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## ORIGINAL RESEARCH

# Transcutaneous Electrical Nerve Stimulation on patients presenting intercostal Drainage

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## ABSTRACT

**Background: Chest drains or the tube thoracotomy or intercostal drainage tube gives a technique for eliminating the air and fluid from the pleural space. It is a most painful cut repressing the hacking, breathing and decreasing the pulmonary functions. The use of TENS gives a pain-relieving impact which decreases the nociceptive pathways and helps in working on pulmonary functions. Consequently, the review expects to see the impact of transcutaneous electrical nerve stimulation on pulmonary functions in patients with an intercostal drainage tube.**

**Material and Method: The review consists of 10 patients with Intercostal Drainage Tube were chosen by convenient sampling at Darbhanga Medical College. The patients were taken in the age group of 20-40 years according to inclusion criteria and intervention protocol was given for 2 weeks.**

**Outcome measures: Pulmonary Function Test (FEV1 and FVC).**

**Results: The mean contrast for FEV1 in litre was 0.225, t esteem 3.406, p esteem 0.0078 and Pred% were 16, t esteem 18.674,p value<0.0001.The mean distinction for FVC in litre was 0.3010,t worth 3.4549,p worth 0.0062 and Pred% was 16,t worth 14.884,p worth <0.0001.Both (FEV1 and FVC) have shown critical improvement after the utilization of TENS for quite some time in patients with Intercostal Drainage Tube.**

**Conclusion: The review concluded that the utilization of Transcutaneous Electrical Nerve Stimulation worked on the Pulmonary Functions in Patients with Intercostal Drainage tubes.**

**Keywords: Transcutaneous Electrical Nerve Stimulation, Pulmonary Functions, IntercostalDrainage Tube, Thoracotomy.**

## INTRODUCTION

The pleural cavity is otherwise called the pleura space, it is the thin liquid occupying space between the two pulmonary pleurae of each lung. A pleura is a serous membrane that folds back onto itself from a two-layered membranous pleural sac. The pleura cavity transmits movements of the ribs muscles to the lungs, especially during heavy breathing. [1] The pleural cavity helps the ideal working of the lungs during breathing. This causes the extension of the chest wall that expands the volume of the lungs. [2] The pleural cavity comprises pleural liquid. The pleural cavity is 3-5mm in width and comprises 10-20ml of pleural fluid. [3]

The intrapleural pressure is the pressure applied in the pleural cavity and it is the negative pressure in the pleural cavity. The ordinary intrapleural pressure is - 5cm H2o and during inspiration, it increments up to 8cm H2o and during expiration, it diminishes to - 4 cm h2o.

Because of negative intrapleural pressure, it keeps the lung expanded and prevent collapsing inclination of the lung produced by elastic recoiling of tissue.

The pleural diseases comprise pleural effusion, hydrothorax, empyema, pneumothorax, pleurisy, hemothorax, hydropneumothorax, chylothorax, and so forth The normal indications during pleural condition are dyspnea, pleuritic chest pain, cough, fever, and weight reduction. The physical assessment findings incorporate tachypnea, tachycardia, the fullness of the affected chest, reduce chest movements, diminished or absent breath sounds. The clinical administration incorporates the treatment of basic reason with anti-microbials and it comprises of the expulsion of pleural liquid and it is taken out with the assistance of thoracocentesis and intercostal drainage tube insertion. The position of the intercostal drainage tube with seal submerged drainage for pneumothorax is the second - third intercostal space, and for hydropneumothorax or pleural effusion, it is the fifth sixth intercostal space. [4]

Chest channels are likewise referred to as underwater sealed drainage, thoracic catheter, tube thoracotomy or intercostal drainage tube. An intercostal drainage tube (ICD) gives a technique for eliminating air and fluid substance from the pleural space. Intercostal drainage tubes are embedded as an obtrusive system for the expulsion of liquid, air from the pleural space or mediastinum or re-expand the lung and restore negative intrapleural pressure and respiratory function. [5]

Thoracotomy can be one of the most painful kinds of incision that patients can insight. Pain might inhibit effective coughing, deep breathing, limit upper limb movement of the affected side. [6] Thus, the objective of the therapist is to develop a pain-relieving routine that gives compelling pain help and permits post-thoracotomy patients, the capacity to keep up with the useful remaining limit by profound breathing and viable clearance of secretion with coughing and early mobilization, which can prompt recuperation and shorter length of hospital stay. [7]

The physiotherapy management for this condition incorporates pain management with TENS, inspiratory activities, expiratory activities, segmental breathing activities, and thoracic expansion exercises. [8]

