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CUPRINS / CONTENT

PURSED LIP BREATHING INCREASES UNSUPPORTED UPPER EXTREMITY EXERCISE ENDURANCE AND REDUCES DESATURATION IN COPD

RESPIRAȚIA PRINTRE BUZELE STRÂNSE CREȘTE REZISTENȚA LA EXERCIȚIILE EXECUTATE CU MEMBRELE SUPERIOARE ȘI REDUCE DESATURAȚIA, ÎN BPOC

Tanushree A. Bharadwaj[1], Mariya Prakash Jiandani[2], Amita Mehta[3]

Key words: pursed lip breathing, unsupported upper extremity exercise, oxygen saturation, exercise endurance, chronic obstructive pulmonary disease (COPD).

Abstract:
Introduction: Patients with chronic obstructive pulmonary disease (COPD) report reduced arm exercise capacity, increased fatigue and dyspnea when performing activities of daily living (ADLs) that require the use of upper limbs. Also, arm activity has been noted to result in abnormal dysynchronous breathing patterns. PLB (pursed lip breathing) works to improve expiration, by requiring active and prolonged expiration and by preventing airway collapse.
The objective of this study was to evaluate the influence of PLB on upper extremity exercise endurance, oxygen saturation, and dyspnea in patients with moderate to severe COPD. **Method:** An experimental cross-over study was conducted at the Physiotherapy Department, Seth GSMC and KEMH, Mumbai, India. Sixty patients with moderate to severe COPD were selected. All patients performed unsupported upper extremity exercise with and without PLB in random order. Upper extremity exercise endurance, oxygen saturation, heart rate, blood pressure, respiratory rate, patients' estimated dyspnea, and rate of perceived exertion were recorded before, immediately after, 3 minutes, and until recovery to the baseline on a Borg Category Ratio 10 scale.
Result: Wilcoxon matched-pairs signed rank test was done to compare means of any two variables. Statistical significance was set at $p < 0.05$.The difference between the exercise endurance (number of sets and duration) with spontaneous breathing (SB) and PLB was found to be significant, showing that the patients could exercise more with PLB. The drop in oxygen saturation with PLB is significantly less as compared to SB. The average drop in oxygen saturation was 1.6% less when spontaneous pursed lips breathing was employed. The increase in rate pressure product, respiratory rate, rate of perceived exertion, and dyspnea were significantly less with PLB. **Conclusion:** Pursed lip breathing can be a useful technique to increase unsupported arm exercise endurance and reduce oxygen desaturation during exercise in patients with moderate to severe COPD.

Cuvinte cheie: respirație printre buzele strânse, exerciții cu membrele superioare, saturația de oxigen, rezistența la exerciții, boală pulmonară cronică obstructivă (BPOC).

Rezumat:
Introducere: Pacienții cu boală pulmonară cronică obstructivă (BPOC) acuză scăderea rezistenței la executarea exercițiilor cu membrele superioare (MS), oboseală marcată și dispnee la realizarea activităților zilnice (ADL) care necesită folosirea membrelor superioare. De asemenea, s-a constatat că folosirea MS determină paternuri de desincronizare respiratorie. PLB (respitația cu buzele strânse) îmbunătățește expirația, deoarece necesită un expir activ și prelungit, prevenind astfel colapsul căilor respiratorii. **Obiectivul** acestui studiu este de a evalua influența PLB asupra rezistenței la executarea exercițiilor cu (MS), a saturației de oxigen și a dispneei, la pacienții cu BPOC moderat spre sever. **Metodă:** Studiul experimental s-a realizat la Departamentul de Fizioterapie, Seth GSMC și KEMH, Mumbai, India. Au fost luați în studiu un număr de 60 de pacienți cu BPOC sever sau moderat. Toți pacienții au executat exerciții cu MS folosind sau nu PLB, în ordine aleatorie. S-au evaluat inițial, la 3 minute și final, până la atingerea pragului 10 pe scala Borg: rezistența la executarea exercițiilor cu MS, saturația în oxigen, frecvența cardiacă, tensiunea arterială, rata respiratorie, gradul de dispnee, rata percepției exortului. **Rezultate:** S-a efectuat testul Wilcoxon pentru eșantioane pereche, pentru a compara mediile variabilelor. Semnificația statistică s-a stabilit la $p < 0.05$. Diferența dintre rezistența la exerciții (numărul de seturi și durata) cu resprație spontană (RS) și PLB a fost semnificativă, demonstrând faptul că pacienții au putut executa mai multe exerciții folosind PLB. Scăderea saturației de oxigen cu PLB este semnificativ mai redusă în comparație cu RS. Media reducerii saturației de oxigen a fost mai mică cu 1.6% față de RS. Creșterea ratei presoare, respiratorii și a percepției efortului și dispneea au fost semnificativ mai reduse cu PLB. **Concluzii:** PLB poate fi o tehnică utilă pentru creșterea rezistenței la executarea exercițiilor cu MS și reducerea saturației de oxigen în timpul executării exercițiilor, la pacienții cu BPOC moderat spre sever.

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Introduction

Chronic obstructive pulmonary disease (COPD) is defined as a group of lung diseases characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible (World Health Organization, 2013). India contributes very significantly to mortality from COPD 102.3/100,000 and 6,740,000 Disability adjusted life years (DALYs) out of world total of 27,756,000 DALYs; thus significantly affecting health related quality of life in the country. COPD is surpassing malaria and tuberculosis numbers and it is expected that the gap would get wider in the near future [1].

Patients with COPD report reduced arm exercise capacity, fatigue, and dyspnea when performing activities of daily living (ADLs) that require the use of upper limbs. [2] They acquire an irregular, superficial, and rapid respiratory pattern when performing activities requiring the upper limbs, such as tying a pair of shoes and combing hair. [2] Arm activity had been noted to result in abnormal breathing patterns during common daily activities. Dysynchronous breathing patterns in some patient with severe Chronic Airflow Obstruction with Unsupported Arm Exercise but not lower extremity activity. [3] The same authors noted that most patients with Chronic Airflow Obstruction shifted a portion of ventilatory burden from the inspiratory muscles of the rib cage to the diaphragm and to the expiratory muscles during unsupported arm activity [4]

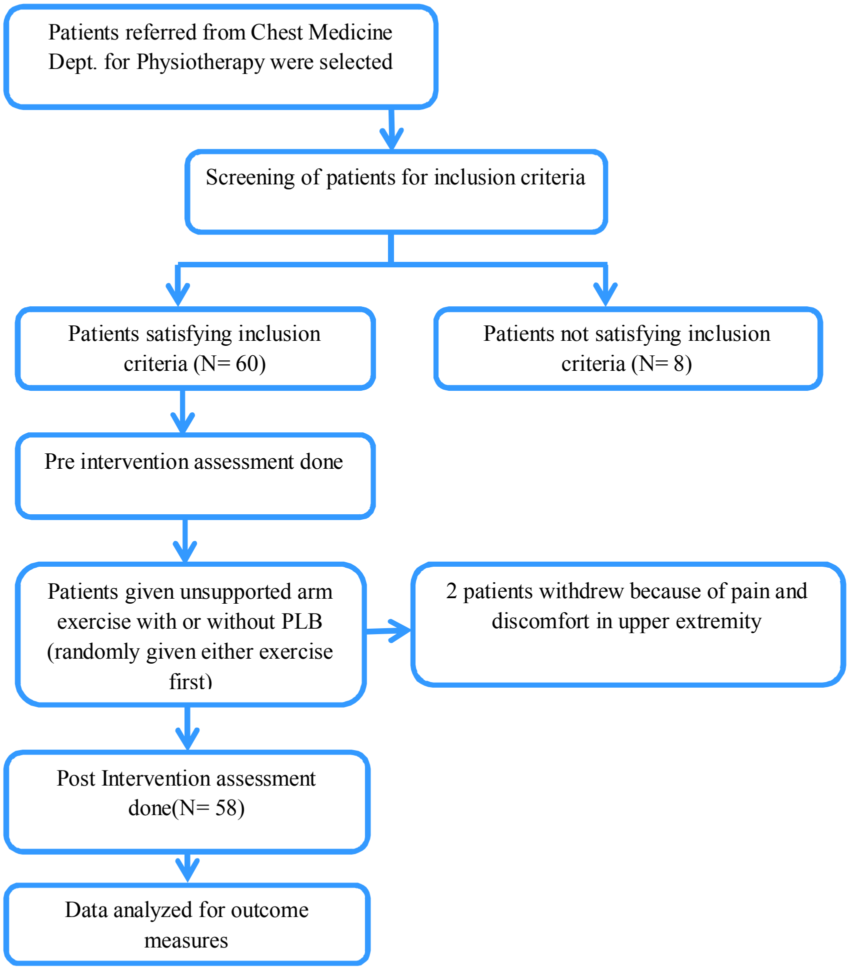
PLB works to improve expiration, both by requiring active and prolonged expiration and by preventing airway collapse. A study done by G Faager concluded that, spontaneous PLB can be a useful technique to increase walking endurance and reduce oxygen desaturation during walking in patients with moderate to severe COPD. [5] PLB during exercise and recovery results in lower post exercise respiratory rate (RR) and speeds return to pre-exercise breathlessness, compared with exercise and non-PLB. [6] However, there is a knowledge gap on the effect of PLB on unsupported upper extremity exercise.

Purpose

The present study aimed to find out the effect of PLB on Unsupported arm exercise endurance, oxygen saturation, rate pressure product, dyspnea, respiratory rate and rate of perceived exertion in patients with COPD.

Material and Methods

The study was carried out at Outpatient Pulmonary Rehabilitation Centre, Physiotherapy Department, Seth GSMC & KEMH. This is an Experimental Cross – over study approved by the ethics committee of the institute. Clinically stable patients between 30 to 70 years of age, of either gender, receiving optimal medical therapy with moderate to severe COPD according to GOLD Classification system for severity of COPD (2006) were included in this study. Patients with dyspnea at rest [Grade 4 on NYHA scale], any musculoskeletal disorder limiting arm exercises, and other cardiac disease potentially contributing to dyspnea were excluded. Also, patients included in upper extremity exercise, and who are already trained to perform PLB were excluded from the study.Patients were allowed to discontinue from the study in case of exacerbation of dyspnea or RPE on Borg's Scale during exercise of more than 5 or 6 points, upper extremity fatigue (inability to continue further), pain in arms and unwillingness to continue. A written informed consent was obtained after explaining the procedures.



Baseline parameters were recorded. Patients were randomly allocated to either Session (A) – no PLB, or Session (B) – with PLB first. They were trained to perform pursed lip breathing for Session (B). Both the sessions were completed in their two consecutive visits with a gap of maximum 3 days.

Session (A): Patients were in sitting position. The following set of unsupported arm exercises were given;

1. Bilateral shoulder flexion and extension.
2. Bilateral shoulder abduction and adduction.
3. Unilateral shoulder circumduction on right and left side.

Patients performed 5 repetitions of each exercise on rhythmic beats at frequency of 1 per two seconds with spontaneous breathing (SB). The protocol was repeated until patient requests to stop. A mouth piece was used to prevent pursed lip breathing. Post exercise parameters were recorded immediately after, 3 minutes, and until recovery to the baseline. Total number of repetitions and time taken were recorded.

Session (B): Subjects performed the same exercises in the same sequence and the difference was performance of pursed lip breathing during the exercise. Post exercise parameters were again recorded immediately after, 3 minutes, and until recovery to the baseline

The following outcome measures were recorded:

1. Upper extremity exercise endurance
2. SpO_2
3. Rate pressure product
4. Respiratory rate
5. Dyspnea on Borg's scale
6. Rate of perceived exertion on Borg's scale

Result

Data was analysed using GraphPad Prism version 6 (La Jolla, CA, USA). Normality of the data was tested using Kolmogorov-Smirnov test. As it did not follow normal distribution, Wilcoxon matched-pairs signed rank test was done to compare means of any two variables. Data of 58 subjects was analysed. Statistical significance was set at $p < 0.05$. The power of sample size for hypothetical difference between pre and post SpO_2 values with PLB was determined using GraphPad StatMate 2.0.

