

# The Use of Acupuncture, Laserpuncture and Sonopuncture in Treatment of Chronic Lumbar Myofascial Pain Syndrome

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## ABSTRACT

*The aim of the present study was to determine the effect of acupuncture, laserpuncture and sonopuncture in chronic lumbar myofascial pain syndrome. Sixty patients with chronic lumbar myofascial pain syndrome volunteered for the present study. They were classified randomly and equally into four equal groups, each group received 12 sessions at a rate of three times per week. The first group (control) received only back and abdominal exercise. The second group received acupuncture and back and abdominal exercise. The third group received laserpuncture, back and abdominal exercises while the fourth group was treated with sonopuncture followed by back and abdominal exercises. The results of the present study showed significant improvement in pain alleviation, range of motion in the sonopuncture group (pain was reduced 94.5% and forward flexion was increased 15.5% and lumbosacral angle was changed 26.2%) compared with the other three groups. The improvement in the group of acupuncture (pain was decreased 62.7% and forward flexion increased 74.2% also lumbosacral angle was improved 15.61%) which was more than the laserpuncture group (pain decreased 29.3% and the forward flexion was increased 28.1% while Lumbosacral Angle decreased 2.9%). It was concluded that sonopuncture, acupuncture, and laserpuncture are respectively effective methods in treatment of chronic lumbar myofascial pain syndrome.*

## INTRODUCTION

**M**yofascial pain syndrome is characterised by the presence of trigger points. This myofascial trigger points are to be found in every case of mechanical type low back pain. Several studies were done to detect the best non invasive method of treatment<sup>21</sup>.

Mao-Liang et al., gave 15-minutes sessions of low-frequency electroacupuncture in cases of chronic low-back pain<sup>16</sup>. Also Loy, compared

acupuncture with physiotherapy modalities in the treatment of cervical spondylosis<sup>14</sup>. He stimulated acupuncture points electrically for as long as 30-40 minutes. Such prolonged stimulation, however, is in marked contrast to that used by Melzack and Wall when they successfully alleviated low-back pain by strong manual rotation of needles inserted into acupuncture points<sup>18</sup>.

Application of acupuncture in low back pain is performed in the points around vertebrae or distal points from the affected

areas. From these points, Urinary Bladder (UB) 25, its location 5 cun (inches = the distance between the highest point in the medial & lateral border of distal phalanx of patient's thumb, measured by cunqmeter) lateral to the lower border of the spinous process of the fourth lumbar vertebra. Urinary bladder 54 and its location is at the level of the fourth sacral foramen, 3.0 cun lateral to the mid line. Extra (EX) 21 which are series of pairs of points situated 0.5 cun lateral to the lower ends of the dorsal spines of the first lumbar to the fourth sacral vertebrae. Gall bladder (GB) 30 which is located by drawing a straight line between the highest point of the greater trochanter and the sacral hiatus. The points are situated at the junction of the outer third with the medial two-thirds on the line. Trigger points (Ah-shi) points may also be used<sup>2,7</sup>.

The wave length of the Helium-Neon laser is in the vicinity of 6328 Angstrom units, (the red part of the visible spectrum).

A Helium-Neon laser is used with an output of 25 milliwatts irradiation of acupuncture points for a few seconds (10-120 sec.) was used for stimulation. The depth of He Ne laser penetration in human tissues is about 5 mm. The treatment is given in dark rooms, and the patient is kept in darkness for some time after treatment to reduce the counteracting effects of other frequencies of light<sup>8,9</sup>.

An ultrasound beam can be administered as a continuous beam or produced in bursts that are pulsed. It is normally pulsed at a frequency of 500 Hz. The time between pulses is 10 ms. This means that ultrasound is pulsed in the ratio of 1:5, which means that it is for only one-fifth of the insonating time. Thermal effects of ultrasound are reduced if the pulsed beam is used, but pressure and

amplitude (the micromassage effect) remain unaltered. The shape of pulse is rectangular<sup>11</sup>.

