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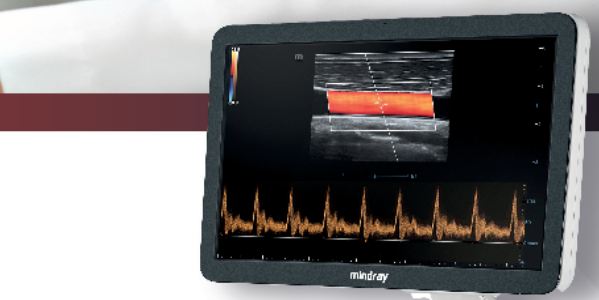

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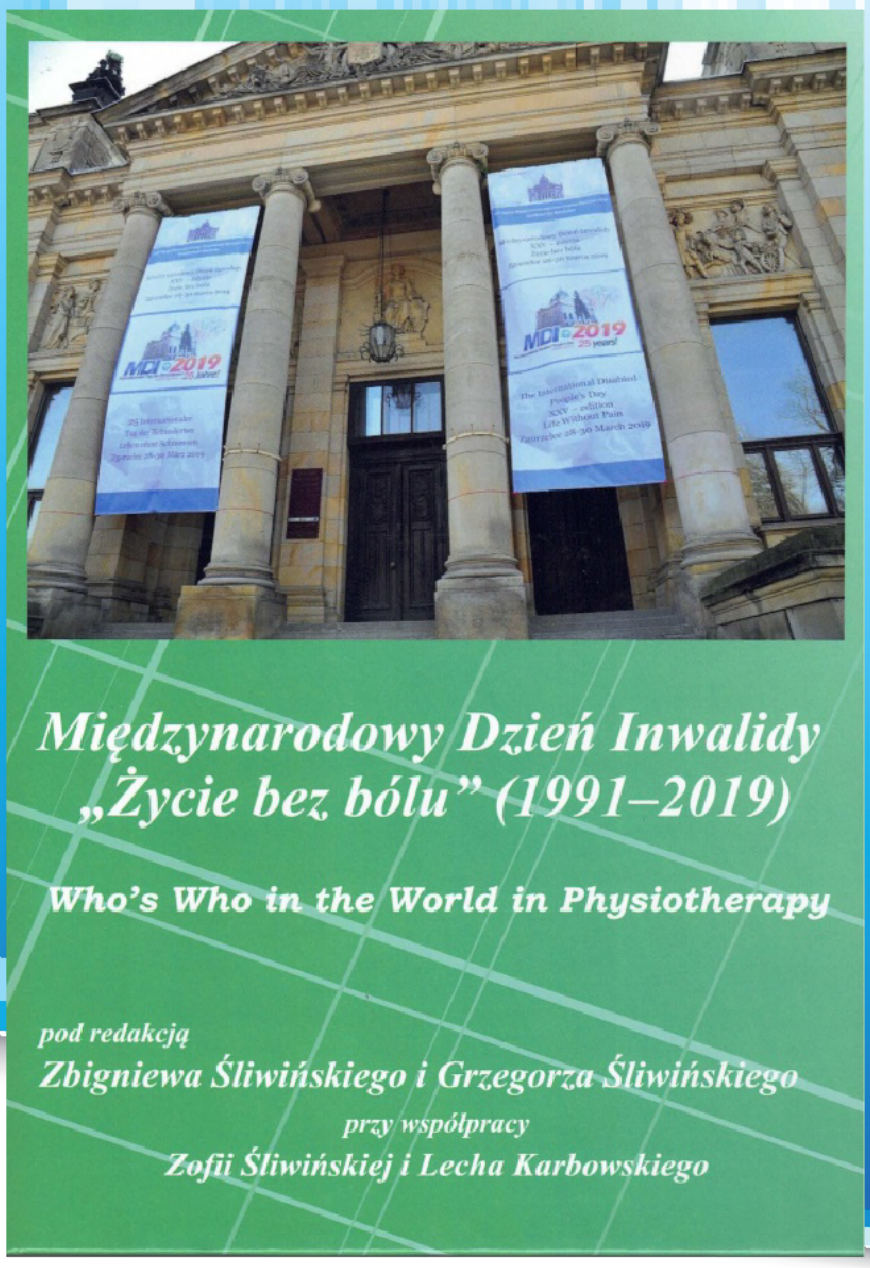

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Potential effect of aerobika oscillating positive expiratory pressure training on arterial blood gases, functional capacity and quality of life in patients with bronchiectasis

Potencjalny wpływ treningu przy użyciu trenażera Aerobika z oscylacją dodatniego ciśnienia wydechowego na gazometrię krwi tętniczej, wydolność funkcjonalną i jakość życia pacjentów z rozstrzeniem oskrzeli

