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Immediate effect of ACU-TENS over non acupuncture points in chronic obstructive pulmonary disease patients

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ABSTRACT

Questions

What is the immediate effect of Acu-TENS over non acupuncture points on reduction of dyspnoea and PEFR in patients with Chronic Obstructive Pulmonary Disease? In India COPD is 2nd most common disorder after pulmonary tuberculosis [2].Dyspnoea occurs in patients with COPD and together with energy requiring consequences of chronic infection and inflammation, leads to increased work of breathing [9]. In COPD patients, changes in lung volume and biomechanics leads to weak and ineffective expiratory manoeuvres [14]. PEFR has been used as surrogate measure of cough and huff strength.[14]Transcutaneous Electrical Nerve Stimulation (TENS) is a non-invasive modality and has been widely used in clinical practice for analgesia [1,15].

Participants

Thirty ambulatory patients with a mean age of 65 years with chronic obstructive pulmonary disease and no previous exposure to TENS or acupuncture.

Intervention

Experimental group received Acu-TENS over non acupuncture (over head of the humerus bilaterally) and controlled group received placebo Acu-TENS with identical electrode placement but no electrical output despite a flashing light indicating stimulus delivery.

Outcome measure

Lung function was measured by Peak Expiratory Flow Rate(PEFR) while dyspnoea was measured using a shortness of breath 100mm visual analog scale.

Results

After 45 mins of Acu-TENS the experimental group has increased PEFR by 8.67 and decreased dyspnoea by 0.4 more than the controlled group.

Conclusion

Acu-TENS may be useful non invasive adjunctive intervention in the management of COPD. This study suggests that the effect of long term Acu-TENS warrants further investigation.

Keywords: Non acupuncture points, Acu-TENS, Chronic Obstructive Pulmonary Disease, Peak Expiratory Flow Rate, Dyspnoea

INTRODUCTION

According to GOLD, "A preventable and treatable disease with some significant extra-pulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases."

In India COPD is 2nd most common disorder after pulmonary tuberculosis [2]

The two major entithesis of COPD are Chronic Bronchitis and Emphysema which are defined in different ways [3]. Patient with COPD presents with symptoms of chronic cough with expectoration, dyspnoea, laboured breathing, cyanotic appearance, weight loss, barrel chest, coarse rhonchi, wheeze and sputum. The patient himself will often date the onset of his llness from some acute exacerbation of cough and sputum which left him with a degree of disability which began seriously to interfere with his daily life. Dyspnoea occurs in patients with COPD and together with energy requiring consequences of chronic infection and inflammation, leads to increased work of breathing.

In COPD patients, changes in lung volume and biomechanics lead to weak and ineffective expiratory manoeuvres.PEFR has been used as surrogate measure of cough and huff strength.

PEFR is defined as maximal flow achieved during expiration delivered with a maximal force, starting from maximal lung inflation. PEFR is determined by the size of lungs, lung elasticity, the dimensions and compliance of the central intra-thoracic airways, the strength and speed of contraction of the respiratory muscles.

Transcutaneous Electrical Nerve Stimulation (TENS) is a non-invasive modality and has been widely used in clinical practice for analgesia. TENS refers to the use of electrical stimulators, capable of delivering pulsed currents, for the purpose of stimulating (depolarising) nerve fibres through the skin using surface stimulating electrodes.

