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POLISH JOURNAL OF PHYSIOTHERAPY

OFICJALNE PISMO POLSKIEGO TOWARZYSTWA FIZJOTERAPII

THE OFFICIAL JOURNAL OF THE POLISH SOCIETY OF PHYSIOTHERAPY

NR 5/2021 (21) KWARTALNIK ISSN 1642-0136



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exercise tolerance in patients
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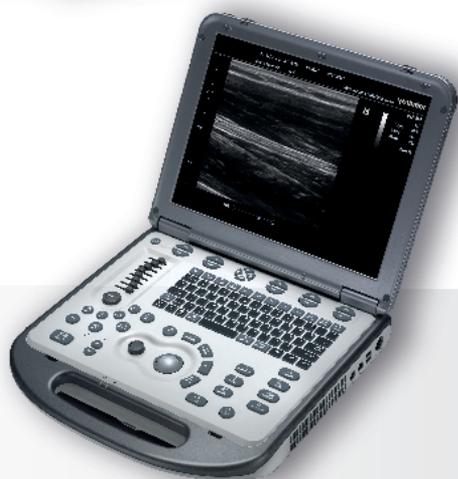
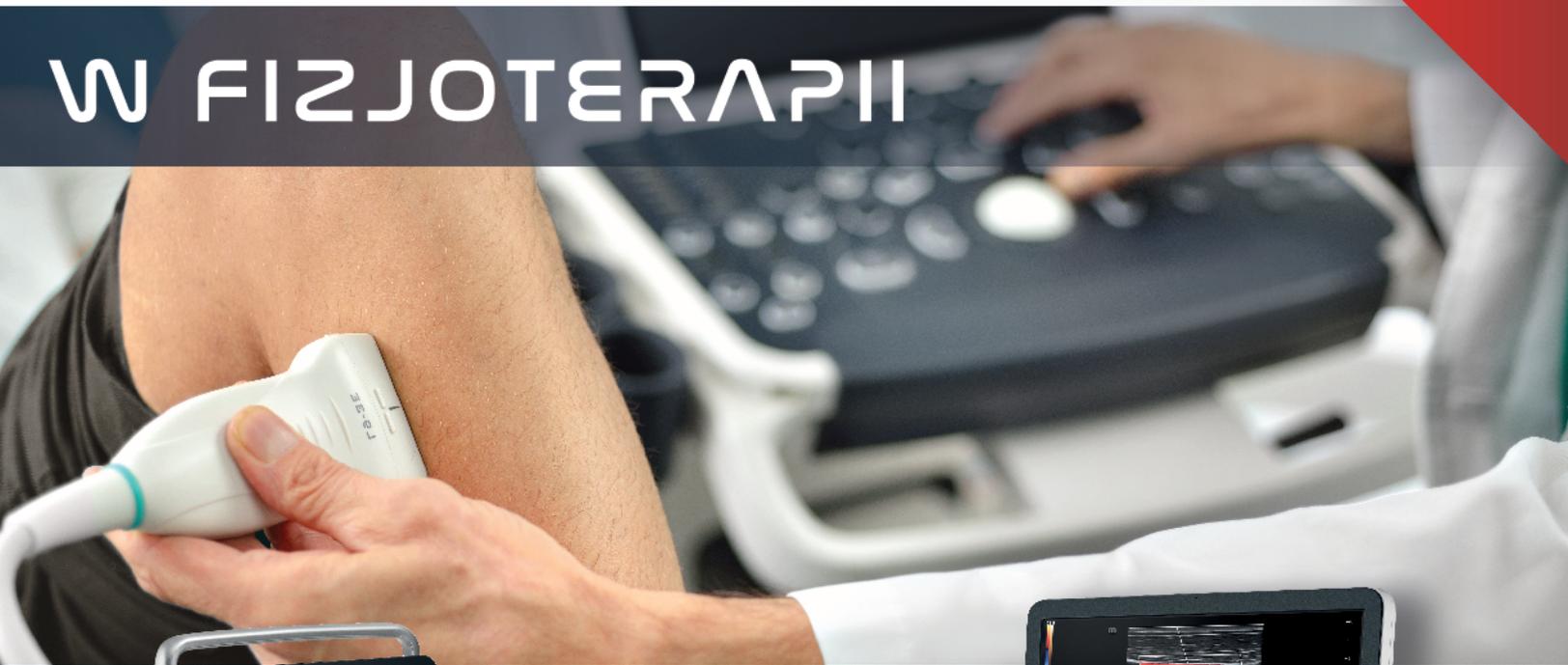
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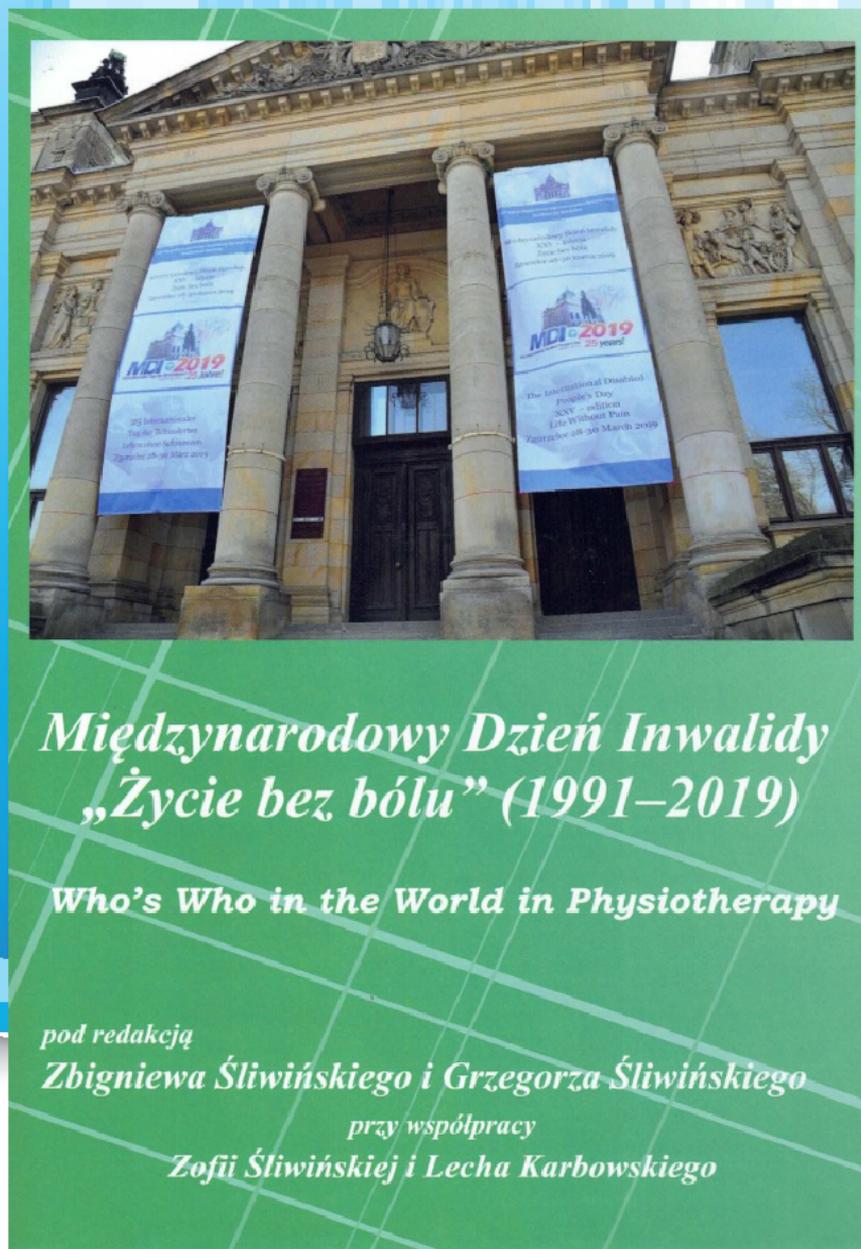
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Effect of new reflexology maneuver on lung function and functional ability of chronic obstructive pulmonary disease patients in pulmonary rehabilitation program: A randomized control trial

Wpływ nowego manewru refleksologicznego na czynność płuc i sprawność funkcjonalną pacjentów z przewlekłą obturacyjną chorobą płuc w programie rehabilitacji oddechowej: randomizowane badanie kontrolne

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Abstract

Introduction. Chronic obstructive pulmonary disease (COPD) is a complex disease that requires multidisciplinary interventions provided by a team work of care providers working closely. Pulmonary rehabilitation should be considered a part of integrated patient management.