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Abstract

Background. In patients with bronchiectasis, the elastic and muscular tissue is lost, obstructing the normal drainage of bronchial secretions, which can become chronically compromised, resulting in mild to moderate airway obstruction, which affects blood oxygenation and, as a consequence, the patients' quality of life. Purpose: The aim of the study was to evaluate the potential effect of Aerobika oscillating positive expiratory pressure training on arterial blood gases, functional capacity, and quality of life in patients with bronchiectasis. Materials and Methods. The study recruited the participation of sixty bronchiectasis patients of both genders (24 males and 36 females). They were divided into two major categories, each with 30 patients: study and control. Both groups continued to take their medications during the study period, and the study group received twice-daily training with the Aerobika positive expiratory pressure device. Before and after the study, both groups had their arterial PaO2 and PaCO2 measured, as well as their quality-of-life questionnaire (STGRQ) score and functional capacity (6MWT and percent predicted 6-MWD). Results. The study group at the end of the study showed improvement ($P < 0.05$) in arterial PaO2 and PaCO2, as well as their quality-of-life questionnaire (STGRQ) score and functional capacity (6MWT and percent predicted 6-MWD with no change in the control group ($P > 0.05$). The mean value of 6MWT showed a strong positive correlation with PaO2 ($r = 0.86$, $P = 0.001$) and at the same time showed a strong negative correlation with the SGRQ score ($r = -0.64$, $P = 0.001$). Conclusions. Aerobika positive expiratory pressure therapy provided an appropriate physiotherapy procedure for patients with bronchiectasis; it maximizes airflow, improves expiratory time and alveolar ventilation, and promotes gas exchange; overall, Aerobika demonstrated great efficacy in draining sputum and improving oxygenation.

Key words:
bronchiectasis, aerobika pep device, blood gases, functional capacity, quality of life

Streszczenie

Informacje wprowadzające. U pacjentów z rozstrzeniem oskrzeli dochodzi do utraty elastycznej i mięśniowej tkanki, co utrudnia prawidłowy drenaż wydzieliny oskrzelowej, który może być chronicznie osłabiony, powodując łagodną lub umiarkowaną niedrożność dróg oddechowych, która wpływa na utlenowanie krwi, a w konsekwencji na jakość życia. Cel: Celem pracy była ocena potencjalnego wpływu treningu przy użyciu trenażera Aerobika z dodatnim ciśnieniem wydechowym na gazometrię krwi tętniczej, wydolność funkcjonalną i jakość życia pacjentów z rozstrzeniem oskrzeli. Materiały i metody. Do badania włączono 60 pacjentów z rozstrzeniem oskrzeli obu płci (24 mężczyzn i 36 kobiet). Uczestnicy zostali podzieleni na dwie główne kategorie, każda obejmująca 30 pacjentów: badanie i kontrola. Obie grupy kontynuowały przyjmowanie leków w okresie badania, a grupa badana realizowała dwa razy dziennie trening z trenażerem Aerobika z oscylacją dodatniego ciśnienia wydechowego. Przed badaniem i po nim w obu grupach zmierzono wartości PaO2 i PaCO2 we krwi tętniczej, a także wykonano kwestionariusz jakości życia (STGRQ) oraz zbadano wydolność funkcjonalną (6MWT i procent przewidywanej wartości 6-MWD). Wyniki. Grupa badana pod koniec badania wykazała poprawę ($P < 0,05$) w zakresie tętniczych PaO2 i PaCO2, a także w zakresie wyników kwestionariusza jakości życia (STGRQ) i wydolności funkcjonalnej (6MWT i procent przewidywanej 6-MWD) bez zmian w grupie kontrolnej ($P > 0,05$). Średnia wartość 6MWT wykazała silną dodatnią korelację z PaO2 ($r = 0,86$, $P = 0,001$) i jednocześnie wykazywała silną ujemną korelację z wynikiem SGRQ ($r = -0,64$, $P = 0,001$). Wnioski. Terapia przy użyciu trenażera Aerobika zapewniła odpowiednią procedurę fizjoterapeutyczną dla pacjentów z rozstrzeniem oskrzeli; maksymalizuje przepływ powietrza, poprawia czas wydechu i wentylację pęcherzykową oraz wspiera wymianę gazową; ogólnie rzecz biorąc, trenażer Aerobika wykazał dużą skuteczność w odprowadzaniu plwociny i poprawie natlenienia.

Słowa kluczowe
rozstrzenie oskrzeli, trenażer Aerobika pep, gazometria, wydolność funkcjonalna, jakość życia

Introduction

Bronchiectasis is a chronic inflammatory condition characterized by abnormal, permanent bronchial dilatation caused by acute or chronic inflammation and infection, which destroys the elastic and muscular tissue. This damage obstructs the normal drainage of bronchial secretions, which can become contaminated over time and cause mild to moderate airway obstruction. The combination of infection and chronic inflammation, if not properly treated, leads to progressive lung damage [1].

