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The DSC index: A new prognostic tool for evaluating functional status in interstitial lung disease

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Abstract. *Background and aim:* The usefulness of the 6-Minute Walk Test (6MWT) in Interstitial Lung Disease (ILD) has been proven. This test assesses the 6-Minute Walk Distance (6MWD), Oxygen Saturation (SpO_2) and Chronotropic Response (CR). We aimed to develop an index, the Distance-Saturation-Chronotropic Response (DSC) index and to analyze its relevance in the evaluation of functional capacity and prognosis of patients with ILD. *Methods:* A retrospective study including 101 ILD patients was conducted. Data collected were results of Pulmonary Functional Tests (PFTs) and 6MWT. We developed a staging system called DSC index and divided it into 3 items (minimal SpO_2, 6MWD and CR). Points are assigned to each item ranging from 0 to 2. The scores of each item are summed to obtain the DSC score. The maximal score is 6. To evaluate the reliability of the DSC in assessing functional impact, we analyzed correlations of DSC index with PFTs results and Gender-Age-Physiology (GAP) index. In addition, Receiver Operating Characteristic (ROC) curves were plotted for DSC index and its components, taking a GAP stage ≥ 2 as reference. *Results:* The DSC index was correlated with respiratory function and GAP score. This correlation was greater than those of PFTs results and GAP score with each component of the DSC taken independently. The ability of DSC to discriminate patients with a GAP stage ≥ 2 was better than that obtained for each 6MWT parameter. *Conclusions*: The DSC index could be considered a practical tool for global assessment of functional capacity and prognosis in patients with ILD.

Key words: interstitial lung disease, six-minute walk test, pulmonary function tests, prognostic biomarkers, distance-saturation-chronotropic index, exercise capacity

Introduction

Interstitial Lung Disease (ILD) describes a heterogeneous group of chronic lung diseases that involve inflammation, fibrosis or both (1,2). The most common ILDs are Idiopathic Pulmonary Fibrosis (IPF), Hypersensitivity Pneumonitis (HP), Sarcoidosis, ILD as a part of Connective Tissue Disease (CTD-ILD), drug-induced ILD and pneumoconiosis (3). Since the course of this disease can vary considerably from one patient to another, the use of a prognostic prediction tool would be very useful for personalized and optimal management (4). Among these tools, there are currently validated composite indices such as the Gender-Age-Physiology (GAP) index (5). This index, initially designed to predict mortality in patients with IPF, has been extended to other subtypes of ILDs (6,7). In addition to the GAP index, prediction of prognosis in patients with

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ILDs can also be based on the use of the 6-Minute Walk Test (6MWT) which is an established measure of the physical capacity of patients with ILD at the time of diagnosis and follow-up (8–10). However, there is a controversy over the use of the 6-Minute Walk Distance (6MWD), Oxygen Saturation (SpO_2) or Chronotropic Response (CR) for better assessment of prognosis (11–16). Few studies suggested indices including 6MWD and SpO_2 to better assess the severity and the mortality of ILDs (8,9,17). But no previous studies involved the CR in a composite index. We hypothesized that incorporating all three parameters (6MWD-SpO_2-CR) into a single composite variable would allow a more accurate assessment of disease severity. Therefore, we defined a new composite index, the Distance-Saturation-Chronotropic response (DSC) index and we aimed in this study to evaluate the reliability of DSC index as a tool for assessing the prognosis of ILD.

Patients and Methods

Study design and patients' selection

This was a retrospective study of ILD patients presenting to Pulmonary Function Tests (PFTs) department of Abderrahmen Mami Hospital, Tunisia from January 2015 to December 2020. Adult patients (> 18 years of age) with confirmed diagnosis of ILD and stable clinical condition were included if they had performed contemporaneous PFTs with the 6MWT. The exclusion criteria were as follows: comorbid cardiac disease (heart failure, heart rhythm disorders, ischemic heart disease, previous cardiac surgery), other respiratory disease (Chronic Obstructive Pulmonary disease, lung cancer), neuromuscular disease of the lower extremities, peripheral vascular disease or other severe comorbid illness. We also excluded 6MWTs performed on supplemental oxygen and patients who had incomplete data for variables used in the analysis.

Data collection

Tests were conducted either at the time of diagnosis or during the course of the disease. If a patient had performed multiple tests, the first complete evaluation was selected for analysis. Demographic, clinical and functional data including PFTs and 6MWT were recorded.

