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Relationship between FACED and Bronchiectasis Severity Index in the evaluation of bronchiectasis severity: Cross-sectional study

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Abstract:

INTRODUCTION: In the same patients with bronchiectasis, it is aimed to compare the bronchiectasis severity scoring questionnaires (Bronchiectasis Severity Index [BSI] and FACED), which are two different scorings validated for the prognosis of the disease.

METHODS: A cross-sectional study was performed in 94 patients (51 males and 43 females) who were diagnosed with bronchiectasis. The severity of bronchiectasis was calculated according to FACED and BSI scores of all patients and relationship between the severity of both scorings were examined. Wilcoxon test was applied to paired samples after both scorings were grouped according to the bronchiectasis severity.

RESULTS: Frequency of patients with mild, moderate, and severe FACED was 59 (62.8%), 27 (28.7%), and 8 (8.5%), respectively. There were 41 (43.6%), 23 (24.5%), and 30 (31.9%) patients with low, intermediate, and high BSI was, respectively. The mean scores of FACED and BSI were 2.0 ± 1.9 and 6.6 ± 4.8 , respectively. A statistically significant relationship was observed between FACED and BSI scores ($P < 0.001$). Both scores were statistically different when evaluated according to the severity of bronchiectasis ($P < 0.001$), and the FACED scale illustrated the lowest scores. The percentage of similarity was found 62.7% among the both scales. It was showed a 68% similarity between the two scales by Kappa test ($P < 0.001$).

DISCUSSION: Patients tend to score with a higher BSI compared to the FACED score, although the correlation between the two scales is statistically significant. This situation may be due to evaluation of body mass index, hospitalization, exacerbations, chronic colonization by other microorganisms, and the presence of cystic bronchiectasis in the BSI score.

Keywords:

Bronchiectasis, Bronchiectasis Severity Index, FACED

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Introduction

Bronchiectasis develops in relation to various etiologies, associated with symptoms such as cough, sputum, and hemoptysis.^[1] The effective treatment approach and evidence-based management recommendations for the evaluation

and follow-up of bronchiectasis are not sufficient. Evaluating the severity of the disease in bronchiectasis is necessary to obtain better treatment results. It is difficult to evaluate bronchiectasis alone due to the lack of a valid and simple method of measurement. Traditionally, in previous reports, the severity of the disease was

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represented by forced expiratory volume in 1 s (FEV₁).^[2] Reiff *et al.* and Bhalla *et al.* scores in high-resolution computerized tomography (HRCT) were evaluated to assess disease severity.^[3,4] However, FEV₁ was not effective in making clinical decisions, correlation of HRCT scores with lung function was poor.^[5] Therefore, a new scoring system was developed to evaluate the severity of bronchiectasis. FACED score (F: FEV₁, A: age, C: colonization, E: number of affected lobes, D: dyspnea) and Bronchiectasis Severity Index (BSI)^[6,7] were designed as two multidimensional bronchiectasis severity rating scales to evaluate the prognosis of bronchiectasis in recent years. FACED score is a five-point rating system that estimates mortality in patients who have been followed for 5 years. BSI is a nine-item scale defining the risk for death, hospitalization, and exacerbations.

Harmony and similarity between the FACED and BSI scores were not adequately investigated. Is there a similarity between the paired groups between the both scoring? This study aimed to compare the outcomes of FACED and BSI scores for the evaluation of bronchiectasis severity in the same patients.

Methods

The patients who were followed by Sakarya Training and Research Hospital Pulmonology Department and confirmed to have bronchiectasis by HRCT, according to British Thoracic Society guide. Patients diagnosed with immunodeficiency, allergic pulmonary aspergillosis, primary siliceous dyskinesia, secondary bronchitis, heart failure, malignancy, pregnancy, chronic renal failure, antibiotics, steroids, and acute exacerbation in the last month are excluded from the study. One-hundred and seventeen patients who met these criteria were included in the study. Permission of the ethics committee received from Sakarya University Medical Faculty Ethics Committee.

FACED and Bronchiectasis Severity Index scoring and grading

FACED score contains five variables. These are %FEV₁, age, *Pseudomonas aeruginosa* colonization, radiological prevalence, and dyspnea assessment with the Medical Research Council scale (MRC), and total score is obtained range from 0 to 7 points. It is evaluated in three groups as mild (0–2), moderate (3–4), and severe bronchiectasis (5–7) based on the total score.

