Results

Table (1) clinical findings (smoking history)

Diagnosis	Number	Smoker	Non-smoker
PSS	30	19(60%)	11(36.7%)
RA	7	6(85.7%)	1(14.3%)
SLE	2	1(50%)	1(50%)
MCTD	3	0	3(100%)
WG	3	2(66.7%)	1(33.3%)
PM/DM	4	1(25%)	4(100%)
Takay	1	1(100%)	0
IPF	14	7(50%)	7(50%)
Amiodr	2	0	2(100%)
Others	8	6(75%)	2(25%)
Total	74(100%)	43(58%)	32(43%)

Table (2): Clinical findings (symptoms).

Diagnosis	Number	Dyspnea	Cough	Both	Dyspne alone	Cough alone
PSS	30	22(73.3%)	8(26%)	8(26%)	13(43.3%)	0
RA	7	4(57.1%)	5(71.4%)	3(42.9%)	1(14.3%)	2(28.6%)
SLE	2	2(100%)	1(50%)	1(50%)	1(50%)	0
MCTD	3	2(66.7%)	2(66.7%)	1(33.3%)	1(33.3%)	1(33.3%)
WG	3	0	0	0	1(33.3%)	0
PM/DM	4	3(75%)	3(75%)	2(50%)	1(25%)	1(25%)
Takay	1	0	0	0	1(100%)	0
IPF	14	10(71%)	8(57.1%)	7(50%)	3(21.4%)	1(7.1%)
Amiodr	2	1(50%)	2(100%)	1(50%)	0	1(50%)
Others	8	4(50%)	4(50%)	3(37.5%)	1(12.5%)	2(25%)
Total	74(100%)	48(65%)	33(45%)	26(35%)	23(31%)	8(10.8%)

32 patients were non-smoker (42.7%) and 43 smoker (57.3%). 48 (64%) patients had dyspnea, 33(44%) patients had cough.

In 30 patients with PSS: 11 non-smoker, 19 smoker, 22 had dyspnea, 8 had cough.

7 patients with RA, 1 non-smoker, 6 smoker, 4 had dyspnea, and 5 had cough.

3 patients with MCTD: 3 non-smoker, 2 had dyspnea, and 2 had cough.

2 patients with SLE: 1 non-smoker, 1 smoker, 2 had dyspnea, and one had cough.

3 patients with WG: 1 non-smoker, 2 smoker, one had dyspnea.

5 patients with PM/DM: 4 non-smoker, 1 smoker, 3 had dyspnea, 3 had cough.

1 patient with Takayasu's A. he was smoker and had dyspnea.

14 patients with IPF: 7 non-smokers, 7 smoker, 10 had dyspnea, and 8 had cough.

2 patients with Amiodarone toxicity: 2 non-smokers, 1 had dyspnea, and 2 had cough.

8 patients with Miscellaneous ILD: 2 non-smoker, 6 smoker, 4 had dyspnea, and 4 had cough.

The (17) Egyptian patients were not included in the clinical findings but all the 17 patients were non-smokers.

Table (3): Classification of patients according to absence or presence of honeycomb on HRCT (91 patients)

	Normal	Without H/C	With H/C
PSS(n=32)	7(21.9%)	13(40.6)	12(37.5)
RA(n=19)	10(52.6%)	8(42.1)	1(5.3)
MCTD(n=3)	0	1(33.3)	2(66.7)
IPF(n=14)	0	3(21.4)	11(78.6)
SLE(n=5)	1(20%)	3(60)	1(20)
WG(n=3)	0	3(100)	0
PM(n=4)	0	1(25)	3(75)
Takay(n=1)	0	1(100)	0
Amiod(n=2)	0	2(100)	0
Others(n=8)	4(50%)	4(50)	0
CVD(n=(67)	18(26.9%)	30(44.8)	19(28.4)

Table (4): Classification of patients according to absence or presence of honeycomb on Spiral CT lower zones (54 patients)

	Normal	Without H/C	With H/C
PSS(n=26)	4(15.5%)	12(46.1%)	10(38.5%)
RA(n=5)	0	5(100%)	0
MCTD(n=2)	0	1(50%)	1(50%)
IPF(n=(9)	0	2(22.2%)	7(77.8%)
SLE(n=1)	0	1(100%)	0
PM/DM(n=4)	0	1(25%)	3(75%)
Takayasu(n=1)	0	1(100%)	0
Amiod(n=2)	0	0	2(100%)
Others(n=4)	2(50%)	2(50%)	0
CVD(n=39)	4(10.3%)	21(53.8%)	14(35.9%)

Table (5): Classification of patients according to absence or presence of honeycomb on chest x-ray (72 patients)

