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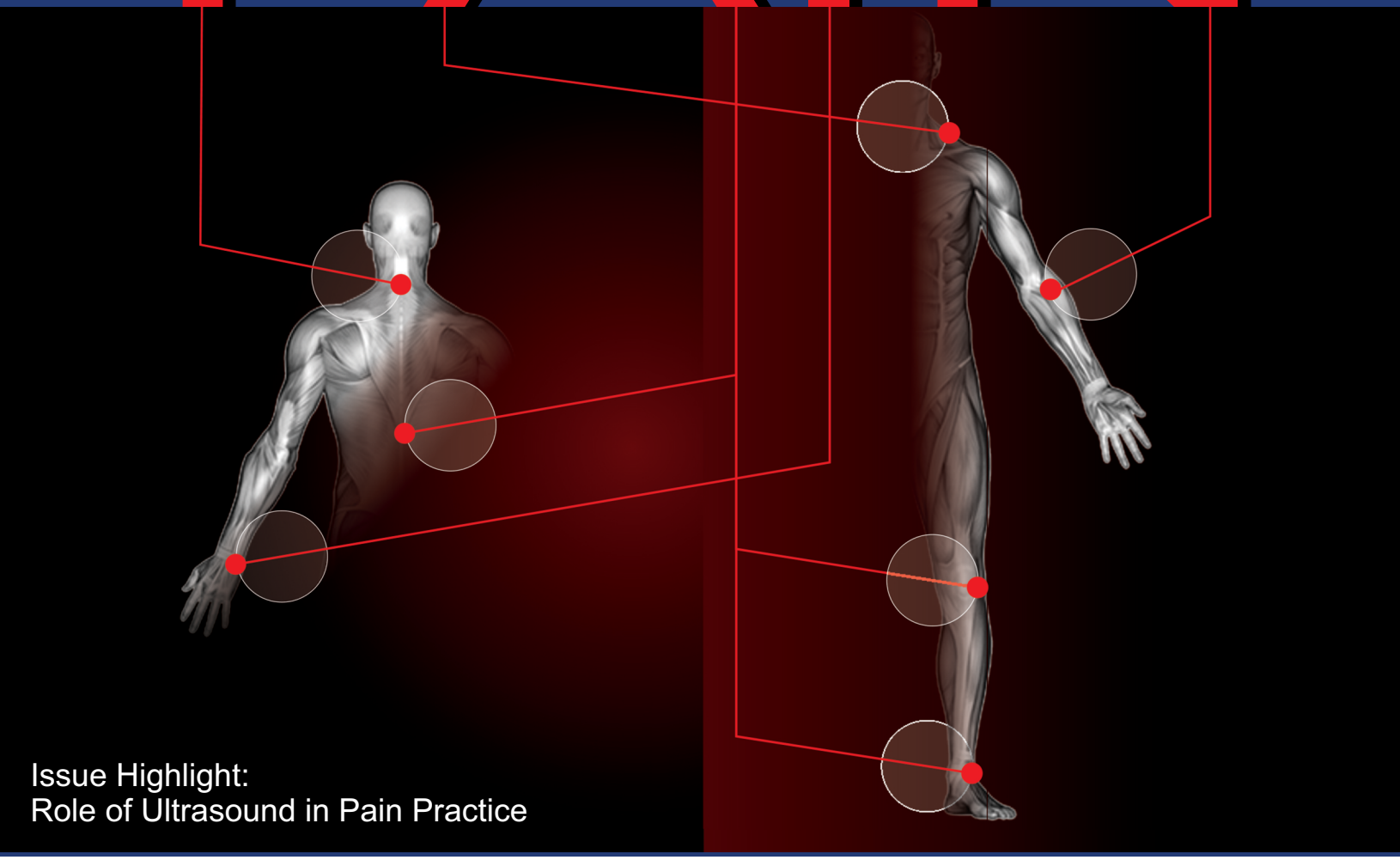

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Original Article

Evaluation of Effectiveness of Dry Needling in the Treatment of Chronic Low Back Pain: A Retrospective Analysis

