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Comparison of Superficial and Deep Acupuncture in the Treatment of Lumbar Myofascial Pain: A Double-Blind Randomized Controlled Study

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Abstract:

Objective: The aim of the study was to compare the therapeutic effect of the superficial and in-depth insertion of acupuncture needles in the treatment of patients with chronic lumbar myofascial pain.

Design: A prospective randomized double-blind study of superficial and deep acupuncture was conducted.

Setting: The study was conducted in the Pain Service Unit of the University of Padova.

Patients: The study comprised 42 patients with lumbar myofascial pain who were divided into two equal groups (A and B).

Intervention: In group A, the needle was introduced in the skin at a depth of 2 mm, whereas in group B the needle was placed deeply into muscular tissue. The treatment was planned for a cycle of eight sessions.

Outcome Measures: The intensity of pain was evaluated with the McGill Pain Questionnaire before and after treatment and at the 3-month follow-up examination.

Results: Although at the end of the treatment there was no evidence of significant statistical differences between the two different groups, pain reduction was greater in the group treated with deep acupuncture. A statistical difference existed between the two groups at the 3-month follow up, with a better result in the deeply stimulated group.

Conclusions: Clinical results show that deep stimulation has a better analgesic effect when compared with superficial stimulation.

Key Words: Acupuncture—Double-blind controlled study—Human clinical trial—Low back pain—Methodology—Myofascial pain.

In Western Europe, acupuncture is mainly used for the management of pain. A condition that has been thoroughly studied is back pain, particularly low back pain. Myofascial lumbar pain is a common chronic condition for which acupuncture is widely used as a therapeutic tool, even though there are contrasting data regarding the effectiveness of this technique.

Mendelson et al.[1] carried out a complex crossed study with 4-week follow up in patients with chronic low back pain in which acupuncture was compared with an injection of lidocaine, followed by needle insertion in the area of analgesia. Pain was measured with visual analog scales. The reduction of pain was more pronounced in the acupuncture-treated group (36 vs. 22%), though not significantly.

Edelist et al.,[2] in a study of the analgesic potential of acupuncture in patients with discal herniation, compared

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a group of 30 patients treated with electrical stimulation of the acupuncture points with a group treated with sham electroacupuncture; however, the 46% improvement obtained with electroacupuncture versus 40% obtained with sham electroacupuncture was not statistically significant. In a study of low back pain in using a crossover comparison of transcutaneous electrical nerve stimulation and classic acupuncture (only three acupuncture points were used for two sessions), Fox and Melzack[3] obtained 75% amelioration in the group treated with acupuncture and 66% in the one treated with transcutaneous electrical nerve stimulation; however, this difference was not significant.

The aim of this study is to evaluate whether there is any difference between the therapeutic effects of deep and superficial acupuncture needle insertion in the management of chronic myofascial lumbar pain.

MATERIALS AND METHODS

The research was conducted on 42 patients treated at the Pain Therapy Unit of the Department of Pharmacology and Anesthesiology of the University of Padova. The patients were recruited after satisfying all the inclusion and exclusion criteria. None of these patients had been previously treated with acupuncture, and all completed the study.

Every patient had chronic lumbosacral myofascial pain. Patients were then divided into two groups according to the therapy performed. Patients in group A received superficial acupuncture, whereas those in group B received deep acupuncture. The two groups were homogeneous regarding the intensity of the initial pain, and the duration of pain (group A, 17.72 months; group B, 18.02 months) was not significantly different between the two groups. Group A comprised five women and 16 men, and group B comprised seven women and 14 men. All patients were between 30 and 50 years (group A, 41.65 ± 11.37 years; group B, 41.63 ± 8.87). Because children do not present to our unit, no patient younger than 18 years took part in the study.

Patients were assigned to groups according to the random number table. When included in the study, each patient was assigned a sequential number and a letter (A or B) that placed him or her into one of the two groups. All patients were previously and correctly informed about the procedures involved in the two methods, and were told that they would have been assigned to one of the groups to ensure that they will be treated in a different way in the case of no-benefit therapy. All patients agreed and gave their consent for the experiment.