Pulmonary function tests and 6-minute walk test

Measurements included Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 second (FEV1), Total Lung Capacity (TLC), and Diffusing capacity of the Lungs for Carbon Monoxide (DLCO). All PFTs was performed following the standards outlined by American Thoracic Society (ATS) and European Respiratory Society (ERS) (18,19). Predicted values for lung volumes and DLCO were based on the Global Lung Initiative and ERS statement (20,21) and lung function parameters were expressed as % of predicted values. The 6MWT was conducted in accordance with the recommendations of the ATS (22). Total distance walked during the 6MWT (6MWD), the minimal SpO_2 (SpO_2 min) and the CR were recorded. CR was defined as peak HR minus resting HR (12,23).

GAP model

The GAP model was used as a functional index of prognosis. GAP index scores were determined according to the system described by Ley et al (5). Points were assigned for each of the variables (Sex; Age; FVC and DLCO) with a total of 8 points maximum. If the DLCO measurement maneuver could not be performed correctly by the patient, three points were assigned (this situation was not present in our study). The GAP stage was determined based on the total GAP index score: stage I (0-3 points), stage II (4-5 points), and stage III (6–8 points). The patients were divided into two groups according to the GAP model as low mortality risk (GAP stage I) and high mortality risk (GAP stage II and III).

Distance-Saturation-Chronotropic response (DSC) index

In our study, we wanted to evaluate the prognostic value of the DSC index (6MWD, SpO2 min, CR) based on the hypothesis that this composite index based only on 6MWT variables could be interesting to grade the severity of the disease and to predict its prognosis. We thus designed a staging system with 3 items, each of which was scored from 0 to 2 (Table 1).

The global DSC score calculated by adding the score of each item has a maximum value of 6.

Table 1. Calculation of the DSC index

	Items	Points
6MWD (m)	≥ 500 [350-500] < 350	2 1 0
Minimal SpO_2 (%)	≥ 95 [90-95] < 90	2 1 0
CR (bpm)	≥ 30 [20-30] < 20	2 1 0
DSC Score 6		

Abbreviations: 6MWD: 6-Minute Walk Distance; m: meters; SpO_2: Oxygen Saturation; CR: Chronotropic Response; bpm: beats per minute; DSC: Distance-Saturation-Chronotropic response

Statistical analysis

Statistical analyses were performed with SPSS version 25.0 software. Categorical data were expressed using frequencies and percentages, while continuous data were expressed using mean values and standard deviation. The Student's *t*-test was used to examine the differences in 6MWT results between patients with high and low mortality risk. Pearson's correlation coefficient was used to analyze the association of the DSC index with respiratory functional parameters (FEV1, FVC, and DLCO) and the GAP score. Receiver operating characteristic (ROC) curves were generated for the DSC index values and its components (DM6, SpO_2 min, and RC) using GAP index ≥ 4 as a reference. ROC curves were compared based on the area under the curve (AUC). A multivariate logistic regression analysis was conducted to assess the prognostic value of DSC index in predicting a GAP stage ≥ 2 in patients with ILD. The independent variables included the 6MWD, SpO_2 min, CR, DSC, ILD subtype, and BMI. A p value < 0.05 was considered significant.

Results

We identified 130 patients diagnosed with ILD in the specified period. A total of 29 patients were excluded. Thus, the study included 101 patients who met the criteria (Figure 1). Forty-four of them had been diagnosed as having IPF, 34 patients had sarcoidosis, 5 patients had HP and 17 patients had CTD-ILD.

The mean age of study population was 54.24 ± 9.02 years. Female gender was more prevalent

