EVALUATION OF THE EFFECTS OF MICROWAVE DIATHERMY IN PATIENTS WITH CHRONIC LOW BACK PAIN

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Abstract

A prospective experimental study on 50 patients of chronic low back pain was conducted in Physical Medicine Department of Dhaka Medical College Hospital to find out the effects of microwave diathermy in the treatment of chronic low back pain, when applied along with other conventional therapies like drug and exercise. They were divided randomly into two groups and treated with nonsteroidal anti-inflammatory drugs, exercises, activities of daily living instructions and with or without microwave diathermy. Thereafter, the patients were evaluated weekly. After six weeks of treatment, improvements were observed in both the groups, but significant difference (P=0) in improvement was found in microwave diathermy group than in non-diathermy group. This study therefore, suggests that microwave diathermy is effective in treatment of patients with chronic low back pain.

Keywords: *Chronic low back pain, Microwave diathermy.*

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Introduction

Back pain affects 60-80% of people at some time in their lives[1]. About 40% of people say that they have had low back pain within the last 6 months[2]. Low back pain is defined as an uncomfortable sensation in the lumbar and buttock region originating from neurons near or around the spinal canal that are injured or irritated by one or more pathologic processes. Low back pain is a symptom complex which persists for more than three months is called chronic low back pain and affects the area between the lower rib cage and gluteal folds[3]. Onset usually begins in the teens to early forties. Most patients have short attacks of pain that are mild or moderate and do not limit activities, but these tend to recur over many years. Most episodes resolve with or without treatment. However,a small percentage of low back pain becomes chronic and causes significant disability.10-15% of patients with acute back pain who develop chronic pain consume 85% of back pain resources[2]. The percentage of patients disabled by back pain, as well as the cost of low back pain, has steadily increased over the past 25 years. This appears, however, to be more from social causes than from a change in the conditions that cause low back pain[2]. In Western countries, back pain is the most common cause of sickness-related work absence, and in the UK 7% of adults consult their GP each year with back pain.[1]

Considering the burden of patients attending the Physical Medicine departments and clinics different government and private medical facilities in Bangladesh with significant low back pain, the conducted

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studies on this topic to date in the context of a Bangladeshi population appears to be much fewer than adequate. Although multiple high-quality studies have found that exercise results in positive outcomes in the treatment of chronic low back pain[2], significant immediate pain relief can be afforded by different therapeutic heating modalities. The proposed mechanisms include an increase in nerve conduction velocity, which may contribute to the reduced pain perception that occurs in response to increasing tissue temperature. In addition, heat increases the firing rate of type 1b fibers from Golgi tendon organs which may contribute to a reduction in firing of alpha motor neurons and thus a reduction in muscle spasm. The apparent pain relief may also result from gating by thermoreceptor activation and indirectly due to reduced ischemia as a result of vaso-dilatation[4].

Microwave diathermy is a physical therapy modality that produces deep heating via conversion of electromagnetic energy to thermal energy. Thermal energy is produced by increased kinetic energy of molecules within the microwave Weld. Federal Communications Commission approved frequencies for therapeutic microwave are 915-MHz (wavelength 33 cm) and 2,456 MHz (wavelength12 cm). Average temperatures of approximately 41°C at a depth of 1–3 cm have been demonstrated[2,5]. Specific contra-indications to microwave diathermy can be known to be sensitive to increase cell proliferation rates or skin treated in the past 6 months with radiotherapy, ischemia, local thrombosis or defective arterial circulation, impaired cutaneous thermal sensitivity, metal implants, local infections, and indwelling electronic equipment, e.g., pumps or cardiac pacemakers[6]. In our study, we utilized 2456-MHz applicators available in the Physical Medicine and Rehabilitation department of Dhaka Medical College Hospital.

The aim of this study was to determine the effects of microwave diathermy in relieving symptoms of chronic low back pain.

Materials and Methods

A total of fifty subjects (32 females and 18 males, age range 24–76 years) were enrolled in this study during the period of January 2010 to July 2010. The patients were selected randomly based on the following criteria:

Inclusion criteria: The patients of either sex, aged above 20 years and below 80 years, with complaints of significant chronic low back pain affecting activities of daily living, who consented to participate in the study.