Both groups underwent radiography of the lumbosacral tract of the vertebral column. Patients that showed bulging disks or acute pain radiating to the lower limbs underwent computed tomography, electromyography, or both.

Inclusion criteria

All patients taking part in the study were experiencing continuous pain that had lasted for more than 3 months or recurrent pain that had become acute more than 1 month before the study and that had not been resolved with drug therapy. All patients had to show normal deep tendon reflexes at the lower limbs, negative Lasegue and Wassermann test findings, no clinical evidence of diminished muscular function, and one or more active trigger points at the lumbar muscular level or in the limbs. Patients with radiographic evidence of arthrosis, negative computed tomographic scan findings for discal bulging (without signs or symptoms of radicular compression), and normal electromyographic results were included in the study.

Exclusion criteria

Patients affected with the following conditions were excluded from the study: paraplegia or quadriplegia, radiographic evidence of osteoporosis with one or more vertebral collapses or fractures, spondylitis, concomitance with other rheumatic diseases with altered blood test results, disk herniation with instrumental electromyography or clinical evidence of radicular compression, outcomes of previous surgery for disk herniation with areas of hypesthesia at the lower limbs, primary fibromyalgia (a painful diffused systemic syndrome[4]), systemic organic diseases (i.e., cardiopathy, vasculopathy, diabetes, hepatic cirrhosis, and cancer), psychiatric illness, alcohol or drug addiction or users of drugs that act on the nervous system (e.g., benzodiazepines, antidepressants, and neuroleptics), arterial blood hypertension managed with reserpine or clonidine, or obesity that does not allow the muscular insertion and stimulation of needles.

Double-blind study design

One practitioner performed the superficial acupuncture procedures and a second performed the deep acupuncture procedures; all practitioners were medical licensed acupuncturists. A third practitioner measured pain with the appropriate tests not knowing whether the patient had undergone superficial or deep acupuncture.

Stimulation technique

Therapeutic pattern

All patients were subjected to the same therapeutic pattern as follows:

The points Shiqizhui (extra 19) and Jizhong (VG 6) located on the posterior middle line of the body.
The points Yangligquan (GB 34), Weizhong (UB 54), and Shenmai (UB 62) were inserted bilaterally (Fig 1).
Four needles were inserted in four trigger points or, as second choice, in the four most painful muscular tender points found in the lumbar area (Fig. 1); these points were used during each of the eight sessions.

Types of needles

Disposable Sedatelec (Irigny, France) 300-μm diameter needles of three different lengths were used: (1) 34.30 needles (useful length of the needle, 18 mm) for superficial insertion; (2) 52.30 (useful length of the needle, 29 mm) for deep insertion when the subcutaneous area is up to 1.5-cm thick; and (3) 72.40 (useful length of the needle, 49 mm) for deep insertion when the subcutaneous area is at least 3 cm thick.

Depth of insertion

In group-A patients, the needle was inserted in the skin and on the trigger points to a depth of 2 mm. In group-B patients, the needle was inserted to a depth of approximately 1.5 cm in the muscle or in the trigger points.

Needle stimulation

All needles were stimulated for 1 minute immediately after the insertion and for 20 seconds every 5 minutes at 5, 10, and 15 minutes. The frequency of alternate right and left rotation of the needles was 2 Hz.

Length and frequency of sessions

The session lasted for 20 minutes. Every patient was subjected to eight sessions; the first four sessions were carried out in 2 weeks, whereas the remaining four sessions were carried out once per week.

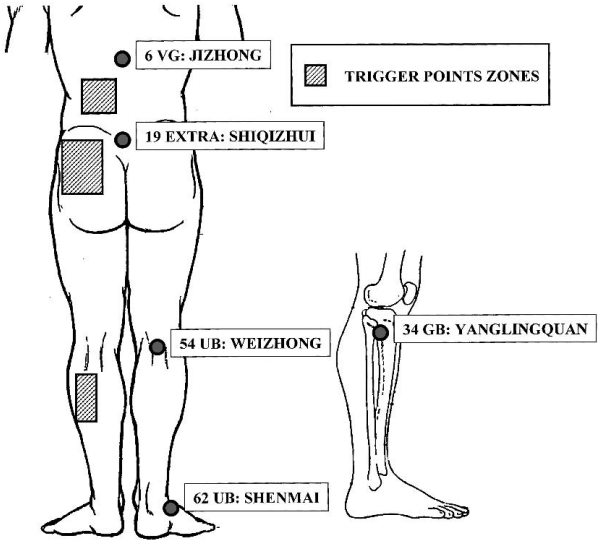

FIG. 1. The acupuncture points stimulated.

