



Effectiveness of Transcutaneous Electrical Nerve Stimulation and Diadynamic Current on Primary Dysmenorrhea : A Randomized Clinical Trial

Authors

Anil Muragod¹, Oshin Mathias², Prachi Bhoir³

¹HOD, Department of Geriatric Physiotherapy, KLEU Institute of Physiotherapy, Belagavi, Karnataka

Email: dranilphysio@rediffmail.com

²Physiotherapy Intern, KLEU Institute of Physiotherapy, Belagavi, Karnataka

Email: sixesout@gmail.com

³Physiotherapy Intern, KLEU Institute of Physiotherapy, Belagavi, Karnataka

Email: coolpb2014@gmail.com

ABSTRACT

Background: Primary Dysmenorrhoea is a common problem among female adolescents which has become a leading cause of recurrent absenteeism from school or work. Studies have shown that TENS is one of the management options for Dysmenorrhea. Hence, this study was undertaken to compare effect of TENS and Diadynamic Current on Primary Dysmenorrhea.

Purpose of the study: The aim of the study was to compare the effect of Transcutaneous Electrical Nerve Stimulation and Diadynamic current on Primary Dysmenorrhea.

Method: 32 subjects diagnosed with Primary Dysmenorrhea were included in the study. The subjects were randomly allocated into two groups, where Group A (n=16) received Transcutaneous Electrical Nerve Stimulation (TENS) and Group B (n=16) received Diadynamic current for 5 days. The outcome measures used were Visual Analogue Scale, Moos Menstrual Distress Questionnaire, and McGill Pain Questionnaire.

Results: The results showed that the intra group comparison was statistically significant with $p = <0.001$ for both the groups in terms of VAS, MPQ and MMDQ respectively. Inter group comparison was statistically insignificant with $p = 0.53, 0.42, 0.19$ for VAS, MPQ and MMDQ respectively. Showing that the Group B has reduced pain significantly more than Group A.

Conclusion: This study indicates that both Diadynamic Current and TENS are effective in reducing dysmenorrheal pain. No adverse effects were being observed. The results clearly showed the immediate effect in pain relief after the use of both TENS and Diadynamic current, more in Diadynamic Current.

Keywords- Primary Dysmenorrhea, TENS, Diadynamic Current.

Introduction

Dysmenorrhea is commonly described as a chronic pelvic pain along with menstrual cramps experienced by menstruating females especially in adolescence.^[1] The other associated problems include low back pain, nausea, vomiting, headache,

breast tenderness, intermenstrual bleeding, dizziness, diarrhoea.^[2] A recent study conducted in an Indian school population in Madhya Pradesh on the prevalence rate of dysmenorrhea in adolescent girls was found to be 73.9% in overall out of which 74.4% was in urban schools where as 72.7% was in rural

schools.^[3] Dysmenorrhea is one of the important unsolved problems in females. Dysmenorrhea is reported to be decreasing with advance in age. ^[4]

Dysmenorrhea is a condition in aggregate causing much human suffering and invalidism. ^[5]

Dysmenorrhoea is classified into Primary and Secondary. The cause of Primary dysmenorrhoea, also known as Spasmodic type is due to unidentifiable pathology while secondary dysmenorrhoea i.e. Congestive type, occurs due to an underlying cause such as genital tract pathology, uterine leiomyomata or endometriosis.^[1] Various studies have proven that physiotherapy treatment such as stretching, pelvic mobilization, treadmill and electrotherapy modalities to be effective for pain relief in primary dysmenorrhea.^[6,7,8]

Transcutaneous Electrical Nerve Stimulation [TENS] It is a simple, non-invasive analgesic treatment used for symptomatic management of acute and chronic pain. ^[9] It is the application of electrodes to the skin with the aim of reducing pain by stimulating the thick afferent nerve fibers. It is generally an alternating current with a variable phase duration and phase interval which can be used to vary the frequency ranging between 10 to 100 Hz. The best known type of TENS include Conventional TENS, Acupuncture TENS, Burst TENS and Modulated TENS.^[10]

TENS is one of the non pharmacological methods of pain relief in several conditions which reduces chronic musculoskeletal pain more effectively than placebo. TENS delivers an electrical current through superficial electrodes placed on the skin around the affected area, causing a tingling sensation and disrupting the pain signal in surrounding nerves. This modality functions by stimulating large diameter afferent nerves fibers, which inhibit pain fibers and evokes responses in the dorsal horn. It encourages the body to produce higher levels of its own natural pain killing chemicals called Endorphins and Enkephalins.^[11]

The effectiveness of TENS for Dysmenorrhea has been included in Cochrane systemic review with conclusions of efficacy for primary dysmenorrhea.