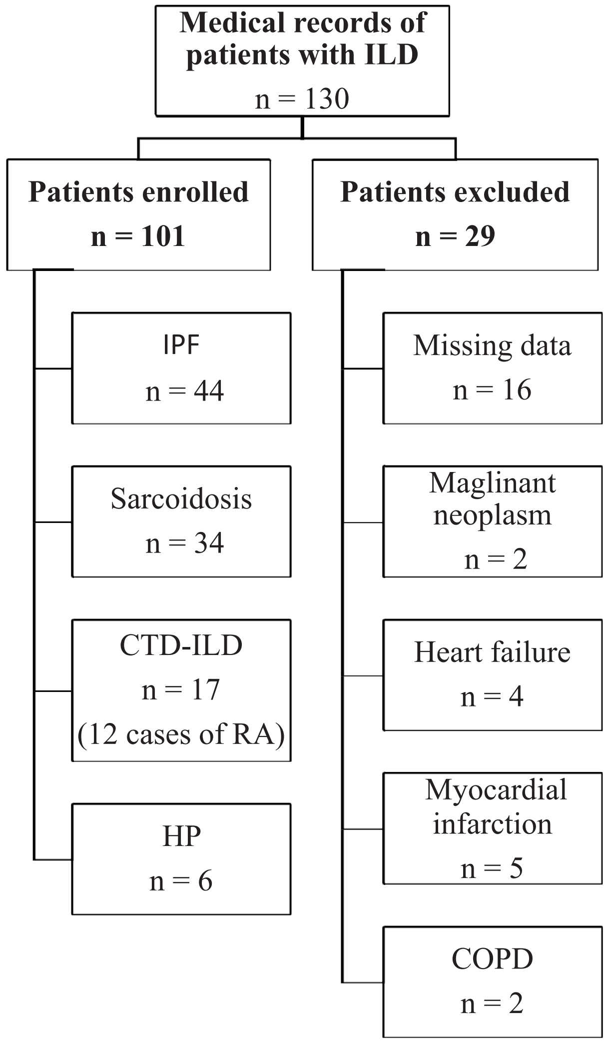

Figure 1. Enrolment of patients. *Abbreviations:* ILD: Interstitial Lung Disease; IPF: Idiopathic Pulmonary Fibrosis; HP: Hypersensitivity Pneumonitis; CTD-ILD: ILD as a part of Connective Tissue Disease; COPD: Chronic Obstructive Pulmonary Disease

than male gender (66.3% versus 33.7%). The demographic, pulmonary function characteristics and parameters of 6MWT of the study population are shown in Table 2.

The mean GAP index was 2 ± 1.68 points (range, 0-7). In total, 82% of patients were at GAP stage I, 14% at GAP stage II, and 4% at GAP stage III. A statistically significant difference was determined between the group with high mortality risk and the one with low mortality risk with respect to 6MWT parameters (6MWD, minimal SpO_2 and CR) and DSC index (p<0.05) (Table 3).

Table 2. Characteristics of the study population

	Total (N=101)	IPF (N=44)	Sarcoidosis (N=34)	CTD-ILD (N=17)	HP (N=6)
Demographic characteristics					
Age (years)	54.44 ± 10,2	56.06 ± 9,74	53.2 ± 9.96	52. 35 ± 9.75	55.5 ± 15.95
Sex (F/M)	1.4	0.6	2.4	4.6	5
Smoking status (%)	44.55	52.27	29.41	52.94	50
Respiratory functional profile					
FEV1 (%)	75.06 ± 18.73	69.67 ± 20,84	82.59 ± 14,.3	69.65 ± 16.45	87.25 ± 13.47
FVC (%)	75.96 ± 17.92	71 ± 21.23	84.24 ± 12.11	69.42 ± 12.84	83.82 ± 12.29
TLC (%)	86.94 ± 18.37	80.53 ± 22,1	94.98 ± 15.79	84.24 ± 20.23	96.08 ± 14.77
DLCO (%)	59.35 ± 20.25	50 ± 19.19	72 ± 17.13	55.41 ± 15.99	67.5 ± 17.03
6MWT and DSC score data					
6MWD (m)	442.83 ± 88.82	414.36 ± 99.95	480.2 ± 64.98	441 ± 88	445 ± 50.54
Minimal SpO_2 (%)	9.68 ± 5.8	90.13 ± 6.9	95.14 ± 2.41	94.29 ± 5.53	92.83 ± 4.49
CR (bpm)	25.8 ± 11,26	21.5 ± 11,29	31.26 ± 9,05	26.29 ± 12.5	25 ± 5.72
DSC index	3.52 ± 1.91	2.56 ± 2	4.64 ± 1.29	3.82 ± 1.7	3.33 ± 1.21

Abbreviations: IPF: Idiopathic Pulmonary Fibrosis; HP: Hypersensitivity Pneumonitis; CTD-ILD: ILD as a part of Connective Tissue Disease; F: Female; M: Male; FEV1: Forced Expiratory Volume in 1 second; FVC: Forced Vital Capacity; TLC: Total Lung Capacity; DLCO: DLCO: Diffusing capacity of the Lungs for Carbon Monoxide; 6MWD: 6-Minute Walk Distance; m: meters; SpO_2: Oxygen Saturation; CR: Chronotropic Response; bpm: beats per minute; DSC: Distance-Saturation-Chronotropic response