Sonopuncture is the name given to the recently developed technique of stimulating acupuncture points by means of ultrasonic waves<sup>2-7</sup>. Bowsher proposed that many advantages are claimed for this new form of therapy and sonic stimulators have already made their appearance in the North American market<sup>4</sup>. While this non-invasive procedure may turn out to be a useful development, the possibility of some damage at the cellular level exists from breaking the sound barrier<sup>9</sup>.

The several biological effects caused after application of ultrasound are:

Loosening of the microscopic cell structure, friction, which will produce a thermal effect, oscillation of particles in a fluid medium; acceleration of the diffusion processes across the cell membrane<sup>7</sup>;

Intracellular massage; Breakdown of complex, biochemically active molecules; depolymerisation of proteins, especially those which are found in nerve, muscle and collagen cement; excitation of calcium bound to proteins; reversible decrease of viscosity of intra- and extracellular colloidal substances and specific effects on neural and circulatory mechanisms<sup>20</sup>. Kahn suggested that Ultrasound can produce effects such as inversion of sugar, changes in crystallisation, hydrolysis, crystallisation of supersaturated solutions, oxidation and depolymerisation of substances<sup>10</sup>.

The aim of the present study was to investigate the effect of acupuncture, laserpuncture sonopuncture in chronic lumbar myofascial pain syndrome.

## MATERIAL AND METHODS

**Subjects:** Sixty participants were included in the present study 46 females and 14 males

Their age ranged from 30 to 45 years. They were recruited from El Sahil hospital and Cairo Metropolitan areas. Subjects with congenital abnormalities or structural discrepancy or any medical problems that may interfere with the results, previous lumbar operation pacemaker, fever and epileptey were excluded. Patients were divided randomly into four groups of equal number as follow:

- G1: received back and abdominal exercises.
  - G2: received acupuncture on lumbar region followed by back and abdominal exercises.
  - G3: received laserpuncture in lumbar region followed by back and abdominal exercises.
  - G4: received of sonopuncture in lumbar region followed by back and abdominal exercises.
- Each group received 12 sessions at a rate of 3 times/week.

## MATERIALS

1. Verbal numerical scale (V.N.S.).
2. Plain lumbar spine radiograph.
3. Acupuncture filiform type of needles.

## Equipment

1. Pleurimeter V-inclinometer.
2. Electrical pulse acupuncture stimulator.
3. Helium Neon laser device.
4. Ultrasonic apparatus with a frequency of 1 MHz.

## Evaluative procedure

*Verbal Numerical Scale (VNS)* was used for assessment of pain. The patient was allowed to choose a number between 1-10 which represent his pain intensity.

*Range of motion of lumbar spine.* Forward flexion. Participant in stride standing position,

the pleurimeter V-inclinometer was supported at the level of L4, L5, and adjusted on zero, while both sides of its arms were kept in contact with the spine through adjustable elastic band. The participant was instructed to lean forward to the limit of pain.

*Measurement of Lumbosacral Angle.* From the lateral view of the plain lumbar spine radiograph, lumbosacral angle was calculated by drawing a horizontal line, that meets a line drawn through the superior surface of the sacral base.

## TREATMENT PROCEDURE

### Back and Abdominal Exercises

Gradual abdominal exercises started with isometric type at the first six sessions then gradual isotonic at the last six sessions, Back exercises for the muscles in lumbar area and pelvis were also used. The period of exercises was 10 minutes in supine and prone positions.

*For the other three modalities of treatment: (acupuncture, laserpuncture and sonopuncture).*

The rationale for treatment, was explained to each patient. Examination of the area to be treated was performed. Accurate location of the anatomical site of the pathology was conducted and the radiation of pain was detected. Good sterilization of the area was done before treatment. Testing the patient to ensure intact thermal and pain sensation was done.

### Acupuncture

KWD-80 II acupuncture device was used. The device was adjusted at 5 volt. frequency 20 Hz and Biphasic spike form. The stimulus impulses were dense-disperse. The patient was lying in prone position.