The power of the experiment was computed using paired t-test, standard deviation difference of pre and post SpO_2 values with PLB (1.27), and significance level ($\alpha = 0.05$). [24] The sample size in our experiments had a 95% power to detect a smallest average difference of 0.60 between pairs with a significance level of α=0.05 (two-tailed). [24]

The demographic data of the subjects are shown in Table 1 and results in table 2(a) and 2(b)

Table 1: Demographic information of the subjects

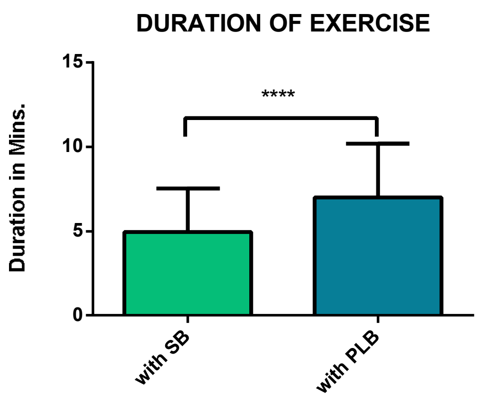
	Maximum	Minimum	Mean	Standard Deviation		Total (%age)
Age (years)	60	42	56	5.3		
Gender					**Males**	45 (77.58%)
					Females	13 (22.41%)
Height (cms)	168	145	159	6.6		
Weight (kgs)	102	31	53	12		
BMI (kg/m²)	36.57	11.52	20.85	4.44	**under wt.**	13 (22.41%)
					Normal	28 (48.27%)
					Over wt.	6 (10.34%)
					Obese	10 (17.24%)
% FVC (%)	137.12	33.96	68.85	20.83		
%FEV_1 (%)	78.64	25.36	49.42	15.28		
FEV_1/FVC	0.69	0.19	0.51	0.12		
GOLD Classification					**Moderate**	33 (56.89%)
					Severe	25 (43.10%)

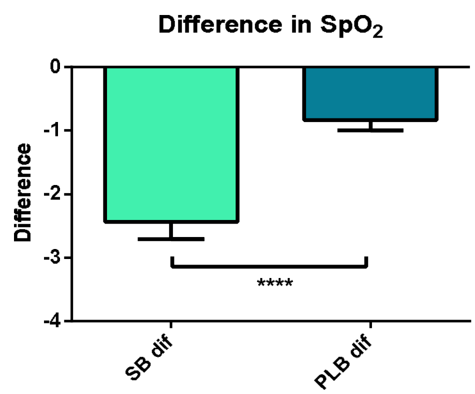
Table 2(a): Number of sets and duration

	SB	PLB	Test used	P value	Sig.
No. of sets	7.45 ± 0.50	10.52 ± 0.62	Wilcoxon Signed rank test	< 0.0001	****
Duration	4.97 ± 0.33	7.01 ± 0.41		< 0.0001	****

Table 2(b): SpO2, Rate pressure product, Respiratory rate, Dyspnea, and Rate of perceived Exertion

	SB (Mean ± SEM)		PLB (Mean ± SEM)		SB Dif (Mean ± SEM)	PLB Dif (Mean ± SEM)	P value	Sig.
	Pre	Post	Pre	Post				
SpO_2	97.1 ± 0.20	94.6 ± 0.33	97.19 ± 0.20	96.36 ± 0.27	-2.43 ± 0.27	-0.82 ± 0.16	<0.0001	****
RPP	10437 ± 217.6	13091 ± 361.6	10359 ± 220.6	12372 ± 358.8	2654 ± 281.3	2012 ± 286.1	0.0008	**
RR	25.69 ± 0.65	33.28 ± 0.69	25.34 ± 0.73	29.79 ± 0.74	7.58 ± 0.78	4.44 ± 0.64	<0.0001	***
Dyspnea	0.64 ± 0.11	3.51 ± 0.22	0.56 ± 0.11	2.43 ± 0.21	2.87 ± 0.19	1.87 ± 0.19	<0.0001	***
RPE	0.56 ± 0.12	3.41 ± 0.23	0.49 ± 0.10	2.50 ± 0.21	2.84 ± 0.24	2.01 ± 0.21	<0.0001	***





Discussion

Pursed lip breathing is a pattern of breathing employed spontaneously by many patients with chronic obstructive pulmonary disease during physical activity. It appears that this technique improves control of breathing and for many, but not all patients, relieves dyspnea.

Pursed lip breathing is used in most pulmonary rehabilitation. In this study we have excluded the effect of spontaneously employed PLB during the activity and therefore considered the clinical benefits in this population.

The data of 58 patients was analyzed as two patients withdrew because of pain and discomfort in the upper extremity. Power test was conducted for all parameters, using standard deviation of the mean difference between pre and post values. Results for all power tests demonstrated 95% power with the current 58 sample size. [7]

The most important finding was -most of the patients could do more number of sets of unsupported arm exercise and for longer duration with less decrease in oxygen saturation when using PLB compared with SB. Also, there was a significant difference with regards to respiratory rate, rate pressure product, rate of perceived exertion and dyspnea when using PLB; the difference was higher with spontaneous breathing for all of these parameters when compared to pursed lip breathing (Tables 2a and 2b).

Upper limb activities commonly require unsupported arm exercise, which poses a unique challenge for patients with COPD whose upper limb muscles also may be required to act as accessory muscles of respiration. Hence, the focus of the study was on how pursed lip breathing may influence unsupported arm exercise endurance. Also, these unsupported arm exercises reflect the activities of daily living with an average intensity on patients with COPD, hence endurance testing was chosen instead of any incremental upper limb endurance test that correlates with maximum of physical capacity.

All patients in the present study employed pursed lips breathing volitionally when they performed the unsupported arm exercise in one of the sessions. In order to prevent the use of pursed lip breathing during session (A), patients held a mouthpiece. This type of breathing was the closest breathing pattern could be obtained to simulate normal open mouth breathing. Since the device was placed inside the mouth and just prevented the patients from closing the mouth it should cause no significant change in anatomical dead space. Nevertheless, such a device might evoke a sensation of uncomfortable breathing or discomfort in holding it. However, none of the patients reported such inconvenience.

The present study showed a significant improvement in the number of sets of unsupported arm exercise and the duration of exercise with PLB. Breathing techniques, such as PLB may reduce progressive hyperinflation in severe COPD. [8,9] Gandevia B. observed that in patients with severe lung emphysema and tracheobronchial collapse, the expired volume during a relaxed expiration increased, on average, by 20% in comparison to a forced expiration. This suggests that relaxed expiration produces less 'air trapping' which resulted in a reduction of hyperinflation. [10] Also, there is a thoracoabdominal dyssynchrony associated with the shift of respiratory work to the diaphragm during unsupported arm exercise due to decreased participation of accessory muscles of respiration in ventilation. [3,4] In addition, since the muscles that move the arms and stabilize the trunk are attached to the rib cage, this increases chest wall impedance, which limits the ability to increase tidal volume during arm activities. [11]

A study suggests that transverse abdominis is continually and increasingly active during an upper limb task in both younger and older asymptomatic subjects. [12] These impairments in ventilatory mechanics result in the termination of arm exercise at low workloads for people with COPD compared to healthy subjects. [13] Pursed lip breathing leads to increased rib cage and accessory muscle recruitment during inspiration and expiration, increased abdominal muscle recruitment during expiration, decreased duty cycle of the inspiratory muscles and respiratory rate, and improved SpO_2. In addition, PLB resulted in no change in pressure across the diaphragm and a less fatiguing breathing pattern of the diaphragm. Self-imposed rhythmic respiration with PLB may favorably affect coordination of respiratory muscle recruitment. [14]

All these changes would lead the COPD patients to breathe more efficiently and consume less oxygen which might have improved the endurance of exercise.

G. Faager et al found that when spontaneous pursed lips breathing was used, patients walked on an average for 37 seconds (16%) longer than when pursed lip breathing was prevented[5]. Fateme S et al found that PLB assisted the patients towards optimal capabilities in carrying out their activities of daily living and improved their overall quality of life. [15]

In patients with COPD, there is a fall in oxygen saturation during exercise. Soguel Schenkel N et al. concluded that daily activities, such as walking, washing, and eating, are associated with transient oxygen desaturation in patients with moderate-to-severe COPD, even without marked resting hypoxemia. [16] The causes for exertional desaturation in patients with COPD are multifactorial with ventilation-perfusion mismatching, diffusion-type limitation, shunting, and reduced oxygen content of mixed venous blood all contributing to some degree. [17] Unsupported arm exercise is associated with dyssynchronous breathing patterns and diaphragm loading and a drop in oxygen saturation of blood is expected. Pursed lip breathing reduces respiratory rate, dyspnea and arterial carbon dioxide tension, and improves tidal volume and oxygen saturation in resting conditions. [18,14] This is supported by E H Breslin who found that the changes in respiration with PLB resulted in improved ventilation denoted by the increase in VT and SpO_2. [14] We found that the drop in oxygen saturation was 1.6% more with SB as compared to PLB.

Rate pressure product is a direct indication of the energy demand of the heart and thus a good measure of the energy consumption of the heart. Our study showed that the change in RPP with SB was higher as compared to PLB. Individual differences in HR and SBP were also found to be significantly higher for SB as compared to PLB. There is abundant evidence of abnormal cardiovascular responses to exercise in COPD. Pulmonary vascular resistance and pulmonary artery pressures are increased; the right ventricular ejection fraction fails to increase even though right ventricular end-diastolic volume is increased [19, 20]; and left ventricular end-diastolic, endsystolic and stroke volumes are decreased [21], presumably secondary to the failure of the right ventricular ejection fraction to increase, or competition for space between the two sides of the heart within the pericardium. The exercise limitation in chronic obstructive pulmonary disease occurs as a result of the dynamic interaction between disordered right heart function and ventilation [22]. Unsupported arm exercises accentuate the exercise limitation. Pursed lip breathing on the other hand, reduces the cost of breathing. AY Jones in a comparison of the oxygen cost of breathing exercises and spontaneous breathing in patients with stable chronic obstructive pulmonary disease found that the mean VO_2 was consistently lower during PLB than during spontaneous breathing. [23] This reduces the oxygen demand and in turn the myocardium is less taxed which might be the reason behind reduced change in RPP with PLB.

Dyspnea reflects afferent activity from muscle spindles and tendon organs associated with length tension and force velocity characteristics of the respiratory muscles and chemoreceptor stimulation; which contribute to an uncomfortable urge to breathe. [24] Exercise-induced dyspnea has been associated with the increased intensity and duration of respiratory muscle force generation as well as with an increased amplitude and velocity of muscle shortening. [24] Dynamic hyperinflation or an increase in the end-expiratory lung volume (EELV), as typically occurs during exercise in patients with COPD, can reduce the pressure-generating capacity of the respiratory muscles and has been associated with increased breathing effort and dyspnea [25, 26]. Respiratory rate is also a determinant of ventilatory efficiency.

Bianchi (2004) found changes in end expiratory volume of chest wall (VCWee) are related to baseline airway obstruction but not to hyperinflation (FRC). By lengthening of expiratory time and total time of respiratory cycle, PLB decreases VCWee and reduces breathlessness. [27] Several researchers reported that PLB and some other breathing exercises could prolong expiration and would decrease the EELV, leading to lower respiratory rate and higher tidal volume. [28, 29] Present study, reports a less increase in respiratory rate post exercise with PLB and a mean fall of 1 unit in dyspnea on Borg Scale with PLB which was statistically significant. Reis AL in 2005 recommended a minimally clinically important difference of 1-unit for the Borg scale; hence the improvement in dyspnea is clinically significant[30]. However, Spahija[31] and Mueller [28] have found variable effects of pursed lip breathing on dyspnea during exercise. G Faager found no significant differences in rated degree of dyspnea while walking with PLB. [5] Garrodl et al. concluded that a significant reduction in respiratory rate occurred at the end of the walking test and that recovery time was shorter when nonspontaneous PLB was used and there was no difference in dyspnea. [6]

Rate of perceived exertion was also found to be scored significantly less with PLB as compared to SB by the patients (mean difference being 0.83) though it might not be clinically significant.This is consistent with the findings of G Faager who did not find significant difference between scores of leg fatigue on Borg scale. [5]

Conclusion

Pursed lip breathing is a useful technique to increase unsupported arm exercise endurance and reduce oxygen desaturation during exercise in patients with moderate to severe chronic obstructive pulmonary disease.

Clinical implication:

- Unsupported arm exercise is typical of activities of daily living in patients with COPD and the changes seen in these exercises with PLB may be of greater clinical significance. Hence, PLB should be incorporated with unsupported arm exercises.
- Training patients for unsupported arm exercise with PLB would give better outcomes and eventually improve their quality of life.

Limitations

The effect of PLB on unsupported arm exercise is studied in sitting position only, while many of the activities of daily living require arm movements in standing or while walking. This study shows the effect of volitionally performed pursed lip breathing on unsupported upper extremity exercises hence the effect of spontaneously performed PLB on the same can be studied. The actual oxygen consumption can be assessed. Also, the effect of PLB on activities of daily living can be studied which would be more beneficial to assess functional impairments.

