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The Use of Alternate Side Lying Manipulation, Acupuncture and Core Stability Exercises in the Treatment Of Multiple Level Disc Prolapse a Case Study

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I. Introduction

The life time prevalence of disc herniation has been estimated at 1%-3% [1,2], although anatomic evidence of disc herniation is said to be present in 20% to 40% imaging tests among asymptomatic persons[3,4] Most clinically relevant herniation occurs between the ages of 30years and 50years but can also occur in adolescent and older people [5]. Two to 5% of patients seeking help are thought to suffer disc herniation [6] while in about 40% of patient with low back pain seeking help, the cause is disc herniation [7]. Conservative care is beneficial in more than 50% of low back pain patients with disc herniation and sciatica and it is associated with low complication rate [7]. Surgery has not been proven to be more effective than conservative care[6] and there is now broad agreement in medical practice that surgery should not generally be considered for these patients until there has been a trial of conservative non-surgical care [8,9]. This could be attributed to the facts that the majority of patients recover adequately and at least as well as after surgery, under conservative care. Also, current surgical techniques, even though less invasive than in the past, have significant problems in terms of effectiveness, safety and cost [9]. Similarly studies have also reported complication rate of 24% associated with surgical interventions with almost half of these complications being serious and approximately 8% of patients required re-operation [9]. This emphasizes the importance of a trial of conservative care, which is beneficial to most patients and has very low complication rates[7], however, on the basis of current evidence, One option, with at least as much research evidence of safety, effectiveness and patient satisfaction as any other, is skilled manipulation[6,7]. Manipulation is one of the physiotherapy treatment options for disc herniation. Manipulation has been reported to be useful for the Syndrome of Prolapsed lumbar intervertebral disc via causing relieve of pain, relaxation of the muscles and recover the nerve function [6, 7].

Reports have indicated that neurological signs where present, such as loss of sensation, motor power and reflex, are the result of nerve compression but that pain from disc herniation could be due to inflammation rather than nerve compression [2,3,4].

There are three points of contact between adjacent vertebrae in the spine; the intervertebral disc and, at the back of the vertebrae on each side, the two facet or zygapophyseal joints. Any loss of height and normal mechanical movement at the disc, as occurs with herniation, inevitably alters function at the facets. These are richly innervated with pain-sensitive nerve fibers, much more so than the disc. Where there is disc degeneration there will likely be facet degeneration. Pain may arise from any or all of the three elements in the three joint complex[7, 4]. Experts agree that pain directly from the disc herniation is primarily from nerve root sleeve oedema and other inflammatory responses around the disc material rather than the pressure of nuclear material on the nerve root [6,7]. Cassidy, Thiel and Kirkaldy-Willis have confirmed the inflammatory effect of the nucleus polposus herniation and the presence of immunoglobulin G in the disc[7]. Similarly, many disc herniation patients with sciatica who go to surgery have swelling and inflammation around the nerve root regardless of the size or extent of the disc herniation. Moreso little to no correlation between the size of the herniation and the patient's syndrome or response to manipulative therapy have been reported where side-posture manipulation has been used in the management of patients with herniation and back pain[7, 7]. Consequently, both inflammatory and mechanical components should be considered and an appropriate rehabilitation enforced to reduce sensitization of the dorsal horn neurons within the spinal cord.

The purpose of this case study was to investigate the effects of using combined treatment of lumbar spine manipulation, acupuncture and core stability exercises in the management of a patient with multiple level disc herniation.

II. Case Description

The patient was a 33yr old man who presented with a diffuse right sided low back pain of gradual onset and an unknown cause with radiation to the back of the right calf. The pain began approximately 2yrs and became worse 6 months before initial examination. Back and leg pain were reportedly aggravated first in the morning, with prolonged sitting, standing and walking. Patient also reported occasional pins and needles sensations in the toes of the right foot. Patient's chief complaint was lower back pain with radiation of the pain to the right lower limb during walking.

III. History

Patient reported no red flag such as abdominal pain, night pain, rectal bleed, bowel or bladder irregularities, unexpected weight loss and bilateral leg pain. No weakness and lack of sensation was reported but occasional muscle tightness at the right lower limb was cited. He had no complains of cardiac, respiratory or neurologic dysfunction. The pain presented by the patient was 6 out of 10 Numerical pain rating scale (NPRS) on the first day of visit prior to treatment; patient reported that he had no known trauma to his back, trunk or hip.

