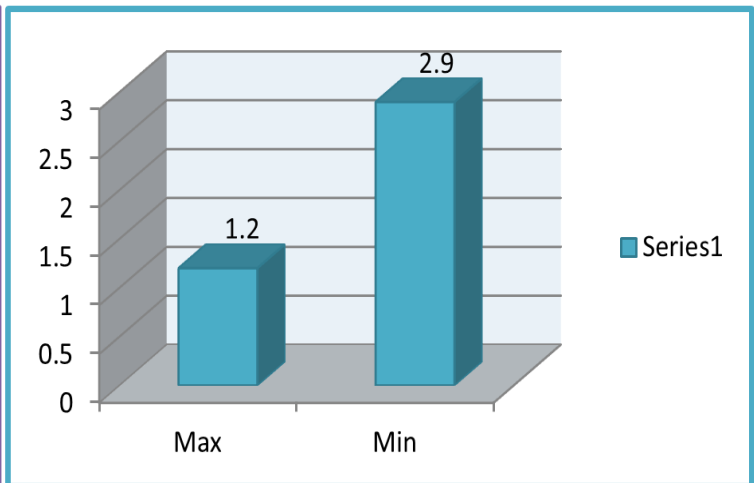**Section 3 Left**
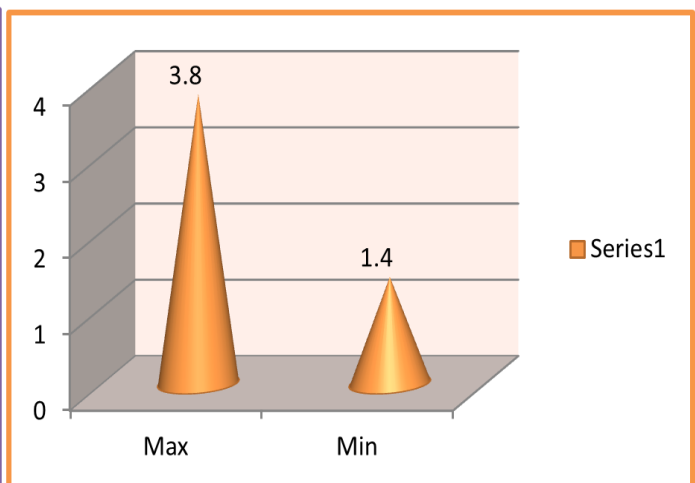
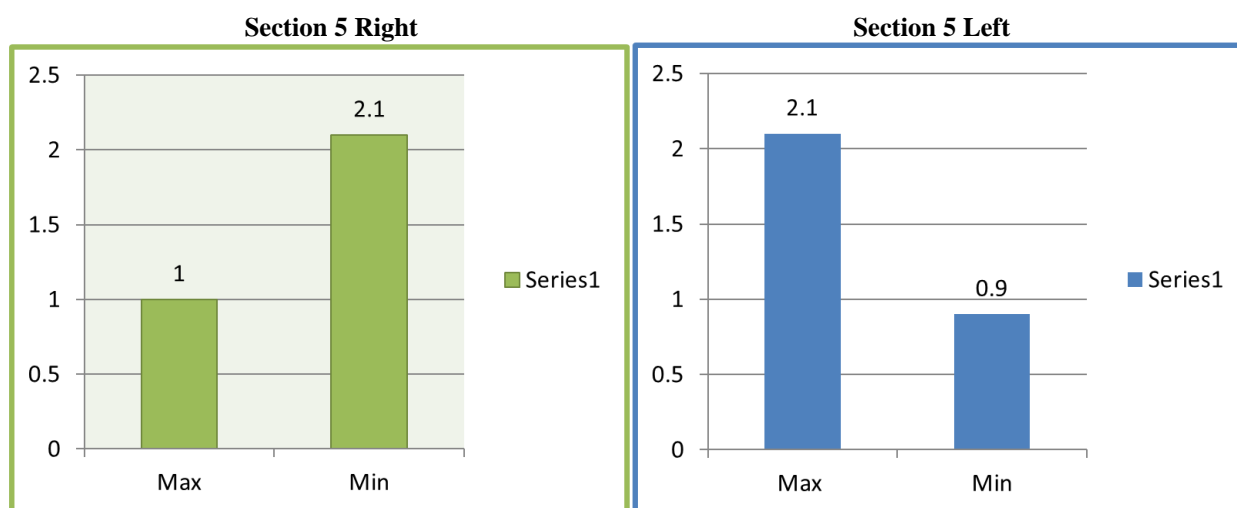**Section 4 Right**

Section 4 Left

Section 5 Right

Section 5 Left

DISCUSSION

Total of 50 patients had a diagnosis of COPD according to the chest physician, the number of 29 of male patient about 58.0% and 21 of female patient about 42.0 % (table No1)**.**

Patient within age group from 20years to 39 years frequented 13time about 26.0%. Patient within age group from 40years to 59 years frequented time 14 about28.0% and patient within age group from 60years to 80 years frequented 23 time about46.0% (table No2)**.**

Section 1

Top of the aortic arch, the maximum wall thickness of the trachea 6.30m, minimum wall thickness1.90m and the mean value of wall thickness 3.4660m. Average tracheal length from 10cm to12 cm with deep inspiration the tracheal length increase by 2 cm. the normal transvers diameter range of trachea between 25mm for male and 10mm to 21mm for female, the transvers diameter of tracheal increase with inspiration and decrease with coughing.

Section 2

Main carina, The wall thickness of the bronchi level of the main carina maximum on right side of the lung4.80mm , the minimum1.90m and a mean value of the wall thickness 2.9860mm .the lung of the left side wall thickness of the bronchi maximum 4.0m, minimum 1.70m.and mean value of the wall thickness2.6804mm.

Section 3

1 cm below the main carina, the wall thickness of the bronchi level 1 cm below of the main carina the maximum on the right side of lung 3.10mm, the minimum 1.50 mm and the mean value of the wall thickness2.3840mm, the wall thickness of lung on the left side maximum 3.80mm, minimum 1.40mm the mean value of the wall thickness2.3349mm.

Section 4

Level of the pulmonary veins The wall thickness of the bronchial for level of the pulmonary veins of lung on the right side maximum4.0m, minimum 1.30m and mean value of the wall thickness2.3511mm and wall thickness of lung on the left side maximum2.90m, minimum 1.20m. Mean value of the wall thickness2.2526mm.

Section 5

2 cm above the right hemi-diaphragm The wall thickness of the bronchi level 2 cm above the right hemi- diaphragm, the lung on the right side maximum wall thickness 2.10 m, minimum 1.0m and the mean value of the wall thickness1.4645 mm. lung of the left side maximum wall thickness 2.10m, minimum 0.90m. Mean value of the wall thickness1.5207mm.

From section 2 to section 5 some samples missed because disappear on anatomical lung section.

CONCLUSION

The male patients within age from 60years to 80years are high risk to COPD more than female about 58.0%. The mean of trachea wall thickness 3.4660m.over all sections bronchial wall thickness on the right lung are more thickened than bronchial on left lung by 0.8 mm to 1.10mm.

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