Exclusion criteria: The patients aged below 20 years and above 80 years, having low back pain for less than three months, with traumatic,acute and inflammatory etiology, constant progressive pain, present medical history of tuberculosis, carcinoma or systemic corticosteroid use, systemic upset with any spinal deformity, muscle wasting or progressive neurological signs, patients with any complications as well as those unwilling to give consent were excluded.

After evaluating to ensure that all participants fulfill the selection criteria, they were informed about the nature of the study and written consents were taken. The participants were initially examined by the same physician. Sociodemographic data including age (years), weight (kg), height (inch), body mass index (BMI, kg/m^2), duration of symptoms (month), job and education level were obtained. Clinical evaluation was done giving importance to the musculoskeletal and the nervous system and necessary investigations were done. Data for other variables like pulse (beats/min), blood pressure (mmHg), Hemoglobin (g/dl), ESR (mm in the 1sthr), Schober's test etc. were thus obtained. Patient's experience of pain before starting treatment was assessed using the Lattinen test[7] score (Table-I).

Table-I

The Lattinen test[7*]

A.	Subjective intensity	
	No pain	0
	Mild	1
	Uncomfortable	2
	Severe	3
	Unbearable	4
B.	Frequency	
	Never	0
	Rare	1
	Frequent	2
	Very Frequent	3
	Continuous	4
C.	Analgesics intake	
	None	0
	Occasional	1
	Moderate	2
	High consumption	3
	Too much	4
D.	Disability due to pain	
	None	0
	Slight	1
	Moderate	2
	Necessary aid	3
	Total dependence	4
E.	Sleep	
	Normal	0
	Sometimes awake	1
	Many times awake	2
	Insomnia	3
	Sedatives needed	4

*Minimum score: 0; maximum score: 20. The score from each group of questions should be added (A – E).

Treatment procedures

Group A received therapeutic microwave diathermy 15 minutes daily along with isometric back muscle exercises,25 repetitions twice daily and NSAID in the form of Tenoxicam 20 mg once daily for 6 weeks. Group B (n = 25) received the same treatment as for group A except that they did not receive microwave diathermy. Normal activities of daily living in structions were advised to both the groups. Therapeutic exercises were demonstrated to the patients of both the groups by the same physiotherapist in the department and patients were advised to continue that at home for the specified duration.

Data collection procedures

After the treatment of the patients as per schedule, the patients were followed up weekly for six weeks and the outcomes were recorded in the data collection sheet.Improvement was graded Lattinen's test score.

Statistical analysis

IBM SPSS Statistics version19.0 software package for Windows was used to analyze and present the outcome assessment data and perform statistical tests including the Paired-Samples T test were required to determine the level of significance. The results were expressed as P value and $P<0.05$ was considered as the cutoff for significance.

Figure 1 presents the overall plan of the study. The patients were divided into one of the two groups: Group A (n = 25) served as treatment group and Group B served as control group.