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COMPARATIVE EFFICACY OF CORE STABILIZATION EXERCISE AND PILATES EXERCISE ON PATIENTS WITH NON-SPECIFIC CHRONIC LOW BACK PAIN

COMPARAREA EFICIENȚEI EXERCIȚIILOR DE TONIFIERE A MUSCULATURII POSTURALE ȘI A EXERCIȚIILOR PILATES LA PACIENȚII CU DURERE LOMBARĂ CRONICĂ NESPECIFICĂ

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Key words: core stabilization exercise, Pilates exercise, low back pain, range of motion, physical.

Abstract:

Introduction:

Objectives: Low back pain poses serious challenge to individual's health worldwide. Supervised therapeutic exercise has been reported as an effective intervention for the treatment of patients with chronic low back pain. This study compared the effect of core stabilization exercise and Pilates exercise on pain, functional disability, range of motion of the lumbar spine and level of physical activity in patients with non-specific chronic low back pain (NSCLBP).

Methods: The study involved 29 individuals (13 males and 16females) with non-specific chronic low back pain. They were randomly assigned into 3 different groups (mean age of 49.10 ± 11.85 years, 45.30 ± 11.31 years, and 40.33 ± 14.47) respectively, using computer generated numbers. Group 1 performed core stabilization exercise + infra-red radiation, group 2 performed Pilates exercise + infra- red radiation and group 3 received infra-red radiation and back care education. Measurement of pain intensity, functional disability, lumbar range of motion and level of physical activity were done using numerical rating scale (NRS), Roland Morris disability questionnaire (RMDQ), Modified Schobers test (MST) and International physical activity questionnaire (IPAQ) respectively at baseline, 2nd week and 4th week (post intervention). Data was analysed using statistical package for social science version 20.

Results: Findings of this study revealed an improved clinical outcome of the three groups post-intervention ($p<0.05$). However, there was statistically significant difference between core stabilization exercise group and control group in all outcome variables ($p<0.05$) except for range of motion.

Conclusion: The result of this study revealed that there was improvement in pain, functional ability and range of motion in the study groups. However both techniques are effective in the treatment of patients with non specific chronic low back pain.

Cuvinte cheie: exerciții de tonifiere a musculaturii posturale, exerciții Pilates, durere lombară, amplitudine demișcare, status fizic

Rezumat:

Obiective: Durerea lombară joasă constituie o provocare serioasă pentru lumea medicală de pretutindeni. Exerciții terapeutice supravegheate sunt considerate ca fiind o intervenție eficientă în tratamentul pacienților cu dureri lombare joase. Acest studiu compară efectul exercițiilor de stabilizare posturală și a celor Pilates asupra durerii, disabilității funcționale, amplitudinii de mișcare a coloanei lombare și nivelul de activitate fizică la pacienții cu durere lombară nespecifică (NSCLBP).

Metode: Studiul s-a realizat pe un număr de 29 de subiecți (13 bărbați și 16 femei) cu durere lombară nespecifică. Ei au fost distribuiți aleatoriu în 3 grupuri diferite (media de vârstă de 49.10±11.85 ani, 45.30±11.31 ani, și respectiv 40.33±14.47), folosind numere generate de computer. Grupul 1 a efectuat exerciții de stabilizare posturală + radiații infraroșii, grupul 2 a efectuat exerciții Pilates + radiații infraroșii și grupul 3 efectuat radiații infraroșii și școala spatelui. Evaluarea intensității durerii, a disabilității funcționale, mobilitatea coloanei lombare și nivelul de activitate fizică s-a realizat folosind scala numerică a durerii, (NRS), Chestionarul Roland Morris pentru disabilitate (RMDQ), testul Schobers modificat (MST) Chestionarul Internațional de activitate fizică (IPAQ), pentru o evaluare inițială, în a 2-a și în a 4-a săptămână, (post intervenție). Datele s-au analizat folosind statistatistical package for social science versiunea 20.

Rezultate: Rezultatele studiului au demonstrat o îmbunătățire a statusului pacienților din cele 3 grupuri post-intervenție ($p<0.05$). AU existat totuși diferențe semnificative statistic între grupul carfe a efectuat exercițiile pentru stabilizare posturală, și grupul de control la toate variabilele evaluate ($p<0.05$) cu excepția amplitudinii de mișcare.

Concluzii: Rezultatul acestui studiu arată că a existat o ameliorare semnificativă a durerii, disabilității funcționale și amplitudinii de mișcare la grupele luate în studiu. Oricum, ambele tehnici sunt eficiente în tratamentul pacienților cu durere lombară nespecifică.

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Introduction

Low back pain (LBP) is a serious health problem and has attracted a significant amount of research [1] (Akinbo *et al,* 2012). Chronic low back pain being a major musculoskeletal condition encountered in the clinical setting is replete with several studies concerning the effectiveness of various techniques [2,3,4] (Smith *et al*, 2014; Stuber *et al*, 2014; Patti *et al*, 2015). Different treatment modalities have been used, but there is temporary relief of symptoms and lack of improvement of the atrophy of Lumbar multifidus muscles which improves stability of the lumbar spine [5] (Akodu *et al*, 2014).

Studies have shown that both core stability exercises and Pilate's exercises are effective in the management of pain and disability in individuals with Chronic LBP [6, 7, 8] (Wajswelner *et al*, 2012; Salimeh *et al*, 2014; Venkata and Sreekar 2015). However, it appears there is dearth of empirical data establishing which is more effective between the core stability exercises and Pilate exercises on individuals with non-specific chronic low back pain. Thus, there exist certain gaps involving the two therapeutic techniques.

Therefore, this study sought to determine the effect of core stabilization exercise and Pilates exercise on pain, functional disability, range of motion of the lumbar spine and physical activity in patients with non-specific chronic low back pain.

Materials and Methods

A total of 48 (23 males and 25 females) subjects with non-specific chronic low back pain (NSCLBP) participated in this study. They were recruited from Lagos University teaching hospital (LUTH), Idi-Araba and Lagos State University Teaching Hospital (LASUTH), Ikeja. All patients included into the study were subjects with history of non-specific chronic low back pain with or without pain radiating to one or both lower limbs, and Patients with recurrent history of LBP of not less than 3 months.

Excluded from the study were subjects confirmed to be pregnant, subjects with specific LBP, subjects with medical or surgical conditions that might hinder exercise performance. Prior to the commencement of the study the subjects' demographic data such as age, gender, weight, height, occupation, marital status, clinical history of LBP and number of LBP episodes during 12 months were obtained from the subjects and the baseline assessment of pain intensity, functional disability and Lumbar range of motion and level of physical activity were done using numerical rating scale (NRS), Roland Morris disability questionnaire (RMDQ) and Modified Schobers test (MST) and International physical activity questionnaire (IPAQ).

Informed written consent was obtained by providing a consent form for the subjects to fill in. Ethical approval was sought and obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital, Idi-Araba, Lagos (LUTH (Approval number ADM/DCST/HREC/APP/316). Of the 48 patients, 6 were found ineligible for the study after screening and were therefore excluded.

The eligible patients were randomly assigned to three groups using computer generated numbers. Each group had 14 patients from the 42 eligible patients.

Group 1 received core stabilization exercise and infra-red radiation. In addition to infra-red radiation, Groups 2 received Pilates exercise and group3 was the control and they received infra-red radiation and back care. However only 29 patients (13 males, 16 females) with mean age of (45.07±12.61) completed the study. 13 subjects did not complete with reasons ranging from illness, transportation problem and lack of effect.

Subjects went through the protocol twice weekly for 4 consecutive weeks.

Assessment of pain intensity, functional disability, Lumbar range of motion and physical activity were done at baseline, end of 2nd week and 4th week respectively.

Core stabilization exercise protocol

Abdominal bracing - 30 repetitions with 8-seconds: Patients were instructed in supine lying position to perform drawing- in maneuver of the abdomen and hold it for 8 seconds, 30 times for 2 minutes.

Bracing with Heel Slides - 20 repetitions per leg with 4-seconds: Patients were instructed in supine lying position to perform drawing- in maneuver of the abdomen and hold it with sliding of the heel per leg for 4seconds, 20 times for 4 minutes.

Bracing with Leg Lift -20 repetitions per leg with 4-seconds: Patients were instructed in supine lying position to perform drawing - in maneuver of the abdomen and hold it with raising up the leg for 4 seconds, 20 times for 4 minutes.

Bracing with Bridging - 30 repetitions with 8-seconds, then progress to one leg: Patients were instructed in supine lying position to perform drawing-in maneuver of the abdomen and gently lift up the buttock and hold it for 8seconds, 30 times for 2 minutes.

Bracing with Bridging and Leg Lift - 30 repetitions with 8-seconds, Patients were instructed in supine lying position to perform drawing-in maneuver of the abdomen and gently lift up the buttock and hold it with raising up the leg for 8seconds, 30 times for 4 minutes.

Bracing in Standing - 30 repetitions with 8-seconds: Patients were instructed to perform drawing - in maneuver of the abdomen in standing for 8 seconds, 30 times for 2 minutes.

Quadruped Arms Lifts with Bracing (Flex one upper extremity) - 30 repetitions with 8 seconds on each side: Patients were instructed in prone kneeling position to perform drawing-in maneuver of the abdomen, flex one upper extremity and hold it for 8 seconds, 30 times on each side for 4 minutes.

Quadruped Leg Lifts with Bracing (Extending one lower extremity and lifting it off the exercise mat) - 30 repetitions with 8 seconds on each side: Patients were instructed in prone kneeling to perform the drawing- in maneuver of the abdomen, extend one lower extremity and lift it off exercise mat and hold it for 8 seconds, 30 times on each side for 4 minutes.

Quadruped Alternate Arm and Leg lift with Bracing (flex one upper extremity and extend contralateral lower extremity) - 30 repetition with 8seconds on each side: Patients were instructed in prone kneeling to perform the drawing- in maneuver of the abdomen, flex one upper extremity and extend contralateral lower extremity and hold it for 8 seconds, 30 times for 4 minutes. (Hick *et al*., 2005; Donald and Robert, 2006, Akodu *et al*, 2015).

Pilate exercise protocol

Exercise 1: Pelvic tilt to Pelvic curl exercises:

The participants were instructed to lie on their back with both knees bent and feet flat on the floor, the feet, ankles and the knees are aligned and the hip distance apart. Pelvic tilt was done by engaging the abdominal muscles, pulling them in towards the spine. This was done for 20 repetitions within 4 seconds.

Pelvic curl:

Participants were instructed to press down the feet allowing to curl up toward the ceiling.

The hips raise, then the lower spine, and finally the middle spine. The Participants were then asked to come to rest on the shoulders at the level of the shoulder blades, with a nice straight line from the hips to the shoulders. This movement was supported with the abdominals and hamstrings. The abdominals was used to roll the spine back down to the floor until the lower spine settles to the floor. This was repeated for 3 to 5 times.

Exercise 2: Chest Lift

The Participants were instructed to lie on their back with the knees bent, feet flat on the floor. Legs and feet parallel - lined up so that the hip, knee and ankle are in one line and the toes pointing directly away. The patients were then in neutral spine position with the natural curve of the lower spine creating a slight lift off the mat. Shoulders were kept down as the participant brings the hands behind the head with the finger tips touching. The patients then slowly pulled down towards the spine, allowing the spine to lengthen. This was repeated for 3-5 times

Exercise 3: Swan Prep

The Participants were instructed to lie face down with arms close to the body as they bend the elbows to bring the hands under the shoulders. The abdominal muscles were engaged, lifting the umbilicus up away from the mat, the abdominals remain lifted throughout the exercise. Repeat 3 to 5 times.

Exercise 4: Kneeling Arm and Leg Reach

The Participants were instructed to reach with the hands directly under the shoulders and the knees directly under the hips. The legs and feet were parallel and hip distanced apart.
The back was in a neutral spine position allowing the natural curves, and supported by the abdominal muscles which was pulled in. Repeat this exercise 3-5 times to each side.

Exercise 5: Child's Pose

With the toes together, the Participants were instructed to open the knees to at least hip distance apart then lean forward and drape the body over the thighs so that the forehead rests on the floor and also reach the arms out in front. Alternately, the Participants were instructed to leave the arms along the both sides. Breathe deeply and then relax.