TABLE 1. *Number of words registered by the McGill Pain Questionnaire: comparison of superficial and deep puncture*

Number of words	Before therapy	End of therapy	Follow up
Superficial (mean ± SD)	13.70 ± 3.49	10.4 ± 6.76	8.50 ± 7.12
Deep (mean ± SD)	13.81 ± 3.95	7.81 ± 4.88	3.63 ± 6.13
p value	ns	ns	<0.05

Evaluation of the patients before, during, and after therapy

The pain status of each patient was obtained verbally using the McGill Pain Questionnaire before and after treatment and again after 3 months.

We considered two indexes of the McGill Pain Questionnaire: the number of words chosen and the pain rating index. The pain rating index is the sum of numerical values that has been assigned to each word used to describe the pain; we have indicated this value as McGill pain score.[5]

Statistical analysis

The results between the two groups were initially compared by a repeated-measurements two-way analysis of variance. Post hoc comparison was made by the Bonferroni correction of the unpaired *t* test (Tables 1 and 2).

RESULTS

The group treated with superficial acupuncture showed a reduction in the pain rate index values from 34.75 ± 11.43 before the therapy to 22.25 ± 16.08 at the end of therapy, and with the number of words chosen (from 13.7 ± 3.49 to 10.4 ± 6.76). The results improved further at the 3-month follow-up visit, reaching a mean value of 18 ± 17.60 for the pain rate index and 8.50 ± 7.12 for the number of words chosen.

The group treated with deep acupuncture showed a reduction in the pain rate index values from 35.4 ± 14.35 before the therapy to 14.54 ± 10.88 at the end, and with a number of words chosen (from 13.81 ± 3.95 to 7.81 ± 4.88). Results improved at the 3-month follow up, reach-

TABLE 2. *Total scores registered by the McGill Pain Questionnaire: comparison of superficial and deep puncture*

Pain rating index	Before therapy	End of therapy	Follow up
Superficial (mean ± SD)	34.75 ± 11.43	22.25 ± 16.08	18.00 ± 17.16
Deep (mean ± SD)	35.4 ± 14.53	14.54 ± 10.88	7.50 ± 12.94
p value	ns	ns	<0.05

ing a mean value of 7.50 ± 12.94 for the pain rate index and 3.63 ± 6.13 for the number of words chosen.

Analyses of these data did not show any statistically significant difference in the therapeutic efficacy between the two groups (Tables 1 and 2) at the end of the treatment. However, deep acupuncture was significantly more effective 3 months after treatments.

DISCUSSION

The power analysis conducted to evaluate the size of the sample showed 21 patients do not produce enough power (1-B <80%). Nevertheless, the clinical results seem interesting. If the sample size was larger, the results might have reached statistical significance. However, economic factors did not allow us to consider a greater number of patients.

For many years, scientific research in the field of acupuncture has focused its attention merely on the problem concerned with the comparison of the therapeutic effect yielded by the acupuncture point stimulation versus sham acupuncture. The term "sham acupuncture" signifies the random needle insertion in casual points of the skin, with the assumption that the needle insertion in areas of the skin not belonging to acupuncture points has no appreciable clinical effect. Therefore, it can be considered a kind of placebo acupuncture. This assumption is not valid because there is physiologic evidence that any nociceptive stimulus applied to the skin reduces pain by activating diffuse noxious inhibitory control.[6]

In a systematic review of low back pain, Van Tulder et al.[7] included 11 clinical studies, 8 of which compared the acupoint stimulation with sham acupuncture. No significant differences were registered between the two stimulation techniques. These studies, in effect, should be considered as evaluations of the effect of acupuncture versus a less effective kind of acupuncture, as confirmed also by Lewith and Machin.[8]

In the evaluation of the efficacy of acupuncture, important parameters are the intensity and the modality of stimulation of the needles. For the assessment of the parameter "intensity," one can point out certain variables, including number of needles used per session, diameter of the needles, number and frequency of sessions, depth of needle insertion, whenever electroacupuncture is performed, and the frequency and amplitude of the stimulation.

