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Immediate changes in Pain after TENS in patients with Abdominal Surgeries: A Case Series

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Abstract

Background:
Abdominal surgical procedures cause tissue damage by direct visceral manipulation, through the incision on anterior abdominal wall and by the use of surgical retractors that help to expose the surgical field. Pain is an important negative influence in the postoperative evolution of abdominal surgeries so the study was conducted to see the changes in pain after TENS in patients' abdominal surgeries through VAS.

Methodology:
A case series was done in six patients in Dhiraj General Hospital, Vadodara. Physiotherapy treatment was given in form of TENS was given to the patients with abdominal surgeries twice a day. Prior to treatment patients were assessed for pain through VAS. Routine physiotherapy management was continued according to patient's conditions.

Result:
SIX patients were included in case series. There was reduction in visual analogue scale in patient with abdominal surgeries.

Conclusions:
There was reduction in pain in all the patients with abdominal surgeries who received physiotherapy treatment in form of TENS for 3 consecutive days.

Keywords:
Abdominal surgeries, physiotherapy

INTRODUCTION

Abdominal surgical procedures cause tissue damage by direct visceral manipulation, through the incision on anterior abdominal wall and by the use of surgical retractors that help to expose the surgical field. Pain after surgery causes discomfort to the patient, preventing the patient from relaxing, leading shallow breathing and hindering the patient's movements in bed. Thus decrease diaphragmatic breathing and cough efficacy that might lead to atelectasis, especially in the lower lung fields. Pain is an important negative influence in the postoperative evolution of abdominal surgeries.The concept of Pain Gait control theory is based on the fact that peripheral stimulation produces impulses that are transmitted to three spinal cord systems: substantial gelatinoids fibers in dorsal horn, dorsal column fibers projecting towards the brain and first central transmission (T cells) in the dorsal horns. What the theory proposes is that substantial gelatinoids is a gait system which modulate efferent impulses before T cells are activated. TENS can be used as conventional analgesia for postoperative pain. Besides being a non- invasive and non-pharmacologic technique; it is comfortable for the patient in 95% of the cases. It can be effective in controlling pain after abdominal surgeries without any side effects.[1] Transcutaneous electrical nerve stimulation (TENS) is a physical therapy tool widely used to relieve pain. The effects of TENS follow the "Pain Gait Theory" (Melzek and Wall, 1965)[2].Laparoscopic surgery has become the standard approach for a large number of gynecologic procedures. The frequency of laparoscopy varies widely across the globe. Laparoscopic operations are performed annually for the following indications: sterilization, diagnosis, cyst enucleating, and salpingooophorectomy.Pain is often a problem after gynecologic laparoscopic surgery, even if the postoperative pain is less significant when compared to that after a similar major laparotomy surgery[3].

Appendectomy was performed through a skin crease incision and muscle splitting approach. An absorbable suture was used to legate and buries the appendix stump. Closer was in layer with an absorbable suture and skin closure was with 3.0 nylon. Patients were excluded if the wound had to be extended by cutting muscle or if there was generalized peritonitis[4]. Electro therapy can treat diverse symptoms produced by diseases that affect the human body. Electro therapy using transcutaneous electrical nerve stimulation is a low cost, non-invasive and easily accessible technique to treat pain. In this context, numerous description emerge on the effectiveness of transcutaneous electrical nerve stimulation (TENS) for treating diverse types of pain, knee osteoarthritis and dysmenorrhea[5]. Transcutaneous electrical nerve stimulation (TENS) is a technique in which a special device transmits low voltage electrical impulses through electrodes on the skin to the area of the body that is in pain. Clinic studies on the role of transcutaneous electrical nerve stimulation (TENS) on postoperative pain were systematically searched and reviewed with the aim to determine its role in post-operative analgesic efficacy[6].

Technical Aspects of Transcutaneous electrical nerve stimulation:-

A TENS unit consists of electrical signal generator, battery and a set of electrodes. The TENS unit is small and programmable and the generator can deliver stimuli with variable current strengths, pulse rates and pulse width. The waveform in TENS machine can be monophonic or biphasic.

The usual settings for the stimulus parameters used clinically are the following:

- Amplitude-TENS unit's intensity ranges from 1 to 100 mA6 Pulse width-40-250 μs.6
- Pulse rate-1 or 2 Hz to 200-250 Hz.
- There are a number of TENS devices available in the market, the main types being conventional TENS acupuncture TENS and intense TENS[6].