Patients characteristically have a daily cough and sputum production, as well as frequent exacerbations. Exacerbations are independently associated with a poor quality of life, decreased lung function, and increased mortality. Inflammation in bronchiectasis is dominated by neutrophils that, when activated, release neutrophil serine proteases, including neutrophil elastase, which is believed to be central to the pathophysiology of bronchiectasis [2]. The vicious cycle hypothesis is used to explain what causes symptoms and exacerbations, with persistent bronchial infection, inflammation, impaired mucociliary clearance, and structural lung damage as main components of the disease. Preventing or suppressing acute and chronic bronchial infection, improving mucociliary clearance, and reducing the effects of structural lung disease are the main goals of treatment [3].

In people with cystic fibrosis, chest physiotherapy is commonly prescribed to aid in the clearing of airway secretions. During expiration, positive expiratory pressure (PEP) devices apply back pressure to the airways. By accumulating gas behind mucus through collateral ventilation and temporarily raising functional residual capability, this may improve clearance. Given the widespread usage of PEP devices, it's important to figure out what evidence there is for their effectiveness [4].

Aim

The aim of this study was to evaluate the potential effect of Aerobika oscillating positive expiratory pressure training on arterial blood gases, functional capacity and quality of life in patients with bronchiectasis.

Subjects and Methods

Design of the study

The study was designed as a randomized, double blind, pre-post-test, controlled trial.

Participants

The study recruited the participation of sixty bronchiectasis patients of both genders (24 males and 36 females). They were between the ages of 45 and 65. They were selected from the Abbassia Chest Hospital's outpatient clinic. All of the patients were medically and clinically stable, with a good mentality to follow the instructions, with the exception of one who was medically unstable.

Ethical approval

All patients were informed about the study's purpose, nature, and potential risks, and written informed consent was obtained prior to participation. The study protocol was reviewed and approved by the Research Ethical Committee of Faculty of Physical Therapy, Cairo University (No: P.T.REC/012/001840).

Randomization

A computer-generated randomized table was the method used to implement the randomization using the SPSS program (version 16 for Windows; SPSS Inc., Chicago, Illinois, USA). Each patient had an identification number. These numbers were assigned into two groups equal in number (n = 30). Sequentially numbered index cards were secured in opaque envelopes. A blinded researcher opened the sealed envelope and allocated the patients according to their groups.

Intervention

All patients were evaluated by taking an arterial blood sample to assess arterial blood gases (partial pressure of oxygen (PaO_2) and partial pressure of carbon dioxide ($PaCO_2$), ST. George's Respiratory Questionnaire was applied to assess the quality of life, Six-minute walk test (6MWT) was conducted to assess functional capacity, percent predicted six-minute walk distance before and after twelve weeks. The study group received Aerobika OPEP training three times per week for twelve weeks and both groups continued their medications.

Arterial Blood Gases

For both patients in both groups, arterial blood gases (PaO_2 and $PaCO_2$) were measured using an acid-base analyzer (SIEMENS 284) and a blood sample obtained from either the radial artery in the wrist or the brachial artery in the arm.

Six-Minute Walk Test

The six-minute walk test was conducted according to ATS guidelines [5]. Patients were asked to walk along with the marked distance as far as they could, they were encouraged to continue walking but allowed to rest when needed without stopping the stopwatch. The distance covered in 6 minute was recorded in meters as well as the percent predicted was calculated by equations [6].

St. George's Respiratory Questionnaire

The St George's Respiratory Questionnaire (SGRQ) is a 50-item self-administered questionnaire assessing the domains of symptoms, activity, and impact. Scores range from 0 to 100, with higher scores indicating more limitations [7]. STGRQ was completed to assess the quality of life of the patients in the same environment. It was crucial to explain to the patients why it was important to collect their opinions to reduce the number of missing data and therefore maximize the quality of the data collected.

Assessment procedures were completed prior to the start of the study, and another measure was taken after twelve weeks for the patients in the study group and the patients in the control group.

Training Program

Aerobika Oscillatory Positive Expiratory Pressure Device

The patients in the study group were trained using the Aerobika oscillatory positive expiratory pressure device (Mw62510ae,

