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ORIGINAL ARTICLE / ÖZGÜN MAKALE

Impact of preoperative scores on postoperative process in bronchiectasis surgery

Bronşektazi cerrahisinde ameliyat öncesi skorların ameliyat sonrası sonuçlara etkisi

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ABSTRACT

Background: In this study, we aimed to investigate the relationship between bronchiectasis criteria, scores, and indices used today and surgical interventions due to bronchiectasis.

Methods: Between January 2009 and December 2018, a total of 106 patients (53 males, 53 females; mean age: 39.1±12.3 years; range, 14 to 68 years) with non-cystic fibrous bronchiectasis were retrospectively analyzed. We determined symptom improvement and complications as main factors. We divided the patients into two main groups: those who had symptom improvement after pulmonary resection (Group 1, n=89) and those who did not (Group 2, n=17). We further analyzed patients who had postoperative complications (n=27) with those who did not (n=79). The following scores and criteria were used in this study: modified Reiff score, Gudbjerg criteria, Naidich criteria, Bronchiectasis Severity Index, and FACED scoring.

Results: There was a statistically significant difference between the groups in terms of the modified Reiff scores and FACED scores. As the modified Reiff score increased, there was a higher rate of symptom relief (p=0.04). Contrary to this, an increase in the FACED score predicted a poorer postoperative outcome (p=0.03). Considering complications, a significant difference was observed in the Gudjberg criteria, and higher grade suggested a higher risk of complication (p=0.02).

Conclusion: The grading and scoring systems related to bronchiectasis may have some predictive value in terms of surgical outcomes. A high modified Reiff score and a low FACED score can predict postoperative success, whereas Gudbjerg criteria can indicate postoperative complications.

Keywords: Bronchiectasis scores, bronchiectasis surgery, FACED score, Gudbjerg criteria, Gudbjerg criteria, Modified Reiff score.

ÖZ

Amaç: Bu çalışmada bronşektazi kriterleri, skorları ve günümüzde kullanılan indeksler ile bronşektazi nedeniyle yapılan cerrahi girişimler arasındaki ilişki araştırıldı.

Çalışma planı: Ocak 2009 - Aralık 2018 tarihleri arasında non-kistik fibröz bronşektazili toplam 106 hasta (53 erkek, 53 kadın; ort. yaş: 39.1±12.3 yıl; dağılım, 14-68 yıl) retrospektif olarak incelendi. Cerrahi sonuçları belirleyen önemli faktörler semptom rahatlaması ve komplikasyonlar olarak belirlendi. Hastalar iki ana gruba ayrıldı: akciğer rezeksiyonu sonrasında semptom rahatlaması görülenler (Grup 1, n=89) ve görülmeyenler (Grup 2, n=17). Hastalar ameliyat sonrası komplikasyon görülenler (n=27) ve görülmeyenler (n=79) olarak da analiz edildi. Çalışmada şu skorlar ve kriterler kullanıldı: modifiye Reiff skoru, Gudbjerg kriterleri, Naidich kriterleri, Bronşektazi Şiddet İndeksi ve FACED skoru.

Bulgular: Modifiye Reiff skorları ve FACED skorları açısından gruplar arasında istatistiksel olarak anlamlı bir fark vardı. Modifiye Reiff skoru arttıkça, semptom rahatlama oranı da yükseldi (p=0.04). Buna karşın, FACED skorundaki artış daha kötü ameliyat sonrası sonucu öngördü (p=0.03). Komplikasyonlar açısından, Gudjberg kriterlerinde anlamlı bir fark tespit edildi ve daha yüksek skorlar daha yüksek komplikasyon oranını gösterdi (p=0.02).

Sonuç: Bronşektazi ile ilgili sınıflandırma ve skorlama sistemleri cerrahi sonuçlar açısından öngördürücü değere sahip olabilir. Yüksek modifiye Reiff skoru ve düşük FACED skoru ameliyat sonrası başarı açısından öngördürücü olabilirken, Gudjberg kriterleri ameliyat sonrası komplikasyonları gösterebilir.

Anahtar sözcükler: Bronşektazi skorları, bronşektazi cerrahisi, FACED skoru, Gudbjerg kriterleri, Modifiye Reiff Skoru.