Filiform type of needles were applied at points UB 25, EX. 21, UB 54, GB 30 and Ah-Shi points. The needles were applied unilaterally or bilaterally according to the site of pain (not exceeded 10 needles). Electro-needling was applied after the needling sensation was obtained. Then turning the output to zero. The negative electrode was connected to the main point and the positive electrode onto the secondary point (or any random point). This was followed by turning the power on, selecting the desired wave-form and slowly increasing the output until it reached the desired level for 1 to 20 minutes. The electricity was cut off for one to two minutes and then applied again to ensure an adequate intensity of stimulation. Removal of needles were done using a piece of sterilized cotton.

#### **Laserpuncture**

From the prone lying position Helium Neon laser with intensity of 20mw was used on ten of the acupuncture points (UB 25 and 54, EX 21, GB 30 and Ah-shi in points). The probe was applied vertical over the acupoints for two minutes at each point.

#### **Sonopuncture**

Patient was in prone lying position. The couplant aquasonic gel was applied to the skin in sufficient quantity to provide an air-free

contact. For perfect transmission of power from the treatment head to the body, the head was applied perpendicularly to the skin surface. Stationary technique pulsed, ultrasonic ( $1 \text{ wcm}^2$ ) was used.

The patient was instructed that there should be no increase in the presenting symptoms and no periosteal pain. Only minimal perceptible warmth should be felt under the sound head, which could be caused by friction forces. The application was two minutes for each acupuncture point and the head was glided to the next point in the same side, then to the other side for no more than 10 points, then the device was turned off. Removal of contact medium was done using methylated spirits.

## **RESULTS**

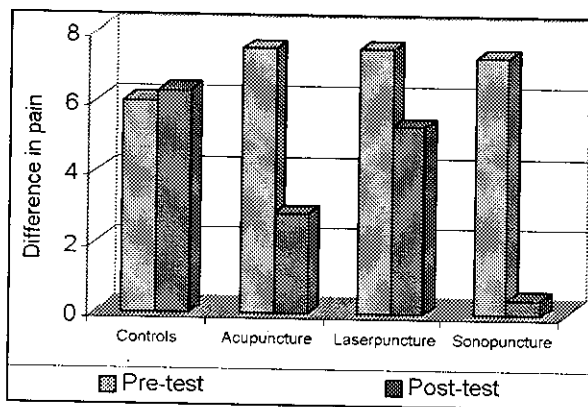
#### **Pain perception**

Table (1) and figure (1 and 2) shows the mean values of the pain perception for the four investigated groups. Thus in group 1 pain decreased by 3.3%, yet the change was clinically insignificant. The pain percentage was reduced in groups II, III, and IV. (62.7%, 29.3 and 94.5 respectively). The significant percentage change was observed more in group IV, II and III respectively.

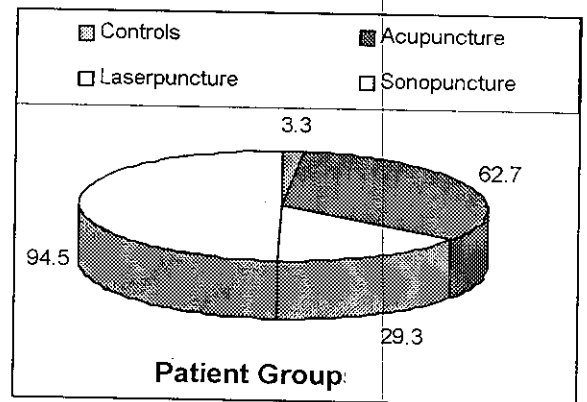
**Table (1): Pain assessment in the four investigated groups including pre and post treatment**