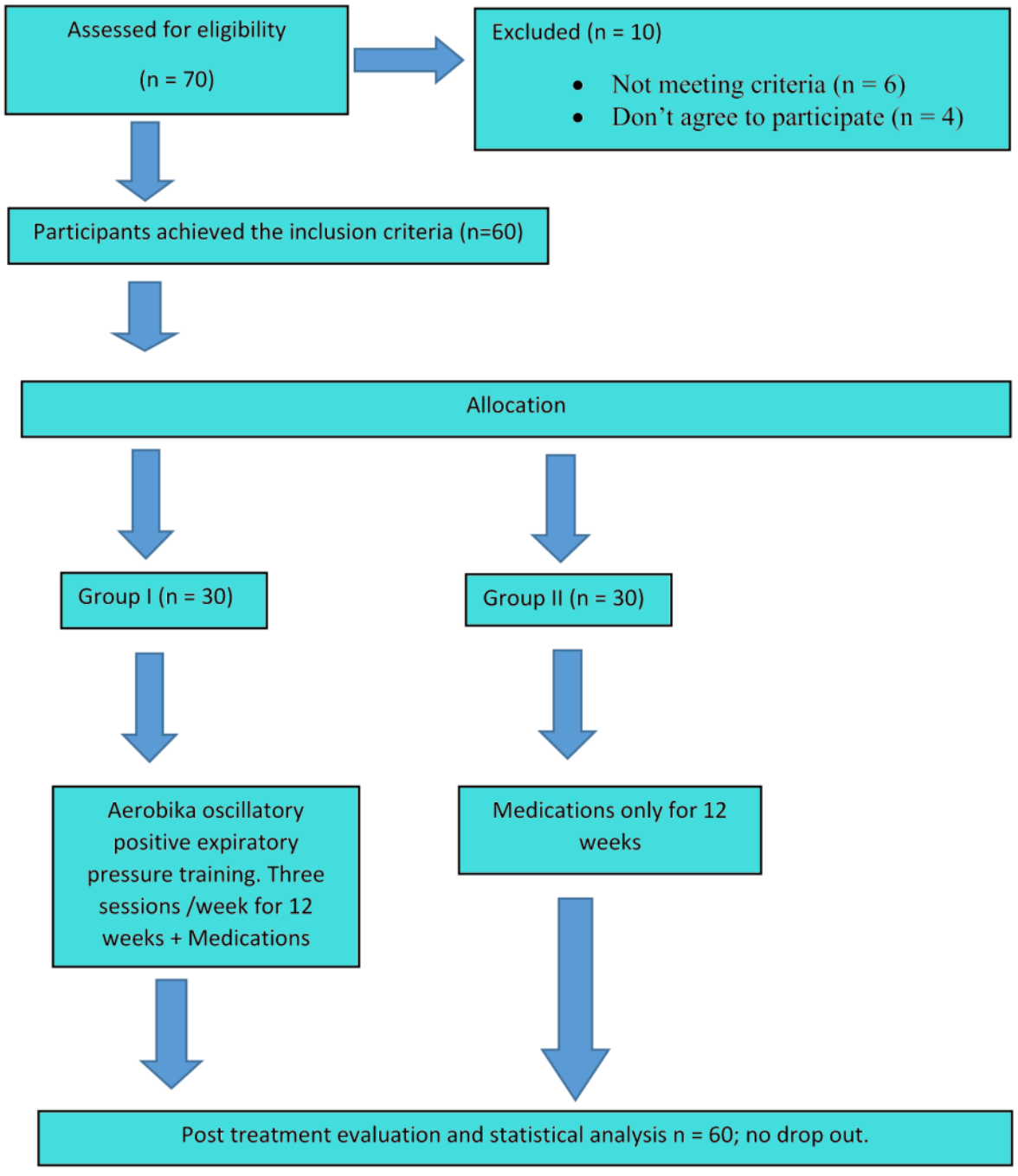

Figure 1. Flow chart of the study

made in Canada). The device consists of a mouthpiece, an Aerobika oscillating top case, and a bottom case. The patient was seated upright in a chair with the mouthpiece squarely between his lips during the process. The patient was then told to inhale deeply enough to fill the diaphragm with air, hold the breath for 3 seconds, and gently exhale while trying to keep the exhalation time three times longer than the inhalation time. Before being advised to cough as much as they needed to clear their secretions, the patient took eight to ten PEP breaths. These procedures were repeated for twenty minutes twice every day, three days a week for a total of twelve weeks [8].

The statistical analysis

The statistics were analyzed using the SPSS software package. The results are shown as the mean ± SD. Multivariate analysis of variance (MANOVA) test were used to assess the significance of differences within each group and between the two groups. Significance was accepted as P-value ≤ 0.05.

Results

The statistical analysis of the data revealed non statistical significant differences in demographic data (age, weight, height, and BMI) between the study and the control group ($P > 0.05$) (Table 1).

Table 1. Comparison of mean values of demographic data between study group and control group

	Study group	Control group	t-value	P-value	P < 0.05
Age [years], Mean ± SD	54.73 ± 5.23	56.03 ± 5.04	0.979	0.331	NS
Weight [kg,] Mean ± SD	57.84 ± 5.71	57.35 ± 4.97	0.352	0.726	NS
Height [cm], Mean ± SD	164.00 ± 6.31	166.23 ± 5.36	1.476	0.145	NS
BMI [kg/m^2], Mean ± SD	21.91 ± 1.24	20.75 ± 1.25	1.166	0.301	NS

Data are expressed as mean ± standard deviation P-value: probability value; NS: non-significant

Statistical analysis of the pre-treatment and post-treatment measurements of the outcomes variables within each group revealed a statistical significant difference for all variables (PaO_2, $PaCO_2$, 6MWT,% predicted 6MWD and SGRQ) in the study group at the post treatment measurements ($P < 0.05$) while in the control group non statistical significant difference was found in the post-treatment measurements for all measured variables ($P > 0.05$) (Table 2).