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Bronchiectasis is a chronic lung disease characterized by congenital or acquired irreversible dilatation of the bronchi. It is characterized by chronic bronchial infection and inflammation and has numerous causes. In general, it is divided into two as cystic fibrosis and non-cystic fibrosis bronchiectasis.[1]

Bronchiectasis is often termed as an orphan disease, as it is not a condition that has been studied frequently.[2] Currently, this omission is also evident in the content of the scoring systems used. Although surgical resection has a considerable impact on the quality of life of patients in the treatment of bronchiectasis, it is not included in the scoring, and no integration has been formed between bronchiectasis scores and surgical intervention.

In the present study, we aimed to investigate the relationship between bronchiectasis criteria, scores, and indices used today and surgical interventions due to bronchiectasis.

PATIENTS AND METHODS

This single-center, retrospective study was conducted at University of Health Sciences Yedikule Chest Diseases and Thoracic Surgery Health Practice and Research Center, Department of Thoracic Surgery between January 2009 and December 2018. Initially, a total of 144 patients who underwent pulmonary resection due to bronchiectasis were screened. Twenty patients who had coexisting malignancy besides bronchiectasis and 18 patients with missing data were excluded. The remaining 106 patients (53 males, 53 females; mean age: 39.1±12.3 years; range, 14 to 68 years) with non-cystic fibrous bronchiectasis were recruited.

We determined symptom improvement and complications as the main factors, as these are considered significant components which designate surgical outcome. Therefore, we divided these patients into two main groups: those who had symptom improvement after pulmonary resection (Group 1, n=89) and those who did not show symptom improvement (Group 2, n=17). Additionally, we further analyzed patients who had postoperative complications (n=27) with those who did not (n=79).

We considered the absence of previous complaints during postoperative follow-up as the improvement of symptoms, while we considered the presence of previous complaints despite the operation as the absence of improvement of symptoms.

We administered bronchiectasis scores and criteria previously defined in the literature to our cases. We studied the following scores and criteria: Modified Reiff score, Gudbjerg criteria, Naidich criteria, Bronchiectasis Severity Index (BSI), and FACED (F: forced expiratory volume in 1 sec [FEV1]; A: age; C: chronic colonization by *Pseudomonas aeruginosa [P. aeruginosa]*, E: radiological extension [number of pulmonary lobes affected], and D: dyspnea) scoring.

We calculated the modified Reiff score from evaluation of the high-resolution computed tomography (HRCT) scan (Table 1) by counting the lingula as a lobe (making six lobes). For each lobe, a score of 0 to 3 was possible, so that the maximum score possible was 18 (3×6 lobes).[3] Based on the findings on the posteroanterior (PA) chest radiograph, we determined the Gudbjerg criteria as A, B, C, and D (Table 2).[4]

We classified the preoperative HRCT findings according to the Naidich criteria.[5] Therefore, we considered the tram track or signet ring sign in the bronchi as cylindrical bronchiectasis, the wider bronchial appearance with beading as varicose bronchiectasis, the air-fluid level or the findings of the bronchial system enlarged enough to form cystic clusters as cystic bronchiectasis. Then, we administered BSI (age, body mass index [BMI], FEV1%, hospital admissions before study, exacerbations before study, dyspnea, chronic colonization by *P. aeruginosa*, chronic colonization with other organisms, extension of bronchiectasis) and FACED (FEV1%, age, chronic colonization by *P. aeruginosa*, extension of bronchiectasis, dyspnea) index to our patients (Tables 3 and 4).[6,7] We assessed the BSI score in the range of 0-26 points. We considered 0-4 points as mild, 5-8 points as moderate, and 9 and above as severe. We considered the maximum score as 7 in the FACED scoring.

Table 1. Modified Reiff Score

0	No bronchiectasis
1	Abnormal image in a small part of the lobe
2	Abnormal image in a medium-sized portion of the lobe
3	Abnormal image in the entire lobe

Table 2. Gudbjerg Criteria

Group A	Normal
Group B	Increased pulmonary markings only
Group C	Increased density of pulmonary markings
Group D	Circular markings and honeycomb-like structures in addition to B+C

The patients were analyzed in terms of age, sex, comorbidity, preoperative symptoms, respiratory rehabilitation period, duration of hospitalization, FEV1 and FEV1%, diseased lobe, operation side, operation extent and mode, improvement of postoperative symptoms, complications and additional chronic infections.