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Abstract

Aim: The aim of the study was to analyze the effectiveness of dry needling (DN) in the management of chronic low back pain (LBP). **Materials and Methods:** Forty patients with chronic LBP (CLBP) (already treated with analgesics and physiotherapy by other clinicians) with myofascial trigger points were given five sessions of DN for 20 min each on every 3rd day. The effect on pain intensity, range of motion (ROM), and disability was observed with the help of numerical rating score (NRS), ROM score, and Owestry Disability Index respectively at 1, 4, and 12 weeks interval. **Results:** The NRS decreased from a mean of 7.39 to 3.68 at the end of 4 weeks and then 2.32 by 12 weeks showing a significant relief in the pain intensity. The ROM improved from the mean of 4.95 to 2.38 at 4 weeks and to 1.34 by 12 weeks. The mean Oswestry disability index was 38.95 before the treatment and significantly reduced to 17.70 after 12 weeks. The use of paracetamol and hot fomentation was very minimal in the majority of patients. **Conclusion:** DN is an effective intervention for the management of chronic LBP with myofascial component up to 12 weeks, irrespective of age or gender after the red flags ruled out.

Keywords: Chronic low back pain, dry needling, myofascial trigger point

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Introduction

Low back pain (LBP) is a common health problem worldwide. Almost 60%–80% of people experience LBP at some point in their life.[1] The point prevalence of chronic back pain is 23%.[2] chronic LBP (CLBP) can be due to various reasons, for example, prolapsed disc, degenerative conditions, sacroiliac or facet joint disorders, spondyloarthropathies, osteoporosis, etc., but a myofascial component seems to make it worse. More than two-thirds of the patients with CLBP have myofascial trigger points (MTP). MTPs are hard, discrete, palpable nodules in taut band of a skeletal muscle that may be painful either spontaneously (active) or on compression (latent).[1] Pharmacological treatment remains the mainstay of the management consisting of nonsteroidal anti-inflammatory drugs and tramadol.[2] Apart from it, different types of nonpharmacological treatment options such as massage, exercise, acupuncture, transelectrical nerve stimulation (TENS), trigger point (TP) injections, and dry needling (DN) are used to treat the patients.[2,3] There are many interventional pain procedures done for different etiologies. In some clinical guidelines, multimodal treatment approach is recommended for CLBP.[1,3]

DN is a well-accepted technique now to treat musculoskeletal chronic pain by clinicians.[1] It has been shown to deactivate MTP and relieve pain in a variety of conditions.[4] It is performed by inserting a long monofilament needle into TP in muscles of the painful part. Various mechanisms are proposed for the effectiveness of DN system. One of them is hyperstimulation analgesia through the descending pain inhibitory system. The researches by Shah, confirmed that biochemicals associated with pain, inflammation, and intercellular signaling (e.g., inflammatory mediators, neuropeptides, catecholamines, and cytokines) were raised near the active MTPs. Melzack's gate control theory of pain describes the modulation of sensory nerve impulses by inhibitory mechanisms in the central nervous

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system. Needling also induces a sympatholytic effect causing vasodilatation and also delivers growth factor to the injured areas, which stimulates collagen formation.[3-5]

A number of clinical trials/analysis have been performed evaluating the effects of DN in a variety chronic pain conditions in the rest of the world, but very few in India.[2] In our clinic, DN is used routinely to treat various chronic pain conditions as a sole or supportive treatment with pharmacological treatment and physiotherapy. Hence, a retrospective study was undertaken to analyze the effect of DN for the treatment of CLBP.

Materials and Methods

This retrospective study was conducted at two pain clinic centers located in central India between January 2019 and December 2019. After screening through the clinic records, a total of forty patients with LBP for more than 3 months with myofascial tender points who have not responded to pharmacological treatment and physiotherapy schedule, without a recent history of trauma, neurological deficit, bladder/bowel incontinence (red flags), with minimum 3-month follow-up were identified. Ethical committee approval for the retrospective study was not required as per our institutional policy. However, written informed consent from all the patients was taken before the procedure. The predominant etiologies of CLBP included discogenic pain, facetogenic pain, arthritic pain, and myofascial pain.