Table 2. Multiple pairwise comparison of for all clinical measured outcome variables pre and post rehabilitation between study group and control group

		Study group (n = 30) Mean ± SD	Control group (n = 30) Mean ± SD	Mean change	F-value	P-value
PaO_2	Pre-treatment	**76.63 ± 4.08**	74.80 ± 3.44	1.83	3.243	0.074
	Post-treatment	**80.90 ± 4.13**	75.80 ± 4.05	5.10	25.097	0.0001*
	Mean change	**4.27**	1.00			
	Improvement%	**5.57%**	1.34%			
	95% CI	**2.25 – 6.28**	−1.02 – 3.02			
	F-value	**17.566**	0.965			
	P-value	**0.0001***	0.328			
$PaCO_2$	Pre-treatment	**45.20 ± 3.29**	46.33 ± 3.07	1.13	1.905	0.170
	Post-treatment	**42.00 ± 3.11**	45.50 ± 3.22	3.50	18.172	0.0001*
	Mean change	**3.20**	0.83			
	Improvement%	**7.08%**	1.79%			
	95% CI	**1.57 – 4.82**	−0.79 – 2.46			
	F-value	**15.190**	1.030			
	P-value	**0.0001***	0.312			
6MWT (meter)	Pre-treatment	**406.67 ± 41.96**	393.00 ± 38.69	13.67	1.585	0.211
	Post-treatment	**443.33 ± 45.58**	406.33 ± 41.64	11.616	11.616	0.001*
	Mean change	**36.66**	13.33			
	Improvement%	**9.01%**	3.39%			
	95% CI	**15.16 – 58.17**	−8.17 – 34.83			
	F-value	**11.408**	1.509			
	P-value	**0.001***	0.222			
% of predicted 6MWD	Pre-treatment	**72.10 ± 5.46**	68.05 ± 4.95	4.05	2.514	0.057
	Post-treatment	**78.36 ± 5.64**	70.34 ± 5.41	8.02	33.296	0.0001*
	Mean change	**6.26**	2.29			
	Improvement%	**8.68%**	3.37%			
	95% CI	**3.51 – 9.01**	−0.45 – 5.05			
	F-value	**20.344**	2.749			
	P-value	**0.0001***	0.100			

		Study group (n = 30) Mean ± SD	Control group (n = 30) Mean ± SD	Mean change	F-value	P-value
SGRQ score	Pre-treatment	47.13 ± 3.38	46.43 ± 3.14	0.70	0.003	0.953
	Post-treatment	36.27 ± 3.68	55.00 ± 2.04	18.73	12.475	0.0001*
	Mean change	10.86	8.57			
	Improvement%	23.04%	18.46%			
	95% CI	−12.71 – 34.45	−15.02 – 32.15			
	F-value	19.833	0.518			
	P-value	0.0001*	0.473			

*Data are expressed as mean ± standard deviation (SD), PaO2: partial pressure of oxygen, PaCO2: partial pressure of carbon dioxide, SGRQ: ST. George's Respiratory Questionnaire, 6MWT: Six-minute walk test, CI: confidence interval, P-value: probability value * Significant (P < 0.05)*

Comparison of the measured variables between the study and the control group at pretreatment measurements revealed non statistical significant differences (P > 0.05). While comparison of the post-treatment measurements revealed statistical significant differences in favor of the study group (P < 0.05) (Table 2).

Other important findings of the current study are the presence of strong positive correlation between PaO2 and the 6MWT with r = 0.86 and P = 0.0001 (Fig. 2) and presence of strong negative correlation between the 6MWT and the SGRQ score with r = −0.64 and P = 0.0001 (Fig. 3).