We listed the comorbidities as respiratory system diseases, accompanying malignancies, hematological diseases, cardiovascular diseases, diabetes mellitus, central nervous system diseases, and infertility. We collected the preoperative symptoms under the titles of hemoptysis, frequently recurrent pulmonary infections, flank pain, and dyspnea. We calculated the hospitalization period as days. We grouped the operation extent as lobectomy, bilobectomy, segmentectomy, and pneumonectomy. We divided the mode of operation as classical thoracotomy and video-assisted thoracoscopic surgery (VATS).

We also listed our complications as tracheostomy opening, pleural fluid/empyema, atelectasis, wound infection, hematoma, hoarseness, persistent air leak, bronchopleural fistula, pneumonia, pericarditis, and chylothorax. Based on the pathology report, chronic infections accompanying bronchiectasis were aspergilloma, Nocardia, and other fungal infections.

We divided the right and left lungs into six zones with two lines drawn from the carina level and the inferior pulmonary vein, based on the preoperative PA chest X-ray and/or HRTC. Accordingly, we specified the part above the line drawn from the carina level as the upper zone, the part between the line drawn from the carina level and the line drawn from the level of the inferior pulmonary vein as the middle zone, and the part below the line drawn at the level of the inferior pulmonary vein as the lower zone. Using the Reiff scoring, we considered the lingula as a lobe.

We selected patients whose preoperative examinations were performed in our center. We performed the pulmonary function tests (PFT) using

Table 3. Bronchiectasis Severity Index

Severity marker	Points
Age (year)	
<50	0
50-69	2
70-79	4
≥80	6
Body mass index (kg/m^2)	
<18.5	2
18.5-25	0
26-29	0
≥30	0
FEV1 % predicted	
>80	0
50-80	1
30-49	2
<30	3
Hospital admissions before study	
No	0
Yes	5
Exacerbations before study	
0	0
1 or 2	0
≥3	2
Dyspnea mMRC score	
0	0
2	2
3	3
Chronic colonization by *Pseudomonas aeruginosa*	
No	0
Yes	3
Chronic colonization with other organisms	
No	0
Yes	1
>3 lobes involved or cystic bronchiectasis	
No	0
Yes	1

FEV1: Forced expiratory volume in the first second; mMRC: Modified medical research council; Points range from 0 to 26 (0-4 Mild, 5-8 Moderate, >9 Severe).

Table 4. FACED score

Severity marker	Points
Chronic colonization by *Pseudomonas aeruginosa*	
No	0
Yes	1
Dyspnea mMRC score	
0-II	0
III-IV	1
FEV1 % predicted	
≥50%	0
<50%	2
Age (year)	
<70	0
≥70	2
Number of lobes	
1-2	0
>2	1

mMRC: Modified medical research council; FEV1: Forced expiratory volume in the first second.

the Jaeger Spirometry device (Jaeger Ltd, Hochberg, Germany). Three-mm cross-sectional devices were used for HRCT.

Statistical analysis

Statistical analysis was performed using the IBM SPSS for Windows version 26.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were presented in mean ± standard deviation (SD) or median (min-max) for continuous variables and in number and frequency for categorical variables. Comparisons of numerical variables between two independent groups were conducted using the Student t-test, when the condition of normal distribution was met, and using the Mann-Whitney U test, when the condition was not met. The rates in the groups were compared using the chi-square test. A *p* value of <0.05 was considered statistically significant.

RESULTS

We performed a comparison between the group with postoperative symptom improvement (Group 1) and the group without (Group 2). According to the results of comparative analysis on scoring systems, there was a statistically significant difference between the groups in terms of the modified Reiff scores and FACED scores. Accordingly, as the modified Reiff score increased, there was a higher rate of symptom relief (p=0.04). Contrary to this, an increase in the FACED score predicted a poorer postoperative outcome. In patients with a high FACED score, the success of the operation would be lower (p=0.03) (Table 5).

No statistically significant difference was found between the two groups in terms of the parameters; i.e., sex, age, hospitalization, comorbidity, preoperative symptoms, FEV1 values, bronchiectasis localization, operation extent, and mode of operation (Table 6). Also, no statistically significant difference was found between the two groups in terms of complications and additional infections (Table 7).