Exercise 6 spine stretches:

Participants were instructed to sit up tall, the legs were straightened in front with shoulder width apart, and the knees faced the ceiling with feet flexed. The Participants were then asked to reach the top of the head with shoulders relaxed, Inhale and extend the arms out in front, shoulder height.

Alternatively, Participants were instructed to place the fingertips on the floor in front between the legs. Exhale as the spine lengthens to curve forward i.e. deep C-Curve, and then reach the fingers toward your toes.

Exercise 7: Pilate saw

Participants were instructed to sit up straight with the legs extended in front of the shoulder width apart. Shoulders were kept down as the arms were being stretched out to the sides, even with the shoulders.

Exercise 8: Swimming

Patients were instructed to lie prone with the legs straight and together, keeping the shoulder blades settled in the back and the shoulders away from the ears, then stretch the arms straight overhead pulling the abdominals. Participants were then asked to continue reaching out the arms and legs very long from the centre as they alternate lifting right arm/left leg, then left arm/right leg, pumping them up and down in small pulses (Wallwort *et al*, 2009).

Data Analysis

Statistical Package for Social Science (SPSS Inc., Chicago, Illinois, USA) version 20.0 for Windows package program was used to analyze the data. Demographic and quantitative data were expressed as mean ± standard deviation (SD).

One-way analysis of variance (ANOVA) was used to detect any statistically significant differences in the (improvement) changes between the three groups. A post-hoc evaluation of ANOVA using the least significant difference (LSD) was carried out to compare the mean changes between the three groups in order to detect where statistical differences existed and which treatment was statistically more effective. Level of significance was set at $p < 0.05$.

Results

Forty eight (48) participants with non- specific chronic low back participated in this study; however twenty-nine (29) completed the study, 10 (34.5%) participants were in group 1, 10 (34.5%) were in group 2 and 9 (31.0%) participants were in the control group.

Thirteen (44.8%) of the participants were males while sixteen (55.2%) were females.

The three groups did not differ significantly in age and body mass index (Table 1).

Table 1: Physical characteristics of the participants

	All participant X±SD N=29	GRP1 X±SD N=10	GRP2 X±SD N= 10	GRP3 X±SD N=9	P-value
AGE (Yrs)	45.07±12.61	49.10±11.85	45.30±11.31	40.33±14.5	0.45
BMI (kg/m²)	25.80±4.17	27.73±4.30	25.69±3.95	23.78±3.64	0.82

Significant at $p<0.05$
KEY:
X±SD = Mean ± Standard Deviation
BMI = Body Mass Index
GRP 1 = Core Stabilization exercise only (Group 1)
GRP 2 = Pilates exercise only (Group 2)
GRP 3 = Control (Group 3)

Analysis of variance test was conducted to compare the differences within Group 1, Group 2 and Group 3 on mean changes in outcome at baseline, end of 2nd week and 4th week post intervention. The clinical outcome variables after 8 sessions (4weeks) are presented in table 2.

Table 2: Analysis of variance of clinical outcome parameters of participants in the three groups at baseline (pre intervention), end of 2nd week and 4th week end of intervention.

Variable	Pain X± SD	FD X± SD	ROM (0) X± SD	PA X± SD
Group1				
Pre-Rx	6.20± 1.14	11.40±2.67	4.75±1.93	1.40±0.52
End of 2nd wk	3.29± 1.42	6.90±2.02	5.00±1.76	2.30± 0.68
End of 4th wk	1.1.±1.29	3.60±2.54	5.65± 1.68	2.80±0.42
F- value	1.41	0.91	0.81	1.85
P-value	0.00*	0.01*	0.19	0. 00*
Group 2				
Pre-Rx	6.90±1.45	11.10±2.80	4.15±1.56	1.20±0.42
End of 2nd wk	3.69± 1.42	8.30±1.49	4.40±1.78	1.78± 0.44
End of 4th wk	2.10± 1.91	5.40±3.03	5.29± 1.62	2.30± 0.68
F-value	0.05	0.21	0.36	0.06
P- value	0.13	0.14	0.89	0.11
Group 3				
Pre-Rx	5.89± 0.93	11.11± 2.85	4.22±1.64	1.40± 0.53
End of 2nd week	3.40± 1.51	8.22± 2.11	3.89±1.82	1.78± 3.70
End of 4th week	3.56± 2.09	7.78± 3.70	4.80± 1.27	1.78± 0.67
F-value	1.41	0.91	1.27	1.83
P-value	0.00*	0.01*	0.28	0.00*

*: Significant at $p< 0.05$
KEY:
Rx= Treatment ROM=
Range of motion PA= Physical activity
X± SD= Mean ± Standard deviation FD= Functional disability F= Analysis of variance
GRP 1 = Core Stabilization exercise only (Group 1)
GRP 2 = Pilates exercise only (Group 2)
GRP 3 = Control (Group 3)

Comparison of Clinical Outcome parameters among the three groups

Analysis of variance (ANOVA) showed that there was statistically significant difference existing among the groups post intervention (Table 3).

Least significance difference (LSD) (post hoc analysis) showed that the significant difference lies between group 1 & 3 for pain, functional disability, physical activity, physical functioning (Table 4).

Table 3: Analysis of variance results of clinical outcome parameters of participants among the three groups, pre intervention, end of 2nd week and 4th week (end of intervention)

	Sum of Squares	Mean Square	F-Value	P-Value
(Baseline)				
PAIN	5.16	2.58	1.79	0.19
ROM(^{0})	2.12	1.06	0.36	0.70
Disability	0.57	0.29	0.04	0.96
PA	0.33	0.17	0.69	0.51
(2^{ND} Week)				
PAIN	0.82	0.41	0.19	0.82
ROM	5.89	2.94	0.92	0.41
Disability	12.20	6.10	1.71	0.20
PA	1.71	0.86	2.40	0.11
(4^{TH} Week) Post-intervention				
PAIN	28.74	14.37	4.56	0.02*
ROM	4.31	2.16	0.91	0.42
Disability	82.89	41.44	4.30	0.02*
PA	4.95	2.48	6.95	0.00*

* Significant difference at $p < 0.05$

KEY
ROM = Range of motion
PA= Physical Activity
F= Analysis of variance

Table 4: Post Hoc analysis of change in the clinical outcome measure parameters across the three groups.

Variables	Group(I)	Group	Mean Difference	p-values
Pain	Group 1	Group 2	-1.00	0.66
		Group 3	-2.46	0.02*
	Group 2	Group 1	-1.46	0.66
		Group3	-2.46	0.25
	Group 3	Group 1	2.46	0.02*
		Group 2	1.46	0.23
Disability	Group 1	Group 2	-1.80	0.62
		Group 3	-4.18	0.02*
	Group 2	Group 1	-0.50	0.62
		Group 3	-2.38	0.32
	Group 3	Group 1	4.18	0.02*
		Group 2	2.38	0.32
Physical Activity	Group 1	Group 2	0.50	0.22
		Group 3	1.02	0.00*
	Group 2	Group 1	-0.50	0.22
		Group 3	0.52	0.20
	Group 3	Group 1	-1.02	0.00*
		Group 2	-0.52	0.20

*: Significant at $p < 0.05$ within the treatment group

Discussion

Participants in the three groups were similar in age and physical characteristics; this means that all the groups were homogenous and therefore comparable.

In this randomised controlled study, marked improvement in the clinical outcomes (Pain intensity, Functional disability, range of motion, physical activity) were observed in the two study groups that is core stabilization exercise (group 1) and Pilates exercise (group 2). This finding shows that most Physiotherapeutic modalities commonly used in the treatment of CLBP are effective [9] (Kumar *et al*, 2013). This finding support the result of the study by Akodu *et al*, [10] 2015 who reported that stabilization exercise is effective in the management of NSCLBP.

This is also in agreement with the study by Natour *et al*, [11] (2014) who assessed the effectiveness of Pilates exercise (PE) on patients with NSCLBP and found PE to be effective in the management of NSCLBP.

The findings that there was significant improvement in core stabilization and Pilates groups buttress the use of exercise therapy in the management of patients with CLBP. However this study shows that both core stability exercise and Pilates exercise are effective in the management of CLBP. This was supported by the findings of Salimeh *et al*, [7] (2014) who in their study on the comparison of the effect of eight week stabilization exercise and Pilates exercise on pain and functional disability of women with chronic low back pain, concluded that the two groups experienced the same improvement on pain and functional disability in patients with chronic low back pain. Other studies [12,13,9,8] (Gladwell *et al*, 2006; Hides *et al*, 2008; Kumar *et al*, 2013; Venkata and Sreekar, 2015) compared either stabilization exercise with general exercise or Pilates exercise with general exercise [6, 11] (Wajswelnar *et al*, 2012; Natour *et al*, 2015) and discovered that there was significant improvement in both stabilization and Pilates group when compared to the other groups. This is however contrary to the finding of Mindy *et al. 14* (2006) who in their study of randomized controlled trial of specific spinal stabilization exercises and conventional physiotherapy for recurrent low back pain do not support the use of stabilization exercise in treatment of NSCLBP. This also disagrees with the study by Pereira *et al*, [15] 2012 who compared Pilates method and stabilization programs and concluded that Pilates did not improve the functional ability and pain in CLBP patients.

The improvement in the parameters measured that is pain, range of motion, functional disability and physical activity could be as a result of reestablishment of the normal control of the deep spinal muscles (DSM), thus reducing the activity of the more superficial muscles which when recruited stiffens the spine and increases the activity of the low back muscles. This can also be as a result of the ability of the exercises to mobilize and stabilize the body thereby activating specific muscles in a functional sequence at controlled speed emphasizing quality, precision and control of movement. This enables the co-contraction of the local muscles such as TrA and LM within the neutral zone [16] (Wells *et al,* 2015).

The finding that there was an improvement in physical activity of patients in CE and PE except the control group was corroborated by previous studies [7] (Salimeh *et al*, 2014). The studies reported that both stabilization exercise and Pilates exercises are effective for improving the physical activities in patients with NSCLBP. This must have led to the improved stability of the spine thereby allowing dynamic control of the spine [5] (Akodu *et al*, 2014). This is also in accordance with study by McGill [17] (1998) that performing exercises on labile surfaces increased the abdominal muscle activity, which changes the level of muscle activity and also increases muscle performance and endurance levels. This could also be due to the reason that Lumbar stability is maintained by improving the activity of the lumbar segmental muscles and highlighting the importance of motor control to coordinate muscle improvement during functional activity.

The present study revealed that there was significant difference between core stabilization and control group on pain, functional disability and physical activity. This is in accordance with the findings by Venkata and Sreekar, [8](2015) who compared Stabilization program and conventional exercises on patients with CLBP and concluded that core stabilization is more effective in the management of mechanical low back pain. This is also in agreement with the conclusion of systematic review of literature and findings by O'Sullivan *et al 18,19,2* 1997; Brumitt *et al*, 2013; Smith *et al*, 2014. These investigators found that training approach that followed the principles of segmental stabilization and neuromuscular control was effective in reducing pain and disability in a group of individuals with CLBP.

Findings from this study revealed that mean range of motion at the end of the intervention for CSE, PE and control groups was 5.65± 1.68, 5.29± 1.62, 4.80± 1.27 respectively, this shows that both core stabilization exercise (group 1) and Pilates exercise (group 2) had better improvement in range of motion. This is also similar to the result of the study by Javadian *et al. 20* (2012) who in their study for the effect of stabilization exercise on pain and disability of patients with lumbar instability found out that the range of motion increased significantly in the stabilization group.

Conclusion

Findings of this study revealed that both Pilates exercise and stabilization exercise reduced pain severity, improved functional ability. Also the two groups experienced the same effect on the entire clinical outcome measure parameters in patients with chronic low back pain. Therefore both exercises are effective in the management of patients with NSCLBP.

