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Original Research Article

EFFECTIVENESS OF INTERMITTENT PELVIC TRACTION WITH AND WITHOUT SELF NEURAL TISSUE MOBILIZATION IN LUMBAR RADICULOPATHY

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ABSTRACT

Background: Low back pain is a very common problem in adults. The clinical application of intermittent pelvic traction has become the common treatment for lumbar radiculopathy and is also used by clinicians in day to day practice. Only few authors have studied about the effectiveness of self neural tissue mobilization during intermittent pelvic traction. Hence the study was undertaken with an intention to find out the effect of intermittent pelvic traction with and without self neural tissue mobilization on pain and functional disability in patients with lumbar radiculopathy.

Methodology: 74 patients with lumbar radiculopathy were included in the study. Subjects were randomly divided into two groups. Group A received only IPT and Group B received IPT with SNTM for 20 minutes with 10 second hold and rest time respectively. The treatment was given initially for 6 days continuously thereafter the treatment was given on alternate days for 1 week. Pre and post intervention pain (VAS) and functional disability (ODI) measures were noted.

Results: On comparison between pre and post interventional values of pain and functional disability using paired 't' test, a significant difference ($p<0.001$) were found in both the groups. As well as the present study showed significant decrease in the pain measurement ($p=0.023$) and functional disability measures ($p=0.043$) in group treated with IPT with SNTM.

Conclusions: This study concluded that both IPT and IPT with SNTM are effective in both pain and functional disability measures. But when both groups were compared with each other, the IPT with SNTM was more effective than that of IPT alone. So it can be chosen as a treatment for lumbar radiculopathy.

KEY WORDS: Lumbar radiculopathy, Intermittent pelvic traction, Self neural tissue mobilization.

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INTRODUCTION

Low back pain (LBP) is a very common problem in adults. Up to 80% of adults suffer from LBP at some time in their life [1,2].

The prevalence and life time incidence of LBP can be as high as 85 to 90%, which means that up to 90% of population between the ages of eighteen to sixty five will experience LBP at some point in their lives [3]. There is an indication that prevalence has doubled over time, this may be due to important changes in lifestyle and in the work industry. The intensive use of computers at work and at home as well as other technologies has increased sedentariness [4]. Low back pain is classified by duration as acute (pain lasting less than 6 weeks), sub-acute

(6 to 12 weeks), or chronic (more than 12 weeks) [5]. The condition may be further classified by the underlying cause as either mechanical, non-mechanical, or referred pain [6]. In a systematic study review, Chen et al suggested that a sedentary lifestyle (which the authors defined as including sitting for prolonged periods at work and during leisure time) is a risk factor for LBP [7]. Chronic low back pain has been associated with neurochemical, structural, and functional cortical changes of several brain regions including the somatosensory cortex [8]. Complex processes of peripheral and central sensitization may influence the evolution of acute to chronic pain [9].

There are many etiologies stated to be responsible for LBP like disc and segmental degeneration, muscle spasm, disc herniation, systemic disorders like metastatic neoplasm, epidural infection, and inflammatory spondyloar thropathy. One of the other possible causes of LBP is lumbar radiculopathy [10]. The low back pain with radiculopathy is mainly referred to the pain originating from the irritation of the sciatic nerve root i.e. L4, L5, S1 nerve root known Sciatica. Here the pain from the back radiates the leg(s) along the distribution of the sciatic nerve (which is related to mechanical pressure, inflammation of lumbosacral nerve roots, or both) [11].

The management of chronic low back pain comprises a range of different intervention strategies including surgery, drug therapy and physical and rehabilitation interventions. Krekoukias G et al in a recent study suggested that Manual therapy is preferable to Conventional physiotherapy (stretching exercises, transcutaneous electrical nerve stimulation, and massage) in order to reduce the pain intensity and disability in subjects with chronic low back pain and associated disc degeneration [12]. In modern time, James Cyriax popularized lumbar traction during 1950s and 1960s as the treatment for disc protrusions. This treatment is most commonly used with patients who have evidence of a herniated intervertebral disc.

Neuro dynamics is now a more accepted term referring to the integrated biomechanical, physiological and morphological functions of the nervous system. Neural mobilization is used for treatment of adverse neurodynamics, the primary role is to restore the dynamic balance between the relative movement of neural tissues & surrounding mechanical interfaces, thereby allowing reduced intrinsic pressures on the neural tissue & thus promoting optimum physiological function [13]. A systematic review and meta-analysis by Neto T et al [14] suggests that the application of neural mobilization to the lower body quadrant shows moderate effects on flexibility in healthy participants, and large effects on pain and disability in people with low back pain. The use of neural mobilization of lower limb i.e. SLR with dorsiflexion of ankle to mobilize the lower limb nervous system is the recent treatment of choice in lumbar radiculopathy.