In most studies, the intensity of stimulation is not specified, which makes it difficult to reproduce the experiment. This fact is often not pointed out literature reviews. In many articles regarding electroacupuncture, the phrase "the intensity of the current used lies under the patient's pain threshold" or "the intensity of needle stimulation does not cause discomfort to the patient" is often found in Materials and Methods. In the case of manual acupuncture we usually can read, "the stimulation is protracted until -te-chi-," without specific information regarding the length and modality of stimulation. The extreme variety of results in research regarding the same syndromes or illnesses may depend on this great variability of the stimulation techniques.

The intensity of stimulation depends on different parameters, among which is the depth of needle insertion. It seems obvious to expect differences in results when using superficial or deep insertion modalities because of the different receptorial apparatus stimulated. Deep insertion of the needle affects several structures—the skin, muscle fascia, and muscle—whereas superficial insertion affects only the skin.

Ishimaru et al.,[9] in a study performed on healthy volunteers, observed the increase of the pain threshold of the skin, muscle fascia, muscle, and periosteum to compare the effect of transcutaneous electrical nerve stimulation with that of electroacupuncture. Their results have shown that electroacupuncture increases the pain threshold in deep tissues more than that observed with transcutaneous electrical nerve stimulation, which involves the use of surface electrodes.

In this study, both techniques seem to produce good results, at least from a statistical point of view. This can be interpreted statistically as a positive fact showing that the results cannot be attributed to causality. If we examine the results from a clinical aspect, different considerations prevail. In the group treated with superficial acupuncture, the reduction of pain observed, even if significant, was only 35.97%, whereas the reduction of the starting pain in the group treated with deep acupuncture was 58.92%. The registered difference is of great clinical importance, and the most interesting finding is that the clinical improvement continues until 3 months after evaluation, with a reduction of 78.5%. These data demonstrate a major efficacy of the deep stimulation technique, underlining the importance of muscular afferents for acupuncture analgesia.

There is experimental evidence that confirms this hypothesis. Chiang et al.[10] observed that the blockade of nervous afferent fibers from the skin did not eliminate the acupuncture analgesia, whereas the anesthetic blockade in deep tissues eliminated acupuncture analgesia. This observation suggested the hypothesis that the muscular afferents were more important for the transmission of the acupunctural signal than the skin afferents.

The sensitive apparatus in the muscle devoted to pain sensation is located close to the muscle cells and is there-

fore preferentially activated by the chemical changes of the extra cellular environment or through the mechanical or thermal stimulation of the muscle fascia, rather than by the muscle cell injury itself.[11] A thick network of receptors exists in the muscle, and is connected with small-diameter myelinic fibers (group III) and amyelinic fibers (group IV).[10] The fibers of groups III and IV are involved in acupuncture analgesia,[12,13] and blocking these fibers with an anesthetic agent at a low concentration reduces the analgesic effect of acupuncture.

Experimental evidence points out that the inhibitory effect of acupuncture depends on the type of tissue stimulated at the acupoint site. Wall and Woolf[14] demonstrated that prolonged increases in the excitability of the flexion reflex in the rat were produced by muscle rather than by cutaneous C-inputs. Hashimoto and Aikawa[15] proved that the stimulation of the muscle produced a stronger and longer-lasting inhibition on the C-evoked discharge than that of the skin. However, the skin stimulation by painful stimuli (pinching) produces a similar inhibition of the C-evoked discharge,[15] and this indicates the importance of the quality of the stimulus to obtain a response.

We conclude that deep stimulation has a better therapeutic effect when compared with superficial stimulation. The depth of stimulation must be considered an important variable in clinical practice. Further studies are necessary to confirm our results and to analyze other variables of needle stimulation.

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