After comparing patients in terms of complication, a significant difference was determined in the Gudjberg criteria indicating that higher grade suggested higher risk of postoperative complications (p=0.02) (Table 8). No significant correlation was found between these two patient groups in terms of the remaining parameters.

All studied patients survived and their clinical follow-ups still continue. The mean follow-up was 8.2±2.7 (range, 3 to 12) years.

DISCUSSION

The causes of non-cystic fibrous bronchiectasis regarding our subject include tuberculosis, pneumonia, foreign body aspiration, corticosteroid-dependent asthma, allergic bronchopulmonary aspergillosis, and bronchial tumors.[8] In addition to infectious

Table 5. Comparison between Group 1 and Group 2 in terms of studied scores and criteria

	Group 1 (n=89)				Group 2 (n=17)				
	n	%	Mean	Range	n	%	Mean	Range	*p*
Modified Reiff score			11.32				5.62		**0.04***
Gudbjerg criteria									0.87’
A	11	12.5			2	11.8			
B	4	4.5			0	0.0			
C	16	18.0			3	17.6			
D	58	65.2			12	70.6			
Naidich criteria									0.41’
Varicose	5	5.6			2	11.8			
Cylindrical	19	21.3			2	11.8			
Cystic	65	73.0			13	76.5			
Body mass index			2	1-4			2	1-6	0.62’
Mild	71	79.8			12	70.6			0.42’
Moderate	15	16.9			5	29.4			
Severe	3	3.4			0	0.0			
FACED			2.36				5.24		**0.03***

* Mann Whitney U test, Chi square analysis

Table 6. Comparison between postoperative symptom improvement group and no improvement group

	Postoperative symptom improvement												
	Yes						No						
	Group 1 (n=89)						Group 2 (n=17)						
	n	%	Mean±SD	Median	Min-Max	IQR	n	%	Mean±SD	Median	Min-Max	IQR	*p*
Age (year)			39.4±12.7		14-68				37.0±1.03		16-58		0.45
Hospitalization (day)				6		5-8				6		4-7	0.31
Sex													0.79
Male	45	50.6					8	47.1					
Female	44	49.4					9	52.9					
Comorbidity	30	33.7					8	47.1					0.29
Respiratory	22	24.7					7	41.2					0.23
Malignancy	2	2.2					0	0.0					0.87
Hematological	0	0.0					1	5.9					0.16
Cardiac	5	5.6					0	0.0					0.88
Diabetes mellitus	5	5.6					1	5.9					0.91
Central nervous system	1	1.1					0	0.0					0.78
Infertility	1	1.1					0	0.0					0.71
Preoperative symptoms													
Hemoptysis	26	29.2					8	47.1					0.14
Frequent infection	57	64.0					11	64.7					0.95
Flank pain	9	10.1					2	11.8					0.77
Dyspnea	15	16.9					0	0.0					0.12
FEV1			2.36±0.69		0.88-3.76				2.21±0.67		1.21-3.46		0.39
FEV1 %			74.6±17.7		32-128				69.4±20.8		41-120		0.27
Side													0.65
Right	36	40.4					5	29.4					
Left	47	52.8					11	64.7					
Bilateral	6	6.7					1	5.9					
Lob													
Segment	10	11.2					4	23.5					0.23
Upper	34	38.2					6	35.3					0.82
Moderate	15	16.9					1	5.9					0.45
Lower	62	69.7					13	76.5					0.77
Operation extent													
Pneumonectomy	11	12.4					2	11.8					0.71
Lobectomy	56	62.9					10	58.8					0.74
Segmentectomy	6	6.7					0	0.0					0.58
Lobectomy segmentectomy	8	9.0					4	23.5					0.19
Bilobectomy	8	9.0					1	5.9					0.69
Mode of operation													0.86
Thoracotomy	80	89.9					15	88.2					
VATS	9	10.1					2	11.8					

SD: Standard deviation; IQR: Interquartile range; FEV1: Forced expiratory volume in 1 sec; VATS: Video-assisted thoracoscopic surgery.