Lumbar radiculopathy is a common clinical condition encountered in a day to day physiotherapy practice. The clinical application of intermittent pelvic traction has become the common treatment for lumbar radiculopathy and is also used by clinicians in day to day practice. Only few authors have so far documented the efficacy of self neural tissue mobilization during intermittent pelvic traction. Hence the study was undertaken with an intention to find out the effect of intermittent pelvic traction with and without self neural tissue mobilization on pain and functional disability in patients with lumbar radiculopathy.

MATERIALS AND METHODS

Inclusive criteria: The age between 18-60 years in both the gender. Patients having lumbar radiculopathy. Oswestry disability score of at least 20%. Positive Straight Leg Raising (SLR) Test or Lasegue's sign.

Exclusive criteria: Red flags such as tumor, RA, osteoporosis, Spinal compression fracture. Surgery to the lumbar spine. Current pregnancy. Evidence of CNS involvement. Not able to understand VAS & Oswestry Disability Questionnaire.

Procedure: A brief explanation of the process has been given to prepare the subjects after obtaining the informed consent.

Group A have received intermittent pelvic traction.

Group B have received intermittent pelvic traction with self neural tissue mobilization.

Fig. 1: Intermittent Pelvic Traction.

Fig. 2: Intermittent Pelvic Traction with Self Neural Tissue Mobilization.

The aim and objectives of the study was established and permission for research was obtained from the Ethical Committee on Research on Human Subjects (ECRHS) which was conducted in MGM College, Aurangabad. The subjects were screened based on the inclusion and exclusion criteria and were provided with an explanation of the study procedures. Consent was taken from every subject before starting the protocol. Demographic data, VAS and ODI was collected of all the subjects individually. Each subject was scheduled for two weeks of intermittent pelvic traction of 20 minutes. The treatment was given initially for 6 days continuously thereafter the treatment was given on alternate days for 1 week. The pain level and back pain specific functional status were assessed by VAS and ODI Questionnaire respectively at the end of second week.

Intermittent lumbar traction had given with the patient lying on the traction table in Fowler's position (i.e. supine with the hips and knees flexed, and the lower legs supported on a stool) [15]. Traction was exerted by 2 Velcro straps; one was attached around the iliac crest and the other around the lower thoracic cage. After unlocking the sliding table top, the traction force was increased [15,16].

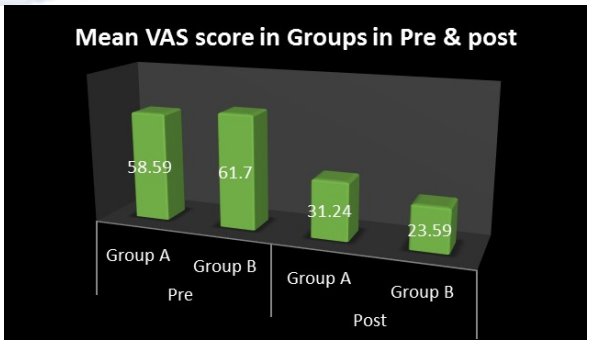
In both the groups, patients were explicitly asked to tell when they felt distinct pulling from the braces. After unlocking the traction table the traction was slowly increased from 30% of total body weight until the patient indicated a distinct but tolerable pulling. The maximum force used was set at 40% of the total body weight. Group A (37 subjects) received only Intermittent pelvic traction (20 minutes, 10 seconds- hold time, 10 seconds-rest time). Group B (37 subjects) received Intermittent pelvic traction (20 minutes, 10 seconds- hold time, 10 seconds-rest time) with self neural tissue mobilization. The patients in this group were advised to do active ankle dorsiflexion and plantar flexion during the rest time at their own speed. Post test measures were taken after the intervention.

RESULTS

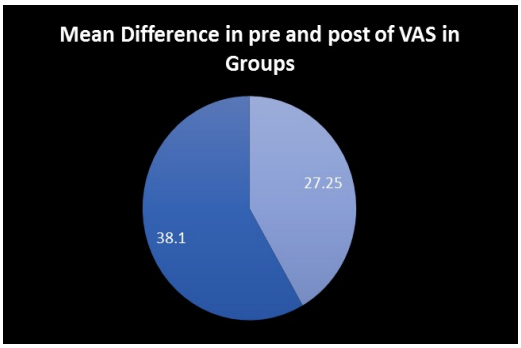
Subject Information: There were two groups, Group A (n=37) (Intermittent pelvic traction), Group B (n=37) (Intermittent pelvic traction with self neural tissue mobilization) were taken for the study.

The comparisons of mean VAS in groups are shown in graph 1. It showed that there was reduction in mean VAS scores in post treatment of both groups and it was statistically significant in post intervention.

Graph 1: Comparison of score in Groups in Pre & post intervention Mean VAS.

