

Review Article

# Role of Transcutaneous Electrical Nerve Stimulation (TENS) in Management of Post-Operative Pain (Thoracotomy)

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## ABSTRACT

Pain has been identified as one of the major concerns in patients after thoracic surgery. It could be arising immediately post operative or as a late onset complication. The reasons immediate post thoracotomy could be attributed to the incision, use of chest tubes and the inflammatory process, where as the late onset pain which is usually after about 6 months is neuropathic in nature. There is a dearth and inconclusive literature on effective pain management approach using TENS (Transcutaneous electrical nerve stimulation). Therefore this review aims at evaluating the application of TENS from the existing literature and practice guidelines to formulate a clinical pathway guideline towards treatment of post operative thoracotomy pain.

**Key words:** Pain, Thoracotomy, High TENS, Low TENS.

## INTRODUCTION

The pain has been identified as the major source of concern for patients in the post-operative thoracic surgery and is known to be due to different reasons like incision, tissue retraction, use of chest tubes after surgery and the inflammatory process. This may increase the pulmonary complications in the post-operative period, such as decreased respiratory muscle strength, reduced lung volumes and capacities, reducing the effectiveness of cough and increased infections, which interferes with the patients' progress and is the main cause of morbidity and mortality. [1]

More than 80% of patients who undergo surgical procedures, experience acute post-operative pain and approximately 75% of them report the severity as moderate, severe or extreme. Evidence suggests that less than half of the patients who undergo surgery, report adequate pain

relief. Inadequately controlled pain negatively affects quality of life, function and functional recovery, the risk of post-surgical complications and risk of persistent post surgical pain. Thoracotomy produces nociceptive and neuropathic pain that is aggravated by respiration and coughing. [2]

Furthermore inadequate acute post-operative pain management may contribute to the development of a chronic post-thoracotomy pain syndrome. It was seen that there was pain which persisted greater than four years post-thoracotomy. It is not severe, but a small proportion of patients, may experience persistent moderately disabling pain. [3]

Therefore the aim of the study was to evaluate the efficacy of TENS application on pain after Thoracotomy.

Thus the goal of the Physiotherapist is to develop an analgesic regimen that provides effective pain relief and to allow post-operative thoracotomy patients, the

ability to maintain their functional residual capacity by deep breathing. Effective clearing of secretions with cough and early mobilisation can lead to quick recovery and shorter length of hospital stay. [4]

### Summary of Literature review:

Based on the Guidelines on management of post-operative pain by the American pain society, it was recommended that TENS should be used as an adjunct to other post-operative pain treatments. (weak recommendation, moderate quality evidence). It is thought to activate endogenous descending inhibitory pathways activating opioid receptors to produce reduced central excitability and decreased pain through stimulatory effects on large diameter afferent fibres. [2]

It has been proposed that there is an interrelationship between the skin, endocrine, immune and central nervous systems, which has been termed the neuro-immuno-cutaneous-endocrine model. According to this theory, electrical stimuli at the skin surface can influence all of these systems at both local and central level. [5]

There is a conflicting professional opinion on the use of TENS in acute post-operative pain. The recommendations of the agency for Health care policy and research(AHCPR) states that in acute pain TENS is effective in decreasing pain and improving physical function, whereas earlier reports tell that TENS is not effective as a sole treatment of moderate or severe pain after surgery. [6]

It was seen that when TENS was used as an adjunct to post-operative medications, the usage of opiates reduced, there was an increase in forced vital capacity, thus improving chest expansion and mobility in patients, better coughing attempts, improved FEV<sub>1</sub>, decreased duration of recovery room stay and also lower pain scores. [7]

TENS alleviates post-thoracotomy pain with reduction of cytokine production and of analgesic consumption and with positive effects on pulmonary ventilatory

functions. TENS increased the spirometric breath function, FEV<sub>1</sub>, FVC, PaO<sub>2</sub> were high and PaCO<sub>2</sub> was low. [8]

Effective pain management is associated with patient satisfaction, earlier mobilization, shortened hospital stay and reduced costs. (AHCPR 1992). Despite these benefits, there are a substantial number of patients who suffer from post-operative pain. Thus Clinical Practice Guideline (CPG) was laid down to manage pain and suffering for patients experiencing acute and chronic pain. [9]

There is a controversy existing about the opt was most optimum frequency to be used when giving TENS to the patient for both acute as well as chronic post-operative thoracotomy pain. When we talk about High TENS/High frequency TENS (25-150 Hz) and Low TENS/Low frequency TENS (1-8 Hz). In a meta-analysis which assessed optimal treatment parameters for post-operative pain, it was concluded that 85 Hz for High TENS and 2 Hz for Low TENS was most appropriate. [10]

In a study done by Walsh et al, it was suggested that a low frequency (4 Hz) of stimulation had a greater analgesic effect than high frequency (100 Hz). However patients preferred high frequency stimulation. It has been reported that low frequency stimulation requires a higher intensity to produce pain –relief equivalent to high –frequency stimulation. However the alternating pattern of low and high frequency stimulation may offer an advantage over either frequency alone. (dense-disperse mode) (mixed frequency). There are findings which suggests that per-incisional stimulation using mixed frequency (2 Hz and 100 Hz) produces a significant reduction in opioid medication requirements. [11]

TRANSCUTANEOUS ELECTRICAL STIMULATION (TENS) is a method of producing electro-analgesia through the spinal cord gating mechanism. TENS has been used as an effective adjunct for providing post-operative pain control.

TENS facilitates movement and exercise by decreasing pain perception and improving physical functioning. (Wall & Melzack, 1989; Bonica, 2001)

Based on all the above literature, meta-analysis, clinical practice guidelines: the following Clinical Pathway has been created which would be the Best Practice Guidelines as of now for.. The role of TENS in the management of post-operative Thoracotomy pain.

## CONCLUSION

### Physiotherapy management for acute and chronic post-operative pain

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**Physical modality (TENS) in pain relief for acute and chronic post-operative Thoracotomy**

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**Current management of care --- Opioid analgesics**

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**Patient Goals:** Reduce pain and improve function

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**Therapist Goals:** Reduce pain, improve function, activity and participation levels

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**Proposed:** TENS as an adjunct with other post-operative pain treatments

#### Pre –treatment Evaluation domains:

- ✓ NRS, VRS (Pain intensity)
- ✓ Opioid dose
- ✓ Respiratory function(FVC,FEV1,PaO2,PaCO2)
- ✓ Cough efficacy
- ✓ Mobility level
- ✓ Length of Hospital stay

#### Intervention:

- ✓ Acute post-operative Thoracotomy pain: (Mixed stimulation) Alternate high and low frequency stimulation. 1-8 Hz as low frequency and 80-100 Hz as high frequency. (evidence..4 Hz and 100 Hz)
- ✓ Chronic post-operative Thoracotomy pain: Low frequency electrical stimulation.

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**Plan of Care:** As early as 6 hours post-operatively. Intermittent stimulation is more effective than prolonged continuous stimulation.

#### Post-treatment Evaluation domains:

- ✓ NRS, VRS (Pain intensity)
- ✓ Opioid dose
- ✓ Respiratory function(FVC,FEV1,PaO2,PaCO2)
- ✓ Cough efficacy
- ✓ Mobility level
- ✓ Length of Hospital stay

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**Variations:** Cognitive impairments, presence of pacemakers

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**Discharge criteria:** Repeated review of NRS..Repeated review of pain intensity and functions for at least 6 months post operative.

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