	Normal	Without H/C	With H/C
PSS(n=18)	2(11.1%)	11(61.1%)	5(27.8%)
RA(n=18)	8(44.4%)	9(50%)	1(5.6%)
IPF(n=13)	0	6(46.1%)	7(53.8%)
SLE(n=5)	3(60%)	2(40%)	0
WG(n=3)	0	3(100%)	0
PM(n=4)	0	2(50%)	2(50%)
Takaysu(n=1)	0	1(100%)	0
Amiod (n=2)	1(50%)	1(50%)	0
Others(n=8)	2(25%)	6(75%)	0
CVD=(49)	13(26.5%)	28(57.1%)	8(16.3%)

In these tables (3,4&5), we classify patients into 3 groups: (1) Normal in which there was no signs of ILD seen on CT or chest radiographs, (2) Without honeycomb (without H/C) in which there was signs of interstitial lung disease such as ground-glass opacities, linear opacities but there was no honeycombing, (3) Patients with honeycombing (with H/C), in which chest radiographs or CT (whether spiral or HRCT) showed honeycombing in addition to other signs of interstitial lung disease.

On HRCT study, there was 91 patients, 22 (24.2%) patients had normal HRCT study, 39(42.9%) patients without honeycombing, and 30(33%) patients with honeycombing. There were 12/32 patients with scleroderma had honeycombing and 11/14 patients with idiopathic pulmonary fibrosis had honeycombing. While 10/19(52.6%) with rheumatoid arthritis were normal.

On Spiral CT, 54 patients underwent spiral high resolution CT, there were 6(11.1) patients had normal study, 25(46.3%) patients with ILD without honeycombing, and 23(42.6%) patients with honeycombing. While 10 patients of scleroderma and 7 patients with IPF had honeycombing.

On chest radiograph, 72 patients had chest x-ray, 16(22.2%) patients had normal chest X-ray, 41(56.9%) patients had abnormal chest x-ray without honeycombing, and 15(20.8) patients had honeycombing. While 8/18 with RA was normal, 5/18 of scleroderma and 7/13 of IPF had honeycombing.

Table (6): Prevalence of chest x-ray signs in CVD and IPF patients

Disease	G/G opacity	Linear opacity	Air space consolidation	Honey comb	Bronchiectasis	↑ PA size	Pleural effusion-thickening	Lymphnodes ↑	↓ Lung volume	CM	Nodules
PSS(18)	11	14	2	5	4	8	7	2	6	1	0
%	61.1	77.8	11.1	25.8	22.2	44.4	38.9	11.1	33.3	5.6	
RA(18)	7	10	3	1	2	1	4	1	2	0	2
%	38.9	55.6	16.7	5.6	11.1	5.6	22.2	5.6	11.1	0	11.1
SLE(5)	1	2	2	0	0	0	2	0	2	1	2
%	20	40	40				40		40	20	40
WG(3)	2	3	0	0	0	1	1	1	1	0	0
%	66.6	100				33.3	33.3	33.3	33.3		
PM(4)	2	4	1	1	1	3	3	1	1	2	0
%	50	100	25	25	25	75	75	25	25	50	
Takay(1)	0	1	0	0	0	0	0	0	0	0	0
Amio(2)	1	1	1	0	0	1	1	0	1	1	0
%	50	50	50			50	50		50	50	
IPF(13)	10	11	2	7	6	7	5	3	6	0	2
%	76.9	84.6	15.4	53.8	46.2	53.8	38.5	23.t	46.2		15.4
CVD(49)	23	34	8	7	7	13	17	5	12	4	4
%	46.9	69.4	16.3	14.3	14.3	26.5	34.7	10.2	24.5	8.2	8.2

CM = cardiomegaly, G/G = ground-glass, PA = pulmonary artery

On chest radiograph also, the prevalence of ground-glass opacities, linear opacities, honeycombing and bronchiectasis was higher among IPF patients than that for CVDs. Air space consolidation, had slight higher incidence in CVD patients than that for IPF. Cardiomegaly also had higher incidence among CVD patients than for IPF. The Collagen vascular disease that had an incidence of pulmonary fibrosis (honeycombing) that followed the incidence of IPF was scleroderma patients. Honeycombing incidence was 53.8% for IPF, 25.8% for PSS, 25% for PM/DM, and 5.6% for RA.