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EFFECTS OF INTERFERENTIAL THERAPY ON SELECTED CARDIOPULMONARY PARAMETERS, ASTHMA CONTROL AND QUALITY OF LIFE OF PEOPLE LIVING WITH ASTHMA

EFFECTUL TERAPIEI INTERFERENȚIALE ASUPRA PARAMETRILOR CARDIOPULMONARI SELECTAȚI, CONTROLUL ASTMULUI ȘI CALITATEA VIEȚII PACIENȚILOR CU ASTM

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Keywords: Interferential therapy, Asthma, Cardiopulmonary, Asthma control test, Quality of life

Background
The introduction of pharmacological interventions for the control of asthma symptoms has resulted in declined interest in non-pharmacological methods despite their usefulness. This study investigated the effects of interferential therapy (IFT) on selected cardiopulmonary parameters, asthma control and quality of life in people living with asthma.
Method: Forty-seven individuals with asthma recruited from the Respiratory clinic of the Lagos State University Teaching Hospital, Ikeja were randomly assigned to two groups. Group A (23 participants) was the intervention group that received IFT for 20 minutes per session, three times a week for six weeks as well as weekly counseling sessions on bronchial asthma while Group B was the control group (24 participants) that received weekly counseling sessions only. Forty two participants completed the study. Selected cardiopulmonary parameters, Asthma control test (ACT) and Asthma quality of life questionnaire (AQLQ) were assessed at baseline, 2nd, 4th and 6th weeks. Data was analyzed using SPSS version 17.
Results: There was significant improvement in the systolic blood pressure of group A (p=0.004). Group A also had significant improvements (increases) in Forced Expiratory Volume in one second (p=0.02), Forced Vital Capacity (p=0.04) and Peak expiratory flow rate (p=0.007) while group B had significant reductions in these pulmonary parameters. There were significant improvements (increases) in the ACT score (p=0.0001) and AQLQ (p=0.001) of group A and a significant reduction in ACT score of group B.
Conclusion: Inteferential therapy brought about significant improvements in most of the selected pulmonary parameters, ACT score and AQLQ score of people living with asthma.

Cuvinte cheie: terapie interferențială, astm, cardiopulmonar, test de control al astmului, calitatea vieții

Introducere
Introducerea intervenției farmacologice pentru controlul simptomelor astmului a dus la reducerea interesului față de metodele nonfarmacologice, în ciuda utilității acestora. Acest studiu dorește să urmărească efectele terapiei interferențiale (IFT) asupra parametrilor cardiopulmonari selectați, controlului astmului și a calității vieții, la persoanele cu astm.
Metode: Patruzeci și șapte de subiceți cu astm selectați din cadrul Clinicii Respiratorii a Lagos State University Teaching Hospital, Ikeja au fost distribuiți aleatoriu în două grupuri. Grupul A (23 participanți) a constituit grupul experimental și a primit IFT timp de 20 minute pe ședință, de 3 ori pe săptămână, timp de 6 săptămâni, consiliere săptămânală privind astmul bronșic, în timp ce Grupul B a constituit grupul de control (24 participanți) care a primit doar consiliere săptămânală. Patruzeci și doi de participanți au terminat studiul. Parametrii cardiopulmonari selectați testul de control al astmului (ACT) și chestionarul de calitatea vieții pacientului cu astm (AQLQ) au fost folosite la evaluarea inițială, apoi la 2, 4 și 6 săptămâni. Pentru analiza statistică s-a folosit SPSS versiunea 17.
Rezultate: A existat o îmbunătățire semnificativă a tensiunii arteriale sistolice la grupul A (p=0.004). De asemenea, grupul A a prezentat îmbunătățiri semnificative (creșteri) a expirului forțat într-o secundă (p=0.02), capacitatea vitală forțată (p=0.04) și rata respiratorie (p=0.007), în timp de grupul B a prezentat o reducere semnificativă în reducerea a parametrilor pulmonari. Au existat creșteri semnificative în scorul ACT (p=0.0001) și AQLQ (p=0.001) a grupului A și o reducere semnificativă a scorului a scorului ACT a grupului B.
Concluzii: Terapia inteferențială a adus îmbunătățiri semnificative în majoritatea parametrilor pulmonari selectați, scorul ACT și AQLQ, la persoanele cu astm.

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Introduction

Globally, asthma affects about 300 million people around the world and its prevalence is variable [1,2]. It is a disease that has been observed to be more prevalent in developed countries [1]. In Nigeria, the prevalence of asthma ranges from 7% to 18% of the general population [3-5]. Asthma prevalence is increasing despite recent advances being made in its management and about 250,000 people die from it every year [2,6,7]. Enormous advances have been made in the understanding and management of asthma in the past 20 years. These include understanding the inflammatory nature of the disease, use of steroids, use of long acting bronchodilators, use of devices to deliver the medications more appropriately/conveniently and appreciation of the value of self-management education [1,7,8].

Treatment of asthma involves controlling triggering factors, drug therapy and other non-pharmacological methods. Since the introduction of pharmacological interventions for the control of asthma symptoms, interest in non-pharmacological methods had declined despite their usefulness [9]. For many years, the effectiveness of asthma medications have been assessed by measuring their impact on conventional clinical outcomes such as expiratory flow rates, symptoms, the need for other medications and airway responsiveness [10]. Few studies have been conducted to investigate the effects of interferential low frequency current and other current modes on different parameters of patients with bronchial asthma [11-14].

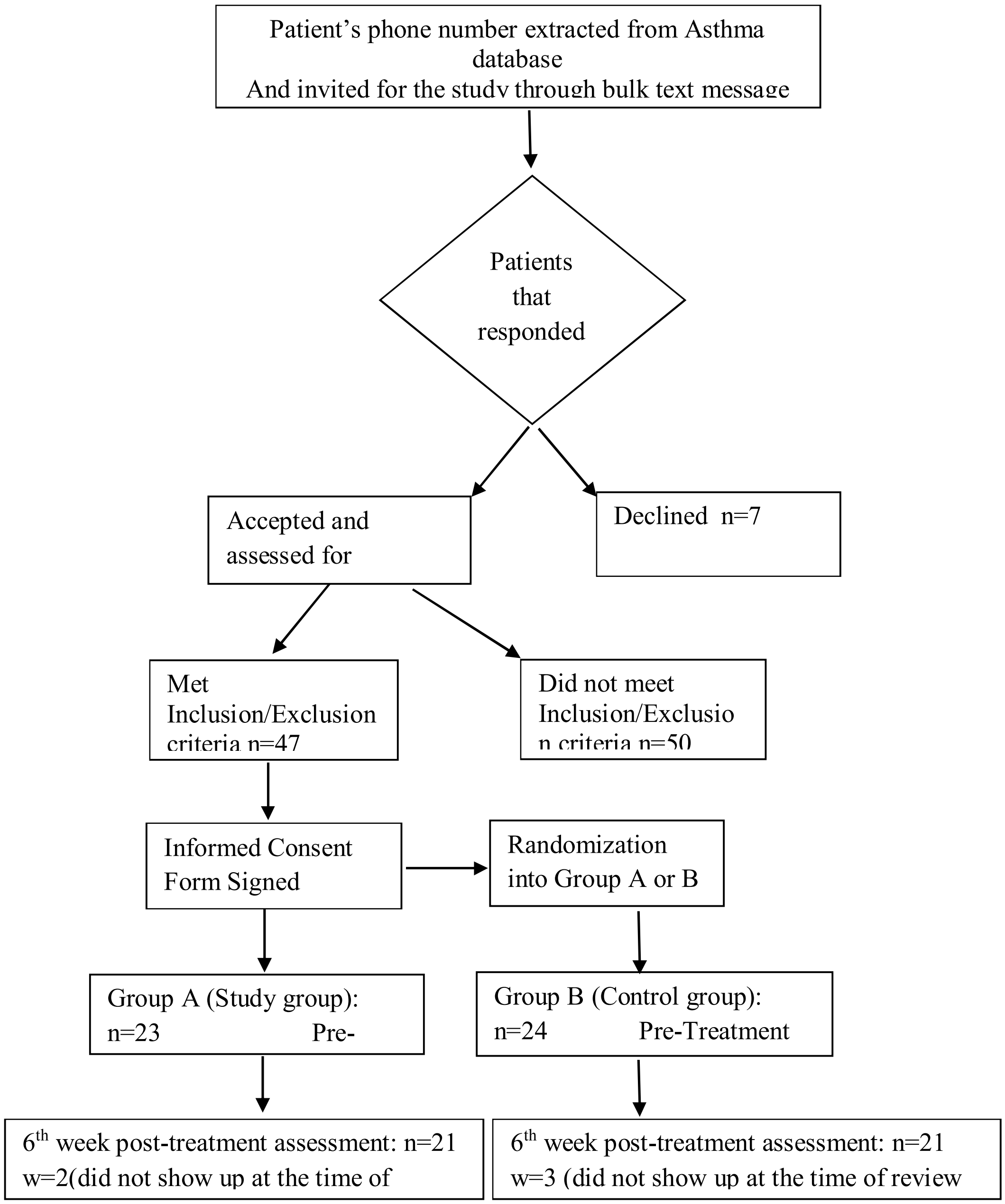
Interferential therapy is the application of two medium frequency currents to the skin in such a way that they "interfere" with each other to produce a "beat" frequency [15-17]. This beat frequency is the difference between the medium frequency currents. The body recognizes it as the required low frequency current. The importance of using low frequencies is that it has been shown that the body itself produces low frequency currents which are between 1 and 256 Hz [15]. Different systems in the body produce different frequencies and these can be picked up by electrocardiography (ECG), electromyography (EMG), and electroencephalography (EEG). By using specific frequencies and frequency ranges, the different systems can be stimulated and activated. Interferential Therapy has been shown to be a valuable treatment system for many years [15]. It is a simple and non-invasive treatment often used to induce analgesia, elicit muscle contractions and reduce oedema [16,18-20]. It induces expectoration by making sputum on the surface of the bronchi mobile and improves pulmonary parameters [11]. It reduces shoulder stiffness, muscular fatigue and myalgia in the chest and upper back regions [11].

Although few studies have investigated the effects of low frequency currents on some parameters in patients with bronchial asthma, not much is known on the effects of IFT on selected cardiopulmonary variables, asthma control and quality of life of patients with asthma. Thus this study investigated the effects of IFT on selected cardiopulmonary parameters, asthma control and quality of life of patients with asthma.

Method

Participants Selection

Two hundred and twelve (212) patients with bronchial asthma attending Respiratory Clinic at the Lagos State University Teaching Hospital (LASUTH), Ikeja were invited over the phone to participate in the study but only 104 of them responded to the invitation. Ninety seven (97) patients accepted to participate in the study while the remaining seven (7) patients declined due to constraint of work. They were subsequently assessed for eligibility based on the inclusion and exclusion criteria of study. Included into the study were patients diagnosed with asthma according to GINA guidelines, who had not smoked for at least one year prior to the study, who were clinically stable and were without acute exacerbation of asthma or respiratory tract infection in the preceding 6 weeks, patients who were aged 15 years and above. Excluded from the study were patients whose diagnosis of asthma were uncertain, those with very severe asthma and whose condition would constitute a considerable risk if they exercised, those with other lung and cardiac diseases and patients with contra-indications to exercise. Forty seven patients who met the inclusion and exclusion criteria signed the written informed consent form and were randomly assigned to two groups (A and B) using the fish bowl technique. Group A (23 patients) was the intervention group while Group B (24 patients) was the control group (Figure 1). Ethical approval was obtained from the Health Research and Ethics Committee of Lagos State University Teaching Hospital (LASUTH), Ikeja, Lagos state, Nigeria (REF. NO: NHREC04/04/2008).



KEY: n=Sample, P=Participants W=withdrawal

Figure 1: Recruitment and Randomization of Participants

Procedure for data collection

The baseline measurements of all the selected cardiopulmonary outcome parameters were taken for all the subjects after a rest period of 15 minutes prior to the intervention. Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV_1) and Peak expiratory flow rate (PEFR) were measured using a spirometer (CONTEC SP10, Model No: JE1405100271, China).

Respiratory rate in beats per minute was assessed for each participant in sitting position using a stop watch. The systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured with a mercury sphygmomanometer and a stethoscope (Lithman) in sitting position, heart rate (HR) with a stethoscope. The Asthma Control Test questionnaire (ACTQ) and Asthma quality of life questionnaire (AQOLQ) were also completed by all the participants at baseline.

All the outcome measures were also assessed at the end of the 2^{nd} week, 4^{th} week and 6^{th} week of the study for the two groups. An Interferential unit "Solo Multidyne 965" with a base frequency of 4,000 Hz was used for the study intervention in group A.

Intervention

The participants in Group A received interferential therapy. They were placed in a half lying position. Two electrodes were positioned over the upper limits of the trapezius bilaterally on the upper back, and the other two electrodes were placed anteriorly over the lower ribs [21]. Using a 4,000 Hz base current, the interferential current range was set from 10 to 150 Hz and participants received the therapy for 20 minutes per session, three times a week for six weeks. They also received group educational counseling on bronchial asthma once a week while Group B received only group educational counseling on bronchial asthma once a week.

