LITERATURE REVIEW

Applicability of Acu-TENS in Patients with Chronic Obstructive Pulmonary Disease

Melinda Harini, I Nyoman Murdana
Department of Physical Medicine and Rehabilitation, Cipto Mangunkusumo General Hospital - Faculty of Medicine, University of Indonesia, Jakarta, Indonesia

ABSTRACT

Asthma and Chronic Obstructive Pulmonary Disease (COPD) are the most global prevalence disease. Accupunture has been proved to be the adjuvant therapy for both airway obstructive diseases. But invasive technique that were used in accupunture, is not comfortable for some patients and depends so much to operator's skill. Acu-TENS is an electrical stimulation therapy with low frequency, in which transcutaneous electrodes are placed over acupuncture points, Dingchuan (EX-B1). It is less invasive, easy to apply and offer advantages to patient with COPD. The Acu-TENS therapy mechanism in COPD were related to lung function, functional capacity, quality of life improvement. Moreover, higher blood ß-endorphin is produced and in fact, it is found to be moderately correlated with reduction of respiratory rate, improvement of forced expiratory volume in one second (FEV1). Therefore, Acu-TENS could be used as alternative electrodes placement in order to improve symptoms, muscle function, and functional capacity in patients with COPD. However, long-term study to evaluate the application of Acu-TENS is highly recommended.

Keywords: *Acu-TENS, COPD, ß-endorphin*

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is one of the most global prevalence disease. Moreover, according to the survey of non-communicable diseases in Indonesia, COPD was in the first place contributor to morbidity (35%).[9] COPD had clinical manifestations of breathlessness (dyspnoea), especially on exertion that would lead to exercise intolerance, quality of life reduction and increase healthcare resources utilization. Due to that challenge, rehabilitation in COPD is a very urgent medical services in Indonesia.

Chest physical therapy and exercise become the first choice of non-pharmacologic treatment of COPD.[8] Exercise-based rehabilitation programs are able to improve lower-limb muscle strength and endurance, functional exercise performance, and health status in patients with obstructive airway disease. However, physical training can be particularly difficult to those who exhibits intense breathlessness at rest or on minimal exertion. Electrical stimulation of limbs muscle by NMES may provide an alternative approach for improving physical capacity in severely compromised patients with COPD who present with incapacitating dyspnoea. NMES gave similar morphological changes to conventional endurance training in patients with COPD.[4-6]

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Correspondence detail:
Received in March 2015 and accepted for publication in April 2015.
Correspondence detail:
Melinda Harini. Email: melindaharini@gmail.com
Phone: +62 8159635765

Electrotherapy in COPD Patients

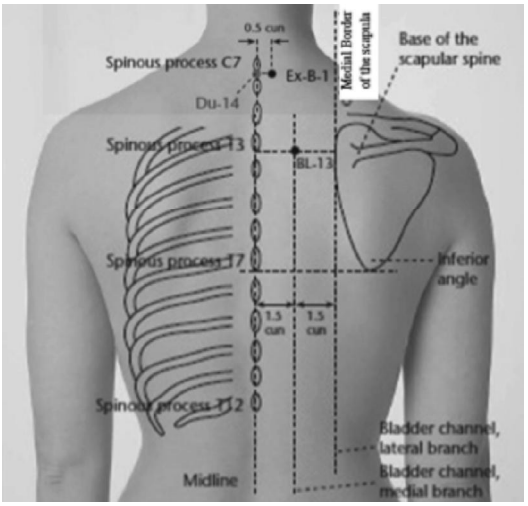
Electrotherapy is a very well known modality therapy that has been widely used. The most popular and first developed electrotherapy was Transcutaneous Electrical Stimulations (TENS). TENS was used especially in pain management, as adjuvant or alternative to pharmacotherapy. It often becomes a favorable choice since it has less side effect than pharmacotherapy. It was also used in urologic and gynecologic issues to reduce urinary urgency; in scleroderma and diabetic neuropathy to increase blood perfusion; in stroke, spinal cord injury and multiple sclerosis to reduce spasticity.[1,2]

Last years, TENS was also used in patient with Chronic Obstructive Pulmonary Disease (COPD).[3] Previous studies concerning the application of Neuromuscular Electrical Stimulation (NMES) application in COPD patients were already developed. Those studies had proven advantages of NMES on relieving dyspnoe symptoms, improving pulmonary function, and exercise capacity enhancement.[4-7] Studies about TENS application in COPD that were presented in a very comprehensive disertation by Ngai (2010), had several differences than those previous studies, one of them was electrode placement over acupuncture point (acu-TENS). In this literature review, we explore about Acu-TENS therapy mechanism, application methods, result and safety to COPD patients.