Aim. The main goal of this study was to search for the effectiveness of introducing new reflexology maneuver as main component in pulmonary rehabilitation program (PRP).

Material and Methods. Randomized control trial was done on 35 COPD patients of both genders their ages ranged from 50-70 with different degrees of functional severity. Patients were grouped into two groups; Reflexology Group (20 patients) including patients underwent classic PRP with addition of the new reflexology maneuver & control group (15 patients) who underwent classic PRP without reflexology maneuver. Outcomes were mentioned as refinement of pulmonary function, exercise tolerance and capacity measured by 6-min walk test, dyspnea score measured by the Modified British Medical Research Council (mMRC) Questionnaire, health status assigned by Combined Assessment test (CAT) score and parameters of blood gases.

Results. Comparison between different variables in both groups before PRP and reflexology revealed statistically significant differences as regards the mean values of forced vital capacity (FVC) only, although the same comparison after full course of PRP and reflexology assigned statistically significant differences as regards the mean values of partial pressure of O₂ (PO₂), partial pressure of CO₂ (PCO₂), oxygen saturation (SaO₂), forced expiratory volume in 1sec (FEV1), dyspnea & CAT score considering (p < 0.05).

Conclusion. With addition of reflexology to PRP the comprehensive PR program outcomes in COPD patients resulted in significant improvement in dyspnea, blood gases, FEV1 and CAT score.

Key words:

COPD, Pulmonary rehabilitation program, reflexology

Streszczenie

Wprowadzenie. Przewlekła obturacyjna choroba płuc (POChP) to złożona choroba, która wymaga interdyscyplinarnych interwencji zapewnionych przez pracę zespołową ściśle współpracujących świadczeniodawców. Rehabilitacja oddechowa powinna być traktowana jako element zintegrowanego leczenia pacjenta.

Cel. Głównym celem badania było sprawdzenie skuteczności wprowadzenia nowego manewru refleksologicznego jako głównego elementu programu rehabilitacji oddechowej (PRP).

Materiał i metody. Randomizowane badanie kontrolne przeprowadzono na 35 pacjentach z POChP obu płci w wieku od 50 do 70 lat z różnym stopniem zaawansowania. Pacjenci zostali podzieleni na dwie grupy; Grupa refleksologii (20 pacjentów) obejmująca pacjentów poddanych klasycznemu PRP z dodatkiem nowego manewru refleksologicznego i grupy kontrolnej (15 pacjentów), którzy byli poddawani klasycznemu PRP bez manewru refleksologicznego. Wyniki obejmowały polepszenie czynności płuc, tolerancji wysiłku i wydolności mierzone testem 6-minutowego marszu; wynik w zakresie duszności mierzony był kwestionariuszem Modified British Medical Research Council (mMRC), stan zdrowia określony w teście Combined Assessment (CAT) oraz parametry gazometrii krwi.

Wyniki. Porównanie różnych zmiennych w obu grupach przed PRP i refleksologią wykazało statystycznie istotne różnice jedynie w zakresie średnich wartości natężonej pojemności życiowej (FVC), chociaż to samo porównanie po pełnym PRP i refleksologii wykazało statystycznie istotne różnice w zakresie średnich wartości ciśnienia cząstkowego O₂ (PO₂), ciśnienia cząstkowego CO₂ (PCO₂), saturacji tlenem (SaO₂), natężonej objętości wydechowej pierwszosekundowej (FEV1), duszności i wyniku CAT z uwzględnieniem (p < 0,05).

Wniosek. Wraz z dodaniem refleksologii do PRP, wyniki kompleksowego programu PR u pacjentów z POChP przyniosły znaczną poprawę w zakresie duszności, gazometrii, wyniku FEV1 i CAT.