Table (7): prevalence of HRCT signs in patients with different CVD and IPF

Disease	G/G	Linear	H/C	Nodules	A/S	B/sis	Emphysema	Malign	LNs	PA	Pleural	Esophagus	CM+ thick
PSS(32)	23	24	12	18	3	21	1	1	16	11	8	18	6
%	71.9	75	37.5	56.3	9.4	65.6	3.1	3.1	50	34.4	25	56.3	18.3
RA(19)	7	8	1	8	2	4	1	1	3	4	3	1	1
%	36.8	42.1	5.3	42.1	10.5	21	5.3	5.3	15.8	21	15.8	5.3	5.3
Mix(3)	2	3	2	1	0	2	0	0	3	2	1	2	2
%	66.6	100	66.6	33.3		66.6			100	66.6	33.3	66.6	66.6
SLE(5)	4	4	1	3	1	1	0	0	2	1	2	1	1
%	80	80	20	60	20	20			40	20	40	20	20
WG(3)	2	3	0	0	0	0	0	0	1	1	1	0	0
%	66.6	100							33.3	33.3	33.3		
PM/DM(4)	4	4	3	3	0	3	0	0	4	0	3	0	2
%	100	100	75	75		75			100		75		50
Takay(1)	1	1	0	0	0	1	1	0	1	0	0	0	0
Amio(2)	2	2	0	2	0	0	0	0	2	1	2	1	0
%	100	100		100					100	50	100	50	
IPF(14)	13	13	11	9	0	12	0	0	8	7	8	5	1
%	92.9	92.9	78.6	64.3		85.6			57.1	50	57.1	35.7	7.1
CVD(67)	43	47	19	33	6	32	3	2	30	19	18	22	12
%	64.2	70.1	28.8	50.0	9.1	47.8	4.5	3.0	44.8	28.8	27.3	33.3	18.2

(GG = ground glass opacity, H/C= honeycomb, A/S= air-space consolidation, B/sis= bronchiectasis, Nod= nodules, LN = lymph nodes, PA =pulmonary artery, CM = Cardiomegaly).

On HRCT, all the HRCT signs used for assessment of ILD and pulmonary fibrosis had a higher incidence in patients with IPF than in patients with a collagen vascular disease. The diseases that followed IPF in incidence of pulmonary fibrosis (e.g. honey combing) was in descending order: IPF (78.6%), PM/DM (75%), MCTD (66.6%), PSS (37.5%), SLE (20%), then RA (5.3%).

CVD patients compared to IPF patients had a higher incidence of air-space consolidation (9.1% compared to 0%), pericardial thickening &/ or effusion (18.2%

compared to 7.1%), lung cancer (3% compared to 0%), and emphysema (4.5% compared to 0%).

Table (8): Nature and distribution of pulmonary abnormalities in CVD patients on HRCT-UML

	Ground glass			Linear opacity			Honeycomb			Nodules			Bronchiectasis		
	U	M	L	U	M	L	U	M	L	U	M	L	U	M	
PSS(32) %	12 37.5	17 53.1	23 71.9	13 40.6	20 62.5	24 75	1 3.1	5 15.6	12 37.5	9 28.1	8 25	15 46.8	4 12.5	10 31.2	
RA(19) %	4 21.0	4 21.0	7 36.8	2 10.5	2 10.5	8 42.1	1 5.2	1 5.2	1 5.2	5 26.3	5 26.3	7 36.8	2 10.5	2 10.5	
Mixed(3) %	1 33.3	1 33.3	2 66.6	1 33.3	2 66.6	3 100	2 66.6	1 33.3	1 33.3	1 33.3	0 0	1 33.3	0 0	0 0	
PM(4) %	3 75	3 75	4 100	3 75	3 75	4 100	0 0	1 25	3 75	1 25	2 50	3 75	1 25	1 25	
SLE(5) %	1 20	2 40	4 80	2 40	3 60	4 80	1 20	1 20	1 20	2 40	1 20	4 80	0 0	0 0	
W.G(3) %	1 33.3	1 33.3	2 66.6	0 0	1 33.3	3 100	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	
Takay(1)	1	1	1	1	1	1	0	0	0	0	0	0	1	0	
Amiodrone(2) %	2 100	2 100	2 100	0 0	1 50	2 100	0 0	0 0	0 0	0 0	1 50	1 50	0 0	0 0	
CVD=67 %	23 34.3	29 43.3	43 64.2	22 32.8	32 47.8	47 70.1	5 7.5	9 13.4	18 26.9	18 26.9	16 23.9	30 44.8	8 11.9	13 19.4	
IPF(14) %	9 64.3	11 78.6	13 92.8	13 92.8	13 92.8	13 92.8	9 64.3	10 71.4	11 78.6	1 7.1	4 28.6	9 64.3	6 42.9	9 64.3	

(U =upper, M= middle, L= lower, the lower value in the same row is % value).

In IPF, the prevalence of all radiological signs in the three lung zones were higher than that for CVDs except for the pulmonary nodules which had higher prevalence in upper lung zones in CVDs (26.9%) compared to 7.1% in IPF. The incidence of honeycombing in the 3 lung zones was much higher in IPF than that for CVDs. Also the incidence of other signs in upper and middle lung zones was much higher in IPF than that for CVDs. This means that the prevalence ILD and pulmonary fibrosis is much common in upper and middle lung zones in IPF.