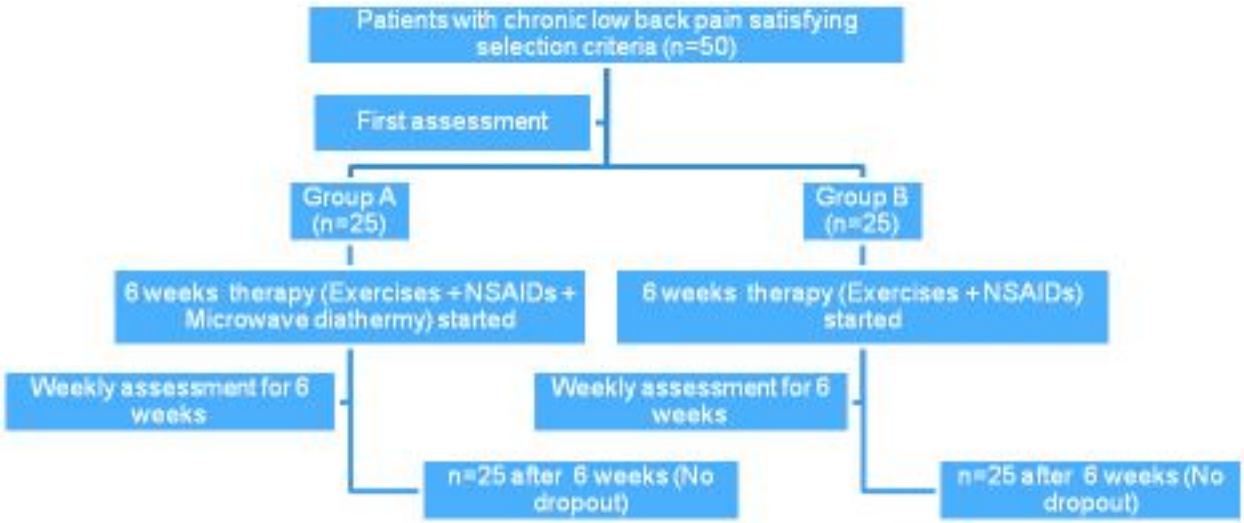

Fig.-1: *Plan of the study*

Table-II

Sociodemographic characteristics of the patients

Characteristics	Group A (microwave treatment n=25)		Group B (control, n=25)		p value
	Mean ± SD	Med (min; max)	Mean ± SD	Med (min; max)	
Age (years)	34.26 ± 4.28	32 (26; 76)	33.03 ±4.97	31 (24;72)	0.623
Height (inch)	64±4	63 (54; 67)	63± 3	62 (55; 65)	0.98
Weight (kg)	58±6	57 (45; 68)	59±6	58 (43; 72)	0.29
Body mass index (BMI, kg/m²)	21.95± 3.76	22.20 (19; 30)	23.04± 3.53	22.76 (20; 32)	0.433
Duration of symptoms (month)	5.5± 2	5 (3; 15)	6.25± 2	6 (3; 12)	0.843
Sex (female/male)	16/9		16/9		1
	N	n%	N	n%	
Education					0.558
1. Illiterate	9	36	8	32	
2. Primary education	6	24	7	28	
3. High school	5	20	5	20	
4. College	3	12	4	16	
5. Higher education	2	8	1	4	
Job					0.867
1. Housewife	8	32	6	24	
2. Student	6	24	4	16	
3. Manual worker	8	32	9	36	
4. Office worker	2	8	4	16	
5. Business	1	4	2	8	

Table-III

Basic examinations and baseline investigations findings of patients

Characteristics	Group A (microwave treatment n=25)		Group B (control, n=25)		P value
	Mean ± SD	Med (min; max)	Mean ± SD	Med (min; max)	
Pulse (beats/min)	70 ± 21	82 (65; 95)	78 ± 12	90 (72; 96)	0.394
Systolic blood pressure (mmHg)	122 ± 30	115 (100; 140)	125 ± 26	110 (105; 135)	0.513
Diastolic blood pressure (mmHg)	75 ± 10	80 (60; 95)	80 ± 5	70 (65; 100)	0.219
Hemoglobin (g/dL)	10.53 ± 2.1	10.3 (8.3; 13.1)	10.78 ± 2.6	10.5 (9.1; 13.8)	0.716
ESR (mm in the 1st hr)	19 ± 4	19 (10; 28)	18 ± 5	18 (9; 30)	0.217
Schober's test	7.2 ± 0.89	7.5 (5; 9.5)	6.8 ± 0.69	7 (5.5; 10)	0.232

Mean ± SD mean ± standard deviation, Med (min; max) median (minimum; maximum)
P value is significant when <0.05

Table-IV

Significance of Lattinen test score change from week to week for six weeks in the study population