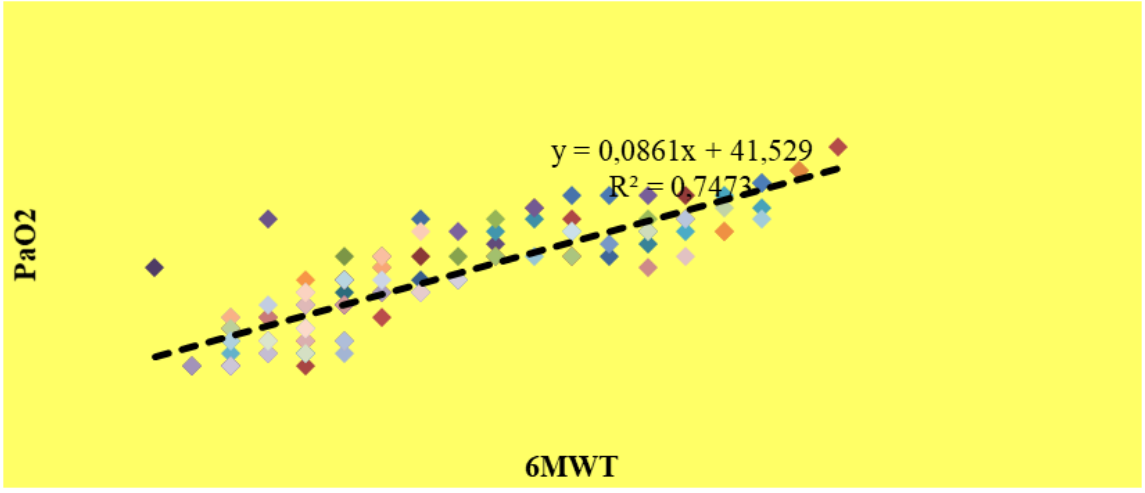

Figure 2. Correlations between 6MWT and PaO_2

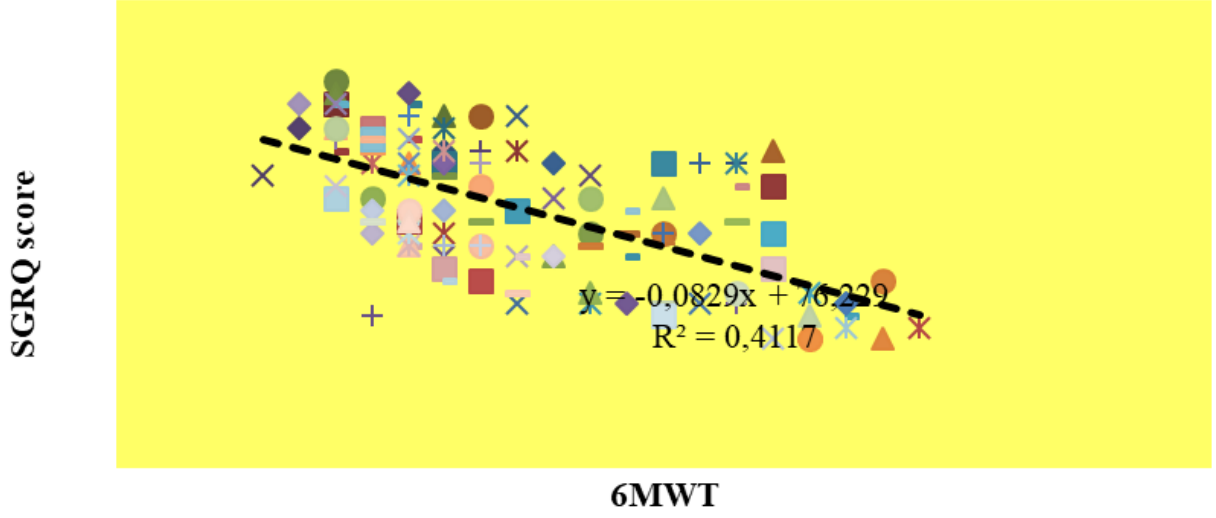

Figure 3. Correlations between 6MWT and SGRQ score.

Discussion

Bronchiectasis is no longer considered a rare condition, but it is still misunderstood because there is a scarcity of clinical evidence and no treatments approved by regulatory authorities in Europe or the United States. Improved understanding of the pathophysiology of bronchiectasis is needed to develop better treatments, and registries will help with this by enhancing disease phenotyping and connecting to patient biobanks/bio services [9].

During the past decade few studies show that oscillating positive expiratory pressure (OPEP) is effective in chronic bronchitis, although the mechanism of this action is incompletely understood and not well focused on bronchiectasis patients, therefore the purpose of this study was to evaluate the efficacy of Aerobika OPEP training device on arterial blood gases, functional capacity, and quality of life in bronchiectasis patient.

The post-treatment measurements revealed a substantial increase in PaO2 in the study group relative to the control group, with a percentage increase of 5.57 percent. At the same time, PaCO2 levels in the study group are significantly lower than in the control group at the end of the program with a percent decrease of 7.08%. These changes in arterial blood gases may be due to the effect of the Aerobika device as an oscillating PEP facilitates gas exchange by shifting equivalent pressure points peripherally to improve airflow, expiratory time, and alveolar ventilation [10].

On expiration, oscillating PEP devices generate varying frequency oscillating waves that are transmitted through the airways, triggering shearing forces that minimize bronchial secretion viscoelasticity and increase mucus transport. Furthermore, the positive pressure generated during expiration aids collateral ventilation, which helps to maintain airway patency and central secretion movement [11, 12].

The current study's findings are consistent with those of previous research, which found changes in PaO2 before and after using active cycle techniques (ACTs). This was due to ACTs' effects on enhancing alveolar ventilation and optimizing ventilation/perfusion matching, which improved gas exchange [13, 14].

Short-term PEP therapy improved PaO_2 and $PaCO_2$ in patients with moderate COPD, which may be due to the opening of the closed airway, which enables trapped air to be exhaled for longer periods of time, resulting in inhalation of a greater amount of gas into the lung and thereby enhancing the gas exchange process and controlling hypoxemia [15].