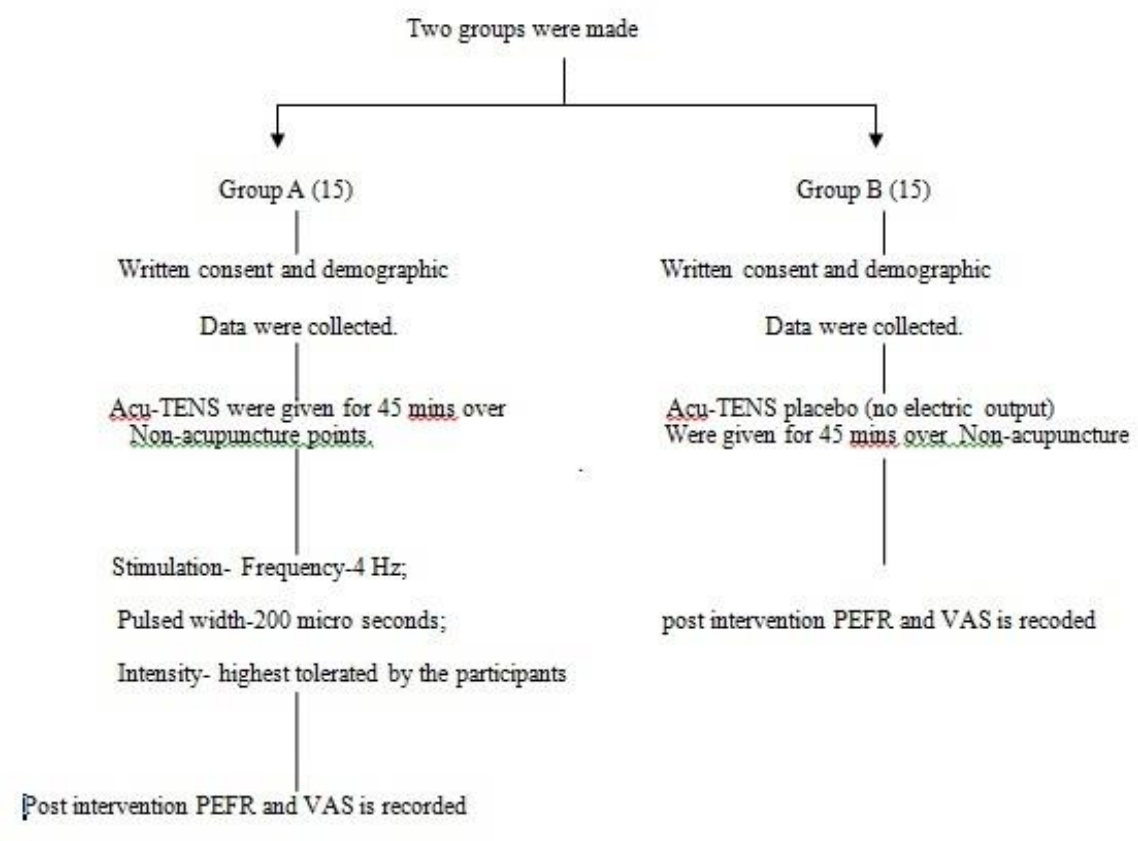
Application of Acu-TENS over specific acu-points (Acu-TENS) is believed to elicit similar response to manual acupuncture in pain relief. So the effect of Acu- TENS applied on non-accupuncture points on PEFR and dyspnoea needs to be studied. So that we can adviceAcu-TENS to be administered by the patient or their care givers to assist control of dyspnoea and thereby promote quality of life in patients with COPD.

METHODOLOGY

The conducted study is the experimental study with simple random sampling done of 30 participants with the following inclusion criteria-diagnosed with COPD, willing to participate, independent in mobility, able to communicate and follow commands, while people with co-existing IHD or neurological deficit, cardiac pacemaker, sensory deficit, poor perception and/or cognition were excluded from the study.

PROCEDURE

With the approval of Institutional ethical committee study was conducted.



RESULTS AND GRAPHS

Data was collected post intervention. Pre and post PEFR was analysed using Paired t test within the group VAS was analysed using Paired t test within the group. And comparison between PEFR and VAS was analysed using Mann Whitney test between the groups.

Graphs:

Graph 1: Dyspnoea

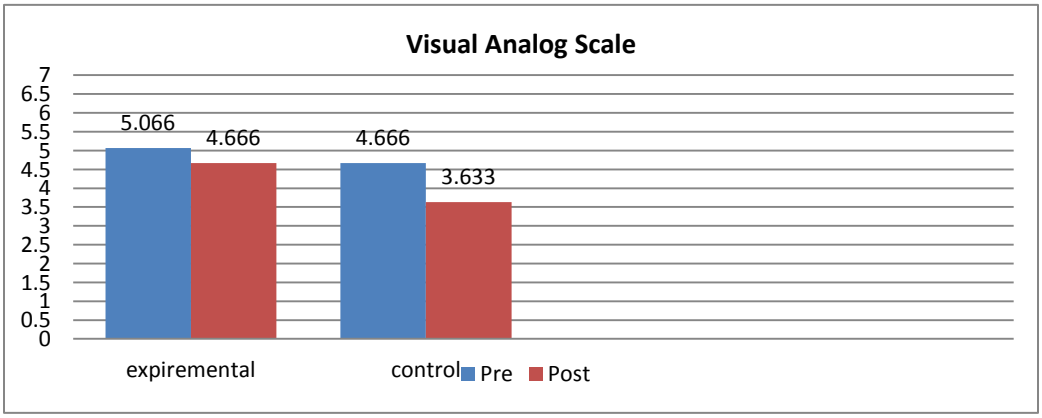


Table 1:

Experimental		**Control**		
	Pre	Post	Pre	Post
Mean	5.066	4.666	4.666	3.633
S.D	1.870	1.877	1.959	1.932
p-value		0.0967		0.0005