Weeks	Average Lattinen test score in Group A	Average Lattinen test score in Group B	P values*	95% Confidence Interval
Pretreatment	9.76 ±4.465	9.28 ± 4.523	0.67	-0.59 to 2.31
Week 1	7.86 ± 4.187	7.94 ± 4.452	0.18	-3.40 to 0.65
Week 2	5.71 ± 4.332	7.11 ± 4.738	0.03	-5.65 to -0.43
Week 3	4.90 ± 4.561	6.83 ± 4.435	0.01	-5.78 to -1.47
Week 4	4.25 ± 4.401	6.22 ± 4.942	0.005	-6.45 to -2.38
Week 5	3.58 ± 4.388	5.76 ± 5.627	0.001	-7.71 to -4.97
Week 6	3.20 ±4.262	5.52 ± 5.599	0.0	-8.28 to -5.22

*From Paired-Samples T test; P<0.05 deemed significant

Table-V

Statistics of different changes in Lattinen test score and its components after 6 weeks since the first visit in Group A and B

Group A	Mean	Median	Mode	Std. Deviation
Subjective intensity on first visit	1.92	2.00	2	.812
Frequency on first visit	2.20	2.00	2	.764
Analgesics intake on first visit	2.12	2.00	2	.881
Disability due to pain on first visit	1.60	1.00	1	.913
Sleep on first week	1.92	2.00	2	1.320
Lattinen test score on first visit	9.76	9.00	10	4.465
Subjective intensity after six weeks	0.64	.00	0	.810
Frequency after six weeks	1.46	1.00	1	.779
Analgesics intake after six weeks	0.80	1.00	0	1.041
Disability due to pain after six weeks	.44	.00	0	.768
Sleep after six weeks	.56	.00	0	1.044
Lattinen test score after six weeks	3.20	2.00	0	4.262
Group B	**Mean**	**Median**	**Mode**	**Std. Deviation**
Subjective intensity on first visit	2.08	2.00	2	.909
Frequency on first visit	2.24	2.00	2	.831
Analgesics intake on first visit	1.92	2.00	2	.812
Disability due to pain on first visit	1.40	1.00	1	.913
Sleep on first week	1.64	1.00	1	1.287
Lattinen test score on first visit	9.28	8.00	8	4.523
Subjective intensity after six weeks	1.20	1.00	1	1.190
Frequency after six weeks	1.24	1.00	0[a]	1.165
Analgesics intake after six weeks	1.12	1.00	0[a]	1.166
Disability due to pain after six weeks	.84	1.00	0	.943
Sleep after six weeks	1.12	1.00	0	1.269
Lattinen test score after six weeks	5.52	5.00	0	5.599

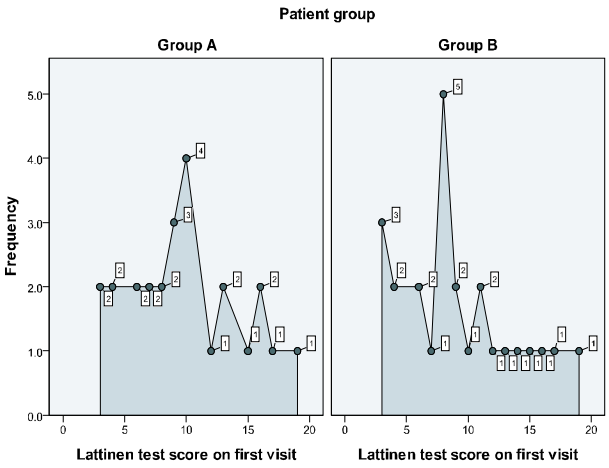

Fig.-2 : *Graphical correlation of lattinen test score distribution between group A and group B before starting therapy*

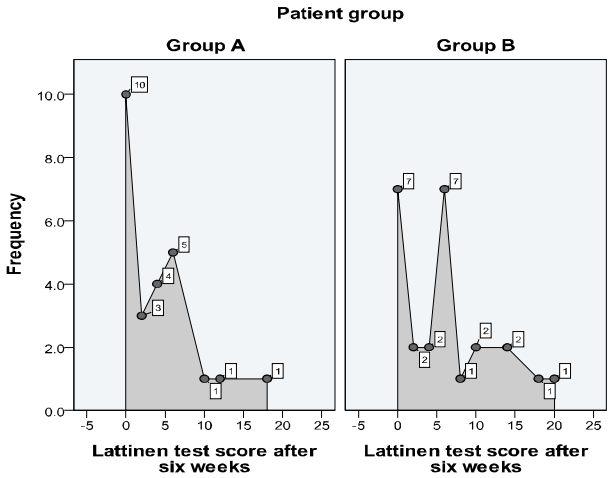

Fig.-3: *Graphical correlation of Lattinen test score distribution between Group A and Group B after Completing therapy*