Table 3. Comparison of 6MWT results between ILD patients with low and high mortality risk

	Patients with low mortality risk (n=18)	Patients with high mortality risk (n=83)	P
6MWD (m)	464.36 ± 71.08	343.55 ± 96.62	< 0.001
Minimal SpO_2 (%)	93.77 ± 4.79	87.66 ± 7.41	< 0.001
CR (bpm)	28.56 ± 10.34	13.05 ± 4.64	< 0.001
DSC index	4.04 ± 1.62	1.11 ± 1.1	< 0.001

Abbreviations: 6MWT: 6-Minute Walk Test; ILD: Interstitial Lung Disease; 6MWD: 6-Minute Walk Distance; m: meters; SpO_2: Oxygen Saturation; CR: Chronotropic Response; bpm: beats per minute; DSC: Distance-Saturation-Chronotropic response

Table 4. Correlations of the DSC index and 6MWT variables with the respiratory functional parameters and the GAP score

	DSC	6MWD (m)	Minimal SpO_2 (%)	CR (bpm)
DLCO%	**0.68***	0.59*	0.59*	0.54*
FVC%	**0.5***	0.33**	0.4*	0.47*
FEV1%	**0.44***	0.28**	0.41*	0.43*
GAP	**-0.72***	-0.6*	-0.58*	-0.64*

Abbreviations: DSC: Distance-Saturation-Chronotropic response; 6MWT: 6-Minute Walk Test; 6MWD: 6-Minute Walk Distance; m: meters; SpO_2: Oxygen Saturation; CR: Chronotropic Response; bpm: beats per minute; DLCO: Diffusing capacity of the Lungs for Carbon Monoxide; FVC: Forced Vital Capacity; FEV1: Forced Expiratory Volume in 1 second; GAP: Gender-Age-Physiology; *p< 0,001; **p < 0,05

Correlation analysis revealed that DSC was significantly correlated with predicted DLCO (r= 0.68; p<0.001), predicted FVC (r=0.5; p<0.001), predicted FEV1 (r= 0.44; p<0.001) and GAP score (r= -0.72; p<0.001).

When assessing each parameter of the 6MWT individually, the correlations of 6MWD, minimal SpO_2 and CR demonstrated a lower correspondence than DSC index with DLCO, FVC, FEV1 and GAP score (Table 4).

The performance of the DSC index in discriminating patients with a GAP stage ≥ 2 (High mortality risk) was better than that obtained for the individual components of the TM6. Indeed, the AUC for the DSC index was higher than that obtained for the DM6, SpO2, and CR with an AUC of 0.911 (95% CI, 0.854-0.967) (Figure 2 and Table 5).

In the multivariate logistic regression analysis, three variables emerged as significant predictors. The DSC index demonstrated the strongest association

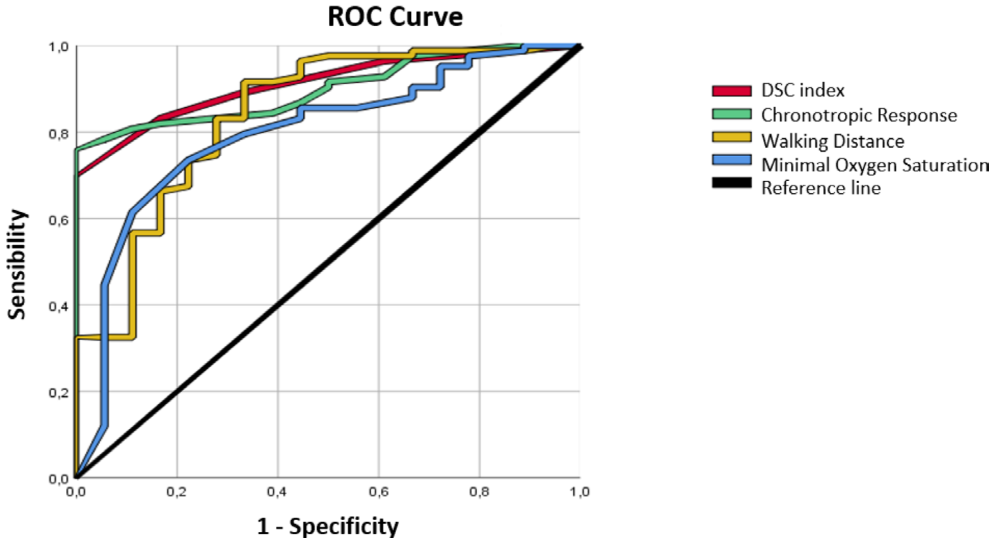

Figure 2. Receiver Operating Characteristic curves of DSC index values and each of its components for a GAP stage ≥ 2