Data Analysis

The Statistical Package for Social Sciences (SPSS Inc, Chicago, II) version 17 was used to analyze data. Descriptive statistic of mean, standard deviation and frequency were used to summarize the results. Repeated measure analysis of variance (ANOVA) was used to determine the statistical significance of the cardiovascular, pulmonary, asthma control test (ACT) score, and standardized asthma quality of life questionnaire (AQLQ) score across the baseline, end of 2^{nd}, 4^{th} and 6^{th} weeks of each group while independent t-test was used to compare the outcome variables across the two groups. The level of significance was set at $p \leq 0.05$.

Results

Out of the 47 participants that started the study, only 42 participants (22 males and 20 females) completed the study with 21 participants in each group. Each group had 11 males and 10 females respectively. Two participants from group A and three participants from group B dropped out at the 4^{th} week of study for reasons such as inflexible office schedule, ill health, high work demand, far distance of study location from their homes and out of station travel during the period of study.

The mean ages of the study and control groups were 44.05 ± 16.37 years and 38.38 ± 13.70 years respectively while the mean body weights were 71.29 ± 17.84 Kg and 79.52 ± 21.67 Kg respectively. Comparison of the baseline data of the study group with that of the control group showed that there was no significant difference (Table 1). This shows that the participants in the two groups were similar and comparable.

Table 1: Comparison between baseline data of the study and control groups

Variables	Study group(A) Mean ± SD	Control group(B) Mean ± SD	p value	
Age (years)	44.05 ± 16.37	38.38 ±13.70		0.53
Height (cm)	163.00 ±7.73	167.67 ± 8.92		0.14
Weight (kg)	71.29 ±17.84	79.52 ± 21.67	0.61	
Forced Vital Capacity ((litres)	1.84 ± 0.76	2.19 ± 0.66	0.12	
Forced Expiratory Flow in one sec ((litres)	1.50 ± 0.54	1.89 ± 0.57	0.63	
Peak Expiratory Flow (litres/min)				
Respiratory Rate (breaths/min)				
Systolic blood pressure (mm/Hg)	3.33 ± 1.49	4.28 ± 1.32	0.69	
Diastolic blood pressure (mm/Hg)	23.14 ± 4.45	20.00 ± 3.70	0.35	
Heart rate (beats/min)	126.24 ± 12.38	120.10 ± 12.81	0.96	
Asthma Control Test (ACT) Score	80.52 ± 10.57	75.81 ± 10.33	0.82	
Asthma Quality of Life Questionnaire (AQLQ) Score	76.43 ± 13.87	76.95 ± 11.62	0.72	
	15.83 ± 4.15	17.33 ± 3.54	0.22	
	4.09 ± 0.92	4.41 ± 1.12	0.23	

Comparison of the mean scores of the cardiovascular parameters of the two groups across baseline, end of 2nd, 4th and 6th week of the study using repeated measure ANOVA showed significant reduction of the SBP of group A. Post hoc analysis showed that the significant reduction in SBP occurred between baseline and the end of 2nd week as well as baseline and the end of 6th week (Table 2).

Table 2: Comparison of cardiovascular parameters of the two groups across six weeks of study

Variable	Baseline Mean±SD (a)	2nd week Mean±SD (b)	4th week Mean±SD (c)	6th week Mean±SD (d)	F	p-value	Post Hoc
Group A							
SBP	126.24±12.38	119.52±12.84	119.14±16.68	117.89±15.48	6.570	0.004*	a&b, a&d
DBP	80.52±10.57	76.19±12.44	75.43±10.04	74.21±9.61	1.421	0.273	
HR	76.43±13.87	76.24±10.08	75.10±8.54	74.74±7.87	0.502	0.686	
Group B							
SBP	120.10±12.81	121.86±16.98	119.29±15.02	121.67±16.98	0.53	0.67	
DBP	75.81±10.33	76.14±9.13	74.52±10.94	77.14±8.45	1.31	0.302	
HR	76.95±11.62	75.38±12.52	74.57±9.80	75.38±9.67	2.89	0.064	

*Significance at $p<0.05$

Key:

SBP: Systolic Blood Pressure
DBP: Diastolic Blood Pressure
HR: Heart rate

Comparison of the mean scores of the pulmonary parameters of the two groups across baseline, end of 2nd, 4th and 6th week of the study using repeated measure ANOVA showed significant changes in the FEV_1, FVC and PEFR of the two groups. While there were significant improvements in group A, group B had significant decrease in these parameters. Post hoc analysis showed that the significant improvement in FEV_1, FVC and PEFR of group A occurred between baseline and the end of 2nd, 4th and 6th weeks respectively; between end of 2nd and 4th weeks, end of 2nd and 6th weeks as well as end of 4th and 6th weeks (Table 3).

Comparison of the mean scores of the ACT and AQLQ of the two groups across baseline, end of 2nd, 4th and 6th week of the study using repeated measure ANOVA showed significant (increases) improvements in the ACT and AQLQ scores of group A and a significant reduction in ACT score of group B. Post hoc analysis showed that the significant improvement in ACT and AQLQ scores of group A occurred between baseline and the end of 2nd, 4th and 6th weeks respectively; between end of 2nd and 4th weeks, end of 2nd and 6th weeks as well as end of 4th and 6th weeks (Table 4).

Table 3: Comparison of pulmonary parameters of the two groups across six weeks of study

Variable	Baseline Mean±SD (a)	2nd week Mean±SD (b)	4th week Mean±SD (c)	6th week Mean±SD (d)	F	p-value	Post Hoc
Group A							
RR	23.14±4.45	21.62±5.13	21.14±4.36	19.94±2.07	3.01	0.061	
FEV_1	1.50±0.54	1.64±0.60	1.83±0.65	1.90±0.77	4.39	0.02*	a&b,a&c,a&d,b&c,b&d,c&d
FVC	1.84±0.76	2.08±0.72	2.17±0.74	2.23±0.82	2.49	0.04*	a&b,a&c,a&d,b&c,b&d,c&d
PEFR	3.33±1.49	3.71±1.47	4.38±1.69	4.12±1.64	5.80	0.007*	a&b,a&c,a&d,b&c,b&d,c&d
Group B							
RR	20.00±3.70	19.48±3.17	18.76±1.92	18.33±1.83	1.78	0.187	
FEV_1	1.89±0.57	1.76±0.57	1.61±0.50	1.51±0.50	13.57	0.0001*	
FVC	2.19±0.66	2.04±0.58	1.89±0.61	1.81±0.63	7.762	0.002*	
PEFR	4.28±1.32	4.03±1.20	3.63±1.19	3.54±1.25	1.47	0.001*	

*Significance at p<0.05

Key:

RR: Respiratory rate

FEV_1: Forced Expiratory Volume in one second

FVC: Forced Vital Capacity

PEFR: Peak Expiratory Flow Rate

Table 4: Comparison of ACT and AQLQ variables of the two groups across six weeks of study

Variable	Baseline Mean±SD	2nd week Mean±SD	4th week Mean±SD	6th week Mean±SD	F	p-value	Post Hoc
Group A							
ACT	15.83±4.15	16.81±4.10	17.92±3.82	17.75±4.15	25.405	0.0001*	a&b,a&c,a&d,b&c,b&d,c&d
AQLQ	4.09±0.92	4.62±0.94	5.13±0.83	5.39±0.83	8.286	0.001*	a&b,a&c,a&d,b&c,b&d,c&d
Group B							
ACT	17.33±3.54	16.52±4.41	16.67±4.12	15.62±3.81	4.836	0.012*	
AQLQ	4.41±1.12	4.64±1.29	4.51±1.29	4.38±1.27	1.381	0.281	

*Significance at p<0.05

Key:

ACT: Asthma Control Test

AQLQ: Asthma Quality of Life Questionnaire

Discussion

The aim of this study was to determine the effects of interferential therapy on selected cardiopulmonary parameters, asthma control and quality of life of people living with asthma.

The result showed that only the SBP of group A had significant reduction of all the selected cardiovascular parameters of the two groups. For the selected pulmonary parameters, group A had significant increases (improvements) in FEV_1, FVC and PEFR while group B had significant reductions in the same parameters. There were significant increases (improvements) in the ACT score and AQLQ of group A but a significant reduction in ACT score of group B.

The finding that IFT brought about significant improvements in most of the selected pulmonary parameters in people living with asthma implies that IFT is effective in the management of asthma. The post hoc analysis showed that the significant improvements in these selected pulmonary parameters brought about by IFT occurred as early as the 2^{nd} week of the study and continued till the end of the 6^{th} week. It has been shown that different systems in the body produce different low frequency currents and by using specific frequencies and frequency ranges such as Interferential frequency currents, the different systems can be stimulated and activated [15]. Interferential therapy induces expectoration by making sputum on the surface of the bronchi mobile and also reduces oedema [16,20]. Shuto *et al.* [11] reported a significant improvement in FEV_1, PEFR, RR and subjective symptoms 147 times (98.7%) following the application of Interferential low frequency therapy (IFLFT) on 46 bronchial Asthma patients.

They also reported that IFLFT reduces shoulder stiffness, muscular fatigue and myalgia in the chest and upper back regions of the patients. They observed no abnormal changes in the ECG, blood pressure and pulse rate of the patients. Sadlonova *et al.* [22] reported that pulsatile electromagnetic field brought about significant improvements of about 70ml in FVC, 80ml in FEV_1 and 480ml in PEFR of children with bronchial asthma. They also observed that the clinical status and the moods of the participants became better. Karashurov *et al.* [14] observed that implanted programmed electrostimulators into the sinocarotid nerves of 78 patients with bronchial asthma were effective in arresting and preventing the majority of asphyxia attacks, reducing the frequency of attacks and the need for medicines. They concluded that electrostimulation of the sinocarotid nerves can be applied in patients with bronchial asthma resistant to drug therapy and those who react adversely to glucocorticosteroids and adrenomimetic drugs.

The finding that there were significant increase in the ACT and AQLQ scores of group A and a significant reduction in ACT score of group B imply that IFT is effective in controlling Asthma attacks and improving the quality of life of people living with Asthma. The post hoc analysis showed that the significant improvements in the ACT and AQLQ scores of group A occurred as early as the 2^{nd} week of the study and continued till the end of the 6^{th} week. Ozoh *et al.* [23] observed a positive correlation between the ACT score and the FEV_1 in Nigerians with bronchial asthma. This indicates that as the FEV_1 of people with bronchial asthma increases, the ACT score increases. Therefore since IFT brought about significant improvement in the FEV_1 of people living with asthma in this study, it also led to the significant improvement in their ACT score. This may be buttressed by the post hoc analysis results of FEV_1 and ACT scores of those treated with IFT which showed that both parameters started improving significantly as early as the 2^{nd} week of the study and continued till the end of the 6^{th} week.

Conclusion

Inteferential therapy brought about significant improvements in most of the selected pulmonary parameters, ACT and AQLQ scores of people living with asthma. However, it had no significant effect on most of the cardiovascular parameters.

Recommendation

Based on the findings of this study, it is recommended that Inteferential therapy should be used in the management of bronchial asthma.

Conflict of Interest: None declared.

Authors' Contribution: HAA performed review of literature, interpretation of data and drafted the manuscript; BAT designed and coordinated the study and reviewed the manuscript; EOA collected data and performed the statistical analysis.

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SINDROMUL DE APERTURĂ TORACICĂ - MODALITĂȚI DE EVALUARE ȘI ABORDARE FIZIOTERAPEUTICĂ

THORACIC OUTLET SYNDROME – MODALITIES OF ASSESSMENT AND PHYSIOTHERAPEUTIC INTERVENTION

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Key words: thoracic outlet syndrome, thoracic-brachial area, scalene muscles, pectoralis muscle, assessment

Abstract

Background. Thoracic outlet syndrome is a condition that can create difficulties regarding diagnose, assessment and physiotherapy intervention strategies.

Scope. This paperwork aims to bring into discussions clinical aspects of thoracic outlet syndrome and to present some modalities of assessment and physiotherapy interventions for this condition.

Means. Had been studied data base like: PubMed, MedLine, Google Scholar, on order to gather informations about thoracic outlet syndrome.

Conclusions. Thoracic outlet syndrome is a frequent condition and its correct diagnose is very imprtant for a correct physiotherapeutic management. Generally, the treatment will target postural correction, stretching of scalene and pactoral muscles ant the strengthening of trapezius and rhomboid muscle.

Cuvinte cheie: sindrom de apertură toracică, defileul toracobrahial, mușchii scalene, pectoral, evaluare

Rezumat

Introducere. Sindromul de apertură toracică este o condiție care poate crea dificultăți în ceea ce privește diagnosticul, evaluarea și abordarea fizioterapeutică.