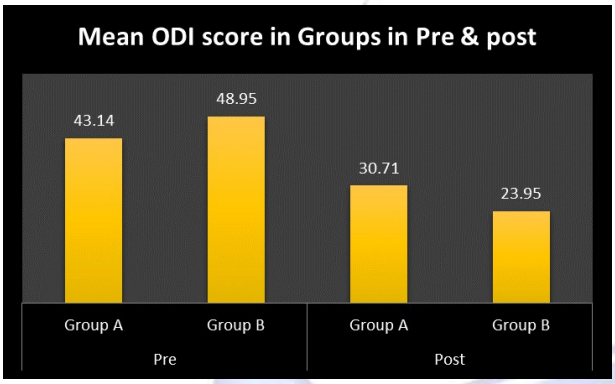


Graph 2: Comparison of Mean Difference in pre and post intervention of VAS in Groups.



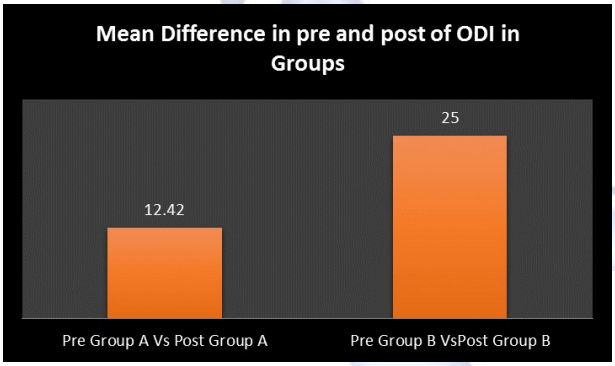
The Comparison of Mean Difference in pre and post intervention of VAS in groups are shown in graph 2. The mean difference in pre and post intervention of VAS in both groups suggests that it was statistically significant.

Graph 3: Comparison of Mean ODI score in Groups in Pre & post intervention.



The Comparison of Mean Difference in pre and post intervention of ODI in groups are shown in graph 4. The mean difference in pre and post intervention of ODI in both groups suggests that it was statistically significant.

Graph 4: Comparison of Mean Difference in pre and post intervention of ODI in Groups.



DISCUSSION

While analyzing the outcome measures of this study, it was observed that significant improvement were found in both the groups, but the intermittent pelvic traction with self neural tissue mobilization showed better results than that of only intermittent pelvic traction on both variables i.e. pain and functional disability thereby supporting the experimental hypothesis.

In this study, distribution of males and females in both groups were 40.5% and 59.5% respectively. The prevalence of lumbar radiculopathy was higher in females than in males. This is supported by Yi Xiang et al in a literature review demonstrated females had higher prevalence of LBP across all age groups [17]. A biopsychosocial model of chronic pain attributes sex differences in pain to interactions between biological, psychological, and sociocultural factors [18,19]. The heightened pain sensitivity among women can also partially explain greater reports of pain by women compared to men [20,21].

In group A i.e. patient who received intermittent pelvic traction, the mean VAS score of pre and post intervention was 58.59±13.02 and 31.24±16.05 respectively; and the mean ODI score of pre and post intervention was 43.14±12.96 and 30.71±15.34 respectively; and the mean difference in pre and post intervention of VAS suggest that it was statistically significant ($p<0.0001$). This is supported by Nosse et al who reported that the pain was relieved by traction therapy, which reduced the activities of muscle fibers.[22] Constantine et al reported the intermittent traction method to be effective for treating patients with cervical radiculopathy and the effects of the intermittent traction method may be superior to the effects of continuous traction [23].

One of the studies supporting the current study found that there are three benefits of lumbar traction: distraction to increase the intervertebral space, tensing of the posterior longitudinal vertebral ligament and suction to draw the disc protrusion towards the center of the joint [24]. Several theories have been proposed to explain the possible clinical benefit of traction therapy. Distracting the motion segment is thought to change the position of the nucleus pulposus relative to the posterior annulus fibrosus or change the disc-nerve interface [25,26]. O'Connell et al suggested that the stretching of that portion of the spinal nerve outside the spinal canal accounted for the symptoms accompanying an intervertebral disk protrusion [27]. Smyth and Wright et al concluded from experimental evidence that pressure on a spinal nerve from a herniated intervertebral disk irritated the nerve, causing it to become hypersensitive [28].

In either instance, there is an encroachment on the nerve by the prolapsed material. Clearly, in reviewing the literature, little separation between the vertebral bodies is accomplished with a traction force which can be tolerated by the patient.