Abbreviations: ROC: Receiver Operating Characteristic; DSC: Distance-Saturation-Chronotropic response

Table 5. AUCs of the ROC curves for the DSC index and 6MWT components for a GAP stage ≥ 2

	AUC	P	CI 95%
DSC	**0,911**	<0,001	0,854-0,967
CR (bpm)	0,9	<0,001	0,733-0,949
6MWD (m)	0,841	<0,001	0,684-0,912
Minimal SpO_2 (%)	0,798	<0,001	0,840-0,959

Abbreviations: 6MWT: 6-Minute Walk Test; DSC: Distance-Saturation-Chronotropic response; GAP: Gender-Age-Physiology; CR: Chronotropic Response; bpm: beats per minute; 6MWD: 6-Minute Walk Distance; m: meters; SpO_2: Oxygen Saturation; AUC: Area Under the Curve; CI: Confidence Interval; ROC: Receiver Operating Characteristic

with a GAP stage ≥ 2, with an odds ratio (OR) of 7.799 (95% CI: 2.689 – 22.622, p < 0.001). This indicates that a one-unit increase in DSC index is associated with a nearly eight-fold increase in the likelihood of a poorer prognosis. SpO2 min was also a significant predictor, with an OR of 1.222 (95% CI: 1.017 – 1.467, p = 0.032), suggesting that lower SpO2 during exercise is associated with worse outcomes. Additionally, BMI was inversely associated with a GAP stage ≥ 2, with an OR of 0.860 (95% CI: 0.764 – 0.968, p = 0.013). Other variables, including the chronotropic response and ILD subtype, were not significant predictors in the final model (p > 0.05).

Discussion

In this study, we tend to analyze the relevance of the DSC index in assessing prognosis in patients with ILD. Our study established significant association of the DSC index with GAP score, supporting the idea that 6MWT with its three main parameters, plays a major role in evaluating patients with ILD. The 6MWT is a reference test since it is easy to use and it is representative of the physical activity level because, like the activities of everyday life, walking is performed at a sub-maximal level of exercise. Moreover, this test is well tolerated and not expensive (24,25). In our study, 101 patients of ILD with different severity levels well performed the 6MWT. It highlights that 6MWT holds potential of being safe and tolerable in patients with different demography and with varied disease status. In addition to 6MWD, we measured during the 6MWT, SpO_2 and CR which are of paramount importance in the evaluation of cardiorespiratory tolerance to exercise. However, the literature does not agree on which parameter provides the best assessment of functional capacity, disease severity and mortality risk in this patient population (14,19,20). In this context, we hypothesized that using these three parameters to create a composite index could help us better assess the prognosis of ILD.