Scop. Lucrarea de față dorește să aducă în discuție aspecte clinice ale sindromului de apertură toracică și să prezinte modalități de evaluare și intervenție fizioterapeutică pentru această afecțiune.

Mijloace. S-au studiat mai multe baze de date precum: PubMed, MedLine, Google Scholar, pentru a aduna informații referitoare la sindromul de apertură toracică.

Concluzii. Sindromul de apertură toracică este o condiție frecventă iar diagnosticarea corectă este un aspect foarte important pentru alegerea intervenției fizioterapeutice corecte. În linii generale, se va avea în vedere corectarea posturii și stretchingul mușchilor scaleni și pectorali, în special a pectoralului mic, dar și tonifierea trapezului și mușchilor romboizi.

Introducere

Sindromul de apertură toracică este o colecție de simptome determinate de compresia anormală a patului neurovascular de către structuri osoase, ligementare sau musculare în spațiul îngust cuprins între claviculă și prima coastă, spațiu denumit defileu toracobrahial.

Cuprinde un spectru de afecțiuni diverse clinic, care rezultă din: compresia plexului brahial (sindrom neurogenic de apertură toracică), a arterei sau venei subclavie ce trec prin defileul toracobrahial (sindrom vascular de apertură toracică) sau din cauze nespecifice (sindrom nespecific de apertură toracică) [1]. Prima descriere clinică a sindromului de apertură toracică a fost realizată de A.Cooper în 1821. În 1956 Peete a introdus termenul de sindrom de apertură toracică (thoracic outlet syndrome), pentru a descrie toate formele și cauzele compresiei neurovasculare de la baza gâtului. [2]

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Vârsta declanșării este între 20-50 de ani. În 97% din cazuri simptomele sunt neurologice, în 2% din cazuri este vorba despre compresie venoasă, în 1% din cazuri este compresie arterială.

Femeile au cu predilectie afectare neurologică. Bărbații au cu predilectie manifestari vasculare.

Repere anatomice ale defileului toracobrahial

- posterior: corpul vertebrei T1
- lateral: prima coastă și cartilajul costal
- anterior: manubriul sternal

Nervii plexului brahial și artera subclaviculară sunt situate între mușchiul scalen anterior ce formează planul anterior al defileului toracic și scalenul mediu ce formează planul posterior al defileului. Cele două elemente se găsesc deasupra primei coaste ce formează podeaua defileului.

Vena subclavie se găsește anterior de mușchiul scalen anterior.

Distanța dintre prima coastă și claviculă este strâns legată de această patologie . Smedby et al. au raportat că distanța minimă la voluntarii sănătoși este 29 mm iar la pacientii cu sindrom de defileu toracobrahial este de 14 mm, spațiu semnificativ mai strâmt la cei cu sindrom de apertură toracică. [3]

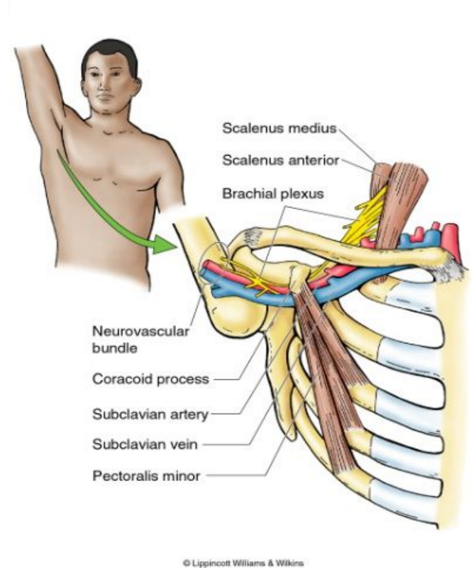

Fig. 1 Repere anatomice ale defileului toracobrahial[10]

Cauze:

Compresia nervului sau vasului de sânge care provoacă sindromul de apertură toracică poate apărea:
- din cauza unei accidentări la nivelul coloanei vertebrale sau claviculei,
- mișcări repetate care pun presiune asupra coloanei vertebrale și a umerilor
- postura cu umerii rotunjiți, purtarea unui rucsac greu
- excesul de greutate, sarcina
- anomalii genetice ale nervilor sau claviculei

Structurile care pot determina compresia vasculară sau neurologică sunt:

- Hipertrofia /traumatismul mușchilor scaleni
- Benzi fibromusculare anormale
- Hipertrofia de tendon a pectoralului mic
- Anomaliile osoase sunt prezente la 30% dintre pacienți
- Coasta cervicală. Prima menționare a coastei cervicale are loc în secolul al doilea, de către Galen. [1]
- Coasta I-a bifidă sau fuziunea coastei 1și 2. [4]:

Există 4 tipuri de simptome descrise:

Sindromul de plex superior (neurologic)
Sindromul de plex inferior (neurologic) – cel mai frecvent
Sindromul vascular (arterial și venos)
Sindrom mixt (asocieri) [5]

Simptome

[10] sursa http://www.mayoclinic.org/diseases-conditions/thoracic-outlet-syndrome/home/ovc-20237878

1. **Sindromul neurogenic de apertură toracică** include simptome precum: durere, parestezie, slăbiciune musculară a mâinii, brațului și umărului, durere la nivelul cefei, dureri de cap cu localizare occipitală – sunt simptomele clasice de sindrom neurogenic de apertură toracică. Fenomenul Raynaud, tegumentul rece și modificările de culoare sunt simptome frecvente ale acestui tip de sindrom de apertură toracică. [6]
2. **Sindromul arterial de apertură toracică** include simptome precum: ischemie digitală, claudicație, paloare, tegument rece, parestezie, durere la nivelul mîinii și uneori la nivelul umărului și gâtului. Aceste simptome sunt rezultatul emboliei arteriale determinate de un trombus, anevrismul arterei subclavie, sau trombus format distal de stenoza arterei subvlavie. În această situație, paloarea și tegumentul rece sunt rezultatul ischemiei arteriale și nu fenomenului Raynaud. [6]
3. **Sindromul venos de apertură toracică** (obstrucția venei subclavie) include simptome precum: edemul membrului superior, cianoza sunt simptome care indică obstrucția venoasă de natură trombotică sau nu; durerea este un simptom adesea prezent, dar poate să și absenteze. Parestezia degetelor și mâinii este frecventă în sindromul venos de apertură toracică și poate fi secundară edemului mâinii, mai degrabă decât să fie rezultatul unei compresii nervoase în zona defileului toracobrahial.

Mijloace de evaluare

Testul sindromului toracic se realizează pentru determinarea implicării vasculare, dacă simptomele pacientului indică pierderea perfuziei vasculare sau cauze neurogenice.

Examenul fizic:

Sindroamele neurogen și cel vascular se pot diferenția prin semnele evidențiate la examenul fizic.

În cazul sindromului neurogen de apertură toracică se observă o tensionare a mușchilor scaleni și apariția simptomelor la următoarele manevre provocative:

1. *Rotația și flexia laterală a capului* (ureche la umăr). Semnul este pozitiv dacă se declanșează durere și parestezie a membrului superior contralateral.
2. *Abducția brațului la 90° în rotație externă* (90° AbdRE). Semnul este pozitiv dacă se declanșează durere și parestezie a membrului superior testat în 60 de secunde, și adesea în mai puțin de 30 de secunde.
3. *Testul EAST* **(**elevated arm stress test**):** Cu brațele în abducție de 90°, coatele flectate la 90°, pacientul închide și deschide pumnii. Pacienții descriu apariția simptomelor caracteristice după 30-60 sec și nu pot continua testul. În cazul persoanelor care nu sunt pozitive la acest test, sindromul neurologic trebuie reconsiderat.
4. *Testul de tensiune al membrului superior modificat, al lui Elvey* (ULTT). Acest test este comparabil cu Strait Leg Raise Test la membrul inferior. Acest test a fost introdus de dr. Ron Stoney și este considerat foarte util în diagnosticarea sindromului neurogen de apertură toracică.

Testul se realizează din așezat, manevrele se execută activ. Realizarea testului în această manieră permite testarea simultană a ambelor member superioare și permite astfel folosirea membrului asimptomatic ca reper pentru compararea cu membrul superior simptomatic. Testul se realizează prin executarea a trei manevre succesive, după cum urmează:

Poziția 1. Abducția ambelor member superioare la 90° cu coatele extinse.

Poziția 2. Dorsiflexia pumnilor.

Poziția 3. Flexia laterală a capului spre o parte (ureche la umăr). Mișcarea se repetă de partea opusă.

Fiecare dintre cele trei manevre crește progresiv gradul de întindere al plexului brahial.

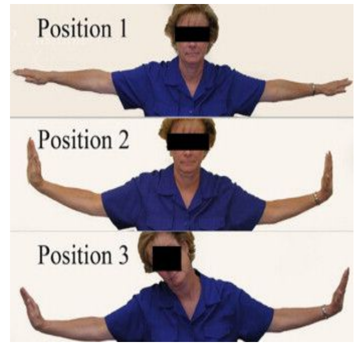

Fig.2 Testul Elvey modificat[11]

Pozițiile 1 și 2 provoacă simptome de partea ipsilaterală, poziția 3 provoacă simptome pe partea contralaterală.

Durerea care coboară pe braț, mai ales spre cot și/ sau parestezia mâinii reprezintă un răspuns pozitiv. Un test puternic pozitiv este cel care declanșează simptomele în poziția 1, cu accentuarea lor în pozițiile 2 și 3. Cel mai slab pozitiv este este cel în care simptomele apar doar în poziția 3.

În cazul pacienților cu dureri severe în repaus, testul se va efectua pasiv de către evaminator, prin ducerea brațului în abducție de 90° cu cotul în flexie de 90°, urmând apoi pozițiile descrise la testul Elvey modificat.

Testul Elvey modificat nu este patognomonic pentru sindromul neurologic de apertură toracică, ci mai degrabă indică compresia ramurilor nervoase ale plexului brachial în una dintre cele trei zone: defileul toracobrahial, spațiul pectoralului mic, zona coloanei cervicale. [6, 7]

Sindromul vascular de apertură toracică este ușor de identificat la examenul fizic, datorită prezenței edemului, cianozei, distensiei venelor superficiale la nivelul umărului și a toracelui superior.

În sindromul arterial de apertură toracică este foarte frecventă absența pulsului radial în repaus, deoarece pensarea/ obstrucția arterei poate avea loc în spațiul antecubital. Abducția bațului pentru a demonstra obliterarea pulsului este uneori necesară. În acest sindrom, de obicei nu este prezentă tensionarea mușchilor scaleni, iar rotația și flexia laterală a capului nu declanșează simptome; ULTT poate fi normal. În sindromul arterial, majoritatea simptomelor se manifestă în mână și antebraț, și foarte puțin în centura scapulară și gât. Diagnosticarea sindromului arterial poate fi stabilit doar prin informațiile clinice obținute la evaluare. [6]

Mijloace de intervenție fizioterapeutică

Modalități terapeutice precum ultrasunetul, căldura superficială, stimulare electrică, exerciții de stretching, exerciții corective posturale, exerciții de forță și rezistență, sunt componente necesare ale tratamentului fizioterapeutic în sindromul de aperture toracică.

Intervenția fizioterapeutică vizează: stretchingul mușchilor gâtului, a trapezului superior și a pectoralilor, neuromobilizarea nervului ulnar, mobilizări ale spatelui și exerciții de tonifiere ale mușchilor romboizi.

Mobilizările și manipulările sunt de obicei indicate și necesare pentru a elibera segmentele vertebrale restricționate și țesuturile miofasciale, mai ales scalenul anterior și mijlociu și pectoralul mic.

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[11] Sursa: Richard J. Sanders, MD,a,b Sharon L. Hammond, MD,a,b and Neal M. Rao, BA,b Denver, Colo (2007) Diagnosis of thoracic outlet syndrome, *Journal of vascular surgery* Volume 46, Number 3

Ultrasunetul este o modalitate de tratament preferată, deoarece permite încălzirea profundă a țesuturilor moi, ceea ce este esențial pentru creșterea elasticității și facilitează efectuarea unui stretching eficient și aplicarea terapiei manuale, în special pentru mușchii scaleni și pectoralul mic.

În mod ideal, ultrasunetul trebuie utilizat imediat înaintea stretchingului sau a terapiei manuale, mai ales datorită faptului că țesuturile profunde își reduc temperatura, de la 41-42º la 37ºC) în decurs de 20-30 de minute.[8]

Postura: corecția posturii și a unei biomecanci deficitare a corpului, care cauzează sau contribuie la compresia structurilor neurovasculare de la nivelul defileului toracobrahial este un aspect foarte important care nu trebuie neglijat în cadrul managementului fizioterapeutic.