Table 7. Comparison between improvement group and no improvement group in terms of postoperative complications and additional infections

	Postoperative symptom improvement				
	Yes		No		
	Group 1 (n=89)		Group 2 (n=17)		
	n	%	n	%	*p*
Complication					0.36
None	68	76.4	11	64.7	
Exist	21	23.6	6	35.3	
Tracheostomy	0	0.0	1	5.9	0.16
Pleural effusion empyema	3	3.4	2	11.8	0.18
Atelectasis	3	3.4	0	0.0	0.66
Wound infection	3	3.4	1	5.9	0.51
Hematoma	4	4.5	0	0.0	0.55
Prolonged air leak	9	10.1	2	11.8	0.68
Bronchopleural fistula	1	1.1	1	5.9	0.29
Pneumonia	1	1.1	0	0.0	0.88
Pericarditis	1	1.1	0	0.0	0.89
Chylothorax	1	1.1	0	0.0	0.91
Additional infection					0.11
None	83	93.3	14	82.4	
Aspergilloma	5	5.6	2	11.8	
Nocardia	0	0.0	1	5.9	
Fungus	1	1.1	0	0.0	

agents such as *Staphylococcus aureus*, *Klebsiella*, and *Bordetella pertussis*, various immunological diseases such as acquired immunodeficiency syndrome (AIDS), ulcerative colitis, and rheumatoid arthritis are also associated with bronchiectasis.[9] Despite this, the cause of a substantial number of cases of bronchiectasis has not been clearly elucidated yet.[10]

Due to the increasing use of HRCT, the frequency of clinical bronchiectasis diagnosis has increased; however, the inadequacy of current publications prevents a definitive incidence of the disease.[11] Bronchiectasis is a serious public health problem and creates an economic burden.[12] Therefore, various criteria and scores have been proposed to determine the severity of the disease in practical applications. Since it is not possible to determine a score based on a single variable in bronchiectasis, as in chronic lung diseases, the criteria for evaluating patients and determining the predictions to improve the quality of life have been diversified.

Bronchiectasis is a complex disease that is impacted by multiple variables and needs standardization in terms of prognosis, and treatment. It would be a mistake to focus on single variables while assessing the treatment process. Since predicting the quality of life of patients with bronchiectasis continues to be a problem for clinicians, various criteria and scores have been suggested to eliminate this problem. However, there is no standard yet to assess the effectiveness of the surgical intervention, which has a crucial role in the treatment of bronchiectasis.

In the light of studied scoring systems and relative criteria, we investigated whether these were clinically useful in predicting postoperative outcome before performing pulmonary resection in patients with bronchiectasis. To the best of our knowledge, there is no similar study in the literature.

Most of the studies carried out to analyze the success of surgical treatment in bronchiectasis consider a single variable. Yet, we consider that it would be reasonable to utilize multivariate and standardized scores and criteria that have already been determined while assessing the surgical outcomes.

While as a radiological scoring system, the modified Reiff score can be a useful tool for assessing the extent of bronchiectasis, as a clinical scoring system, the FACED score provides a more comprehensive evaluation of disease severity and takes into account multiple important factors that can influence prognosis

Table 8. The effects of scores on postoperative complication

	Postoperative symptom improvement												
	Yes						No						
	Group 1 (n=89)						Group 2 (n=17)						
	n	%	Mean±SD	Median	Min-Max	IQR	n	%	Mean±SD	Median	Min-Max	IQR	*p**
Age (year)			38.2±11.9		20-65				39.3±12.5		14-68		0.68
Sex													0.51
Male	15	55.6					38	48.1					
Female	12	44.4					41	51.9					
Comorbidity	30	33.7					8	47.1					0.88
Respiratory	22	24.7					7	41.2					0.75
Malignancy	2	2.2					0	0.0					0.81
Hematological	0	0.0					1	5.9					0.25
Cardiac	5	5.6					0	0.0					0.61
Diabetes mellitus	5	5.6					1	5.9					0.64
Central nervous system	1	1.1					0	0.0					0.22
Infertility	1	1.1					0	0.0					0.44
Symptoms													
Hemoptysis	26	29.2					8	47.1					0.87
Frequent recurring infection	57	64.0					11	64.7					0.43
Flank pain	9	10.1					2	11.8					0.72
Dyspnea	15	16.9					0	0.0					0.11
FEV1			2.40±0.71		1.25-3.74				2.31±0.69		0.88-3.76		0.56
FEV1 %			73.4±16.8		44-102				73.9±18.8		32-128		0.91
Side													0.72
Right	36	40.4					5	29.4					
Left	47	52.8					11	64.7					
Bilateral	6	6.7					1	5.9					
Lob													
Segment	4	14.8					10	12.7					0.75
Upper	12	44.4					28	35.4					0.41
Moderate	3	11.1					13	16.5					0.75
Lower	19	70.4					56	70.9					0.95
Gudbjerg criteria													0.02
A	0	0.0					13	16.6					
B	1	3.7					16	20.4					
C	4	14.8					18	22.8					
D	22	81.5					32	40.2					
Modified Reiff score				4.12						5.38			0.78‡
Naidich criteria													0.75
Varicose	1	3.7					6	7.6					
Cylindrical	6	22.2					15	19.0					
Cystic	20	74.1					58	73.4					
BSI													0.73
Mild	21	77.8					62	78.5					
Moderate	6	22.2					14	17.7					
Severe	0	0.0					3	3.8					
FACED				4.21						3.36			0.75‡