Mechanism of action of transcutaneous electrical nerve stimulation:-

The mechanism of pain relief by TENS has been explained by various theories. According to the gate control theory by Melzack and Wall. When an electrical current is applied to a painful area, transmission of the perception of pain through small diameter fibers to the brain is inhibited by the activity of the large diameter, fast-conducting highly militated, proprioceptive sensory nerve fibers, closing the gate to the pain perception to the brain. Another mechanism proposed is activation of descending inhibitory pathway, through release of endogenous opioids. The areas involved in descending inhibition include nucleus raphe Magnus in rostral ventral medulla (RVM) and the periaqueductal gray (PAG). The PAG sends projections to the RVM, which in turn send projections to the spinal dorsal horn. The stimulation of PAG or the RVM produces inhibition of dorsal horn nucleus including spin thalamic tract cells. Specific and different opioids receptors are activated through release of endogenous opioids by different frequencies of TENS. Application of low frequency TENS causes activation of δ-opioids receptors and high frequency TENS activates μ-opioids receptors. These opioids receptors in turn activate the PAG-RVM pathway.8 Uncontrolled postoperative pain may produce a range of detrimental acute and chronic effects. Attenuation of postoperative pathophysiology that occurs during surgery through reduction of nociceptive input into the central nervous system (CNS) and optimization of preoperative analgesic may decrease complications and facilitate the patient's recovery during the immediate postoperative period and after discharge from the hospital[7]. Evidence based practice is essential in clinical practice to hasten the recovery of a patient. In electro therapy the applied energy is the trigger that stimulates or activates physiological events, which achieve therapeutic benefits that bring about pain relief[8].

METHODOLOGY

Research design: Case series

Study Population: Patients with abdominal surgeries

Source of data: Patients coming to Dhiraj General Hospital, Vadodara.

Sample size: 6 patients

Outcome measures: VAS (visual analogue scale)

Inclusion criteria:

- Subjects referred for post-operative physiotherapy following abdominal Surgery:- Gynaecologic Laparoscopy
- Appendectomy

Exclusion criteria:

- History of pain other than incision site.
- Patients with cognitive deficiencies.
- Patients with Cardiovascular instability

Outcome Measures:

- Visual analogue scale

Materials used:

- TENS-Transcutaneous electrical nerve stimulator.
- Electrode gel.
- Carbon rubber electrode.
- Microspore tape

After getting approval from Institutional Ethical Committee of Venus Institute of Physiotherapy, a referred post-operative surgery patients coming to Dhiraj General Hospital, Vadodara were screened according to assessment format. The patient fulfilled the inclusion criteria he/she was included in the study. Each subject was explained about the study and informed consent was taken.The purpose of the study was explained to the participants. Then pre VAS was taken. Accordingly, patient was treated with TENS at the incision site.In gynaecological laparoscopy the electrodes were placed over the area of pain, usually at dermatome Th11- L1for approximately 60 s. High-intensity stimulation was achieved through increasing the stimulation step by step to reach a stimulation intensity of 40 to 60 mA. The pain intensity was reassessed immediately after the end of treatment, i.e., after 60 s of stimulation. Then post VAS was taken. This procedure repeat for twice a day.The purpose of the study was explained to the participants. Then pre VAS was taken. Then Appendectomy was performed through a skin crease incision and muscle splitting approach. Electrodes applied to either side of the wound for 30 minutes. The pain intensity was re-assessed immediately after the end of treatment, i.e., after 60 s of stimulation. Then post VAS was taken. This procedure repeat for twice a day.

- Frequency - 100 Hz
- Plus duration - Short
- Time duration - 30 minutes

Visual analogue scale is used to measure intensity of pain for example the amount of pain that patient feels ranges across a continuum from none to an extreme amount of pain.A VAS is usually a horizontal line 100mm in length, anchored by word descriptors at each end as illustrated in figure. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimetres from the left hand end of the line to the point that the patient mark.Other than TENS regular medical management was continued.

DATA ANALYSIS

Descriptive statistical analysis was carried out in the present study. Scale Vas scale (VAS). Significance was assessed at 5% level of significance $p<0.005$ (2-tailed hypothesis test considered).

Statistical tests:

- Paired “T” test as a parametric was used for analysis of Vas scale (VAS) variables within the Case series calculation of percentage of change.

Statistical software:

- **T**he Statistical software namely SPSS2.1.0.1 will be used for the analysis of the data and Microsoft word and Excel was used to generate graphs, tables etc.

RESULT:

In present study 6 peoples with the age group of 24 to 66 were taken. 6 subjects follow the session, 6 subjects were analysed. All the 6 participants were evaluated with the transcutaneous electrical nerve stimulation by the same rather before and after Vas scale (VAS scale). The data obtained in the gender are as follows. Statistical package for social science (SPSS) version 20 was used for the data analysis

Sr No.	Age/Gender	Day 1				Day 2				Day 3				Result
		Morning		Afternoon		Morning		Afternoon		Morning		Afternoon		
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
1	24/F	5	4	5	4	5	3	4	3	4	3	3	2	<3
2	50/F	6	5	6	5	5	4	5	4	4	3	4	2	<5
3	24/M	5	4	5	4	5	4	4	3	3	2	2	1	<4
4	66/M	6	5	6	5	6	5	5	4	5	4	5	4	<4
5	35/F	7	7	7	6	6	5	6	6	6	5	6	5	<5
6	56/M	6	5	5	4	5	4	5	4	4	3	4	3	<4

Table no 1:Represent the ratioof male and female

GENDER	SCALE	PRE	POST	T-	P-
		MEAN/SD	MEAN/SD	VALUE	VALUE
	VAS	181.0000 ±12.56777	192.7500±14.13987	-9.945	.000

Table no 2: Pre-Post Mean Value of VAS SCALE

Intra analysis: The above table shows the Visual Analogue Scale (VAS) for functional assessment the done through paired t test. The p value of pre and post treatment Scale of VAS is 0.000. The p value is < 0.05 which shows that is significant in improving Visual Analogue Scale (VAS). So, Null hypothesis is H0 is rejected and alternate hypothesis H1 is accepted.