No	G1 controls		G2 Acupuncture		G3 Laser puncture		G4 Sono-puncture	
	Pre	post	Pre	Post	Pre	post	Pre	post
1	7	8	10	6	7	6	9	2
2	6	6	7	4	8	6	8	0
3	7	7	5	2	7	6	8	0
4	9	8	5	0	6	5	7	2
5	5	6	8	5	9	2	10	0
6	5	5	7	2	8	6	5	0
7	4	5	10	5	8	5	7	0
8	6	5	3	0	5	4	5	0
9	7	8	8	3	9	8	7	2
10	6	6	10	3	9	7	8	0
11	7	6	7	0	8	5	6	0
12	7	7	7	2	8	6	5	0
13	4	4	7	3	5	0	6	0
14	4	5	10	5	7	7	10	0
15	7	8	8	2	9	7	8	0
Mean	6.	6.3	7.5	2.8	7.5	5.3	7.3	0.4
SD ±	1.4	1.3	2.1	1.9	1.4	2.1	1.7	0.8
t value	1.0000		13.4360		4.7845		15.0470	
P value	>0.1		<0.001		<0.001		<0.001	
% change	3.3		62.7		29.3		94.5	

SD = Standard deviation  
P = probability



**Fig. (1): Pain assessment in the four investigated groups including pre and post treatment.**



**Fig. (2): Pain improvement in the four investigated groups (% of change).**

### Forward flexion:

Table (2) and Figures (3 and 4) show the mean and SD for the forward flexion of the 4 investigated groups pre and post treatment. Thus in G1 forward flexion increased 3.9% yet

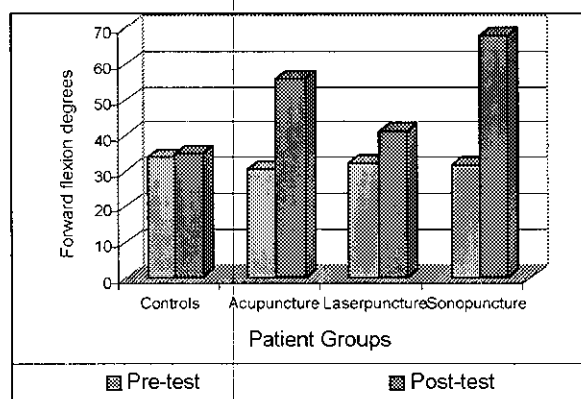
the change was clinically insignificant. Forward flexion was increased in G2, G3 and G4 with a percentage of 74.2, 28.1 and 115.5 respectively. These changes were more in G4 followed by G2 then G3.

**Table (2): Forward flexion assessment in the four investigated groups including pre and post treatment.**

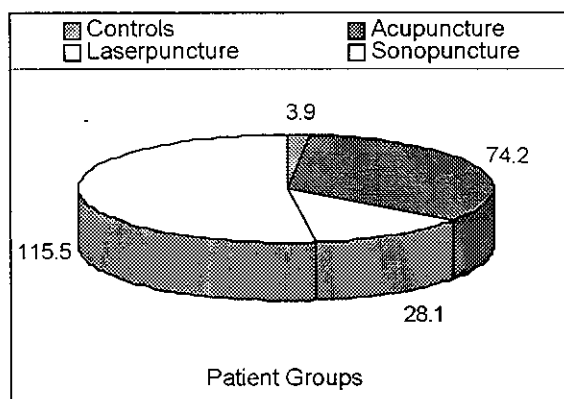
No	G1 controls		G2 acupuncture		G3 laserpuncture		G4 sonopuncture	
	Pre	post	Pre	Post	Pre	post	Pre	post
1	30	30	40	60	20	30	20	65
2	40	40	30	50	30	40	35	70
3	25	30	30	50	25	30	15	70
4	20	30	40	70	40	45	45	60
5	40	35	30	60	40	50	20	70
6	40	40	35	50	40	45	40	70
7	50	45	20	50	25	40	30	70
8	20	30	50	70	35	40	40	70
9	30	30	30	45	40	45	35	60
10	40	40	20	50	30	35	40	70
11	35	30	50	70	30	40	40	70
12	40	40	20	45	30	35	40	70
13	15	20	30	60	35	70	40	70
14	50	50	10	50	40	40	20	70
15	30	35	25	55	20	30	15	70
Mean	33.7	35.0	30.7	55.7	32.0	41.0	31.7	68.3
SD ±	10.6	7.6	11.2	8.8	7.3	10.0	10.6	3.6
t value	1.0745		13.6931		4.3235		11.9312	
P value	>0.1		<0.001		<0.001		<0.001	
% change	3.9		74.2		28.1		115.5	