^[20] Dysmenorrheal pain is based on gate control theory, release of endogenous morphine and is

believed to have reduced uterine muscle ischemia brought about by local vasodilatation after skin stimulation which makes TENS effective.^[11]

Diadynamic currents also known as Bernard Currents, are unidirectional sinusoidal currents with a frequency of 50 to 100 Hz and pulse duration of 10 milliseconds. ^[10] Various modulations of Diadynamic currents are Monophasic Fixe, Biphasic Fixe, Courtes Perodes and Longues Perodes. The effects of diadynamic currents is based on gate control theory of pain by Wall and Melzack. Diadynamic currents give an analgesic effect due to release of endorphins in the system. Diadynamic currents are used to relieve pain, reduce swelling, minimize inflammation, facilitate healing, improve blood circulation, motor re-education and inflammatory disorders. ^[10]

The impact of Diadynamic currents consists of analgesic and strong congestive effects and they occur during the administration of the current and lasts for few hours after the treatment has been ended. Vasodilatation takes place on the way of selective stimulation of nerve endings in the ANS system responsible for vascular reaction under the influence of direct current. Dynamogenic and inhibitory action of Diadynamic currents has been used in treating many different ailments. Diadynamic currents have been shown to have beneficial effects on reducing pain through its physiological effects like vasodilatation, hyperemia, muscle fiber stimulation and stimulation of sensory and motor nerves. Hence, the purpose of the study was to compare the effects of TENS and Diadynamic currents on dysmenorrhea

Materials & Methodology

Ethical clearance was obtained from the institutional ethical committee. All subjects were screened based on the inclusion and exclusion criteria prior to their enrolment in the study. The purpose of the study was explained and a written informed consent was obtained from all the subjects who were willing to participate in the study. A brief demographic data was obtained from all the subjects.

The inclusion criteria was 1) Age group 18-25 years, 2) Regular menstrual cycles, 3) Free from

gynecological problems, 4) Subjects having Primary Dysmenorrhea, 5) Subjects not on any special dietary regimen, 6) Subjects not on any analgesics. Exclusion criteria was 1) Presence of IUDs, 2) Consumption of OCPs, 3) Irregular menses, 4) Subjects with Secondary Dysmenorrhea.

Participants: 32 subjects with Primary Dysmenorrhea were included in the study. After fulfillment of the exclusion and the inclusion criterion, Subjects were randomly allocated into two groups using chit method, Group A: TENS & Group B: Diadynamic currents.

Intervention: Group A was given Conventional TENS for duration of 20 mins, pulse width 40-75 ms with a frequency of 50-100 Hz. The intensity was increased at the tolerable level of the subject. Group B was given Diadynamic currents for a duration of 20 mins, modulation 2 (Diphase Fixe), for a frequency of 50- 100 Hz and the pulse duration of 10 milliseconds. The subjects were treated for 5 days when they experienced dysmenorrhoea. The subjects were positioned in supine lying with a pillow placed under the neck. The electrodes were placed on the lower abdominal area where the subject experienced pain, i.e. within the umbilicus and the ASIS for both the groups.

Outcome Measures: Moos Menstrual Distress Questionnaire, McGill Pain Questionnaire and Visual Analogue Scales were used as outcome measures, before starting the treatment and after 5 days of treatment.

Results

The results were analysed in terms of reduction in pain and improvement in quality of life in females suffering from Primary Dysmenorrhea. The data was tabulated and entered into excel sheet. The statistical analysis was done with Kolmogorov-Smirnov Z test.