BSI score includes nine variables. These are age, body mass index (BMI), %FEV₁, hospitalization in the last 2 years, number of attacks in the last year, dyspnea evaluation with MRC scale, *P. aeruginosa* colonization, colonization with other microorganisms, radiologic prevalence and/or cystic bronchiectasis, and total score

is scored between 0 and 26. BSI is classified as low (0–4), intermediate (5–8), and high (9 and over).

The similarity between the two scales was assessed by Fishers' exact and tau-b Kendall tests. BSI and FACED scales were grouped according to the severity of bronchiectasis and the relationship between the paired samples was done by Wilcoxon test. The similarity between the Paired samples was evaluated by the Cohens' kappa test.

Results

Table 1 shows the characteristics of 94 patients with bronchiectasis studied. The averages of FACED and BSI scores of these patients and the numbers and percentages of mild, moderate, and severe bronchiectasis patients according to both scorings are shown in Figure 1. With regard to FACED score, 59 patients (62.8%) with mild bronchiectasis, 27 patients (28.7%) with moderate bronchiectasis, and 8 patients (8.5%) with severe bronchiectasis [Figure 1]. The mean derived

Table 1: General characteristics of the patients included in the study

	Patients (n=94)
Male/female, n (%)	51/43 (54.3/45.7)
Age (years)	51±15.4
BMI (kg/m ²)	26.7±5.5
FVC (%)	63.0±22.2
FEV ₁ (%)	55.0±22.5
FEV ₁ /FVC (%)	70.8±14.2
<i>Pseudomonas aeruginosa</i> , n (%)	11 (11.7)
Other microorganism, n (%)	11 (11.7)
Number of lobes affected	2.7±1.1
Number of hospitalizations in the last 2 years	0.3±0.8
Number of exacerbations in the last year	2.0±2.2
BSI score	6.6±4.8*
FACED score	2.0±1.9*

*Fisher's exact test (P<0.001) and tau-b Kendall test (0.677; P<0.001) between FACED and BSI scores. BMI: Body mass index, FVC: Forced vital capacity, FEV₁: Forced expiratory volume in 1 s, BSI: Bronchiectasis Severity Index

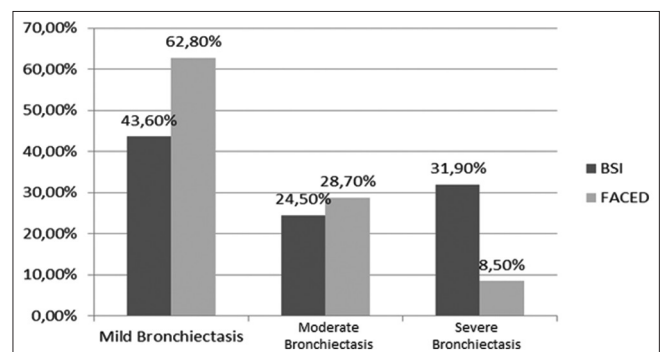


Figure 1: Distribution of the patients by the FACED and Bronchiectasis Severity Index scores

Table 2: Percentage similarity of the FACED and Bronchiectasis Severity Index scores according to the severity for paired samples

FACED	Percentage score FACED conditioned by BSI score		
	Low BSI	Intermediate BSI	High BSI
Mild bronchiectasis	100.0	55.5	16.7
Moderate bronchiectasis	0.0	44.5	56.6
Severe bronchiectasis	0.0	0.0	26.7

BSI	Percentage score BSI conditioned by FACED score		
	Mild bronchiectasis	Moderate bronchiectasis	Severe bronchiectasis
Low BSI	71.2	0.0	0.0
Intermediate BSI	20.3	37.0	0.0
High BSI	8.5	63.0	100.0

BSI: Bronchiectasis Severity Index

Table 3: Wilcoxon and Cohens' Kappa test for paired samples

BSI-FACED	n	P
BSI >FACED	35	<0.001
BSI <FACED	0	
BSI=FACED	59	
Total	94	
κ	0.408	<0.001

BSI: Bronchiectasis Severity Index

FACED score was 2.0 ± 1.9 . According to the BSI score, 41 patients (43.6%) with low BSI score, 23 patients (24.5%) with intermediate BSI score, and 30 patients (31.9%) with high BSI score [Figure 1]. The mean derived BSI score was 6.6 ± 4.8 .