Referring to different studies in the literature, we chose cutoff values of 6MWD, SpO_2 min, and CR applied for severity stratification of patients' functional capacity. One study showed that the cutoff value for 6MWD that defines functional impairment and has a significant impact on mortality risk in IPF patients was 350 m (26). This same threshold value was related to a higher risk of mortality in patients with Eisenmenger syndrome (27) and COPD (28,29). A 6MWD ≥ 500 m has also been shown to be associated with a good prognosis in patients with PH (30). In another study (31), lobectomy candidate patients with a 6MWD ≥ 500 had a lower risk of postoperative complications and prolonged hospital stay. In addition, a decrease in SpO_2 ≥ 4% or SpO_2 < 88% or 90% during exercise is considered clinically significant (13,32,33). Various mortality prediction models have used a cutoff of SpO_2 < 90% (34,35). SpO_2 values ≥ 95 are generally considered normal (36–38). In the study by Holland et al (12), a CR below 20 bpm during 6MWT was predictive of mortality. The CR in those who survived to 4 years was 30 bpm. In our study, the 3 parameters of the DSC index listed above were studied in relation to FVC, FEV1 and DLCO. Significant correlations were demonstrated between components of 6MWT and functional respiratory profile. These results were consistent with data in the literature (39,40). When assessing correlations between the DSC index and functional respiratory profile, we found that the DSC index was correlated with FEV1 (r=0.44), FVC (r=0.5) and DLCO (r=0.68). We also showed that among these parameters, DLCO, which reflects the state of the pulmonary exchanger, was the best correlated with the DSC index. Therefore, this new composite index could help medical specialists to better assess the consequences of these pulmonary interstitial pathologies on gas exchange and which usually worsen during physical exercise (41). The main outcome of this work was the demonstration of the association of the DSC index with disease prognosis assessed by the GAP model. In fact, the best significant correlation was found between DSC index and GAP score (r=- 0.72; p<0.001), the correlation between the GAP score and 6MWD, SpO_2 min and CR being respectively of r=-0.6 (p<0.001), r=-0.58 (p<0.001) and r=-0.64 (p<0.001). In addition, the DSC achieved the greatest AUC as a predictor of GAP stage ≥ 2 better than if each of the three parameters was used independently. This highlights how the DSC may enhance the resolution of the 6MWT and may encourage us to use it more as a prognostic predictive tool in ILD. Furthermore, attention to TM6 parameters should not be limited to DM6 or SpO_2. Several studies showed in patients with ILD that 6MWD, desaturation and CR during the 6MWT are associated with bad outcomes and mortality but without specifying which of these parameters is more reliable in predicting prognosis (11–13,42). Few studies proposed composite indices including parameters of 6MWT to predict mortality or reflect the functional limitations in patients with ILD. Pimenta et al. (9) proposed the desaturation distance ratio (DDR) as a new concept for a functional assessment of ILD. They analyzed 6MWD and desaturation area (DAO2), obtained by taking the difference between maximal SpO2 possible (100%) and patient's SpO_2 every 2 seconds. DDR was calculated using the ratio between DAO2 and 6MWD. A correlation analysis revealed that DDR correlated better with DLCO (r = - 0.72; p,0.001), than SpO_2 min (r = 0.61; p,0.001) and 6MWD (r = 0.58; p,0.05) with DLCO. Arkan et al. (42) also studied the value of the DDR in assessing the severity of lung function impairment in IFT patients. The results of this study showed that DDR correlated better with FVC% and FEV1% than 6MWD. In addition, a significant correlation was found between DDR and DLCO.

Lettieri et al. (8) suggested an index that involves 6MWD and desaturation during 6MWT. Using the product of the lowest SpO_2 identified by the 6MWD in meters (distance − saturation product − DSP), they developed a composite index with higher sensitivity and specificity to determine 12-month survival in IPF patients compared to lung function or isolated parameters of 6MWT. A study conducted by Holland et al. (12) demonstrated that in individuals with ILD, a smaller CR to 6MWT is associated with lower functional exercise capacity and reduced survival at four years. A CR ≤ 20 bpm on 6MWT identified a high-risk patient group with adequate sensitivity and specificity. Yet, despite the importance of this parameter that can be easily assessed at 6MWT, no previous study has included it in a composite index to assess the prognosis of patients with ILD. The results of the multivariate logistic regression analysis demonstrated that the DSC index is a significant predictor of a GAP stage ≥ 2 in patients with ILD. Specifically, the DSC index was found to have an OR of 7.799 (95% CI: 2.689 – 22.622, p < 0.001). This substantial increase highlights the potential of the DSC index to serve as a comprehensive marker by incorporating multiple physiologic parameters into a single measure. Importantly, the DSC index outperformed individual components such as the 6MWD, SpO_2 min and CR, which, though contributory, did not reach the same level of predictive power. This suggests that the integration of these components into the DSC provides added prognostic value, supporting the hypothesis that a composite index may better capture the complexity of ILD's impact on cardiorespiratory function (43–46). The DSC index was more strongly associated with prognosis than SpO_2 min alone, which had an OR of 1.222 ($p = 0.032$). This reinforces the argument that composite measures, which reflect the interaction between 6MWD, SpO_2 min, and CR, may offer a more nuanced assessment of ILD severity (47,48). Additionally, BMI was inversely associated with prognosis, with an OR of 0.860 ($p = 0.013$), suggesting that higher BMI is a protective factor. This counterintuitive finding may be reflective of the "obesity paradox," a phenomenon observed in several chronic diseases (47,48) where higher BMI is associated with improved survival, possibly due to enhanced metabolic reserves or other compensatory mechanisms (49,50). In contrast, individual predictors such as the CR and ILD subtype did not emerge as significant predictors of outcomes in the final regression model, highlighting the need for composite indices that account for multifactorial physiologic impairments. An interesting finding in our study was that the CR, which had shown a relatively high AUC in the ROC analysis, was not a significant predictor in the multivariate logistic regression model for predicting GAP stage ≥ 2. This apparent discrepancy can be explained by several factors. Firstly, ROC analysis evaluates the diagnostic accuracy of a single variable independently (51). In our study, CR demonstrated a strong ability to discriminate between patients with different GAP stages in isolation, reflected by a large AUC. However, logistic regression is a multivariate analysis that assesses the predictive power of a variable in the context of other covariates included in the model (52). In this case, while CR performed well on its own in the ROC analysis, its contribution may have been overshadowed by the DSC index and other predictors. Another reason for the lack of significance in the regression model could be multicollinearity between CR and the other variables (53,54), particularly the DSC index, which incorporates chronotropic response as one of its components. Multicollinearity can reduce the statistical power of individual predictors, making it harder to detect their independent effects in a multivariate context (55). This issue highlights the value of the DSC index, which consolidates multiple parameters into a single prognostic tool, potentially offering a more robust predictive capacity compared to the individual components, including CR.