Słowa kluczowe

POChP, program rehabilitacji oddechowej, refleksologia

Introduction

Chronic Obstructive Pulmonary Disease (COPD) accompanied by permanent respiratory symptoms and airflow reduction as a result of airway or alveolar changes. COPD could be preventable and treatable disease which is usually caused by significant exposure to noxious particles [1]. Whereas COPD considered as airway disease which is obstructive and progressive, it leads to reduction in physical activity accompanied by poor health-related quality of life (HRQoL) in addition to psychological problems [2]. Pulmonary rehabilitation (PR) is a combined intervention designed for people with chronic respiratory disorders to improve their physical. PR which includes for example: exercise training, education and behavior change, will lead to long-term adherence of health-enhancing behaviors as a result of improvement in physical and emotional condition [3].

PR runs as a combined therapy to pharmacological therapy (not competitive). They must work closely together for better outcomes [4]. Reflexology context defined reflex as the 'reflection' of all the organs, systems and structures of the body onto the feet. The body equilibrium and health is enhanced by working on these reflexes (reflex therapy) to produce a relaxation and effect in their related body regions. Reflex therapy performed by using the thumbs or index fingers to apply controlled pressure to the feet points called reflex points. Reflex therapy also influences the relationship between different functions of body organs, processes and parts. The reflexes working on feet points are more sensitive than hand reflexes and more efficacious to work with them [5]. Corresponding organs of foot reflex points stimulated by reflexology will generate effects by body cell responses [6]. Reflexology owns a positive effect on tension, mental state, immunity, and the sense of well-being [7]. A few research works investigate the effects of reflexology on COPD patients especially in pulmonary rehabilitation outcomes. Thus, the aim of this study is to assess effectiveness of new reflexology maneuver in pulmonary rehabilitation outcomes in (COPD) patients.

Materials and methods

Study Design

Prospective pre-test post-test randomized controlled study was done after all patients were given an informed consent before the start. The study population consists of 35 patients with a clinical diagnosis of COPD. They were chosen from outpatient clinic of chest diseases department, at faculty of medicine Beni-Suef University.

The included patients were classified into two groups; Group (1) reflexology group, 20 patients underwent classic PRP with addition of reflexology maneuver and group (2) control group, 15 patients who underwent classic PRP without reflexology maneuver.

Inclusion criteria: The diagnosis of COPD was confirmed by clinical history and examination consistent with emphysema or chronic Bronchitis, history of cigarette smoking or history of indoor biomass fuel exposure, and irreversible airflow obstruction defined by pulmonary function tests. All patients were fulfilling the criteria of COPD according to latest GOLD classification. All patients were with FEV1 less than 50.

At least 3 months of successful smoking cessation, for all patients to become eligible for outpatient pulmonary rehabilitation. The patients were educated on COPD disease progression and trained on use of inhalers, breathing strategies with healthy diet and psychological counseling.

Exclusion criteria

Patients with disorders which make exercising not safely as severe cardiovascular disease or severe musculoskeletal problems. Patients are unable to follow simple instructions as patients with significant cognitive impairment or lack of motivation to participate in the program. Contraindications to reflexology include: Burns, fractures, bites, Impetigo, scabies, chicken pox, mumps and any contagious skin disease. Foot eczema or severe psoriasis, cuts, grazes, open skin and rashes [6].

Randomization

The recruited patients were randomly assigned, after signing consent form, into two groups. A single blind randomization was carried out by assigning the odd numbers to group (1) (reflexology group) and the even numbers were assigned to group (2) (control group) – Figure (1).

Reflexology group intervention

The program consists of a one-hour divided into 45 minutes of classic PRP and 15 minutes for reflexology maneuver, three times a week for 8 weeks with a total of 24 sessions. Patient underwent strengthening, endurance exercise and respiratory muscle exercises. Each rehabilitation session consisted of exercises on treadmill, a stationary cycle ergometer, stretching exercises and light floor exercises with and without weights. Reflexology is performed by applying pressure to specific areas, these areas claimed to correspond to the internal organs, pressure applied by using the thumb and fore finger [8]. Patients in group (1) were positioned in supine and relaxed in bed, a neutral lubricant cream was applied for the feet then patients received reflexology on both feet. Reflexology performed by applying intermittent pressure on the reflex zones of the foot, targeting lung zone showed by reflexology map (Fig. 2). To obtain optimum relaxation; massage or moving ankle in circles should be done during application of pressure. Warm up for the first three minutes was done for each foot through rotating the toes and ankles [9].