Table (9): Prevalence of CT signs on Spiral HRCT of the lower part of middle lung zones

DIS	G/G	Linear	H/C	Nod	A/S	B/sis	Emphy	Malign
PSS(28)	23(82.1)	21(75)	11(39.3)	12(42.9)	2(7.1)	15(53.6)	0	0
RA(5)	4(80)	5(100)	0	1(20)	0	1(20)	1(20)	0
PM(4)	4(100)	4(100)	3(75)	1(25)	0	3(75)	0	0
SLE(1)	1(100)	1	0	1	0	1	0	0
Taka(1)	1(100)	1	0	1	0	1	0	0
Amio(2)	2(100)	2(100)	2(100)	2(100)	0	1(50)	0	0
Other(3)	0	1(33.3)	0	0	0	0	1(33.3)	0
CVD(39)	33(84.6)	32(82.1)	14(35.9)	16(41.0)	2(5.1)	21(53.8)	1(2.6)	0
IPF(9)	8(88.9)	8(88.9)	7(77.8)	7(77.8)	0	7(77.8)	0	0

(The value in parenthesis is a % value)

On Spiral HRCT, 9 patients with IPF underwent the same spiral thin sections that 39 patients with CVD go. All CT signs had a higher incidence among patients with IPF than patients with CVD except for air-space consolidation and emphysema which had a higher incidence in CVD patients than that for IPF patients. The incidence of ground glass and linear opacities were very close in CVD and IPF patients.

Table (10): Comparison of prevalence of radiological signs in CVD patients using different imaging techniques

Technique	G/G	Linear	Honeycomb	Nodules	Bronchiectasis
Chest x-ray(48)	23(47.9)	33(68.8)	7(14.6)	4(8.3)	7(14.6)
HRCT(66)	42(63.6)	46(69.7)	19(28.8)	33(50)	31(47)
HRCT-L(66)	43(65.2)	46(69.7)	18(27.3)	30(45.5)	21(31.8)
HRCT-M(66)	29(43.9)	31(47.0)	9(13.6)	16(24.2)	13(19.7)
Spiral(39)	33(84.6)	32(82.1)	14(35.9)	16(41.0)	21(53.8)

(The value in parenthesis is a % value)

Table (11): Comparison of Prevalence of radiological signs in IPF patients using different imaging techniques

Technique	G/G	Linear	Honeycomb	Nodules	Bronchiectsis
Chest x-ray (13)	10(76.9)	11(84.6)	7(53.8)	2(15.4)	6(46.2)
HRCT (14)	13(92.9)	13(92.9)	11(78.6)	9(64.3)	12(85.6)
HRCT-L (14)	13(92.9)	13(92.9)	11(78.6)	9(64.3)	12(85.7)
HRCT-M (14)	11(78.6)	13(92.9)	10(71.4)	4(28.6)	9(64.3)
Spiral (9)	8(88.9)	8(88.9)	7(77.8)	7(77.8)	7(77.8)

(The value in parenthesis is a % value)

The highest incidence of ground glass opacity was seen on spiral CT more than HRCT and Chest radiographs. Also, the highest incidence of linear opacities was seen on spiral HRCT. The same thing is applied for honeycombing and bronchiectasis. But pulmonary nodules were having a higher incidence on HRCT for the whole lungs simply because the score include the whole lung in HRCT not a small section of the middle zones as in spiral HRCT. So, it is clear that spiral HRCT is an excellent technique for detection of lung abnormalities in CVD.

Table (12): Mean score of Chest x-ray signs in different CVD and IPF patients (% value)

	Linear	G/G	H/C	A/S	B/sis	PA	Pleura	LN	↓Lung volume
PSS(18)	15	14	5	6	15	7	6	2	6
RA(18)	8	4	2	6	5	1	4	1	2
SLE(5)	8	3	0	2	0	0	7	0	7
WG(3)	11	11	0	0	0	6	6	6	6
PM(4)	19	8	3	13	8	13	13	4	4
Amio(2)	17	3	0	8	0	8	8	0	8
IPF(13)	24	17	9	17	22	9	6	1	8

Table (13): Mean score of HRCT signs found in CVD and IPF (%value)