Table-VI

Improvement of Lattinen test score with application of Microwave diathermy

	Microwave diathermy given			
	Yes (Group A)		No (Group B)	
	Count	Column N %	Count	Column N %
Improvement and lower Lettinen score	24	96.0%	23	92.0%
No improvement	1	4.0%	2	8.0%

Results

Demographical properties of patients are shown in Table-II. There was no statistically significant difference for age, sex, BMI, educational level, jobs and duration of symptoms between the groups (P > 0.05). Basic clinical examination and baseline investigation findings of both groups were also found to be almost identical (Table-III).

The treatment response assessed at weekly interval by means of Lattinen test score showed gradual reduction in the test score along with clinical improvement with increasing significance as demonstrated by gradual reduction in P value (Table-IV). Pretreatment combined Lattinen test scores in Group A=9.76 ± 4.465 and in Group B= 9.28± 4.523. At the end of 6th week,Group A score was 3.20 ± 4.262 in comparison to Group B score of 5.52 ± 5.599 (Table-V). Treatment failure rate is also 4% lower with microwave diathermy (Table 6).Improvement of Lattinen test score is also significantly associated with application of microwave diathermy at the end of 6 weeks (P=0.006, Table 7). As compared to conventional drug therapy and exercise, microwave diathermy significantly retards progression and improves symptoms of chronic low back pain at the end of the six weeks therapy as evidenced by more left shifting of area under curve in Figure 2 in case of Group A. Left shifting of area under curve also occurs for Group B (Figure 2), although to a lesser degree. This denotes a notable fall in Lattinen test score value as compared to the pretreatment value depicted in Figure 1, which was quite similar in both the groups.

Discussion

The present study does not discard existing modality of treatments like exercise and drug therapy when comparing them to microwave diathermy. Rather, it shows that microwave diathermy can be an effective adjunct in improving outcome and to some degree, lessen treatment failure rate. The patients of both groups responded well to the treatment, yet a treatment failure rate of about 10% was observed in commensurate to standardized data[1]. A steady

trends of improvement in symptoms was observed throughout tthe whole period of six weeks of study. But, in comparison, the significance of improvement in the group of patients who received microwave diathermy was better than that of non-diathermy group(p=0). The outcome of treatment was unrelated to the initial severity or duration of pain of both thegroups.

There appears to be a lack of evidence base regarding use of microwave diathermy in the treatment of chronic low back pain, apparent because of the relative paucity of literature on the issue.In their study, Akyol[6] et al. found no evidence that true MD, as compared with sham MD, is beneficial when applied in addition to some commonly used interventions, including modalities such as superficial heat and exercises. Multiple researches have been conducted on a related deep heating modality namely shortwave diathermy. Zaman[8] reported in a study at IPGMR that partial or complete relief of pain was more in the patients who received shortwave diathermy than the exercise group or placebo group. Gibson et al. studied 109 patients and significant improvements after treatment were observed in 59% patients who received shortwave diathermy[9]. Shakoor et al. found that there was significant improvement after giving shortwave diathermy on he patients with neck pain[10]. In a meticulous review, Chard and Dieppe indicated that the use of non-pharmacological interventions short wave diathermy in osteoarthritis is essential for goodmanagement[11]. Ullah showed that improvement was better in the patients who received short wave diathermy than that of the patients who were not treated with shortwave diathermy[12]. Kerem and Yigiter studied 60 patients and showed significant improvements in measured parameters in shortwave diathermy group after the treatment[13]. Debsarma in a study showed that deep heat modality is more effective than superficial heat in pain management in chronic low back painpatients[14].

Conclusion

In conclusion, the present study infers that microwave diathermy can be an effective modality in the treatment of the patients with chronic low back pain. However, our effort needs to be clarified with more research works on potential application of microwave diathermy in management of chronic pains.

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