SD = Standard deviation

P = probability



**Fig. (3): Forward flexion assessment in the four investigated groups before and after treatment.**



**Fig. (4): Percentage of increase of forward flexion in the four investigated groups.**

**Lumbosacral angle:**

Table 3 and Fig. (5 and 6) show the mean and SD of lumbosacral angle for the four investigated groups. Thus in group 1 Lumbosacral Angle changed 0.2% yet the

change was clinically insignificant. The Lumbosacral Angle was changed in the other 3 groups. It was decreased by percentage of 15.61, 2.9 and 26.2 respectively for the three groups G2, G3 and G4. Thus the changes were more in G4, G2, G3 respectively.

**Table (3): Lumbosacral angle assessment in the four investigated groups including pre and post treatment.**

No	G1 Control		G2 Acupuncture		G3 laserpuncture		G4 Sonopuncture	
	Pre	post	Pre	post	Pre	post	Pre	post
1	50	50	50	45	40	38	40	32
2	45	45	40	35	45	44	40	30
3	40	40	40	32	50	42	46	32
4	45	43	45	35	40	38	45	32
5	35	35	35	32	40	38	36	30
6	50	50	37	35	46	46	40	30
7	35	35	40	35	42	41	42	30
8	40	43	35	35	40	38	45	38
9	55	55	50	45	45	45	40	30
10	60	60	50	35	40	48	60	38
11	70	40	40	30	45	40	45	30
12	38	38	45	40	38	38	35	30
13	47	47	40	35	35	30	40	30
14	34	34	48	38	40	38	42	30
15	36	36	50	38	40	37	45	30
Mean	43.3	43.4	43.0	36.3	41.7	40.5	42.7	31.5
SD ±	7.9	7.8	5.6	4.3	3.8	4.9	5.8	2.8
t value	0.2686		6.3795		1.6422		10.1858	
P value	>0.3		<0.001		:>0.05		<0.001	
% change	0.2		15.61		2.9		26.2	

SD = Standard deviation

P = probability

### Effect of Laserpuncture

Stux and Pomerumz and Jayasuriga mentioned that acupuncture deals with the bioenergetic system of acupuncture channels and points<sup>21-9</sup>. The researches have shown that the acupuncture points are specific points of energy exchange between the living organism and the surrounding environment, and that the application of laser therapy in acupuncture points has specific advantages whereby significant results are obtained in a variety of diseases<sup>2,3</sup>. Mansson<sup>15</sup> stated that biophysical experiments have demonstrated that the bioenergy produced by laser radiation of acupuncture points is conducted along bioenergetic channels similar to the accepted traditional acupuncture channels.

According to Kahn, Low and Reed the acupuncture points are specific points in the bioenergetic sense<sup>11-13</sup>. This is indicated by experimental findings that the conductance of various forms of energy, like light, is greater in the area of the point than in the surrounding areas of the skin. The acupuncture system is apparently not only a bioelectrical system, but also a photobiological system, where biological (cosmic) energy and information are being transferred in the form of electromagnetic radiation<sup>15,12,5</sup>. Kitchen and Bazin proposed that stimulation of acupuncture points with laser lead to suppression pain of through part or all of the previous explanations<sup>12</sup>.

### Effect of Sonopuncture

The fourth group showed the best scores of improvement. As the ultrasonic energy stimulate acupuncture points, it transferred in the channel in the form of electromagnetic radiation<sup>1,16,13</sup>. It produces the same effects as acupuncture with the same explanation<sup>4-16</sup>.