	GG	Linear	H/C	Nodul	A/S	B/sis	Emp	Malig	LN	PA	Pleura	eso
PSS(32)	27	20	6	28	2	36	2	1	44	34	25	56
RA(19)	8	7	2	26	4	12	5	1	16	21	16	5
MCTD(3)	27	27	17	17	0	11	0	0	100	67	33	67
SLE(5)	19	20	7	17	13	0	0	0	40	20	40	20
WG(3)	27	8	0	0	0	0	0	0	33	33	33	0
PM/DM(4)	30	28	8	33	0	38	0	0	100	0	75	0
Other(8)	9	5	0	19	0	31	6	0	38	25	13	0
Amiod-(2)	58	30	0	17	0	0	0	0	100	50	100	50
IPF(14)	36	41	24	33	0	63	0	0	53	47	53	33

The mean score for ground glass opacities in different CVD and IPF was in descending order: 58% for amiodarone toxicity, 36% for IPF, 30% for PM/DM, 27% for (PSS, MCTD, & WG), 19% for SLE, and 8% for RA. The mean score for honeycombing was: 24% for IPF, 17% for MCTD, 8% for PM/DM, 7% for SLE, 6% for PSS and 2% for RA.

Table (14): Mean score of HRCT signs on HRCT –UML (% value)

	GG			Linear			H/C			Nod			B/sis		
	U	M	L	U	M	L	U	M	L	U	M	L	U	M	L
PSS(32)	13	26	41	8	20	35	0	5	14	20	22	42	13	31	64
RA(19)	6	7	12	3	5	14	1	2	3	21	18	34	11	8	18
SLE(5)	4	12	40	12	16	32	8	4	8	40	20	50	0	0	0
WG(3)	13	20	47	0	3	20	0	0	0	0	0	0	0	0	0
PM/DM(4)	15	30	45	15	20	50	0	3	25	13	38	50	13	25	75
IPF(14)	24	35	50	28	41	56	15	23	31	7	25	64	39	57	86

U= upper, M= middle, L= lower

As we can see here, the mean score of CT signs in all diseases including IPF had a higher mean score in lower lung zones more than the score for the middle zones and that for the middle zones was higher than that for upper lung zones except for bronchiectasis score in RA was higher in the upper lung zones (11%) than that for

middle lung zones (8%). It means that bronchiectasis in RA can occur alone not secondary to lung fibrosis. Also, the mean score of pulmonary nodules was higher in upper zones more than the middle zones in RA and SLE patients.

Table (15): Mean score of HRCT signs seen by spiral HRCT (% value)

	GG	Linear	H/C	Nodul	A/S	B/sis	Emphysema	Malignancy
PSS(28)	38	29	7	30	7	48	0	0
RA(5)	18	24	0	20	0	20	20	0
SLE(1)	60	60	0	50	0	100	0	0
PM/DM(4)	40	45	13	13	0	75	0	0
Others (3)	0	7	0	0	0	0	33	0
Amiod(2)	70	50	10	75	0	50	0	0
IPF(9)	42	51	27	67	0	67	0	0

We will compare mean score of the 4 major groups by spiral CT

Ground glass mean score was: 42% for IPF, 40% for PM/DM, 38% for PSS, and 18% for RA.

Linear opacities mean score was 51% for IPF, 45% for PM/DM, 29% for PSS, and 24% for RA.

Honeycomb mean score was 27% for IPF, 13% for PM/DM, 7% for PSS, and 0% for RA.

Pulmonary nodules mean score was 67% for IPF, 30% for PSS, 20% for RA, and 13% for PM/DM.

Bronchiectasis mean score was 67% for IPF, 75% for PM/DM, 48% for PSS, and 20% for RA.

Table (16): Cephalocaudal distribution of ground-glass opacity on HRCT for different CVD patients (incidence)

Diseases	Right Lung			Left Lung		
	Upper	Middle	Lower	Upper	Middle	Lower
PSS(n=32)	12(37.5)	17(53.1)	23(71.9)	12(37.5)	17(53.1)	23(71.9)
RA(n=19)	4(21.1)	4(21.1)	7(36.8)	4(21.1)	4(21.1)	7(36.8)
MCTD(n=3)	1(33.3)	1(33.3)	2(66.6)	1(33.3)	1(33.3)	2(66.6)
SLE(n=5)	1(20)	1(20)	3(60)	1(20)	1(20)	4(80)
W.G(n=3)	1(33.3)	1(33.3)	2(66.6)	1(33.3)	1(33.3)	2(66.6)
PM/DM(n=4)	3(75)	3(75)	4(100)	3(75)	3(75)	4(100)
Takays(n=1)	1	1	1	1	1	1
Amiod(n=2)	2(100)	2(100)	2(100)	2(100)	2(100)	2(100)
Cvd(N=67)	23(34.3)	28(41.8)	42(62.7)	23(34.3)	28(41.8)	43(64.2)
IPF(n=14)	9(64.3)	11(78.6)	13(92.9)	8(57.1)	11(78.6)	13(92.9)

(The value in parenthesis is a % value)