It is currently difficult to confirm which of these three parameters: 6MWD, SpO_2 min or CR would have a better predictive value for disease prognosis because of inconsistent study results. As a result, several research teams have attempted to create more complex assessment systems using at least two parameters of the 6MWT. These indices have demonstrated better reliability in assessing prognosis in patients with ILD. Our results concluded that as the functional capacity of the patient decreases as assessed by DSC as the prognosis of ILD is poorer. This demonstrated that integrating minimal SpO_2, 6MWD and CR allows global assessment of functional capacity of cardio respiratory system in a very simple and practical way in addition of evaluating the prognosis of ILD. The physiological explanations we propose in the association between decreased DSC index and impaired respiratory function in ILD are reduced lung compliance, abnormal gas exchange in the lung, dyspnea and muscle weakness. Indeed, the reduced lung compliance requiring higher effort to increase ventilation and altered pulmonary gas exchange are responsible for dyspnea in ILD (56,57). In addition, in advanced disease, when respiratory function is impaired, there is loss of fat-free mass, muscle atrophy and deconditioning of muscle mass (4,58,59). Dyspnea and muscle dysfunction would be the key points promoting functional limitation and reduction in exercise tolerance in patients with ILD and thus, leading to a reduction of 6MWD. Impaired CR to 6MWT, according to the study of Holland et al., is associated with reduced 6MWD in ILD (12). Moreover, DLCO have a large impact on exertional desaturation in patients suffering from ILD (60–62). Consequently, the multiple impairments in the physiology of the lung in ILD is translated into alterations in exercise capacity. This could in fact mirror the main finding in our study, where DSC appeared to be the variable most strongly associated with ILD-GAP reflecting the prognosis of the disease.

Strength and limitations of the study

We have proposed a new composite index, the DSC index, which is accessible to all practitioners and whose calculation does not require the use of functional respiratory tests. This index would have the advantage of providing information on the degree of severity of the disease and predicting the prognosis of the patient. However, some limitations of our study should be discussed:

- It was a retrospective study. Indeed, it was based on the analysis of patients' files, some of which were incomplete and therefore excluded from the study, which reduced the sample size.
- We included a modest sample size with participants with a variety of ILDs. These results need to be validated in a larger sample, where potential for differing effects in diagnostic groups can be more clearly delineated.
- Our study does not take into account the different therapies received during the initial evaluation and during the follow-up. These treatments could have positively or negatively influenced the prognosis of the patients.

In conclusion, the combination of 6MWD, SpO_2 min, and CR during a 6MWT (DSC index) could be considered as a reliable, simple, and practical tool for the overall assessment of the functional capacity of the cardiorespiratory system in patients with ILD. This study should be complemented by a prospective study to better evaluate this new DSC index.

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Authors Contribution: Khouloud Kchaou conceived and designed the study, collected the data, and wrote the manuscript. Soumaya Khaldi contributed to the writing and critical revision of the manuscript. Nadia Lazreg assisted in data collection. Saloua Ben Khamsa and Kaouthar Masmoudi provided supervision, critical revision, and final approval of the manuscript.

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