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Effectiveness of electrical acupunture pain relief pen on paraspinal muscles for acute low back pain

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Abstract
Background: According to a study done by "The British national health service", acupuncture has been reported to be useful for pain relief. This device combines the properties of acupuncture and transcutaneous electrical nerve stimulation for clinical use.
Objective: The aim of this study was to evaluate the efficacy of the electric acupuncture pain relief pen on Para spinal muscles for low back pain.
Methodology: The study was conducted in DR.BR. Ambedkar medical College, department of physiotherapy with 20 samples by getting their consent who met inclusion and exclusion criteria. The treatment was administered with electric acupuncture pain relief pen. Mc gill pain questionnaire and NPRS are used as outcome measures.
Results: There was a significant reduction noted in terms of pain statically in the patients with low back pain.
Conclusion: The present study concluded that the patients with LBP showed reduction statistically and clinically in terms of pain.

Keywords: paraspinal muscles, low back pain, electrical acupunture pain

Introduction

Low back pain is a common condition and a major cause of morbidity in adult population worldwide. Because non-specific low back pain does not have a known path anatomical cause, treatment focuses only on reducing pain [1]. According to the 2010 Global Burden of Disease Study, low back pain (LBP) is the leading cause of disability worldwide [2].

Most of the movements of the vertebral column are produced by an extensive group of muscles that run all the way along the back of the spine. They are known as the Para spinal muscles. These muscles support the spine and stabilise movement of the spine [3].

Acupuncture therapy is increasing in popularity throughout the world which has led to the development of modern acupuncture [4]. Physiotherapists are among the largest number of acupuncture providers within the National Health Service, and they usually use acupuncture therapy alongside advice and exercise [5]

Acupuncture is used increasingly throughout the world by physiotherapists as a modality of treatment; Acupuncture is an addition to their other skills and is mostly used in combination with them. The International Acupuncture Association of Physical Therapists was established in 1991 and as of 2000 it had members in nearly 20 countries [6].

The electric acupuncture pain relief pen is a convenient way to administer low-voltage therapy. The pulsed contraction effectively works on the muscle which prevents muscle atrophy [7].

It helps in relieving pain by blocking the pain signals as they travel from the nervous system through the c-fibres to the sensory cortex of the brain. It provides a low-voltage electric current to stimulate the acupuncture points, which makes the procedure simple, clean, gentle, and ideal for patients who are sensitive to acupuncture needling as there is no piercing of the skin required and the stimulus is conducted by simply touching the button [8]. Acupuncture Pen has an intensity ranging from 1 to 9, 1 being the lowest and 9 being the highest intensity, which is displayed on the device.

Methodology

1. **Study design:** Experimental
2. **Study setting:** Dr BR Ambedkar Medical College and Hospital, Department of physiotherapy, Bangalore 560045.

3. Criteria for sample selection: The patients were selected for the study based on the following criteria:

Inclusion criteria

- Adult population (20- 60 years)
- Both male and female
- Patient complaining of low back pain
- Pain intensity (> 2) measure with PPI in mc gill pain questionnaire
- Pain intensity (>20) score with PRI in mc gill pain questionnaire
- Duration of symptoms between 2 – 12 weeks

Exclusion criteria

- Recent trauma or injury
- Infection
- Skin allergy
- Recent surgery
- Pacemaker

3. Sample size: 20 participants

4. Sampling method

Simple Random Sampling. The patients who complained of LBP and met the inclusion criteria were randomly selected and given treatment with electric acupuncture pain relief pen.

5. Study duration: 6 Months

6. Treatment Duration: 8 minutes

7. Procedure and treatment

- The patients were assessed with Mc gill pain questionnaire), followed by administration of the treatment, and were reassessed after 7 treatment sessions.
- The patients were asked to be in prone lying and close to the edge of the bed.
- The therapist placed the electric acupuncture pen on the area of pain in the lower back.
- The intensity of the electric acupuncture pen has an intensity ranging from 1 to 9, 1 is the lowest intensity and 9 is the highest intensity.
- The treatment is given for a duration of 8 minutes with 5 secs of relaxation after every 30 contractions for 7 continuous days.

Fig 1: Therapist giving treatment with electric acupuncture pain relief pen

Data analysis

Statistical analysis was done using SPSS 24 version. Descriptive statistics found using mean, SD and frequency percentage. Pre post comparison was done by paired t test.

1. Mc gill pain questionnaire (PRI – pain rating index)

Table 1: Mean and SD of Pain Rating Index in Mc gill pain questionnaire

PRI	MEAN	Std. Deviation
Pre	39.35	9.05
Post	13.2	7.80

The above table shows pre post mean score and SD of Pain Rating Index score in the mc gill pain questionnaire. Pre – PRI is 39.35 ± 9.05 and post treatment the pain rating index score reduced to 13.2 ± 7.80.