Table (17): Cephalocaudal distribution of honeycombing on HRCT for CVD and IPF patients (incidence)

Diseases	Right Lung			Left Lung		
	Upper	Middle	Lower	Upper	Middle	Lower
PSS(n=32)	1(3.1)	5(15.6)	12(37.5)	0	5(15.6)	12(37.5)
RA(n=19)	1(5.2)	1(5.2)	1(5.2)	1(5.2)	1(5.2)	1(5.2)
MCTD(n=3)	2(66.6)	1(33.3)	1(33.3)	1(33.3)	1(33.3)	1(33.3)
SLE(n=5)	1(20)	1(20)	1(20)	1(20)	1(20)	1(20)
W.G(n=3)	0	0	0	0	0	0
PM/DM(n=4)	0	1(25)	3(75)	0	0	3(75)
Takay(n=1)	0	0	0	0	0	0
Amiodr(n=2)	0	0	0	0	0	0
CVD(n=67)	5(7.5)	9(13.4)	18(26.9)	3(4.5)	8(11.9)	18(26.9)
IPF(n=14)	9(64.3)	10(71.4)	11(78.6)	8(57.1)	10(71.4)	11(78.6)

(The value in parenthesis is a % value)

Table (18): Cephalocaudal distribution of air space consolidation in each disease on HRCT (incidence)

Diseases	Right Lung			Left Lung		
	Upper	Middle	Lower	Upper	Middle	Lower
PSS(n=32)	0	0	3(9.4)	0	0	2(6.3)
RA(n=19)	0	1(5.3)	1(5.3)	0	1(5.3)	2(10.5)
MCTD(n=3)	0	0	0	0	0	0
SLE(n=5)	1(20)	2(40)	1(20)	1(20)	2(40)	1(20)
W.G(n=3)	0	0	0	0	0	0
PM/DM(n=4)	0	0	0	0	0	0
Takay(n=1)	0	0	0	0	0	0
Amiod(n=2)	0	0	0	0	0	0
CVD(n=67)	1(1.5)	3(4.5)	5(7.5)	1((1.5)	3(4.5)	5(7.5)
IPF(n=14)	0	0	0	0	0	0

As we see here the variable means of CT score of ground-glass opacities (G/G), linear opacities (linear), honeycombing (H/C), pulmonary nodules, and traction bronchiectasis in 48 patients with collagen vascular disease are higher on spiral CT than on HRCT in middle lung zones (HRCT-M) but these values are slightly higher on HRCT taken in lower lung zones (HRCT-L), this is because our spiral section was 3 cm below the carina.

Table (23): Paired T-test for Spiral and HRCT-M Group

Variable	Label	N	Mean	Std Error	T	Prob>[T]
Ground glass opacity		48	-1.1041667	0.2459595	-4.4892211	0.0001
Linear opacities		48	-1.1458333	0.2325269	-4.9277444	0.0001
Honeycomb		48	-0.4791667	0.1427615	-3.3564146	0.0016
Pulmonary nodules		48	-0.2708333	0.1143110	-2.3692673	0.0220
Bronchiectasis		48	-0.3958333	0.1419831	-2.7878902	0.0076

When comparing variable mean of spiral and HRCT-M, it was found $P<0.05$, that means it is statistically significant.

Table (24): Paired T-test for Spiral and HRCT-L Group

Variable	Label	N	Mean	Std Error	T	Prob>[T]
Ground glass opacity		48	0.5833333	0.2415841	2.4146179	0.0197
Linear opacities		48	0.5833333	0.2015748	2.8938807	0.0058
Honeycomb		48	0.3541667	0.2217947	1.5968220	0.1170
Pulmonary nodules		48	0.1041667	0.1236257	0.8425970	0.4037
Bronchiectasis		48	0.1666667	0.1407091	1.1844767	0.2422

On the other hand, on comparing spiral means for CT parameters with that of HRCT-L, it was found in most parameters it is not statistically significant ($p>0.05$).

Table (25): PFTs (Restrictive ventilation and obstructive defects) in CVD and IPF patients

	# of Cases	Restrictive ventilation Defect			Obstructive defect		
		Mild	Moderate	severe	Mild	Moderate	Severe
PSS	27	10 37.04%	10 37.04%	1 3.70%	6 22.22%	1 3.70%	0 0.00%
RA	9	3 33.33%	1 11.11%	0 0.00%	3 33.33%	1 11.11%	1 11.11%
SLE	2	1 50.00%	0 0.00%	1 50.00%	0 0.00%	0 0.00%	0 0.00%
MCTD	2	0 0.00%	0 0.00%	1 50.00%	0 0.00%	0 0.00%	0 0.00%
PM/DM	3	0 0.00%	1 33.33%	1 33.33%	0 0.00%	0 0.00%	0 0.00%
WG	1	0	1	0	1	0	0
amio	2	0	1	1	0	0	0
IPF	9	2 22.22%	5 55.56%	3 33.33%	0 0.00%	0 0.00%	0 0.00%
CVD	44	31.82%	29.55%	9.09%	22.73%	4.55%	2.27%