Graph 2: Peak Expiratory Flow

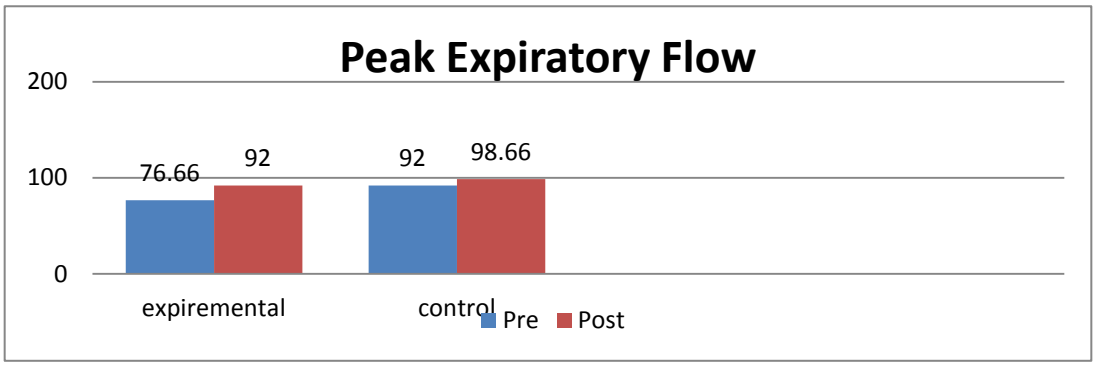
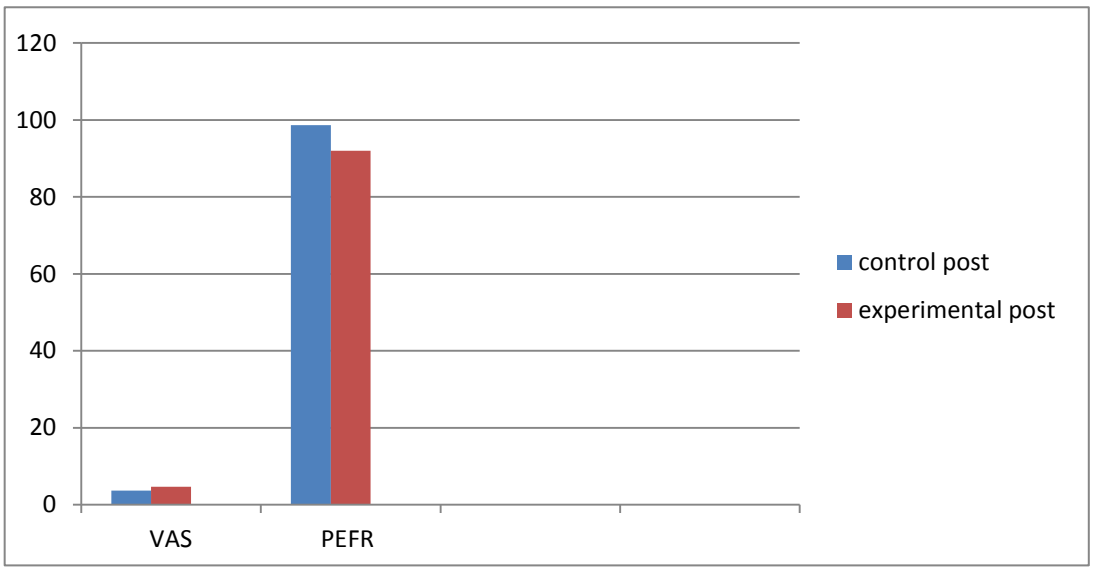


Table 2:

Experimental		**Control**		
	Pre	Post	Pre	Post
Mean	76.66	92	92	98.66
S.D	21.931	34.059	46.476	50.831
p-value		0.0017		0.0234

Graph 3: Comparison BetweenPefr And Vas



DISCUSSION

The clinical trial was conducted to study the immediate effect of Acu-TENS over non acupuncture point in terms of reduction of dyspnoea in COPD patient using VAS (visual analog scale) and PEFR(peak expiratory flow rate).

The results obtained from the statistical analysis of the present study supported the hypothesis which stated that there will be effect of Acu-TENS over non acupuncture points to relieve dyspnoea in COPD patients.

Positive effects of acupuncture and acupressure on dyspnoea management have been reported previously over acupuncture points, but was it Acu point specific was the study question. Which showed that the reduction of dyspnoea in patient with Acu- TENS over non acupuncture points for 45 mins is different by 0.4 than in the patients with placebo Acu-TENS (with no electrical output) over non acupuncture points for 45 mins and reduction in PEFR in patient with Acu-TENS over non acupuncture points for 45 mins is different by 8.67 than in the patients with placebo Acu-TENS.