SD: Standard deviation; IQR: Interquartile range; FEV1: Forced expiratory volume in 1 sec; BSI: Bronchiectasis Severity Index; * Chi-square analysis; ‡ Mann-Whitney U.

and management. As a result of our study, we revealed that a high modified Reiff score and a low FACED score suggest higher possible surgical outcome meaning more symptom relief for our patients in the postoperative period. Therefore, a highly classified Gudbjerg criteria is associated with a possible higher postoperative complication rate. Currently, as a result of the increasing use of HRCT, the use of the Gudbjerg criterion defined by chest X-ray, is limited. Finally, in our study, there was no statistically significant outcome in terms of Naidich criteria and BSI.

Albeit bronchiectasis scores are not used in the evaluation of complications related to the operation in the literature, many studies have been conducted on the FEV1 value, which is a part of the scores. In the studies of Eren et al.[13] and Balcı et al.,[14] a preoperative FEV1 value of <60% was found to be associated with postoperative complications. On the other hand, Zhang et al.,[15] in their retrospective study, found a lower FEV1 rate as a predictor of complications. In a study by Mariani et al.,[16] positive cultured bronchoalveolar lavage was determined to be a predictive criterion for postoperative complications, not a low FEV1 value. In our study, no correlation was found between preoperative FEV1 value and surgery.

Review of the literature reveals that there are recent articles about surgical interventions due to bronchiectasis; however, bronchiectasis scores were not studied in these studies.[17] On the other hand, the role of surgery in the management of bronchiectasis was not mentioned in studies where clinical and functional evaluation of bronchiectasis were performed.[18] We present our study as a new perspective in terms of evaluating the relationship between clinical and radiological scores and surgery in bronchiectasis.

The main limitations to this study are that it is a single-center, retrospective study with a relatively small sample size. Quality of life was unable to be evaluated due to retrospective nature of the study. Since there is no standard for bronchoscopy in selected patients, the bronchoscopy procedure could not be evaluated.

In conclusion, based on the results of our study, it appears that the grading and scoring systems related to bronchiectasis may have some predictive value in terms of surgical outcomes. Significant analysis results were revealed in three of the analyzed scores. We have spotted that a high modified Reiff score and a low FACED score can predict postoperative success whereas Gudbjerg criteria can stipulate the postoperative complication. Further research with comprehensive and nuanced outcome measures may be necessary to better evaluate the potential value of these scores. Therefore, while these scores may provide some insight into the course, further investigation is needed to determine their true usefulness in predicting surgical outcomes with larger cohort.

Ethics Committee Approval: The study protocol was approved by the Istanbul Yedikule Chest Diseases and Thoracic Surgery Training and Research Hospital Clinical Research Ethics Committee (date: 14.01.2021, no: 2021-71). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from the patients and/or parents of the patients.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Design, data collection and/or processing, literature review, writing the article, references and fundings, materials: A.M.A.; Data collection and/or processing, Writing the article: O.V.Y.; Idea/concept, control/supervision, analysis and/or interpretation, critical review: L.C.; Critical review: C.A., M.A.B.; Control/supervision, analysis and/or interpretation, critical review, writing the article: Y.S.