Control group intervention

The program consists of 45 minutes of classic PRP as same as done in reflexology group without reflexology maneuver, three times a week for 8 weeks with a total of 24 sessions.

Rehabilitation Outcomes assessment

- Pulmonary function tests: resting spirometry was performed by masterscreen NO.781040 (care fusion). pre and post bronchodilator test with post bronchodilator parameters taken (FVC-FEV1-FEV1/FVC) [10].
- Assessment of Exercise tolerance by 6-min walk test (6MWT) [11].
- Symptoms assessment by the Modified British Medical Research Council (mMRC) Questionnaire [12].

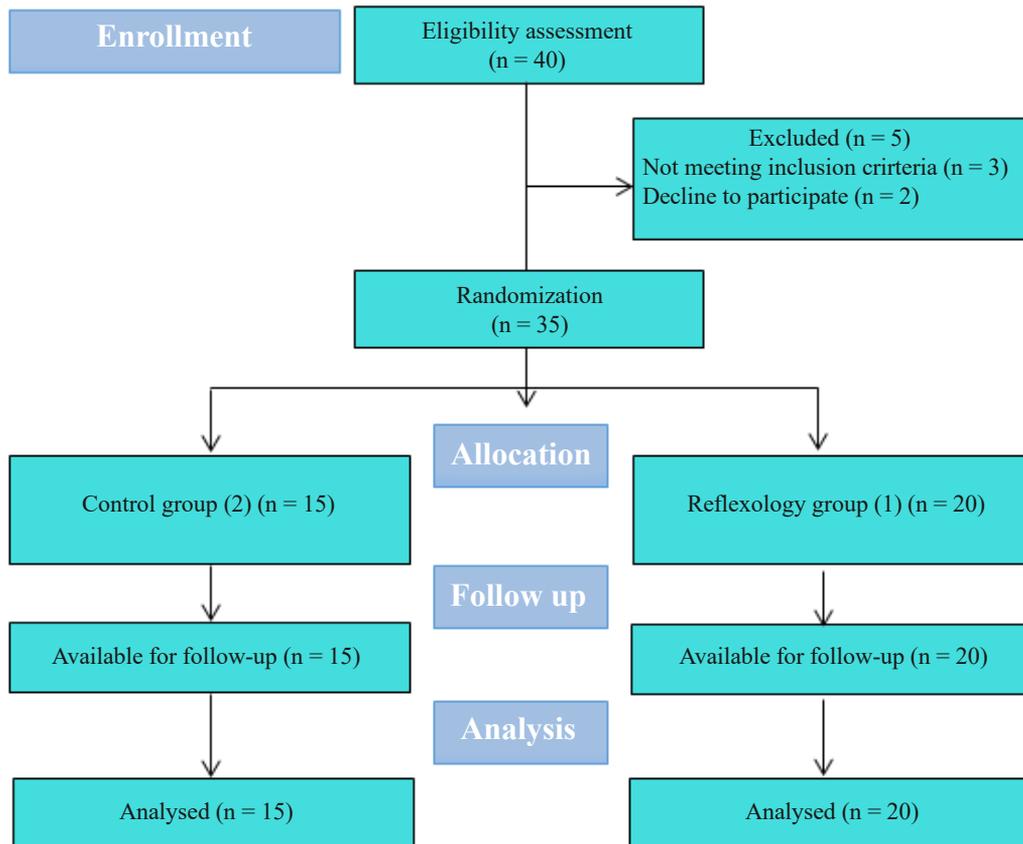


Figure 1. Flow chart of the study

Foot Reflexology Chart

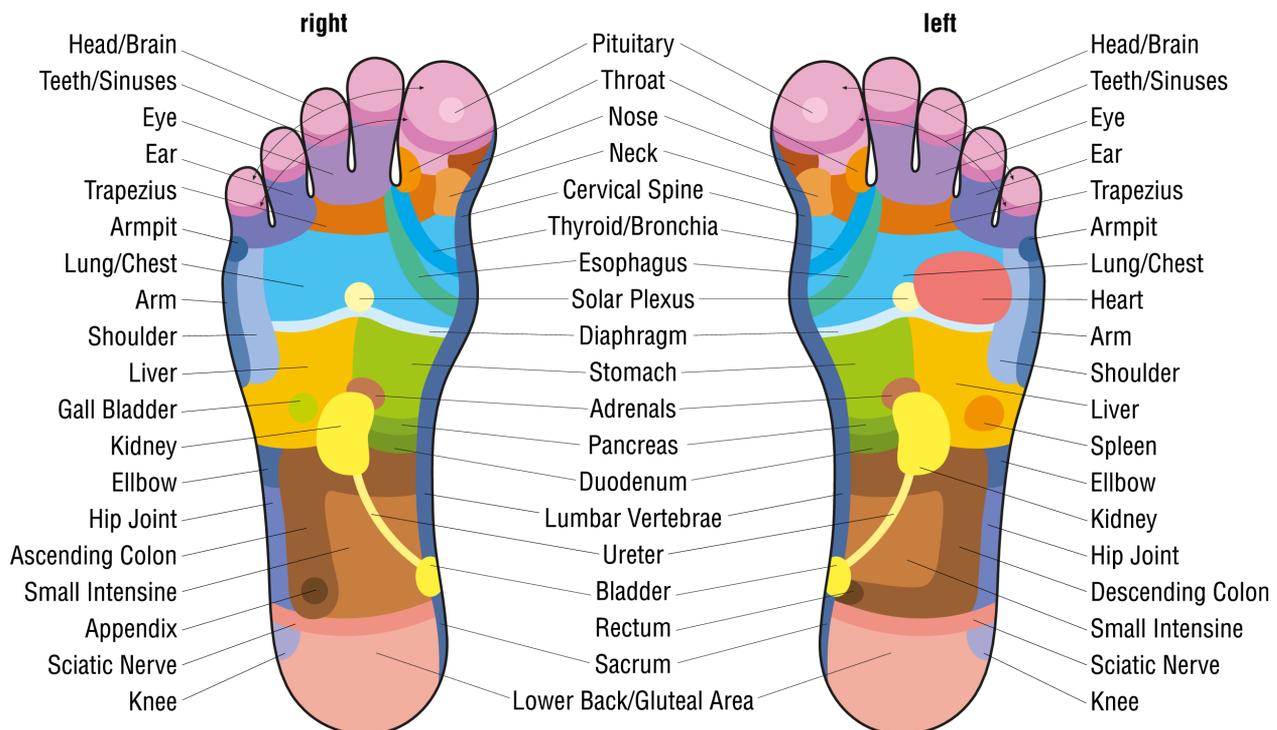


Fig. 2. Foot reflexology chart. Source: Chroma Stock

- Assessment of health status impairment in COPD by CAT score. The COPD Assessment Test is an 8-item [13].
- Arterial blood gas measurements: twenty minutes after discontinuing oxygen therapy in patients who on oxygen therapy [11].
- Body mass index BMI measurement which compares a person's weight and height [11]. Body mass index is calculated by dividing the weight in kilograms by the height in meters squared

Statistical Analysis

The statistical analyses calculated by SPSS 19. The mean and SD used to describe the study results, unless stated otherwise,

and proportional data showed by percentages. Two groups were compared using the independent samples unpaired t test. P value of .05 or less was considered statistically significant, while paired t test used to compare each group pre and post intervention.

Results

In Table 1. the mean age in reflexology group was 66.7 (71-59) while in control group was 66.8 (73-61) with no statistically significant difference between them. Regarding gender distribution in reflexology group there were 15 male & 5 females while in control group were 13 male & 2 females.

Table 1. Physical characteristics in both groups

	Reflexology Group Mean ± SD	Control group Mean ± SD	P-value
Age – range [years]	71-59	73-61	0.334
Age – mean (SD) [years]	66.73 (3.16)	66.80 (2.85)	
Sex:			
Male	15 (75%)	13 (86%)	0.75
Female	5 (25%)	2 (13%)	

Analyzing reflexology group there were statistically significant differences as regards the mean values of PO₂, PCO₂, SAO₂, FEV1, 6MWT, dyspnea and CAT. before and after intervention. In control group there were statistically significant differences as regards the mean values of PO₂, PCO₂, FVC, dyspnea and BMI before and after intervention (Table 2).