Each group had 16 participants. Mean age of the females was Group A 21.31 ± 1.74 & Group B 21.88 ± 1.71 in years. In this study the mean BMI was found to be $24.16 \pm 3.95 \text{ kg/m}^2$ for Group A and $23.49 \pm 3.83 \text{ kg/m}^2$ for Group B. (Table-1)

Within each group a statistically significant decrease in pain and improvement in the quality of

life was being noted. In Group A, the mean VAS scores reduced from 6.78 ± 1.89 pre treatment to 3.54 ± 2.10 post treatment with a mean difference of 3.24 ± 1.45 . In Group B, the scores reduced from 6.94 ± 1.53 to pre treatment 3.38 ± 1.52 post treatment with a mean difference of 3.56 ± 1.43 . Intra Group comparison of the pain score revealed statistically significance with $p=0.001$ for Group A and $p=0.001$ for Group B. In Group A, the mean MMDQ scores were reduced from 91.31 ± 18.16 pre treatment to 71.81 ± 10.75 post treatment and in Group B, it came down from 107.56 ± 39.43 pre treatment to 74.69 ± 18.31 post treatment, with a mean difference of 19.50 ± 20.26 and 32.88 ± 34.59 in Group A and Group B respectively. Intra Group comparison of the pain score revealed statistically significance with $p=0.001$ for Group A and $p=0.001$ for Group B. In Group A, the mean MPQ scores were reduced from 55.13 ± 9.56 pre treatment to 46.94 ± 14.74 post treatment and in Group B, it came down from 60.25 ± 11.58 pre treatment to 47.75 ± 9.46 post treatment, with a mean difference of 8.19 ± 16.93 and 12.50 ± 12.85 in Group A and Group B respectively. Intra Group comparison of the pain score revealed statistically significance with $p=0.001$ for Group A and $p=0.001$ for Group B. (Table-2)

When compared, there was a significant difference seen between VAS scores of Group A and Group B. The results have shown that Group B has reduced more VAS scores than Group A, showing that Group B is more effective in reducing pain. In comparison with Group A, Group B has shown to have significantly reduced the perimenstrual symptoms after receiving the treatment according to the Moos Menstrual Distress Questionnaire. When the scores of Group A and Group B were being compared, Group B showed reduced scores post treatment indicating that Group B is better as per McGill Pain Questionnaire. The between groups comparison showed clinical significance with p values 0.53, 0.42 and 0.19 for VAS, MPQ and MMDQ respectively. (Table-3)

Table-1 Age & BMI Distribution

Study Groups	Mean \pm SD (Age)	Mean \pm SD (BMI)
Group A	21.31 \pm 1.74	59.25 \pm 10.78
Group B	21.88 \pm 1.71	58.94 \pm 9.88

Table-2 Intra-Group Comparision of Group A and Group B

Outcome Measures	Study Groups	Mean Difference	T	P
VAS	Group-A	3.24 \pm 1.45	0.25	0.001*
	Group-B	3.56 \pm 1.43	0.62	0.001*
MPQ	Group-A	8.19 \pm 16.93	0.18	0.072
	Group-B	12.50 \pm 12.85	0.81	0.001*
MMDQ	Group-A	19.50 \pm 20.26	0.54	0.001*
	Group-B	32.88 \pm 34.59	1.33	0.001*

p<0.001* is a statistically significant value.

Table-3 Inter-Group Comparision of Group A and Group B

Group A versus Group B	Outcome measures	Pre test p-value	Post test p-value	Changes p-value
Group A versus Group B	VAS	0.7986	0.8038	0.5368
	MPQ	0.1824	0.8540	0.4234
	MMDQ	0.1448	0.5921	0.1920

p<0.05* shows that it is statistically significant.

Discussion

The results in this study indicate that both TENS and Diadynamic Current are effective in reducing dysmenorrheal pain. No adverse effects were observed. The results clearly showed the immediate effect in pain relief after the use of both TENS and Diadynamic current. However, Diadynamic Currents showed to be slightly more effective than TENS. The present study has shown that TENS is beneficial in the treatment of Primary Dysmenorrhea which is supported by other previous researches. A study done by Sulima A AL Yousef et al to find out the effect of TENS on the relief of dysmenorrheal pain among the college students where the subjects were treated with conventional TENS for 10-30 mins three times per day for two menstrual cycles which resulted to be safe and effective non-pharmacological method for primary dysmenorrhea.^[1]