An important finding of the current study is the improvement in the functional capacity of the patients who received training with the Aerobika device in comparison to the control group. This improvement is evident by the significant increase in the 6MWD measured through the 6MWT which is taken as a measure of the functional capacity. The improvement in the 6MWD occurred in both the absolute distance and in the percentage of predicted distance with a percent of increase of 9.01 and 8.68 respectively.

The impact of the Aerobika device as an oscillating PEP device on prolonging expiratory period, decreasing respiratory rate, and thus reducing airway closure during expiration and dynamic hyperinflation could explain the increase in functional capacity. Also, the increase in 6MWD may be due to the effect of the PEP in assisting secretion clearance, promoting collateral ventilation, preventing premature airway collapse, and thus reducing air trapping [16, 17].

The findings of this study matched those of Heffiner et al., (2008) [16], who found that using a positive expiratory pressure increased the distance walked in the 6MWT in patients after coronary artery bypass graft compared to controls.

According to Padkao et al., (2010) [18], adding a low positive pressure (5 cm H_2O) PEP to rehabilitation programs in moderate to severe COPD patients improves exercise capacity as measured by distance walked during 6MWT. The main effect of PEP devices during exercise is to increase expiratory flow and decrease pulmonary hyperinflation.

PEP treatment increased inspiratory ability in patients with moderate to severe COPD, according to Monteiro et al., (2012). In COPD patients, using PEP during submaximal exercise may help to prevent the development of dynamic hyperinflation [19].

Another important finding of the current study is the significant improvement in the QOL as evidenced by a reduction in the SGRQ score by a percent of 23.04%. Such change may be due to the improved arterial blood gases that result in increasing functional capacity and so increasing the patient's abilities to perform their daily activities and their independence.

Patients with various respiratory disorders reported a higher quality of life after using OPEP devices. In patients with cystic bronchiectasis, the efficacy of the lung flute (as an OPEP device) for bronchial hygiene was demonstrated, and it improved patient compliance, independence, and quality of life in hyper secretory respiratory conditions [20]. Three weeks of regular Aerobika exercise improved quality of life in a combined cohort of COPD and bronchiectasis patients [21]. In non-cystic bronchiectasis patients, twice daily oscillating PEP improved the overall SGRQ as well as the activities domain compared to no treatment [22].

An important finding of the current study is the strong positive correlations between PaO2 and 6MWT results as well as the strong negative correlation between the 6MWT result and SGRQ result which indicate that improved oxygenation is correlated with increased functional capacity and increased quality of life that can be explained by that increasing the PaO2 leading to an increased ability of the patients to sustain daily physical activities with less dyspnea which results in increasing the patient independence and self-confidence that consequently improves the quality of life.

This was supported by Lee et al., (2009) [23], who discovered a stronger connection between the 6MWD and physical symptoms as measured by health-related quality of life in a group of patients with mild to moderate bronchiectasis.

The Aerobika device was shown to reduce the frequency of exacerbations among COPD patients in a published real-world evidence study by Burudpakdee et al., (2017) [24]. With the Aerobika device, there was a decrease in exacerbation frequency, as well as a decrease in rehospitalization rates.

In contrast, the results of the current study contradict the results of a randomized crossover trial conducted on twenty patients with stable bronchiectasis who received training sessions on Acapella and ACBT. According to the findings, oscillating PEP had no benefit over breathing exercises like the active cycle of breathing technique (ACBT) with or without gravity-

assisted drainage in reducing breathlessness. They speculated that the lack of increase in oxygen saturation with oscillating PEP relative to other techniques may be due to minimal gas exchange impairment before commencement of therapy [25]. The differences in the results of this study from the current study may be due to the difference in study duration as they conducted their treatment for three days while the program of the current study was three times per week for twelve weeks.

Conclusion

Blood gas measurements (PO_2 and PCO_2), the quality-of-life questionnaire (STGRQ), and functional exercise capacity assessments (6MWT and percent predicted 6-MWD) all improved in bronchiectasis patients. Easy measures like functional exercise capacity assessment like the 6-MWT and percent predicted 6-MWD, as well as the administration of quality-of-life questionnaires (STGRQ), can be used to assess bronchiectasis and its progress. The latest respiratory device (AEROBIKA) was found to be an adequate physiotherapy procedure for bronchiectasis patients, as it maximizes airflow, improves expiratory time and alveolar ventilation, and facilitates gas exchange.