Pain is a common symptom felt during the postoperative period at the incision site, which might interfere with pulmonary functions and healing. Respiratory complications are the most common complications that may occur in a postoperative period which typically develops during the first 48 hours after the surgery. Anaesthesia and tissue dissection during insertion of intercostal drainage tube contributes to changes in lung volume ad gas exchange. Because of anaesthesia the motility of cilia reduces and causes retaining secretions, thereby causing atelectasis. Reduction in functional capacity has implications for postoperative complications and the course of recovery. Therefore an early pain reduction helps to keep the patient relieved from the adverse effect of analgesia, cough, and thereby helps to speed up recovery.

Transcutaneous electrical nerve stimulation (TENS) is popularized name for electrical stimulation produced by a portable stimulator used to treat pain and also to see the effect on the pulmonary function of the patient. Pain control TENS units typically produce a continuous train of pulsed current at frequencies ranging from 1-120 $H_z$. The pulses are normally rectangular, biphasic and the pulse duration is normally 50-200μs.

Johnson et al. reported that the efficacy of transcutaneous electrical nerve stimulation in producing analgesia in cold-induced pain was assessed using a range of 5 stimulating frequencies (10Hz, 20Hz, 40Hz, 80Hz, and 160Hz) in 83 normal healthy subjects. TENS significantly elevated ice pain threshold when compared with sham and control groups. TENS frequencies between 20 and 80Hz produced the greatest analgesia, while frequencies below and above this level (10 and 160Hz) although significantly elevating the ice pain threshold, produced effects of lesser magnitude.

Cheung D &C et al. reported that high TENS has been used to control postoperative pain after thoracotomy and improve pulmonary functions.

## MATERIAL AND METHODS

The review was conducted at Darbhanga Medical College. The source of data was gathered from In Patients Surgery and Medicine wards referred to Cardiorespiratory Department. Among every one of the members referred to cardiorespiratory physiotherapy, written consent was taken and 10 patients in the age group of 20-40 years who had gone through the insertion of an intercostal drainage tube were conveniently chosen based on Selection standards. For the review Transcutaneous electrical nerve stimulation was allowed for about fourteen days and a Pulmonary Function test was performed before and following fourteen days of intercession with TENS.

## INTERVENTION PROTOCOL

### TENS

### TYPE

Conventional Type.

### FREQUENCY

100-150 $H_z$

### DURATION OF TREATMENT

10-15 min.

### INTENSITY

As per patients' tolerance.

### ELECTRODE PLACEMENT

At the site of insertion of the intercostal drainage tube.

## RESULT

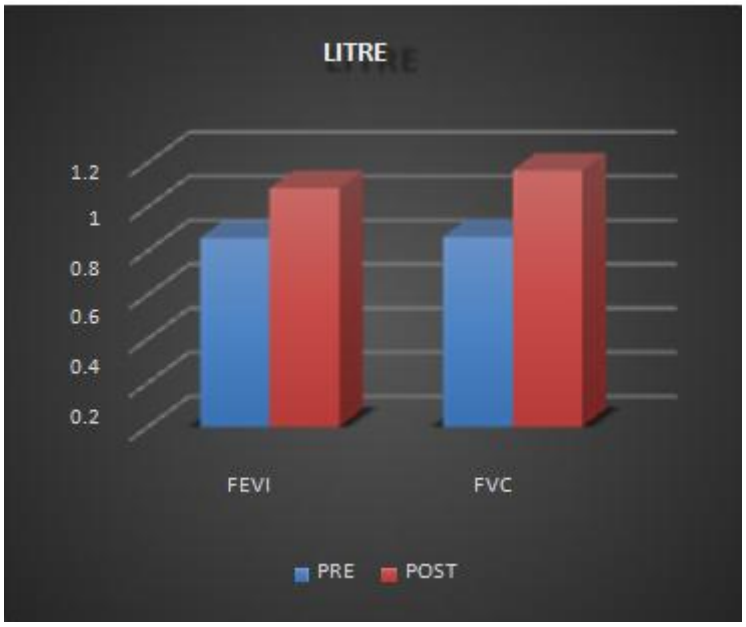
The present study included a total of 10 participants among which 6 were males and 4 were females.

The pre-intervention Mean ± SD for FEVI was 0.858±0.2133 in litre & 39.1±7.505 in Pred%. The post interventional Mean ± SD of FEV1 was 1.083±0.3690 in litre & 55.2±7.786 in pred%. The pre and post value of FEV1 was compared and the mean difference was 0.225, the t value was 3.406 and P value was 0.0078 in litre & the mean difference in Pred% was 16, the t value was 18.674 and the P-value was <0.0001.