Table (26): PFTs (Diffusion impairment and % DLCO) in CVD and IPF patients

	# of Cases	Diffusion Impairment			%DLCO
		Mild	Moderate	severe	
PSS	27	9 33.3%	6 22.2%	14 51.8%	1171 43.3%
RA	9	1 11.1%	2 22.2%	2 22.2%	553 61.4%
SLE	2	0 0%	0 0%	1 50%	83 41.5%
MCTD	2	0 0%	0 0%	2 100%	53 26.5%
PM/DM	3	0 0%	1 33.3%	2 66.7%	119 39.6%
WG	1	0	1	0	50%
amio	2	0	1	1	75%
IPF	9	1 0.1%	3 33.3%	7 77.8%	365 40.56%
CVD	44	22.73%	22.73%	47.73%	46.11%

Table (27): Total number and percentage of patients regarding PFTs

Disease	Restrictive impairment	Obstructive defect	Diffusion impairment
PSS(27)	21(77.7%)	7(25.9%)	26(96.3%)
RA(9)	4(44.4%)	4(44.4%)	4(44.4%)
SLE(2)	2(100%)	0	2(100%)
PM/DM(3)	3(100%)	0	3(100%)
MCTD(2)	2(100%)	0	2(100%)
IPF(9)	9(100%)	0	9(100%)
Amiodarone(2)	2(100%)	0	2(100%)

Table (28): %DLCO in group 1 HRCT (no signs of ILD)

#	Diagnosis	%DLCO
22	PSS	41%
52	PSS	66%
93	PSS	51%
94	PSS	63%
68	RA	92%
83	Occ. Exposure	90%
64	Asthma	125%

In this group, 7 patients underwent pulmonary function tests with the mean DLCO was 75.4%. HRCT scans of these patients were interpreted free from signs of interstitial lung disease.

Table (29): % DLCO in group 2 HRCT patients.

#	Diagnosis	%DLCO
30	PSS	45%
35	PSS	63%
41	PSS	29%
54	PSS	41%
58	PSS	30%
67	PSS	54%
70	PSS	40%
73	PSS	44%
81	PSS	41%
89	PSS	35%
91	PSS	57%
92	PSS	42%
13	RA	44%
14	RA	43%
15	RA	44%
37	RA	43%
42	RA	56%
53	RA	26%
60	RA	46%
12	SLE	43%
85	SLE	18%
71	MCTD	38%
29	DM	39%
24	W G	44%
69	Amiodarone	43%
86	Amiodarone	25%
59	IPF	54%
65	IPF	37%
76	Ground glass	57%
66	Bronchiectasis	44%
63	Emphysema	39%
44	Sarcoid	83%
38	Heat faliure	55%

Group 2 patients whose HRCT scans were abnormal and contain HRCT signs of ILD but without honeycomb, 33 patients underwent PFTs with the mean DLCO = 43.7%

Table (30): % DLCO in group 3 HRCT patients.

#	Diagnosis	%DLCO
32	PSS	5%
34	Crest	62%
47	Crest	41%
72	PSS	67%
74	PSS	27%
77	PSS	39%
78	PSS	57%
80	PSS	30%
87	PSS	33%
88	PSS	30%
90	Crest	23%
20	RA	33%
31	MCT	15%
28	PM	22%
62	DM	58%
36	IPF	44%
39	IPF	35%
43	IPF	62%
46	IPF	23%
48	IPF	36%
50	IPF	21%
55	IPF	36%

In Group 3 patients in which HRCT scans were abnormal with honeycomb change, 22 underwent PFTs with the mean DLCO was 36.3%

62 patients underwent pulmonary function tests in the 3 groups.

PFTs also suggest airway obstruction, small airway obstruction as in smoking, or the defect due to obesity, or there is occult asthma or if there is respiratory muscle weakness.