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REFERENCES

1. King P, Holdsworth S, Freezer N, Holmes P. Bronchiectasis. Intern Med J 2006;36:729-37. doi: 10.1111/j.1445-5994.2006.01219.x.
2. Mobaireek KF. Noncystic fibrosis bronchiectasis: Is it an orphan disease? Ann Thorac Med 2007;2:2. doi: 10.4103/1817-1737.30353.
3. Reiff DB, Wells AU, Carr DH, Cole PJ, Hansell DM. CT findings in bronchiectasis: Limited value in distinguishing between idiopathic and specific types. AJR Am J Roentgenol 1995;165:261-7. doi: 10.2214/ajr.165.2.7618537.
4. Gudbjerg CE. Roentgenologic diagnosis of bronchiectasis; an analysis of 112 cases. Acta Radiol 1955;43:210-26.
5. Naidich DP, McCauley DI, Khouri NF, Stitik FP, Siegelman SS. Computed tomography of bronchiectasis. J Comput Assist Tomogr 1982;6:437-44. doi: 10.1097/00004728-198206000-00001.
6. Chalmers JD, Goeminne P, Aliberti S, McDonnell MJ, Lonni S, Davidson J, et al. The bronchiectasis severity index. An international derivation and validation study. Am J Respir Crit Care Med 2014;189:576-85. doi: 10.1164/rccm.201309-1575OC.

7. Martínez-García MÁ, de Gracia J, Vendrell Relat M, Girón RM, Máiz Carro L, de la Rosa Carrillo D, et al. Multidimensional approach to non-cystic fibrosis bronchiectasis: The FACED score. Eur Respir J 2014;43:1357-67. doi: 10.1183/09031936.00026313.
8. Minov J, Karadzinska-Bislimovska J, Vasilevska K, Stoleski S, Mijakoski D. Assessment of the non-cystic fibrosis bronchiectasis severity: The FACED Score vs the Bronchiectasis Severity Index. Open Respir Med J 2015;9:46-51. doi: 10.2174/1874306401509010046.
9. Hill AT, Pasteur M, Cornford C, Welham S, Bilton D. Primary care summary of the British Thoracic Society Guideline on the management of non-cystic fibrosis bronchiectasis. Prim Care Respir J 2011;20:135-40. doi: 10.4104/pcrj.2011.00007.
10. Lazarus A, Myers J, Fuhrer G. Bronchiectasis in adults: A review. Postgrad Med 2008;120:113-21. doi: 10.3810/pgm.2008.09.1912.
11. Weycker D, Hansen GL, Seifer FD. Prevalence and incidence of noncystic fibrosis bronchiectasis among US adults in 2013. Chron Respir Dis 2017;14:377-84. doi: 10.1177/1479972317709649.
12. Weycker D, Edelsberg J, Oster G, Tino G. Prevalence and economic burden of bronchiectasis. Clin Pulm Med 2005;12:205-9. doi: 10.1097/01.cpm.0000171422.98696.ed.
13. Eren S, Esme H, Avci A. Risk factors affecting outcome and morbidity in the surgical management of bronchiectasis. J Thorac Cardiovasc Surg 2007;134:392-8. doi: 10.1016/j.jtcvs.2007.04.024.
14. Balci AE, Balci TA, Ozyurtan MO. Current surgical therapy for bronchiectasis: Surgical results and predictive factors in 86 patients. Ann Thorac Surg 2014;97:211-7. doi: 10.1016/j.athoracsur.2013.09.013.
15. Zhang P, Jiang G, Ding J, Zhou X, Gao W. Surgical treatment of bronchiectasis: A retrospective analysis of 790 patients. Ann Thorac Surg 2010;90:246-50. doi: 10.1016/j.athoracsur.2010.03.064.
16. Mariani AW, Vallilo CC, de Albuquerque ALP, Salge JM, Augusto MC, Suesada MM, et al. Preoperative evaluation for lung resection in patients with bronchiectasis: Should we rely on standard lung function evaluation? Eur J Cardiothorac Surg 2021;59:1272-8. doi: 10.1093/ejcts/ezaa454.
17. Selman A, Merhej H, Nakagiri T, Zinne N, Goecke T, Haverich A, et al. Surgical treatment of non-cystic fibrosis bronchiectasis in Central Europe. J Thorac Dis 2021;13:5843-50. doi: 10.21037/jtd-21-879.
18. Giacon V, Sanduzzi Zamparelli S, Sanduzzi Zamparelli A, Bruzzese D, Bocchino M. Correlation between clinical-functional parameters and number of lobes involved in non-cystic fibrosis bronchiectasis. Multidiscip Respir Med 2021;16:791. doi: 10.4081/mrm.2021.791.