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THE CORRELATION OF DLCO WITH OTHER PHYSIOLOGICAL PARAMETERS IN PATIENTS WITH INTERSTITIAL LUNG DISEASE

Pulmonary Medicine

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ABSTRACT

Abnormal gas exchange is an important hallmark of various forms of ILD. And Diffusion capacity is an important index of gas exchange and physiological severity in these disorders. Our study aims to find out the correlation between diffusing capacity and six minute walk test parameters and alveolar arterial gradient in patients with interstitial lung disease. A total of 50 willing and stable patients clinicoradiologically suggestive of ILD were selected. All patients underwent complete clinical workup including DLCO ,six minute walk test and ABG . The Mean DLCO (%) was 59.76 ± 19.36. Mean 6MWD (m), Mean End test SPO_2(%),Mean BORG scale at the end of test and Mean PA– aO_2were,271.98 ± 95.29, 88.8 ± 4.12, 2.54 ± 0.61and 34.9 ± 9.11 respectively. We observed a significant strong positive correlation between DLCO and end test saturation and PaO2. Significant moderate positive correlation between DLCO and walk distance and FVC. Significant moderate negative and weak negative correlation between DLCO and alveolar arterial gradient and borg scale respectively. Correlation with FEV1 was not significant. Where DLCO facilities not easily available, one can rely on initial and serial measurement of six minute walk test parameters, alveolar arterial gradient.

KEYWORDS

ILD (Interstitial Lung Disease), DLCO (Diffusing Capacity),

INTRODUCTION:

Interstitial lung disease (ILD) or diffuse parenchymal lung disease (DPLD,[1]), is a group of lung diseases affecting the interstitium (the tissue and space around the air sacs of the lungs)[2]concerning alveolar epithelium, pulmonary capillary endothelium, basement membrane, and perilymphatic tissue. Abnormal gas exchange is an important hallmark of various forms of ILD. Diffusion capacity is an important index of gas exchange and physiological severity in these disorders. Other physiological parameters which could be considered as surrogate markers of gas exchange are –

- Alveolar arterial gradient $P_{(A-a)}O_2$
- Six minute walk test

Although DL_{CO} is an important and reliable indicator of gas exchange and severity in ILD, it has certain limitations.

- It is not easily availability and require infrastructure.
- Investigation is costly.
- It routinely measured diffusion capacity at rest only.

It is known fact that patient with ILD has further worsening in gas exchange on exercise and this exercise related abnormal gas exchange cannot be measured routinely on diffusion study. On the other hand six minute walk test and Alveolar arterial gradient also reflect abnormal gas exchange. Therefore if we can find some correlation between DL_{CO} and six minute walk test and /or A-a gradient, same can be considered as a substitute for DL_{CO} at least during Follow up of patients.

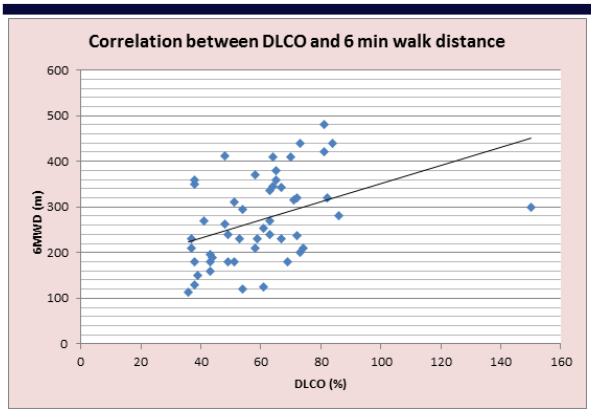
MATERIALS & METHODS:

The present study was conducted from August 2016 to September 2017 in Kamla Nehru Chest Hospital, Dr S N Medical College, Jodhpur, a tertiary care centre for respiratory diseases in western part of Rajasthan. This study was a prospective cross sectional study of pulmonary function parameters in 50 patients with ILD. Patients of all ages either admitted or attending the Outpatient Clinic of the Department of Tuberculosis & Respiratory Diseases of our Hospital, who were clinicoradiologically suggestive of ILD and willing to participate in the study were enrolled after proper counselling. 75 patients were screened and 25 patients were excluded because some were also suffering from other cardiac and respiratory ailments, lower resting spo2 and few were unable to perform the tests. Our aim was to find out correlation between DLCO and six minute walk test parameters and alveolar arterial gradient. Qualitative data was expressed as number and percentage. Quantitative data was expressed as mean and standard deviation. Qualitative data was analyzed using Chi square test. Correlation between two quantitative data was analyzed using Pearson correlation coefficient. Difference in mean was inferred to using unpaired t test for two group Comparison . A p value less than 0.05 was taken as statistically significant. Data was analysed using Epi-info7.2.1.0 software.