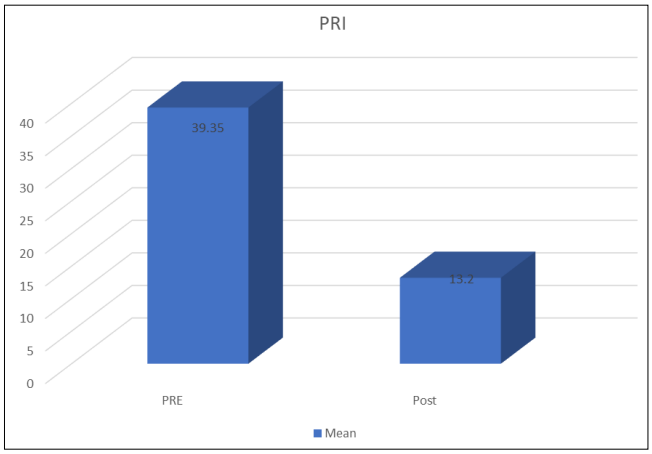

Fig 1: Mean and SD of Pain Rating Index in Mc gill pain questionnaire

Pre-post comparison of PRI in mc gill pain questionnaire

Any statistical test is said to be statically significant if the p-value is <0.05. If p-value >0.05 we say that is not statistically significant.

Table 2: t value and p value of PRI in mc gill pain questionnaire

Average improvement from pre to post	t-value	p-value	Result
26.15	9.785	0.03	P<0.05

The above table shows that the average improvement is 26.15 i.e. [Pre score - Post score] = [39.35-13.2 = 26.15] t-value is 9.78**.** So, p-value is 0.03. Hereby, Pre post comparison by paired t-test shows an average improvement from pre to post is 26.15 with p value <0.05. Pre post comparison shows significant reduction in terms of Pain Rating Index in Mc gill pain questionnaire.

2. Mc gill pain questionnaire (PPI – present pain intensity)

Table 3: Mean and SD of Present Pain Intensity in Mc gill pain questionnaire

PPI	MEAN	Std. Deviation
Pre	3.9	0.72
Post	1.65	0.93

The above table shows pre post mean score and SD of Present Pain Intensity score in the mc gill pain questionnaire. Pre PPI is 3.9 ± 0.72 and post treatment the present pain intensity score reduced to 1.65± 0.93.

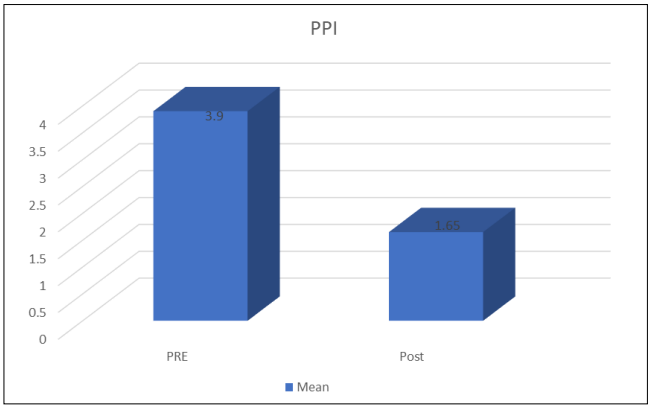

Fig 2: Mean and SD of Present Pain Intensity in Mc gill pain questionnaire

Pre-post comparison of PPI in mc gill pain questionnaire

Any statistical test is said to be statically significant if the p-value is <0.05. If p-value >0.05 we say that is not statistically significant.

Table 4: t value and p value of PPI in Mc gill pain questionnaire

Average improvement from pre to post	t-value	p-value	result
2.25	8.544	0.03	P<0.05

The above table shows that the average improvement is2.25i.e. [Pre score Post score] = [3.9-.65 = 2.25] t-value is 8.544**.** So, p-value is 0.03. Hereby, Pre post comparison by paired t-test shows an average improvement from pre to post is 2.25 with p value <0.05. Pre post comparison shows significant reduction in terms of Present pain intensity score in Mc gill pain questionnaire.

3. Numerical pain rating scale

Table 5: Mean and SD of NPRS

NPRS	MEAN	Std. Deviation
Pre	7.7	1.08
Post	3.05	1.50

The above table shows pre post mean score and SD of NPRS. Pre NPRS is 7.7 ± 1.08 and post treatment the pain intensity reduced to 3.05 ± 1.50.