In all patients, the number of active and latent TPs was noted on back muscles (quadratus lumborum, latissimus dorsi, serratus posterior, erector spinae, lumbar multifidus, and gluteal muscles) by direct finger pressure and flat palpation method. After a written informed consent, under all aseptic precautions, DN was performed using thin stainless steel needles of 30–32G of varying length between 45 mm and 70 mm. The DN sessions were done by the two authors. Follow-up was done by the same operator for the respective patient. The needles were applied perpendicular to skin. The number of needles used varied depending on the number of TPs. A local twitch response was obtained most of the times.[6] Needles were kept in place for 20 min. After 10 min, they were slightly rotated (twirling) to enable re-stimulation. The procedure was done every 3rd day, and five sittings were given in the same way. The number of TP was examined before every sitting. Patients were advised to take tablet paracetamol and/or hot fomentation (HF) for 10 min at home if their back pain worsened during the course of the treatment. Soreness at the site of needling was advised to be treated with ice application at home.

Three primary outcomes, namely, pain intensity, range of motion (ROM), and disability due to pain were studied.[7] Level of pain intensity was assessed by numerical rating score (NRS) (a numerical expression of pain from 0 to 10 where 0 is no pain and 10 is worst possible pain) before and after 1, 4, and 12 weeks of treatment. The ROM was assessed by asking the patient to do flexion/extension/rotation-right and left at lumbosacral joint and hip flexion and extension before and at 1-, 4-, and 12-week interval. One mark for painful movement and zero for nonpainful movement was allotted so that a score of 0–6 can be calculated. Oswestry LBP disability questionnaire was used before and at 12 weeks after the study. It consists of ten functions related to daily life, for example, pain while walking, sitting, travelling, and socializing. A set of five answers are designed for each function and marks are allotted for each answer from 0 to 5. We need to select one answer for each function. A ratio of total number of marks obtained by the patient to maximum possible marks is Oswestry disability index (ODI). A number of paracetamol tablets and HF required were noted as secondary outcomes.

Statistical method

The quantitative parameters were expressed in terms of mean, standard deviation, median, and interquartile range, while sex, which was the only categorical parameter, was expressed in terms of numbers and percentage. The comparison of NRS pain score and range of movement was carried out using Friedman analysis of variance (ANOVA), while ODI between two times was compared using *Wilcoxon signed rank test*. All the analyses were performed using SPSS version 20.0 (IBM Corp. USA) (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp., USA), and the statistical significance was evaluated at 5% level.

Results

The descriptive statistics of demographic characteristics of forty patients are shown in Table 1. The mean age of patients was 49.51 ± 14.52 years and ranged between 18 and 79 years. The mean duration of pain was 1.39 ± 2.03 years and ranged between 3 months and 8 years. The male proportion in the study was marginally higher than that of females. Table 2 provides the comparison of mean NRS of pain over time. At baseline, the mean NRS was 7.39 (1.33), which was decreased to 5.58 (1.55) at 1st week, 3.68 (1.47) at week 4, and 2.32 (0.99) at week 12. The decrease in the score was statistically significant with a $P < 0.0001$ using Friedman ANOVA. A pair-wise analysis of NRS showed statistically significant improvement between consecutive time points with a $P < 0.0001$. On similar lines, the comparison was performed for ROM [Table 2]. At baseline, the mean ROM score was 4.95 (1.19), improving to 3.49 (1.07) at 1st week, 2.38 (1.04) at week 4, and 1.34 (0.88) at week 12. The difference in the score was statistically significant with a

Table 1: Descriptive statistics for age, gender, and duration of patients

Parameters	*n* (%)	Mean±SD	Minimum	Maximum
Age (years)	40 (100.0)	49.51±14.52	18.00	79.00
Duration (years)	40 (100.0)	1.39±2.03	0.04	8.00
Sex				
Female	17 (42.5)			
Male	22 (55.0)			

SD: Standard deviation

$P < 0.0001$. All the paired differences were also statistically significant with a $P < 0.0001$. Further, ODI also indicated statistically significant difference of means across times with a $P < 0.0001$ [Table 2]. At baseline, the mean ODI score was 38.95 (6.28), which reduced to 17.70 (4.63) at week 12, indicating a very good effect of the treatment. Figure 1 shows the visualization of mean scores of NRS, ROM, and ODI at different time points.

Table 3 provides the observation of patients according to a number of paracetamol and HF required. It shows that 14 (35%) patients did not require any supporting treatment. There were 7 (17.5%) patients who required one paracetamol and one HF, 3 (7.5%) patients required only one paracetamol, and no HF, while three (7.5%) other patients required single HF but no paracetamol. Only two (5%) cases required two paracetamols and up to three HFs.