Comparison between different variables in both groups before intervention there were statistically significant differences as regards the mean values of FVC only (Table 2).

In table 2 comparison between different variables in both groups after intervention there were statistically significant differences as regards the mean values of PO₂, PCO₂, SaO₂, FEV1, dyspnea and CAT score.

Table 2. Mean, SD, and percentage change values of BMI, WC, Abdominal subcutaneous fat thickness, TC, TG, LDL, VLDL, and HDL in both tested groups

		Pre- treatment Mean ± SD	Post- treatment Mean ± SD	Mean difference
PO ₂	Pre-treatment	42.63 ± 7.5	39.88 ± 6.2	0.234 ^{NS}
	Post-treatment	67.60 ± 6.9	48.00 ± 7.8	0.000 ^S
	p value**	0.000 ^S	0.001 ^S	
PCO ₂	Pre-treatment	48.73 ± 6.0	49.7 ± 5.9	0.614 ^{NS}
	Post-treatment	40.04 ± 4.5	44.40 ± 4.8	0.010 ^S
	p value**	0.000 ^S	0.013 ^S	
SaO ₂	Pre-treatment	88.10 ± 4.3	83.66 ± 6.3	0.070 ^{NS}
	Post-treatment	93.90 ± 2.1	86.06 ± 4.4	0.000 ^S
	p value**	0.000 ^S	0.283 ^{NS}	
FVC	Pre-treatment	53.78 ± 15.2	43.16 ± 5.9	0.016 ^S
	Post-treatment	56.18 ± 15.2	51.82 ± 8.2	0.324 ^{NS}
	p value**	0.168 ^{NS}	0.005 ^S	
FEV1	Pre-treatment	33.78 ± 9.9	29.26 ± 7.0	0.142 ^{NS}
	Post-treatment	45.2 ± 13.3	36.08 ± 11.9	0.044 ^S
	p value**	0.000 ^S	0.093 ^{NS}	
FEV1\FVC	Pre-treatment	48.55 ± 11.2	43.96 ± 13.1	0.275 ^{NS}
	Post-treatment	50.78 ± 10.6	48.55 ± 12.8	0.394 ^{NS}
	p value**	0.098 ^{NS}	0.362 ^{NS}	

		Pre-treatment Mean ± SD	Post-treatment Mean ± SD	Mean difference
6MWT	Pre-treatment	209.05 ± 65	218.13 ± 62.8	0.664 ^{NS}
	Post-treatment	293.05 ± 74.3	274.20 ± 91.3	0.506 ^{NS}
	p value**	0.000 ^S	0.094 ^{NS}	
DYSPNEA (mMRC)	Pre-treatment	3.25 ± .78	3.40 ± .73	0.570 ^{NS}
	Post-treatment	1.95 ± .88	2.53 ± 1.1	0.009 ^S
	p value**	0.000 ^S	0.048 ^S	
CAT score	Pre-treatment	14.25 ± 7.1	13.33 ± 7.05	0.692 ^{NS}
	Post-treatment	25.60 ± 6.4	18.13 ± 7.1	0.004 ^S
	p value**	0.000 ^S	0.139 ^{NS}	
BMI [kg/m ²]	Pre-treatment	25.1 ± 6.3	23.13 ± 4.5	0.318 ^{NS}
	Post-treatment	26.3 ± 4.8	27.26 ± 5.1	0.572 ^{NS}
	p value**	0.531 ^{NS}	0.038 ^S	

* Inter-group comparison; ** intra-group comparison of the results pre- and post-treatment.

NS $p > 0.05$ = non-significant, S $p < 0.05$ = significant, p = probability.