The pre-interventional Mean± SD of FVC was 0.864±0.2156 in litre & 31±4.397 in Pred%. The post interventional Mean± SD of FVC was 1.165±0.3996 in litre & 47±5.735in Pred%. The pre and post value of FVC was compared and the mean difference was 0.3010, the t value was 3.4549 and P value was 0.0062 in litre & the mean difference in Pred% was 16, t value was 14.884 and the P-value was <0.0001. Paired t-test was used to compare the pre and post interventional values and it showed a statistically significant difference after 2 weeks of intervention with TENS.

| | | PRE MEAN±SD | POST MEAN±SD | MEAN DIFFERENCE | t VALUE | P VALUE |
|---|---|---|---|---|---|---|
| FEV1 | litre | 0.858±0.2133 | 1.083±0.3690 | 0.225 | 3.406 | 0.0078 Significant |
| | Pred% | 39.1±7.505 | 55.2±7.786 | 16 | 18.674 | <0.0001 significant |
| | litre | 0.864±0.2156 | 1.165±0.3996 | 0.3010 | 3.549 | 0.0062 significant |

| | | | | | | |
|---|---|---|---|---|---|---|
| FVC | Pred% | 31±4.397 | 47±5.735 | 16 | 14.884 | <0.0001 significant |




**DISCUSSION**

The current review was directed to discover the Effect of Transcutaneous Electrical Nerve Stimulation on Pulmonary Functions in Patients with Intercostal Drainage tubes. Consequently, the current review showed that TENS was powerful in the improvement of pulmonary functions following fourteen days of use of TENS in patients with an intercostal drainage tube.

A comparative examination supporting the current review was conducted on post-thoracotomy pain and pulmonary functions, It included 60 patients in the first group with TENS and 56 patients in the other group without TENS. They noticed the pain with a visual analog scale and noticed the pulmonary functions of the patients and along these lines inferred that TENS is advantageous for pain help and no aftereffects and works on the pulmonary capacity of the patients after the thoracic medical procedure [9] Another comparable review was conducted on the impact of transcutaneous electrical nerve stimulation on forced vital capacity. 21 patients were haphazardly chosen to a group (n=11) or a control group (n=10). Each group performed three preliminaries of forced vital capacity testing north of a 20-minutes time frame. The group was given 10 minutes of transcutaneous electrical nerve stimulation at the locales of most prominent pain. The review inferred that there is a huge expansion in force vital capacity during the stimulation and recommended that the use of TENS further develops the chest expansion and mobility in patients who had thoracotomies. [10]

Thoracotomy or insertion of an intercostal drainage tube is one of the most incredibly painful incisions the patient can insight. Pain inhibits the viability of coughing, influences profound breathing, and confines the upper limb mobility of the affected side, this outcomes in a decrease of lung volume and lung limits bring about a decrease in pulmonary functions and causes prohibitive ventilatory deformity. The utilization of TENS helps in pain decrease and by implication further develops the lung volume and limits this assists the patient with breathing viably and in a roundabout way works on the pulmonary functions.

O Solank, A Turna likewise led a comparative kind of study to decide the impact of transcutaneous electrical nerve stimulation on pain force and pulmonary functions in patients going through coronary artery bypass surgery. They were divided into two groups one

intervention group(n=50), patients got normal consideration alongside the (TENS) and other the treatment group(n=50) got just standard consideration. The pain power was estimated involving a visual simple scale like clockwork for 72 hours after medical procedure rest and coughing. Pulmonary functions were surveyed through Forced expiratory volume in one second (Fev1) and forced vital capacity (FVC) at 24,48,72 hours after a medical procedure. The review reasoned that TENS might reduce postoperative pain in resting and coughing conditions, work on the pulmonary capacity in patients going through coronary artery bypass surgery. [11]

The current review concluded that there is improvement in pulmonary functions after the use of TENS and the system behind this is the application of TENS gives a pain-relieving impact which reduces the enactment of nociceptive pathway and gives pain help which by implication works on the depth of breathing and further develops the lung volume and lung capacities and works on the pulmonary functions in patients with an intercostal drainage tube.

## CONCLUSION

The review concluded that the use of Transcutaneous Nerve Stimulation worked on the Pulmonary Functions in patients with Intercostal Drainage tubes. Subsequently, TENS should be applied in the normal act of physiotherapy in pain management in patients with Intercostal drainage tubes.

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