	GENDER	MEAN/SD	T-VALUE	P-VALUE
VAS	MALE	-12.000± 6.07644	-426	0.671
	FEMALE	-11.5000 ±4.26675		

Table no 3: INTER MALE / FEMALE FOR VAS SCALE

The above table shows inter -group comparison of post treatment 6MWT scores for functional assessment of group A and B. the analysis was carried out by. At base line, the p value is <0.05. It shows that there is significant difference between the post-treatments scores of both groups. The value comparing the post treatment score for Group A and Group B is 0.671 which is suggestive of significant improvement both groups.However, statistically significant result were noticed in both the groups, clinically it was observed and also observed that PMR technique had greater effects than conventional therapy.

DISCUSSION

Abdominal surgical procedures cause tissue damage by direct visceral manipulation, through the incision on anterior abdominal wall and by the use of surgical retractors that help to expose the surgical field. Pain after surgery causes discomfort to the patient, preventing the patient from relaxing, leading shallow breathing and hindering the patient's movements in bed. Thus decrease diaphragmatic breathing and cough efficacy that might lead to atelectasis, especially in the lower lung fields. Pain is an important negative influence in the postoperative evolution of abdominal surgeries. Transcutaneous electrical nerve stimulation (TENS) is a physical therapy tool widely used to relieve pain.[1]

Laparoscopic surgery has become the standard approach for a large number of gynaecologic procedures. The frequency of laparoscopy varies widely across the globe. Laparoscopic operations are performed annually for the following indications: sterilization, diagnosis, cyst enucleating, and salpingo-oophorectomy.Pain is often a problem after gynaecologic laparoscopic surgery, even if the postoperative pain is less significant when compared to that after a similar major laparotomy surgery.[3] Appendectomy was performed through a skin crease incision and muscle splitting approach. An absorbable suture was used to legate and buries the appendix stump. Closer was in layer with an absorbable suture and skin closure was with 3.0 nylon. Patients were excluded if the wound had to be extended by cutting muscle or if there was generalized peritonitis.[4] Transcutaneous electrical stimulation (TENS) is not major benefit compared with the usual opioids and non-opioids analgesics when pain intensity is high but it can be used as an adjunct to other medications when the pain is moderate and can be the only pain therapy when the pain is mild[6].Uncontrolled postoperative pain may produce range of determinate acute and chronic effects. Electrotherapy can treat diverse symptoms produced by disease that affect the human body[7].In electro therapy the applied energy is the trigger that stimulates or activates physiological events which achieve therapeutic benefits that bring about pain relief. Hence, this study is designed to see the immediate change in pain after TENS application in patient with abdominal surgeries[8].Electro therapy can treat diverse symptoms produced by diseases that affect the human body. Electro therapy using transcutaneous electrical nerve stimulation is a low cost, non-invasive and easily accessible technique to treat pain. In this context, numerous description emerge on the effectiveness of Transcuteous electrical nerve stimulation (TENS) for treating diverse types of pain, knee osteoarthritis and dysmenorrheal[5].Transcutaneous electrical nerve stimulation (TENS) is a technique in which a special device transmits low voltage electrical impulses through electrodes on the skin to the area of the body that is in pain. Clinic studies on the role of transcutaneous electrical nerve stimulation (TENS) on postoperative pain were systematically searched and reviewed with the aim to determine its role in post-operative analgesic efficacy[6].In a case series a total of 6 patients of abdominal surgeries referred for physiotherapy were included in study according to inclusion criteria. Patients were assessed and treated for 3 consecutive days. •TENS was given for 3 consecutive days two times in a day to see the changes in incision pain.In this study high TENS was given for 30 minutes twice a day with frequency 100 Hz.Result showed the changes in visual analogue scale (VAS) after applying transcutaneous electrical nerve stimulation (TENS) in abdominal surgeries. The visual analogue scale for pain is a straight line with one end meaning no pain and the other end meaning the worst pain imaginable. A patient marks a point on the line that matches the amount of pain he or she feels. It may be used to help choose the right dose of

pain medicine. Also called VAS.There was reduction in pain in all the patients with abdominal surgeries who received physiotherapy treatment in form of TENS for 3 consecutive days.

CONCLUSION

In this case series we found that there was decrease in pain in all the patients of abdominal surgeries who received physiotherapy treatment in form of TENS for 3 consecutive days.Exploration of the effect of PMR on stress, fatigue, and quality of life during postpartum

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