Table (31): BAL Findings in patients with Group 2 HRCT (without honeycomb)

			Cytological exam (cell count				Smear Characteristics					Diagnosis
#	Diag	BAL	Mac	Lym	Neutr	Esiop	Hisit	Squa	Colu	Lym	RBCs	Diagnosis
22	PSS	RML		7	5	2	+	Few	+		Few	Inflammation,acute,mild
30	PSS	RML		20	4	3	+	Few	+		+	Inflammation ,acute
35	PSS	LLL	67	28	3	1.2	+	Few	+	+		Lymphocytosis- reactive changes
		Ling	79	17	2.5	0	+	+	+	+		Inflamm.chronic.mixed
41	PSS	RML		14	3		+					Inflammation.acute
		Ling		13	3		+	+	+++			-ve for malignant cells
67	PSS	RLL	71.2	3.75			+		+	+		Lymphocytosis
		BAL	77.5	1.2		2	+				+	-ve for malignant cells
70	PSS	LLL	59.2	13.2	12.75	14.75	+		+			Inflamm.chronic.mixed
		Ling	64.5	6.75	10.75	18						Inlamm.chronic,mixed
73	PSS	RML	95	4	1	-			+		+	-ve for malignant cells
		BAL	90	8	2	-	+		+			-ve for malignant cells
92	PSS	LLL	81	18	1	0	+		+	+		Histio-lymph-colm.cells
		Ling	61	37	2	0	+		+	+		Lymphocytes & monocytes
93	PSS	BAL	87	13	0	0	+		+	+		Colmn,Histio,lymphocytes
		RML	87	12	0	1	+		+	+		Colmn,Histio,lymphocytes
21	WG	BAL					+		+		+	Histiocyte-multinucleated
57	Taka	Ling					+		+			Scant cellularity
44	Sarc	RML	44	5	51	0	+		+	+		Inflammation,acute
25	IPF	RML					+	+				Bronchial epithelium- reactive
65	IPF	RLL					+	+	+	+		Many lymphocytes, eosinophil

(Mac = macrophages, Lym = lymphocytes, neutr =neutrophils, Hisit =histiocytes, squa = squamous cells, col= columnar cells)

BAL examination was done in 24 cases:

16 scleroderma, 1 Wegener's, 1 SLE, 1 Takayasu's, 1 PM, (20 CVD), 3 IPF, 1Sarcoidosis.

In group 2 HRCT, 14 cases (with a total of 21 lung Segments) underwent BAL examinations. As shown above, acute inflammation (alveolitis) was seen in Group 2 HRCT patients. Of note in our patients, we found that no patient with normal HRCT chest (Group 1) underwent BAL examination in our study, so subclinical alveolitis is not demonstrated in our study because most of our patients are either symptomatic or the patient who had normal HRCT study does not have BAL examination.

Table (32): BAL Findings in patients with Group 3 HRCT (with H/C)

			Cytological exam (cell count				Smear Characteristics					Diagnosis
#	Diag	BAL	Mac	Lym	Neutr	Esion	Hisi	Squ	Col	Lym	RBCs	Diagnosis
32	PSS	LLL		20	3		+	+++	+		+	Inflamm,chronic
47	Cres	RML	74	25	1	0	+		+	+		+ monocytes
72	PSS	RML	79	11	10	-	+		+	+few		-ve for malignant cells
		RUL	87	8	5	-	+		+			-ve for malignant cells
74	PSS	RLL	54.5	40.2	2.5	2.7	+		+			Degenerated cells,
		RML	51	25	0.5	19	+		+			Inflamm,chronic,mixed
80	PSS	RLL	65	17	16	2	+			+		Degenerat cells, histiocy
		Ling	87	10	2	1	+		+	+		Histiocytes, multinuclea
88	PSS	RLL	70.7	6.7	8	14.6	+				+	Blood & degenerated ce
		LLL	77.5	8.5	4	10	+					Histiocytes present
90	Cres	RML	53	32	15	0	+		+	+		Inflamm-acute, reactive
84	SLE	RLL	86	7	6	1	+	+	+			Colmn,squam,histiocyte
		RLL	29	3	67	1	+	+	+			+neutrophil, no active alveoli
28	PM	RLL					+			+		Lymphocytosis
		LLL					+		+			+Goblet cells
59	IPF	LLL	75	4.5	17.5	3	+					Histocytes present
		RLL	67.2	7.5	23.7	1.5	+					Histiocytes present

10 patients of this group (17 lung segments) underwent BAL examinations, as we see from the table, also alveolitis can be seen even in the presence of honeycomb change. And this alveolitis does not mean that the condition is reversible but it means that there are different stages of disease activity and non-activity in the same lung segment.

The presence of > 3% Neutrophil & / or >2% eosinophils in BAL fluid is indicative of active alveolitis. There are 14 cases consistent with these criteria in our study.

BAL can rule out infection, malignancy or hemorrhage.

<u>In Scleroderma patients:</u>

9 patients from group II with 16 BAL examinations, alveolitis was demonstrated in 4 examinations (25%).

7 patients from group III with total 11 BAL examinations, alveolitis was demonstrated in 8 examinations (72.7%). This means that alveolitis was higher among group III (with honeycombing on HRCT).

The total percentage of alveolitis in 27 (16+11) BAL examinations in scleroderma was 12/27= 44.4%.