Cele mai frecvente posturi care favorizează compresia neurovasculară din defileul toracobrahial sunt: umeri rotunzi, cap proiectat înainte, cifoză toracică, bascularea posterioară și depresia omoplatului. [3]

Stretching

Stretchingul pectoralilor mare și mic:

PI. Stând în cadrul ușii sau într-un colt, palmele plasate pe tocul ușii de o parte și cealaltă, ușor deasupra liniei capului.

Se execută o aplecare anterioară a trunchiului până se percepe senzația de întindere în partea anterioară a toracelui superior și a umărului anterior.

Se menține 15 - 30 secunde. Se repetă de 3 ori.

Stretching-ul pectoralului mic

PI. Pacientul plasează brațul, antebrațul și palma pe colțul unui perete, cotul flectat și brațul peste nivelul umărului.

Se rotează trunchiul în direcție opusă, într-o mișcare de îndepărtare a trunchiului de membrul superior plasat pe perete, până la apariția senzației de disconfort ușor.

Se menține întinderea 30 sec și se repetă de 3 ori.

Se efectuează de minim 3 ori/zi pentru a crește flexibilitatea.

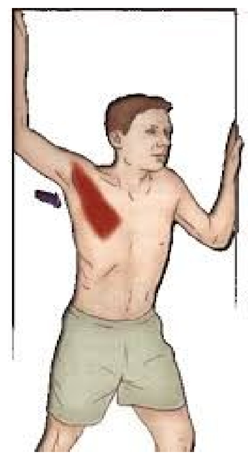

Fig.3 Stretching pectorali

Mușchii scaleni

A. **Stretching pentru mușchii scaleni anterior și mijlociu**

PI. Așezat. Pacientul flectează capul lateral, de partea opusă celei care trebuie alungită. Membrul superior de partea care trebuie alungită va apuca marginea scaunului, pentru fixarea membrului superior si pentru a menține umărul coborât (fig.4)

Mâna opusă se va plasa pe cap și va exercita o mișcare de apăsare, pentru a asista la întinderea mușchilor. (fig.5) După ce se atinge alungrea maximă, pacientul își apleacă tot corpul spre partea opusă celei pentru care se efectuează întinderea, pentru a crea o tracțiune adițională. (fig.6)

Fig.4 *Fig.5* *Fig6*

Stretching pentru mușchii scaleni anterior și mijlociu[12]

B. **Stretching scaleni:**

[12] Sursa: The Journal of the American Osteopathic Association

PI. Din stând sau așezat, se prind palmele la spate. Se coboară umărul stâng și se flectează capul de partea dreaptă până se percepe senzația de întindere a mușchilor.
Se menține poziția 15 - 30 secunde și se revine în poziția inițială.
Se repetă de partea opusă.
Se menține 15 - 30 secunde. Se repetă de 3 ori.

Relaxarea scalenului lateral

- Se localizează mușchiul scalen lateral prin plasearea degetelor chiar deasupra claviculei, la jumătatea distanței față de umăr. Se va palpa inserția mușchiului.
- Se presează mușchiul și în același timp se flectează capul spre partea heterolaterală. Apoi capul de rotează, privirea se va orienta spre umărul opus, apoi capul revine spre linia de mijloc.
- Această combinație de mișcări se execută până când se percepe senzația de relaxare a mușchiului.
- Se repetă cu partea opusă.

Relaxarea mușchilor pectorali

- Stând cu fața la perete, se plasează o minge de tenis la două degete sub claviculă și spre axilă. Se presează mingea cu corpul spre perete.
- Se mișcă mingea stânga-dreapta până se descoperă o zonă tensionată și dureroasă. Apoi, se va mișca brațul și umărul sus-jos și înainte-înapoi.
- Mișcările se execută timp de 45 de secunde sau până la detensionarea mușchiului.

Relaxarea bicepsului

- Cu mâna opusă, se va așeza o minge de tenis pe masa mușchiului biceps și se va exercita o presiune în mușchi
- Se execută flexia și extensia cotului, presând mingea spre mușchi, până ce se percepe senzația de reducere a disconfortului în acea zonă.
- Se va mișca mingea de-a lungul corpului muscular, pentru a găsi și alte puncte dureroase.
- Tehnica se realizează timp de 2 minute/ 10 - 15 repetări pentru fiecare zonă dureroasă pentru fiecare braț.

Relaxarea tricepsului

- Decubit lateral, se așează o minge de tenis sub triceps, căutând zonele tensionate și dureroase.
- Se flectează-extinde cotul până ce se percepe senzația de reducere a disconfortului în acea zonă.
- Se execută 2 minute/ 10 - 15 repetări pentru fiecare zonă dureroasă.

Exercițiu în A și W

- Se ancorează o bandă elastică la înălțimea pieptului. Pacientul se poziționează cu fața spre banda ancorată, membrele inferioare depărtate, genunchii relaxați, abdomenul contractat, brațele pe lângă corp cu coatele extinse, palmele orientate spre înainte, umerii relaxați.
- Se apucă banda elastică, menținând brațele pe lângă corp cu coatele extinse, palmele în spatele șoldurilor, orientate spre înainte. Din această poziție se vor apropia omoplații și se vor coborî, în timp ce membrele superioare extinse se vor duce spre înapoi.
- Se menține 3 secunde. Se execute 3 seturi/ 15 repetări.
- Apoi ținând banda cu ambele mîini, se vor abduce membrele superioare lateral de trunchi și se vor flecta coatele, formînd astfel litera '*W*', palmele orientate în sus.
- Banda va ajunge la nivelul pieptului. Se vor apropia omoplații, se vor flecta pumnii astfel încât mîinile/ pumnii să se alinieze cu umerii, coatele privesc spre sol.
- Se menține poziția 3 secunde. Se execută3 seturi/ 15 repetări.

Împingeri cu palmele în perete

- Stând cu fața la perete, la jumătate de pas distanță de acesta, picioarele la nivelul umerilor, genunchii ușor flectați.
- Palmele se așează pe perete cu policele privind în sus, iar celelate degete orientate spre lateral.
- Se execută o flexie anterioară a trunchiului, aplecând pieptul spre podea și îndepărtând șoldurile de perete.
- Se tracționează omoplații spre în jos, pe măsură ce se execută flexia trunchiului
- Se revine în poziție inițială.
- Se execută 3 seturi a câte 15 repetări.

Exercitii

- **Alunecarea brațelor pe perete:**

PI. Din stând sau așezat cu spatele lipit de perete, membrele superioare lipite de perete.
Se duc brațele deasupra capului, cât de sus posibil, menținând coatele și pumnii lipiți de perete.
Se execută 2 seturi/ 12 repetări

- **Extensii de trunchi:**

PI. Așezat pe scaun, palmele se împreunează la ceafă.
Se execută o arcuire posterioară a spatelui, concomitent cu ridicarea privirii spre tavan.
Se repetă zilnic, de 10 ori/ de mai multe ori/ zi.

- **Exercițiu pentru trapezul mijlociu:**

PI: Decubit ventral pe o suprafață dură, cu o pernă sub piept. Brațele se duc în abducție, cu coatele extinse, policele privește spre tavan.

Se ridică încet membrele superioare spre tavan în timp ce se apropie omoplații. Se revine lent în poziția inițială.

Se execută 3 seturi a câte 15 repetări.

Exercițiul se poate îngreuna prin ținerea unor greutăți în mîini.

Concluzii

Sindromul de apertură toracică este o condiție frecventă iar diagnosticarea corectă este un aspect foarte important pentru alegerea intervenției fizioterapeutice corecte. În linii generale, se va avea în vedere corectarea posturii și stretchingul mușchilor scaleni și pectoral, în special a pectoralului mic, dar și tonifierea romboizilor.

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La baza redactării lucrării stau principii deontologice, reguli, norme şi uzanţe etice şi estetice. Pentru realizarea aspectului uniform al revistei şi pentru asigurarea ţinutei ştiinţifice a articolelor, colectivul de redacţie recomandă colaboratorilor revistei să ia în considerare aspectele ce se vor prezenta.

Redactarea articolelor se conformează în general recomandărilor stabilite de Comitetul Internaţional al Editorilor de Reviste Medicale (www.icmje.org).

Lucrarea în extenso se va redacta în limbile română, engleză sau franceză şi va fi precedată de un rezumat în limba în care este redactat articolul, precum şi de un rezumat în limba română. Pentru autorii străini, lucrarea în extenso şi rezumatul se vor trimite într-o limbă de circulaţie internaţională (engleză sau franceză).

Lucrarea va avea **8-10 pagini**, inclusiv ilustraţii, tabele, grafice. Se va procesa spaţiat la un rând, justified, redactat în Office Word, Time New Roman, font 12, diacritice, format A4, cu margini: top 2 cm, bottom 2 cm, left/inside 2,5cm, right/outside 2cm.

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Titlul lucrării(în limbile română şi engleză sau franceză):Din punct de vedere formal acesta trebuie să fie scurt şi concis, fără paranteze, abrevieri, să nu fie explicat printr-un subtitlu, să anunţe conţinutul şi caracteristicile dominante ale articolului.

Titlul se scrie cu majuscule, bold, centrat, font 14.

Rezumatul lucrării(în limbile engleză sau franceză, precum şi în limba română)

Acesta trebuie să informeze cititorul asupra esenţei conţinutului şi asupra contribuţiei autorului; trebuie să fie fidel textului, să nu depăşească 15-20 de rânduri sau 250 de cuvinte scrise cu font 11. El trebuie să fie cât mai informativ. Rezumatul va cuprinde obiectivele lucrării, metodele noi utilizate, una sau mai multe concluzii edificatoare.

Cuvinte-cheie(în limbile română şi engleză sau franceză) : - Vor fi precizate 3-5 cuvinte cheie, italic, aliniate stânga, cu font 11. Ele trebuie să fie semnificative, să exprime esenţa demersului epistemic şi a conţinutului articolului şi să difere pe cât posibil de cuvintele din titlu.

Textul lucrării. Textul trebuie să fie echilibrat ca volum al părţilor componente, să aibă o exprimare clară şi elevată, frazele să fie scurte, evitându-se propoziţiile negative, exagerările lingvistice.

Când tema studiată necesită o clarificare teoretică sau o discuţie teoretică pentru justificarea formulării ipotezei, în planul lucrării se poate afecta un capitol destinat discuţiilor datelor din literatură, încadrarea temei cercetate în contextul domeniului, aportul cercetării la clarificarea, precizarea unor aspecte, etc. Prima parte a textului cuprinde noţiuni care evidenţiază importanţa teoretică şi practică a temei, reflectarea acesteia în literatura de specialitate, scopul lucrării, obiectivele şi sarcinile acesteia, pe scurt. Dacă este necesară amintirea datelor anatomo-fizio-patologice acestea trebuie să fie scurte şi noi, prin conţinut şi prezentare.

Se recomandă pentru studii structurarea în următoarele secţiuni:

• ***Introducere*** – se arată pe scurt scopul şi raţiunea studiului. Se prezintă numai fundalul, cu un număr limitat de referinţe necesare cititorului să înţeleagă de ce a fost condus studiul.

• ***Material şi metodă*** – se prezintă ipoteza sau ipotezele alternative, se descriu pe scurt, planul şi organizarea cercetării, pacienţii, materialele, metodele, criteriile de includere-exludere, explorările, procedura precum şi metoda statistică folosită.

Experimentele umane şi non-umane: Când sunt raportate experimente umane autorii trebuie sa precizeze dacă au fost respectate standardele etice pentru experimentele umane după cum este specificat în declaraţia de la Helsinki, revizuite în 2000 (*World Medical Association Declaration of Helsinki: ethical principles for medicalresearch involving human subjects*. JAMA. 2000 Dec 20; 284(23):3043-5)

• ***Ilustraţiile şi tabelele*** vor fi inserate în text la locul potrivit, numerotate cu cifre arabe (Tabel 1,2 etc., scris deasupra tabelului sau Fig.1,2.etc. scris dedesuptul figurii, caractere de 11, boltit), cu un titlu şi legendă însoţite de precizarea sursei exacte a citării (titlul lucrării\articolului şi primul autor). Imaginile, tabelele şi figurile trebuie să fie în format jpeg, de minimum 300 dpi. Figurile (desene, scheme) vor fi reprezentate grafic profesional. Fiecare fotografie va avea menţionat în subsol numărul, iar partea superioară a figurii - indicată cu o săgeată (dacă nu se poate deduce care este aceasta).

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