Beside this changes also it has other effects. According to Sclapbach when ultrasound waves are absorbed in the tissues, there will be immense mechanical forces working in the tissues which cannot be compared with any other physical agent<sup>20</sup>. The alternation of positive and negative pressures at the frequency of the machine causes the micromassage and chemical effects which lead to suppression of pain and increasing active range of motion.

The effects which was noticed in acupuncture and sonopuncture group were more than that of laserpuncture group. This may be due to the various effects of ultrasound pluse its stimulation of acupuncture points. Also, electroacupuncture might be more effective through the possibility of increasing the intensity, till acupuncture sensation is felt, while those patients in laserpuncture gorup are subjected to stable intensity<sup>16</sup>. On the other hand the stimulation with laser was continuous compared with acupuncture and sonopuncture which were pulsed. This might decrease the possibility of adaptation to the stimulus.

The first group (control) showed increasing pain and muscle spasm in most of their cases and no significant improvement in lumbosacral angle or active range of motion were noticed. These results might be due to less analgesic effect of exercises which were applied alone without other modalities, which suppress pain.

### CONCLUSION

Sonopuncture, acupuncture and laserpuncture are respectively able to improve the cases of chronic lumber myofascial pain syndrome.



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## الملخص العربي

### استخدام الإبر الصينية وخز الليزر وخز الموجات فوق الصوتية في علاج الآلام المزمنة للنسيج العضلي الضام للفقرات القطنية

نقاط الألم الخاصة بالنسيج العضلي الضام غالبا ما توجد في حالة الام الظهر الميكانيكية تم عمل عدة دراسات لتحديد أنسب الوسائل الطبيعية للتغلب على هذه المشكلة. ستون متطوعا يعانون من الآلام النسيج العضلي الضام بالفقرات القطنية تم اختيارهم للدراسة الحالية. تم تقسيمهم إلى أربعة مجموعات بالتساوي وعشوائيا حيث تلقوا ١٢ جلسة، ثلاثة أيام أسبوعيا. المجموعة الأولى تم علاجها بتمارين الظهر والبطن والثانية بالإبر الصينية بجانب تمارين الظهر والبطن أما المجموعة الثالثة تم علاجها بخز الليزر بجانب تمارين الظهر والبطن وفي المجموعة الرابعة تم عمل ١٢ جلسة بخز الموجات فوق الصوتية وعقبها تمارين للظهر والبطن. وقبل عمل الدراسة تم تقييم الألم والانحناء الأمامي للظهر وأيضا الزاوية القطنية العجزية. وقد أشارت النتائج إلى أن أفضل نوعيات العلاج التي استخدمت كانت هي الوخز بالموجات الصوتية حيث انخفض الألم بنسبة ٩٤,٥% وزاد الانحناء الأمامي بنسبة ١١٥,٥%. وغيّرت الزاوية القطنية العجزية نسبة ٢٦,٢%. وقد لوحظ التحسن في المجموعة الثانية الخاصة بالإبر الصينية (انخفض الألم ٦٢,٧%، زيادة الانحناء الأمامي ٢٤,٢% وتغيرت الزاوية القطنية العجزية ٦٥,٦٨%) وهذا التقدم أكثر من مجموعة الوخز بالليزر (انخفاض الألم ٢٩,٣% وزيادة الانحناء الأمامي ٢٨,١% وتغيرت الزاوية القطنية العجزية ٢,٩%). التأثير الواضح في مجموعة الوخز بالموجات الصوتية ربما نتيجة التأثير الميكانيكي والكيميائي والكهربي للموجات فوق الصوتية بجانب التأثير على نقاط الإبر الصينية، أيضا ربما يرجع إلى إمكانية تعديل التنبيه في الإبر الصينية ووجود التيار المتردد ولا توجد هذه المتغيرات في الليزر. وربما أدى هذا إلى ظهور نتائج أكثر إيجابية في مجموعة الإبر الصينية عنها في مجموعة الليزر.