The intermittent pelvic traction cause unloading of the content of intervertebral foramen i.e. nerve root, dorsal root ganglion, spinal nerve, intraforaminal blood vessels, sinuvertebral nerve [29]. Intermittent pelvic traction also causes movement of the affected region which assists in circulation and may help in reducing stenosis from circulatory congestion, thus relieves pressure on dura, blood vessels and nerve root in intervertebral foramina. The traction causes normalization of interfacing tissues thus helps to restore axoplasmic flow. Traction leads to reduction of disc protrusion by positive decompression, drawing the protrusion towards the center thus the pressure on the contents of intervertebral foramina gets released [30].

A clinically relevant effect was achieved in pain intensity at three to five weeks' follow-up in people with and without sciatica undergoing traction when compared with sham treatment, Konrad et al. [31] In this study patients who received intermittent pelvic traction for two weeks showed decrease in pain intensity showing mean difference of VAS by 27.25 and it was statistically significant ($p<0.0001$).

In group B i.e. patient who received intermittent pelvic traction with self neural tissue mobilization, the mean VAS score of pre and post intervention was 61.70±17.35 and 23.59±14.26 respectively; and the mean ODI score of pre and post intervention was 48.95±18.42 and 23.95±16.65 respectively. This comes in agreement with Gladson et al., who mention that when the nerve root was compressed and microcirculation was compromised; and the pressure received by the nerve will affect the edema and the demyelination. Neural mobilization techniques consist of short oscillatory movements and were sufficient to disperse the edema, thus alleviating the hypoxia and reducing the associated symptoms. In addition, there is the hypothesis that nerve movement within pain-free variations can help to reduce nerve compression, friction and tension, therefore decreasing its mechanosensitivity [32].

There is ample evidence to support the notion that neurodynamic tests elongate the nerve bed and that this elongation is associated with nerve gliding. Lengthening of the nerve bed may also elongate the nerve, which may result in an increase in tension and intraneural pressure. It was suggested that nerves has the ability to create their own pathways as long as they can move. They seem to have some chemically based ability to dissolve over time impinging them. Thus, by working the nerves back and forth in whatever limited range they can manage in spite of impingement, it was facilitating the dissolving of the impingement and the gradual release of the nerve to once again move freely. This helped in chronic sciatica resolution [33].

The neural mobilization technique is used to regain the movement and elasticity of the nervous system, with the objective of improving neurodynamics and reestablishing axoplasmic flow, thus restoring nerve tissue homeostasis, which promotes the return to its normal functions. The technique is also used to regain joint flexibility [32].

An appropriate explanation for the improvement of pain level and functional disability as by neural mobilization is that it affected the mechanical properties of peripheral nerves, and this alteration in nerve mechanics lead to direct effect on nerve physiology [34,35]. It has been reported that neural mobilization generated various amounts of longitudinal nerve excursion and strain [36,37].

Neural mobilization techniques helped in restoring the movement between the nerves and surrounding structures through the gliding movement. Therefore, the intrinsic pressures on the nervous tissue were decreased and consequently enhanced the nerve function [38,39]. Compression of the nerve root because of disc herniations hindered the blood flow of the nerve root [40], this alteration of the microcirculation of the nerve lead to pain and release of inflammatory mediators [41]. Furthermore, block of neural conduction, edema, and mechanical sensitization resulted also from compression of nerve root [42,43]. Also, neural mobilization technique enhanced intraneural blood flow, axoplasmic flow, and sympathetic activation. Furthermore, it help in dispersion of tissue fluid and diminishing intraneural oedema [39,44]. These findings came in concurrent with Cleland et al. who reported that nerve root compression impede nerve root microcirculation leading to nerve edema and demyelination and application

of neural mobilization technique alleviate and dissipate the edema [45].

In another study conducted by Brown et al in cadavers suggests that neural mobilization technique can reduce or prevent intraneural edema of the tibial nerve as result of increased fluid dispersion [46]. Furthermore, Beneciuk et al reported that neural mobilization had hypoalgesic effect on C-fiber which transmit pain signal after application of some neural mobilization techniques on median nerve. The authors suggest that this hypoalgesic effect may be due to inhibition of pain signals at the dorsal horn [47]. It is supported to this study, patients who received intermittent pelvic traction with self neural tissue mobilization showed decrease in pain intensity showing mean difference of VAS by 38.10 and it was statistically significant ($p<0.0001$).

Therefore, it is suggested that the self neural tissue mobilization during traction is effective in chronic low back pain with sciatica and it should be added in our day to day clinical practice.

CONCLUSION

The study concluded that both the groups are found to be effective but Intermittent pelvic traction with self neural tissue mobilization has found to be more beneficial in improving both variables i.e. pain and functional disability status in chronic low back pain with sciatica.

ABBREVIATIONS

IPT – Intermittent Pelvic Traction
SNTM – Self Neural Tissue Mobilization
VAS – Visual Analogue Scale
ODI – Oswestry Disability Index

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Conflicts of interest: **None**

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