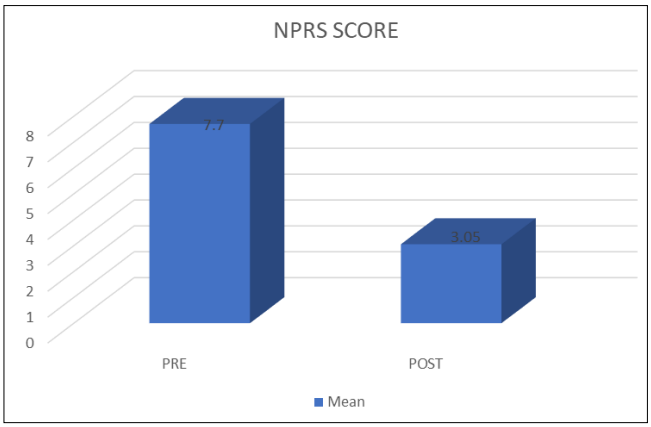

Fig 3: Mean and SD of NPRS

Pre-post comparison of NPRS

Any statistical test is said to be statically significant if the p-value is <0.05. If p-value >0.05 we say that is not statistically significant.

Table 6: pre-post comparison of NPRS

Average improvement from pre to post	t-value	p-value	result
4.65	11.23	0.02	P<0.05

The above table shows that the average improvement is 4.65 i.e. [Pre score Post score] = [7.7-3.05 = 4.65] t-value is 11.23**.** So, p-value is 0.02. Hereby, Pre post comparison by paired t-test shows an average improvement from pre to post is 4.65 with p value <0.05. Pre post comparison shows significant improvement in terms of pain intensity in NPRS.

Discussion

The mean pain rating index in mc gill pain questionnaire post treatment was 13.2 with a difference of 26.15 from pre to post intervention, with a t value of 9.78 indicating that there was significant reduction in pain post intervention.

The mean present pain intensity in Mc gill pain questionnaire post treatment was 1.65 with a difference of 2.25 from pre to post intervention, with a t value of 8.54 indicating that there was significant reduction in pain post intervention.

The mean NPRS post intervention was 3.05 with a difference of 4.65 from pre to post intervention, with a t value of 11.23 indicating that there was significant improvement in NPRS post intervention.

The possible physiology of reduction in pain may be due to the following reasons, electric acupuncture pain relief pen is thought to relieve pain by blocking pain signals as they

travel through the nociceptors to the brain. The mild electrical pulses act in the same way as acupuncture needles or acupoint massage.

The electric acupuncture pain relief pen uses the therapist's hand as a ground pole to complete the circuit, so the therapist feels the voltage in the hand they are holding it with. The therapist feels the voltage because there are many acupoints that get stimulated which are present in the hand they are holding the electric acupuncture pain relief pen with. The therapist should change the grip slightly or grip the device with more contact of hand surface to disperse the effect of the voltage on the therapist's hand.

Based on the current findings; it appears that the electric acupuncture pain relief pen has the capacity to relieve pain after a given number of treatment sessions

Conclusion

The present study concluded that the patients with LBP showed reduction statistically and clinically in terms of pain. The conclusion of this study is based on the comparison of pre post mean measures of PRI in Mc gill pain questionnaire, PPI in Mc gill pain questionnaire and Numerical Pain Rating Scale within 20 participants which concluded that there is significant improvement in participants who received treatment with the electric acupuncture pain relief pen in terms of pain. The difference was significant statistically.

Implication to practice

As this study has shown significant improvement in participants who received treatment with the electric acupuncture pain relief pen in terms of pain, it can be used in the treatment protocol of low back pain, and it may also increase the patient therapist adherence and treatment adherence.

Limitations and recommendations

This study was conducted with small sample size and in future, studies with a larger sample size can be conducted for better results.

This study showed the effectiveness of the treatment in mere 7 sessions; hence, it is not possible to know the long-lasting effects of the treatment, for which a study of longer duration can be conducted.

The electric acupuncture pain relief pain uses the therapist's hand as the ground pole which causes a feeling of voltage in the hand; therefore, the therapist should change the grip or grab the device with more hand surface to disperse this effect.

Recommended grip method

This gripping method is recommended as it can reduce the stinging feeling in the therapist's hand which is caused due to the voltage.

Holding the pen only by the tip can cause a stinging sensation which feels like shocks and can lead to numbness in the therapist's hand if it is used for some time continuously.

Increasing the area of surface of contact can reduce the feeling of tingling but it cannot be eliminated completely as the electric acupuncture pain relief pen forms a circulation from the pen tip to the tail through the human body.

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