Acupuncture points on TENS (Acu-TENS): Application in Airway Obstruction Disease

Berger et al. and Tashkin et al. stated that the application of acupuncture in asthma patients can improve the air flow conduction and it is associated to respiratory resistance reduction.[10-12] Autonomic control of respiratory muscles occured in thoracal segment of spinal nerve. Andersson hypothesized that stimulation in the afferent of thoracal segment spinal nerve would affect the sympathetic and then reduce air way resistance.[3]

The acupuncture points are specifically individualized, based on the experience of the therapist as well as disease diagnosed using Traditional Chinese Medicine (TCM) approach. However, some Chinese literature provides a general selection guide of acupuncture points. For the case of respiration, a point which is usually used is LU 7 (Lieque), LI 4 (Hegu), BL 13 (Feishu), EX-B1 (Dingchuan), GV 14 (dazhui), ST 36 (Zushanli) and CV 17 (Tanzhong). In clinical studies, the point that is commonly used is the LU 7 (Lieque), BL 13 (Feishu) and EX-B1 (Dingchuan), as visualized in figure 1.[10,13,14]



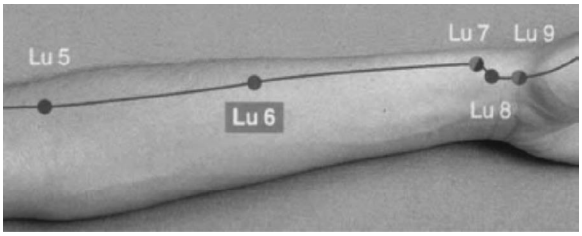


Figure 1. Acupuncture pointsthat are usually used for the respiratory cases: LU 7 (Lieque), EX-B1 (Dingchuan), and BL 13 (Feishu).
Source: acupunctureschoolonline.com

Acupunture had been proven to be the adjuvant therapy for airway obstructive diseases. But invasive technique that were used in accupunture, is not comfortable for some patients and depends so much in the operator's skill. Due to such condition, Acu-TENS was developed. Acu-TENS is electrical stimulation therapy in which transcutaneous electrodes are placed over acupuncture points.[15] According to study literature, it is less invasive, less difficult and gave advantages to patient with COPD.

DISCUSSION

The Role of Acu-TENS in Obstructive Airway Disease

A double-blinded randomized control trial (RCT) by Ngai (2010) used Acu-TENS on the studied group which includes asthmatic and COPD patients. TENS was applied on the acupuncture EX-B1 point that is anatomically located on paracervical at spinous processus of C7 vertebra, with the frequency of 2 Hz and pulse width of 200 µs wave for 45 minutes per session (Figure 2). They have to fulfilled 5 sessions weekly for 4 weeks or 20 sessions in total. Lung fuction measured as forced expiratory volume in 1 second (FEV_1) shows the studied group exhibits higher lung function improvement by 13.6% (p=0.012) compared to the Sham-TENS group (TENS applied onto non-acupuncture point). The functional capacity was measured by 6 minutes walking test (6MWT). The studied group completes longer distance, 11.4% higher than in Sham-TENS (p=0.047). Acu-TENS increases patients' quality of life as seen in the St.George Respiratory Questionnaire (SGRQ) results on activity (-9(2.5), p=0.007) and total scores (5.2(5.4), p=0.028) . Moreover, Acu-TENS stimulates the higher production of ß–endorphin level in blood by13.3% (p=0.0012). It appears immediately after treatment and decreased with the termination of therapy session.

ß–endorphin acts on µ-opioid receptors affecting respiratory rhythm-generating center in order to reduce respiratory rate which in turn reducing ventilation demand. Reduction of ventilatory demand made patient to be less desaturated during exercise and have better exercise tolerance. ß–endorphin could also enhances ß–adrenoreceptor by mediating brochodilation through alteration of cAMP-dependent pathway which leads to FEV_1 improvement.[3]

No adverse effects were recorded in this study. Acu-TENS could be used as alternative electrodes placement in order to overcome symptoms, obtain muscle function, and functional capacity improvement to patients with COPD.

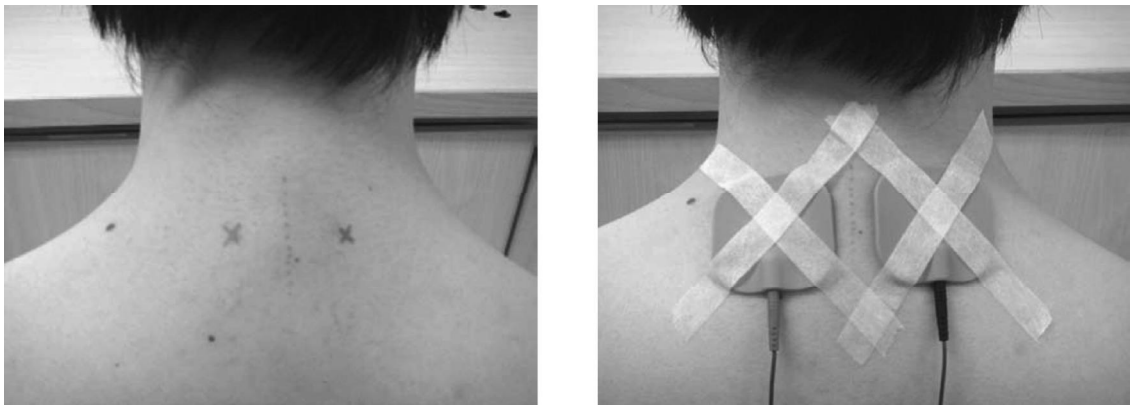


Figure 2. Acu-TENS in Airway Obstructive Disease[16]

CONCLUSION

Patient with COPD might get advantages from Acu-TENS as adjuvant therapy to exercise in order to reduce symptoms, gain muscle function, and functional capacity improvement, yet long term evaluation study is still required.

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