Discussion

The result of this study showed that DN was effective for the treatment of CLBP with myofascial component irrespective of age, gender, or etiology as measured by improvement in intensity of pain, ROM, and ODI. The need for extra pain killers and/or HF was also less during the treatment phase.

The first study on the effect of DN on CLBP was done way back in 1980 by Gunn *et al*., in which the patients consented to DN after finding no relief with standard exercise and physical therapy.[8] The results in the DN group were significantly better in terms of pain relief and functional improvement than control group. Out of 29 study subjects, 19 returned to their jobs and 10 to a lighter work as compared to 4 and 14, respectively, in control group. In our study also, we could find a significant reduction in pain intensity (NRS reduced from 7.39 to 3.68 at 4 weeks and 2.32 at 12 weeks) and functional disability (ODI decreased from 38.95 to 17.70 at 12 weeks). In 1983, Travell and Simons published a book, which mentioned pain pattern of TPs in every

Table 2: Comparison of numerical rating system, range of movement pain score and Oswestry disability index at different time points

Parameter	Time point	Mean±SD	Median	Range	IQR
NRS	Baseline	7.39±1.33	7.00	4.00	2.00
	1 week	5.58±1.55	5.50	6.00	2.00
	4 weeks	3.68±1.47	4.00	6.00	2.00
	12 weeks	2.32±0.99	2.00	4.00	1.00
*P**	<0.0001 (S)				
ROM	Baseline	4.95±1.19	5.00	4.00	2.00
	1 week	3.49±1.07	4.00	4.00	1.00
	4 weeks	2.38±1.04	2.00	4.00	1.00
	12 weeks	1.34±0.80	1.00	3.00	1.00
*P**	<0.0001 (S)				
ODI (%)	Baseline	38.95±6.28	36.00	24.00	8.00
	12 weeks	17.70±4.63	18.00	28.00	4.00
P‡	<0.0001 (S)				

*Obtained using Friedman ANOVA test; ‡Obtained using Wilcoxon signed rank test. S: Significant, NRS: Numerical rating system, ROM: Range of movement, ODI: Oswestry disability index, SD: Standard deviation, IQR: Interquartile range

Table 3: Distribution of patients according to number of paracetamol and hot fomentation required

Paracetamol	Hot fomentation					Total
	0	1	2	3	4	
0	14	3	2	0	0	19
1	3	7	0	1	0	11
2	2	2	2	2	0	8
3	0	1	0	0	0	1
4	0	0	0	0	1	1
Total	19	13	4	3	1	40