A study conducted by Chaitali Shah et al. with the aim to compare the effect of High frequency TENS at dermatome level and Low frequency TENS at root level in the relief of dysmenorrhea among the

age group of 19-25 yrs concluded that both are effective although high frequency TENS at dermatome level is more effective in relieving pain.^[12]

Furthermore, this study has shown drastic improvement through Diadynamic currents as well. Although the mechanism of TENS and Diadynamic current in pain relief is different, they are classified as low frequency currents. A similar study conducted by Anand Hegganavar et al to compare the effect of MENS and Diadynamic current in improving the functional abilities and reducing heel pain. Group A received Diadynamic current and Group B received TENS and the results obtained stated that both the therapies reduce pain effectively, have analgesic effects and help to improve the functional abilities in the subjects.^[13]

A study done in Elfroic Nord Hospital on patients with Sciatica used physiotherapy interventions like galvanic stimulation, laser therapy, diadynamic currents, ultrasound therapy, magneto therapy which were patient tailored. Post treatment the pain dropped upto 70% on VAS.^[16]

The mechanism of TENS is based on pain gate control theory or axonal reflex to make vessels around the local organ dilate by stimulating the peripheral nerves and release of endorphin. Dawood and Ramos demonstrated that TENS provided good to excellent subjective pain relief. They indicated that TENS is an appropriate pain relief equipment. It significantly reduced menstrual flow, diarrhoea, clot formation, and fatigue when compared to placebo TENS.^[17]

Diadynamic currents relieve the pain through pain masking i.e. increase of stimulation threshold by Diaphase Fixe current. Vasodilatation and hyperemia, causes the release of histamine in the tissues which reduces the effect of pain. Diadynamic currents stimulates the muscle contraction, increase in blood flow to the muscle and reduce pain. Investigating relation between the effects of TENS and Diadynamic current associated with dysmenorrhea, the present study highlighted that there is significant improvement in physical symptoms from pre to post application as regard to fatigue, tiredness, pain, cramp and dizziness. Thus TENS and Diadynamic currents contribute in the

effectiveness of pain reduction and helps in raising the pain threshold of the body.^[17]

Inter group comparison of the three functional outcome measures were clinically significant in all the groups. Inter group comparison showed difference $p= 0.5368$ for VAS , $p=0.1920$ for MMDQ and $p= 0.4234$ for MPQ conforming that the pain intensity of Group B was reduced more than Group A which was attributed to the therapy that was given to the participants in both the groups. Pain and cramping sensations in the abdomen, feeling of pressure over the abdomen, pain in the hip, low back and inner thigh and nausea are the factors that contribute for the absenteeism of females from their respective schools and office work. Reduction in pain, cramps and associated symptoms will lead to an improvement in the functional abilities of the subjects, which was also seen in the present study. The subjects administered with TENS and Diadynamic current showing great improvements in terms of pain, functional abilities and quality of life was seen.

The results of the present study thus proves that TENS and diadynamic current are both effective in improving primary dysmenorrhea, relieving the associated symptoms and thus improving the quality of life and functional abilities of the subject.

Conclusion

On the basis of present study it can be concluded that, both TENS and Diadynamic currents are equally effective in the treatment of primary dysmenorrhea to relive pain and improve the quality of life in terms of VAS, McGill Pain Questionnaire and Moos menstrual distress questionnaire respectively. However the results show that Diadynamic current have better results than TENS in relieving pain in dysmenorrhea. Hence, Diadynamic current appears to be safe, effective, non medicative method in the management of primary dymenorrhea.

Limitations

The present study was conducted by giving treatment for duration of one cycle. Long term benefits couldn't be observed in the same.

The treatment protocol can be given in increased frequency of either two or three times a day, since our study is limited to only once in a day.

Future Scope for Study

Further studies can be taken on secondary dysmenorrhoea.

Acknowledgement

We are grateful to all the participants for providing time for the study

Conflicts of Interest: Nil.