PRP = Pulmonary rehabilitation program, PO₂ = Partial pressure of oxygen, PCO₂ = Partial pressure of carbon dioxide, SaO₂ = oxygen saturation,

FVC = Forced vital capacity, FEV1 = Forced expiratory volume in 1 s, 6MWT = 6-min walk test, (mMRC) = Modified Medical Research Council

Questionnaire, CAT = Combined Assessment test, BMI = Body mass index

Discussions

Smoking, aging, and inactivity, linked to concomitant chronic diseases as well as to most patients with COPD which leads to negative impact on health status and survival [14, 15]. One of the most effective therapeutic strategies which reported to improve dyspnea, health status and exercise capacity is pulmonary rehabilitation [16, 17]. Pulmonary rehabilitation may help reduce anxiety symptoms, so this study was done on thirty-five stable non-exacerbating COPD patients with different obstructive pulmonary functions according to latest GOLD classification on their usual pharmacological treatments. All patients underwent PRP but 20 patients received reflexology in addition to PRP (reflexology) group while the remaining 15 patient (control) group did not receive reflexology. Aiming not only to assess PRP on COPD patients but also to study the effectiveness of adding this new reflexology maneuver to PRP.

The mean age in reflexology group was 62.45 (72-52) while in control group was 66.6 (73-52) with statistically no significant difference between them. Regarding gender distribution in reflexology group there were 15 males and 5 females while in control group were 13 male and 2 females. After pulmonary rehabilitation program we found in reflexology group there were improvement in different pulmonary function parameters, arterial blood gases, dyspnea, BMI, exercise capacity, health status by CAT score with statistically significant differences as regards the mean values of PO₂, PCO₂, SaO₂, FEV1, 6MWT, Dyspnea, CAT score. While in control group there were statistically significant differences as regards the mean values of PO₂, PCO₂, FVC, Dyspnea and BMI. Comparison between different variables in both groups after intervention revealed statistically significant differences as regards the mean values of PO₂, PCO₂, SaO₂, FEV1, dyspnea and CAT score.

Exercise capacity limitation, decreased quality of life and

increased frequency of exacerbations are all linked to subjects with COPD and closely correlated to weight loss [18]. Criner et al. [19] found that here were statistically significant improvement of the mean values of FEV1, FEV1/FVC but there were improvement in 6mwt but not significant After eight weeks of pulmonary rehabilitation. Exercise training in patients with COPD proved many benefits as such as improvements in exercise performance, peripheral muscle function, and quality of life [19]. Behavioral, social and biological factors contribute to depression and anxiety symptoms in people with COPD [20]. Enhancing hemostasis, improving body's blood flow and reducing blood pressure and stress all of that were confirmed as a benefit for applying reflexology [21]. A primary advantage also was reported as the psychologically relaxing effect of touch during foot massage. In current study in comparison between different spirometry functions, ventilatory capacity, dyspnea score and health status by CAT score in both reflexology and control groups there were statistically significant difference only regarding FVC before intervention while when comparing the same parameters after intervention there were statistically significant difference regarding PO₂, PCO₂, SaO₂, FEV1, dyspnea and CAT score so addition of reflexology maneuver to PRP resulted in significant improvement in different arterial blood gas parameters, functional severity of COPD, dyspnea score by mMRC and health status by CAT score. Complementary and alternative medicine gained widespread acceptance, largely without the clinical evidence for safety and efficacy [22]. Reflexology considered as one of the most popular alternative and complementary medicine. Reflexology is applying pressure to specific reflex points of the hands and feet, corresponding with specific areas of the body [23]. Manipulating these points with specific massage, increase circulation the corresponding organs [24]. Several theories exist to explain unknown exact mechanism of reflexology

action. Reflexology assumed to increase blood supply and relieve tension [24]. Reflexology was mentioned as to activate the body's own healing power [25]. It was found that COPD related dyspnea and fatigue reduced by reflexology. Clinical relevance: Complementary methods such as reflexology should be used as a combined therapy with pharmacological methods to reduce dyspnea and fatigue of COPD patients [26]. Wilkinson et al. found that there were no significant changes in patients' respiration function tests after reflexology; however, there was an improvement compared to the first measurement, but there was no significant change in their quality of life [27].

Study limitations

The study was limited by extraneous factors that may have interfered with the results of this study, these factors are related to variations in life style between patients as activity

level, being working/non-working, ergonomical design of the surrounding environment of participants at home and/or work. Another limitation was the psychological factor of the participants during the period of application of the study.

Conclusion

In conclusion, this study indicated that addition of reflexology maneuver to PRP showing more significant improvement in in different arterial blood gas parameters, functional severity of COPD, dyspnea score by mMRC and health status by CAT score but a larger scale study with a longer time frame is needed for a full evaluation of these effects.

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