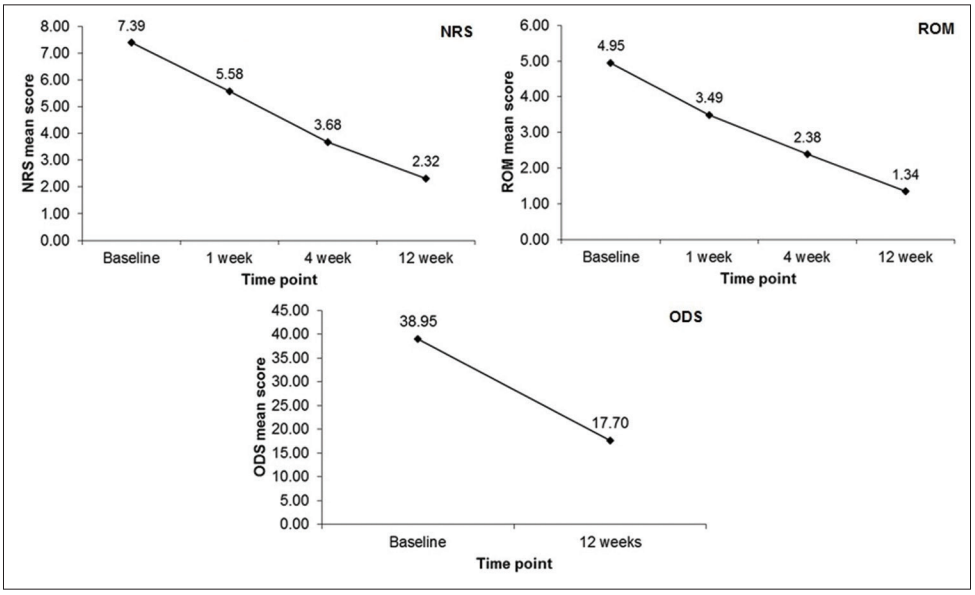

Figure 1: Line plots for the study parameters across times

muscle of the body.[9] In a study by Itoh *et al*., the deep DN patients ($n = 9$) reported a significant reduction in the intensity of pain during and after completion of sessions when compared with superficial DN ($n = 9$) and traditional acupuncture (TA) ($n = 9$). DN can be superficial (i.e., tissues above the TP,) or deep (into the TP), the depth varies.[10] In a systematic review within the framework of Cochrane collaboration by Furlan *et al*., deep DN appeared to be a useful adjuvant to other therapies for CLBP.[11] Vas has developed an ultrasound-guided DN protocol, which has also shown remarkable success not only in pain relief but also in disability management of various pain conditions.[4,12] In our study, we performed deep DN without ultrasound.

In most of the studies, the needles are applied in a perpendicular direction but with different techniques such as in and out, rotation, and *in situ*. A recent meta-analysis showed *in situ* technique to be better than in and out technique.[13] We followed *in situ* technique with one re-stimulation and with rotational movement after 10 min, so as to get the benefit of both the techniques.[8,14] Considerable effect was seen after the first session itself in many patients.

TA, which is often confused with DN, is actually an ancient Chinese technique, which works on energy meridians and is used as a treatment in many other conditions apart from chronic pain.[15-17] Compared to TENS, DN showed long-lasting benefits in a study by Fargass- Fargas-Babjak and Rainey.[18,19] We did not compare DN with any other intervention so could not comment on it. Overload or trauma or repetitive strain of muscles can result in the formation of MTP[1]. Akamatsu *et al*. identified TP as entry points of spinal accessory nerve into Trapezius muscle and tendon.[20] In our study, we could find such TPs in almost all the patients. Thoracolumbar and hip muscles (Quadratus lumborum, Latissimus dorsi, Serratus posterior, Erector spinae, Multifidus (lumbar), Gluteal muscles) are particularly looked for TPs in cases of nonspecific CLBP.[7,20] All the muscles in lumbar region function to ensure lumbar vertebral stability, most important being the multifidus. Spasm or atrophy in this muscle can cause local as well as reflected pain.[1,8] Needling of the muscle is found to increase the muscle strength and improve the ROM of joints.[2,21]

Tough *et al*., in a systematic review and meta-analysis of randomized controlled trials, found DN to be a useful addition to standard therapy.[21] A number of meta-analysis and reviews in last decade have reported DN to be as an effective adjuvant as a part of multimodal management for different types of musculoskeletal pain including LBP. The findings of the study by Gattie *et al*., are in agreement with previous reviews that DN may be superior to no treatment or sham needling in reducing pain in the immediate to 12 weeks follow up period[22] Woehrle *et al*. in their study confirmed the efficacy of DN in addition to standard therapy such as exercise and/or other interventions.[23] Results of the study by Liu *et al*. suggested that compared to other treatments, DN was more effective in alleviating pain and functional disability in LBP.[24] The results of our study also show positive response to DN in alleviating pain and restoring functionality in 4–12 weeks follow up.

As compared to interventions in and around spine, DN is cost effective. Although there is a possibility of serious complications (e.g., infection, hematoma, muscle weakness, etc.), the chances of their occurrence are greatly reduced when performed by a trained person.[15] In our study, we did not observe serious adverse effects of DN, except a few cases of soreness or droplet bleeding at the site of needling, which was treated with ice application.

We are aware about the limitations of the study. First, the number of patients was small. Second, there was no control group. Furthermore, the causes of back pain were different in different patients, which may affect the outcome. The long-term effect (more than 3 months) and its effect on sleep could not be noted due to various reasons. As the operator and the observer are the same, chances of observer bias cannot be ruled out. We look forward to overcome these limitations in our future studies

Conclusion

DN is an effective adjuvant method of treatment for patients with CLBP with myofascial component irrespective of age and gender and etiology, after ruling out the red flags. It reduces pain intensity and functional disability with a reduction in the use of pain killers which may have many adverse effects. The long-term effectiveness of DN and its use as a sole measure for CLBP remains to be evaluated.

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Conflicts of interest

There are no conflicts of interest.

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