Results:

The mean FEV1, FVC, FEV1 / FVC of the patients were 64.84±11.95, 63.7±12.33, 75.8±8.53 respectively. Mean DLCO (%) was 59.76 ± 19.36. Most patients had moderate grade of restriction (62%) followed by mild restriction (24%). Most of the patients (34) had mild hypoxemia and with Alveolar arterial Gradient between 15-35 mm Hg pressure.Out of 50 patients, 19 had mild diffusion defect (38%) followed by moderate diffusion defect in 17 patients (34%). Most patients walked between 200-299 meters.Patients with higher DLCO had walked more distance compared to those with lower values of DLCO. Statistical analysis showed r value of 0.404 suggestive of moderate positive correlation, which was statistically significant. The mean end test saturation of the patients in the study was 88.8 ± 4.12. A significant strong positive correlation (r = 0.615) was observed between DLCO (%predicted) and End test Spo2. It was observed that as DLCO (%predicted) decreases, the end test saturation also falls. The mean alveolar arterial gradient in study patients was 34.9 ± 9.11. With decrease in DLCO (%predicted), alveolar arterial gradient showed an increase trend. This observation of correlation coefficient (r) shows a value of - 0.480 signify a moderate negative correlation between DLCO (%predicted) and alveolar arterial gradient, which was statistically significant. The mean Borg scale score at the end of test in study patients was 2.54 ± 0.61.With decrease in DLCO (%predicted), Borg scale score at the end of test showed an increase trend. This observation of correlation coefficient (r) shows a value of - 0.283 signify a weak negative correlation between DLCO (%predicted) and Borg scale score.

Mean DLCO (%)	59.76 ± 19.36
Mean 6MWD (m)	271.98 ± 95.29
Pearson correlation coefficient (r)	0.404
P value	0.004 (S)



Mean DLCO (%)	59.76 ± 19.36
Mean End test SPO_2 (%)	88.8 ± 4.12
Pearson correlation coefficient (r)	0.615
P value	<0.001 (S)

Mean DLCO (%)	59.76 ± 19.36
Mean PA– aO_2	34.9 ± 9.11
Pearson correlation coefficient (r)	- 0.480
P value	<0.001 (S)

Mean DLCO (%)	59.76 ± 19.36
Mean BORG scale	2.54 ± 0.61
Spearman correlation coefficient (r)	- 0.283
P value	<0.046 (S)

Discussion:

Patients with higher DLCO had walked more distance compared to those with lower values of DLCO. Mogulkoc et al [3] in their study also observed a significant positive correlation between six minute walk distance and DLCO and our study also favours this.David et al [4]showed that inspite of many confounders like cardiac, vascular, metabolic, musculoskeletal in six minute walk test, this test has been great value in assessing the progression and even in predicting the mortality in patients with ILD/DPLD. Authors also observed that six minute walk test is comparable with DLCO in predicting mortality in patients with IPF. It was observed that as DLCO (%predicted) decreases, the end test saturation also falls. With decrease in DLCO (%predicted), alveolar arterial gradient showed an increase trend. Clifford et al [5] also observed similar correlation in their study. However they also studied end exercise alveolar arterial gradient which was more sensitive measure of disease severity. In normal healthy patients, a slight degree of ventilation perfusion mismatch in lung parenchyma results in alveolar arterial oxygen gradient of 10 to 15 mm Hg.[6,7]. The alveolar arterial oxygen gradient increase with advancement of age. Non uniform involvements of lung parenchyma in patients with ILD and to lesser extent increase in thickness of alveolar capillary membrane are two important reasons for increased alveolar arterial oxygen gradient .[8,9] In present study we also observed that almost all patients showed increased alveolar arterial oxygen gradient . With decrease in DLCO (%predicted), Borg scale score at the end of test showed an increase trend. T.S. HALLSTRAND et al.[10] showed that, there were strong correlations between DLCO, resting arterial oxygen tension (Pa,O2) and PA–a O2 difference, and end exercise saturation, walk-distance and walk-velocity parameters of the TWT in IPF patients. There were no correlations between the parameters of the TWT and the FVC, FEV1, total lung capacity and arterial carbon dioxide tension.

Conclusion:

A significant strong positive correlation between DLCO and end test saturation and PaO2. Significant moderate positive correlation between DLCO and walk distance and FVC. Significant moderate negative and weak negative correlation between DLCO and alveolar arterial gradient and borg scale respectively. Correlation with FEV1 was not significant. None of the physiological parameters showed perfect (+1 or -1) correlation with DLCO. Still, in view of significant correlation of above parameters, can be used as a surrogate markers of DLCO wherever DLCO not feasible. Hence, in resource starved countries where DLCO facilities not easily available, one can rely on initial and serial measurement of these parameters to access the progress of ILD/DPLD. Parameter like FEV1 did not showed significant correlation, hence it is not recommended.

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