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Piśmiennictwo/ References

1. Aliberti S, Lonni S, Dore S, et al. Clinical phenotypes in adult patients with bronchiectasis. Eur Respir J 2016; 47: 1113–1122.
2. Chalmers JD, Charles SH, Mark LM, Michael RL, et al. Phase 2 Trial of the DPP-1 Inhibitor Brensocatib in Bronchiectasis. N Engl J Med 2020; 383:2127-37.
3. Polverino E, Goeminne PC, McDonnell MJ, et al. European Respiratory Society guidelines for the management of adult bronchiectasis. Eur Respir 2017; 50: 1700629.
4. McIlwaine M, Button B and DwaK. Positive expiratory pressure physiotherapy for airway clearance in people with cystic fibrosis. Cochrane Database Syst Rev. 2015;17: 6.
5. American Thoracic Society. Guidelines for the Six Minute Walk Test. Am. J. Respir. Crit. Care Med 2002; 166:111-117.
6. Jay SJ. Reference Equations for the Six-Minute Walk in Healthy Adults. Am J Respir Crit Care Med. 2020 1;201(3):393.
7. Jones PW. St George's Respiratory Questionnaire: MCID. Journal of COPD 2005; 2:75- 79.
8. Murray M, Pentland J and Hill A. A randomised crossover trial of chest physiotherapy in non-cystic fibrosis bronchiectasis. Eur Respir J 2009; 34: 1086–1092.
9. Chalmers JD and Hill AT. Mechanisms of immune dysfunction and bacterial persistence in non-cystic fibrosis bronchiectasis. Mol Immunol 2013; 55: 27–34.
10. Nicolini A, Mascardi V, Grecchi B, et al. Comparison of effectiveness of temporary positive expiratory pressure versus oscillatory positive expiratory pressure in severe COPD patients. Clin Respir J 2018; 12: 1274-1282.
11. Wu Y, Potempa LA, El Kebir D, et al. C-reactive protein and inflammation: Conformational changes affect function. Biol Chem 2015; 396: 1181-1197.
12. Narula D and Nangia V.: Use of an oscillatory PEP device to enhance bronchial hygiene in a patient of post-H1NI pneumonia and acute respiratory distress syndrome with pneumothorax. BMJ Case Rep: 2014.
13. Abdel Halim HA, Abo Elnaga HH and Fathy KA. Comparison between active cycles of breathing with postural drainage versus conventional chest physiotherapy in subjects with bronchiectasis. Egypt J Chest Dis Tuberc 2016; 65: 157–165.
14. D'Abrosca F, Garabelli B, Savio G, et al. Comparing airways clearance techniques in chronic obstructive pulmonary disease and bronchiectasis: positive expiratory pressure or temporary positive expiratory pressure? A retrospective study. Braz J Phys Ther 2017; 21: 15–23.
15. Fatma Aboelmagd M. and Farag A. Aly: Physiological Evidence for the Efficacy of Short Term Positive Expiratory Pressure Training in COPD Patients. Bull. Faculty of Physical Therapy Cairo University 2013; 18:53-57.
16. Heffiner MP, Ferreira GM, MennaBarreto SS, Arena R, et al. Incentive spirometry with expiratory positive airway pressure reduces pulmonary complications, improves pulmonary function and 6-minute walk distance in patients undergoing coronary artery bypass graft surgery. Am J Heart 2008, 156:900-908.
17. Oliveira CC, Carrascosa CR, Borghi-Silva A, et al. Influence of respiratory pressure support on hemodynamics and exercise tolerance in patients with COPD. Eur J Appl Physiol 2010, 109:681–689.
18. Padkao T, Boonsawat W and Chulee UJ. Conical-PEP is safe, reduces lung hyperinflation and contributes to improved exercise endurance in patients with COPD:a randomized cross-over trial. J Physiother 2010, 56:33–39.
19. Monteiro MB, Berton DC, Moreira FM, et al. Effects of expiratory positive airway pressure on dynamic hyperinflation during exercise in patients with COPD. Respir Care 2012, 57(9):1405–1412.
20. Ashwini D and Medha D: Effectiveness of lung flute - an OPEP device for bronchial hygiene in a patient with cystic bronchiectasis: a case report. Int J Health Sci Res.2015; 5(5):570-575.
21. Svenningsen S, Guo F, McCormack D, et al. Noncystic fibrosis bronchiectasis: regional abnormalities and response to airway clearance therapy using pulmonary functional magnetic resonance imaging. Acad Radiol 2017; 24: 4–12.
22. Lee AL, Hill CJ, McDonald CF, et al. Pulmonary Rehabilitation in Individuals with Non–Cystic Fibrosis Bronchiectasis: A Systematic Review Archives of Physical Medicine and Rehabilitation. 2017; 98 (4): 774-782.
23. Lee AL, Button BM, Ellis S, et al. Clinical determinants of the 6-Minute Walk Test in bronchiectasis. Respir Res 2009;103(5):780-785.
24. Burudpakdee C, Seetasith A, Dunne P, et al. A real world study of 30-day exacerbation outcomes in chronic obstructive pulmonary disease (COPD) patients managed with Aerobika OPEP. Pulm Ther. 2017;3(1):163–171.
25. Patterson J, Bradley J, Hewitt O, et al.: Airway clearance in bronchiectasis: a randomized crossover trial of active cycle of breathing techniques versus Acapella. Respiration 2005; 72: 239–242.