References

1. AlYousef SA, El-Hay SA, Mohamed NS, Baker LR. Effect of Transcutaneous Electrical Nerve Stimulation (TENS) on the Relief of Dysmenorrhoeal Pain among Students of Applied Medical Science College at Hafer Al-Batin. *Journal of American Science*. 2013;9(11),75–84.
2. Kannan P, Claydon LS. Some physiotherapy treatments may relieve menstrual pain in women with primary dysmenorrhoea: a systematic review. *Journal of physiotherapy*. 2014 Mar 31;60(1):13-21.
3. Sinha S, Srivastava JP, Sachan B, Singh RB. A study of menstrual pattern and prevalence of dysmenorrhoea during menstruation among school going adolescent girls in Lucknow district, Uttar Pradesh, India. *International Journal of Community Medicine and Public Health*. 2016 May;3(5):1200-3.
4. Kotagasti T, Rias N. An observational population based study on dysmenorrhoea and its risk factors. *Tang [Humanitas Medicine]*. 2015 Aug 31;5(3):18-20.
5. Proctor M, Farquhar C. Diagnosis and management of dysmenorrhoea. *British Medical Journal*. 2006 May 13;7550:1134.
6. Molins-Cubero S, Rodríguez-Blanco C, Oliva-Pascual-Vaca Á, Heredia-Rizo AM, Boscá-Gandía JJ, Ricard F. Changes in pain perception after pelvis manipulation in women with primary dysmenorrhoea: a

- randomized controlled trial. Pain Medicine. 2014 Sep 1;15(9):1455-63.
7. Gamit KS, Sheth MS, Vyas NJ. The effect of stretching exercise on primary dysmenorrhoea in adult girls. Int J Med Sci Public Health 2014;(3):549-551
 8. Kannan P, Claydon LS, Miller D, Chapple CM. Vigorous exercises in the management of primary dysmenorrhoea: a feasibility study. Disability and rehabilitation. 2015 Jul 17;37(15):1334-9.
 9. Angela Foster, Nigel Palastanga, Clayton's Electrotherapy: Theory & Practice, 9th edition, Delhi: AITBS Publishers; 2006. Pg103-106.
 10. Robertson VJ, Ward A, Low J, Reed A. Electrotherapy explained: principles and practice, Elsevier Health Sciences; London: Butterworth Heinemann; 2006. pg 69-70.
 11. Den Adel RV, Luykx RH. Low and medium Frequency Electrotherapy, Enraf-Nonius; 1996. Pg 12-13, 30.
 12. Shah C. To Compare The Effect Of High Frequency (Conventional) Tens At Dermatome Level & Low Frequency (Acupuncture Like) Tens At Root Level In Pain Management Of Dysmenorrhoea. Indian Journal Of Physical Therapy. 2015 Jun 11;2(2):34-8.
 13. Heggannavar AB, Ramannavar PR, Bhodaji SS. Effectiveness of diadynamic current and mens in heel pain: a randomized clinical trial. Int J Physiotherapy Res. 2015;3(2):992-8.
 14. Melzack R. Katz J. The McGill Pain Questionnaire: Major properties and scoring methods. Pain. 1975; (1): 277-299.
 15. Parsa P, Bashirian S. Effect of transcutaneous electrical nerve stimulation (TENS) on primary dysmenorrhoea in adolescent girls. Journal of Postgraduate Medical Institute (Peshawar-Pakistan). 2013 Jun 21; 27(3).
 16. Adriana C, Nicoleta MM. Effects of physical therapy in patients with sciatica. ARS Medica Tomitana. 2012 Nov 1;18(4):174-8.
 17. Dawood MY. Primary dysmenorrhea: advances in pathogenesis and management. Obstetrics & Gynecology. 2006 Aug 1; 108(2):428-41.
 18. Proctor M, Farquhar C. Diagnosis and management of dysmenorrhoea. BMJ: British Medical Journal. 2006 May 11; 332(7550):1134.
 19. Lewers D, Clelland J.A., Jackson J.R, Varner R.E, Bergman .J, (1989). Transcutaneous Electrical Nerve Stimulation in the Relief of Primary Dysmenorrhea. Physical Therapy, 69(1), 3-9.
 20. Carroll D, Moore R A, McQuay H J, Fairman F, Tramer M, Leijon G, TENS for Chronic Low Back Pain, Cochrane Database Sys Rev. 2001;(3), p 1.