It was determined a significant relationship between FACED and BSI scores using Fisher's exact ($P < 0.001$) and tau-b Kendall tests (0.677 ; $P < 0.001$). Similarity of the FACED and BSI scores according to the severity is shown in Table 2. Wilcoxon test was applied to paired samples after both scorings were grouped according to bronchiectasis severity, the two scales being significantly different ($P < 0.001$) and the BSI scale showed the highest scores [Table 3]. A 62.7% similarity ($59 \text{ equations} / 94 = 0.627$) was found between the two scales by this test. It was founded 68.1% similarity between the two scales by using Cohen's Kappa test ($\kappa = 0.408$, $P < 0.001$).

Discussion

Nowadays, we are faced with two groups of patients in the management of bronchiectasis. A group of patients including the patients with increased symptoms, frequent exacerbations, a risk of rapid pulmonary function decline, complications, and more closely monitored at specialist centers; the other patient group is low-risk patients who do not require specialist follow-up and they are suitable for simpler treatment regimens. Thus, it will be possible to increase the cost of health and patient satisfaction in patients with bronchiectasis.

There are two scales called FACED and BSI, which are used to evaluate the severity and prognosis of bronchiectasis. There are some convenience and difficulties in the use of FACED and BSI scales. FACED contains five variables, and the score of this scale is easy to obtain, calculate and interpret. The BSI scale contains nine variables and each variable has different values. Due to these qualities, BSI is a more complex scale than FACED both scales are divided into severe risk categories. In addition, different purposes have been used to develop these two scales. The FACED is specifically developed to predict the probability of mortality in a 5-year follow-up of bronchiectasis. In the development of BSI scale, mortality, severe exacerbations requiring hospitalization, frequency of exacerbations, and quality of life were prioritized.^[7]

Although FACED score shows a significant prognostic capacity in the evaluation of bronchiectasis, it does not include the number or severity of exacerbations. Because of this feature, the predictability of exacerbations and mortality rates of the FACED scale is low. E-FACED, a new scale, was developed in order to overcome this deficiency. E-FACED score significantly increased FACED capacity to predict future annual exacerbations and the prognostic capacity for mortality and simplicity was maintained.^[8]

McDonnell *et al.* have shown that FACED and BSI satisfactorily predict the mortality of bronchiectasis but demonstrated that BSI is superior to FACED for clinical predictions of hospital admissions, exacerbations, quality of life, respiratory symptoms, exercise capacity, and decreased lung function.^[9] Ellis *et al.* have shown that both scoring systems developed to assess long-term mortality predictability have similar predictive power for 5-year mortality. Both scales predicted 15-year mortality, and the estimated capacity of FACED was found to be superior for 15-year mortality.^[10] Minov *et al.* found that BSI was similar to FACED score in assessing bronchiectasis severity.^[11] Costa *et al.* found that BSI was clinically more effective in evaluating bronchiectasis

severity according to the FACED score.^[12] In the study conducted by Coban and Gungen, it was shown that significant heterogeneity was present the patient groups, in which bronchiectasis severity was assessed. A significant correlation was determined between both scorings.^[13]

In this study, patients tend to score with a higher BSI than FACED. This situation can be explained that there are no parameters such as BMI, hospitalization, chronic colonization by other microorganisms, and exacerbations on the FACED scale. In the calculation of the BSI score, age, level of dyspnea, and expected FEV₁% parameters may be contributing to the different scoring.

There are limitations that need to be specified by this study. Since there is a limited number of patients and due to being a cross-sectional study, this study does not provide the predictive capacity for mortality. Our results do not prove that the application of BSI or FACED can improve clinical outcomes, and more studies are needed to determine how these measures can have an impact on clinical practice.

As a result, the severity and prognosis of bronchiectasis is a multivariate pathology, and it cannot be sufficiently analyzed by a single variable. Therefore, FACED and BSI are validated multivariate scoring systems that provide accurate assessment of the severity and prognosis of bronchiectasis. BSI contains more variables than FACED, and patients had a tendency to score with higher BSI than FACED.

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Conflicts of interest

There are no conflicts of interest.

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