TENS refers to the use of electrical stimulator, capable of delivering pulsed currents, for the purpose of stimulating (depolarising) nerve fibers through the skin using surface stimulating electrodes [5,6].Acu-TENS is stimulation of the point with an electric pulse rather than the traditional needle penetrating the skin [7]. The electric pulses used for treatment are usually some form of long duration, low frequency, high intensity TENS stimulating a-delta nerve fibers to achieve encephalinergic pain relief [7, 5, 6]. The pulse rate is set at 1-4 Hz and pulse duration at 0.200-0.300 mS. The reason that such a short duration pulses can be achieve these effect is that the targets are the sensory nerves which tend to have relatively low threshold (i.e. they are quite easy to excite) and that they will respond to a rapid change of electrical state. Treatment time is usually 45 mins, depending on the fatigability of muscle being stimulated [6]. 30 minswill need to delivered as a minimally effective dose [6]. The intensity employed will usually need to be greater than with the traditional TENS –still not at the patients threshold but quite strong and definite sensation. Dyspnoea in COPD is due to increased bronchial and systemic inflammation leads to change in levels of inflammatory mediators such as necrosis factor and interleukin causing airflow limitation. Inflammation leads to a rise in cytokine levels which transmitted to the hypothalamus via sensory nerve transmission an efferent signal from the hypothalamus via parasympathetic nerve causes a release of acetylcholine suppressing the inflammatory cytoxins [1].

Increased levels of cytokines may also directly activate the hypothalamus pituitary-adrenal axis via the vagus nerve, inducing the release of glucocorticocoids, further suppressing cytokine synthesis [1].

Acu- TENS is thought to evoke a suppressive effect on inflammatory mediator levels either via afferent (presynaptic) or efferent (post-synaptic) vagus nerve stimulation thereby decreasing dyspnea [1].

In the study by Ken Lau and Alice Jones, A single session of Acu-TENS over acupuncture points reduces dyspnoea in patients with COPD, a randomised, placebo-controlled trial. Department of rehabilitation sciences, Hong Kong Polytechnic University, Hong Kong. 2008-2009 showed that subjects with asthma receiving Acu-TENS before, after and during exercise showed a reduced percentage drop of lung function after exercise. Acu-TENS may help to alleviate airway obstruction and enhance the recovery of normal heart rate [1].

This study shows that the positive effect of Acu-TENS on acupuncture point and the present study helps to state that the Acu-TENS is also effective over non-acupuncture points when given for 45 mins. This is because High intensity and low frequency (1-5 Hz), though to work like acupuncture by endogenous opioid release. It takes some time for the opioid levels to build up (20-30 mins) with this type of TENS and hence the onset of pain relief may be slower than with the traditional mode. Once sufficient opioid has been released however, it will keep on working after cessation of the stimulation. Indeed opiates are prescribed as respiratory depressant to modulate the sensation of breathlessness.

The sensation of dyspnoea is related to the intensity of the input from the thoracic structures and from the chemoreceptors. It varies directly with ventilator demands such as exercise and inversely with ventilatory capacity (increased demands &/or reduced capacity leads to increase in dyspnoea).[8]perception of dyspnoea depends on

information arriving at the sensory motor cortex and interpretation is highly dependent on the psychological makeup of the person [8].The Acu-TENS and placebo like TENS to be equally effective and even more, in control group. The results obtained are due to suggestions and attention of visual stimulus (flashing light). Placebos can cause very real physical effects, producing changes in respiration, immune function and neurotransmitter and endorphin levels (kirsch, 2005)[26]

PEFR is influenced by lung volumes and muscle length tension relationship. The expiratory flow volume curve is grossly abnormal in severe disease, after a brief interval of moderately high flow, flow is strikingly reduced as the airways collapse and flow limitation by dynamic compression occurs [9].

As (mean) PEFR has been increased by 8.67 in experimental group more over placebo group, the possible reason for this could be due to release of opioid receptors triggered by Acu-TENS similar to acupuncture as demonstrated by Wang and co-workers [1]. Levin and Lui Chan showed that TENS excited large diameter afferents. Airway diameter is primarily influenced by parasympathetic nervous system fibers with sparse sympathetic innervations. Parasympathetic control dominates at rest, but vagal tone is reduced or even abolished during exercise, thereby leading to relaxation of the airway smooth muscles and consequently leads to bronchodilation [1].

Low frequency, high intensity TENS has been shown to trigger the release of opioids. Stimulation of opioid μreceptors was shown to specifically augment beta adreno receptors mediated bronchodilation [1].

The effect of Acu-TENS are rapid in onset, so immediate benefits can be achieved.[5] It is very easy to apply TENS at home as well as at work which makes it more beneficial [5,6].

Compared to the high cost of drugs and surgery, TENS costs very low, so more affordable for the patients [5,6].

CONCLUSION AND CLINICAL SIGNIFICAN

Acu-TENS may be useful non-invasive adjunctive intervention in the management of tachypnoea and lung function (PEFR) in patients with Chronic Obstructive Pulmonary Disease.

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