IV. Physical Examination

With the patient in prone lying position, A posteroanterior (PA) thrust was carried out in the lumbosacral region elicited tenderness at L4, L5 and S1 and at right transverse processes of L4 and L5 vertebra levels.

Lumbar spine active range of motion was also used to demonstrate changes to pain and lumbar spine active ROM as a result of lumbar spine manipulation. Anatomical landmarks (spinous processes of L1 and L5) were identified and marked. A tape measure measurement is made of the distance between the two points. The patient is asked to carry out flexion (bend forward as much as possible at the waist) extension (bend backward at the waist as much as possible at the waist) and lateral flexion (bend at the waist, to the left and then to the right as much as possible) and the new distance between the two points was measured again. The difference between the first and second measurement is an objective assessment of segmental or regional spine mobility between the initial anatomical landmarks.[11] Hilde and Anne demonstrated test- retest reliability with Intratester ICC = .95; Intertester ICC = .94 [11]. Lumbar spinal range motion was assessed prior to intervention, during intervention to determine the effects of lumbar spine manipulation and at the end of each week till end of 8 week of intervention [11].

Spinal stability test was carried out with the patient in prone lying position with the body on the examining table and legs over the edge with feet resting on the floor. While the patient rests in this position, the examiner applied posterior to anterior pressure to the lumbar spine and patient was asked to report any provocation of pain. The patient was then ask to lift the legs off the floor (hand-holding to the table may be used to maintain position), and posterior compression is applied again to the lumbar spine at the level at which pain provocation was noted with the legs on the floor[3]. The test showed positive results (i.e. pain was present in the resting position but relieved in the second position).

Effects of disc prolapse on nerve root signs and skin sensation was carried out with straight leg raise test and Semmes-Weinstein monofilaments test. Straight leg raise test was performed with the patient in supine with the hips and knees extended. The examiner then passively lifted the straight leg to the maximum tolerated straight leg raise and the degree of motion was recorded. Semmes-Weinstein monofilaments test was performed to assess the sensation of the leg, foot and ankle as described by Mueller et al[12]. The result of this test showed that the sensation in both leg foot and ankle were intact. Full hip assessment was performed with no evidence of the pain was from the hip girdle region

V. Outcome Measures

Modified Oswestry Disability Index*:* The modified ODI was used to measure the disability due to low back pain and consist of 10 questions. Each question is scored from 0 to 5 with higher scores indicating greater disability [6]. The scores were then converted to percentage score. The test-retest reliability of modified ODI has been shown to be high (ICC =0.90)[6]. A 50% reduction in ODI served as a reference standard to determine whether a successful outcome was achieved[6]. The questionnaire was administered at the beginning of the treatment and at the end of each week till completion of treatment at the end of 5 week of treatment.

Numerical pain rating scale (NPRS)*:* Pain intensity was assessed and graded using numeric pain rating scale (NPRS) with 11 point scale ranging from 0 no pain to 10 extreme pain. Reliability and validity data for the NPRS have been found to be high with a 2- point change demonstrating clinical significance pain [13]. Patient was asked to chose the number from 0 to 10 that best describe his pain on the day of assessments NPRS scores was assessed prior to intervention and at the end of each week till end of 5-week of intervention.

VI. Main Findings From Assessments

The main findings of the assessments were low back pain with radiation to the back of right calf with occasional pins and needles sensations in the right foot. Posterioanterior thrust digital palpation elicited pain at L4, L5 and S1 spinous process areas and at the right transverse processes of L5 and S1. Pain was described as 6/10 on the NPRS was experienced at L4, L5 and S1 vertebral levels, the lumbar spine ranges of motion were reduced in flexion and right side flexion. Spinal instability test was positive indicating segmental spinal instability at L4, L5 and S1 vertebral levels. Straight leg raising test was positive with pain in the lower back radiating to the back of the right leg at 60degree of hip flexion. MRI result dated 24\01\14 showed disc bulging with right mediolateral protrusion at L4/L5 and L5/S1

VII. Clinical Impression

Impairments of pain, lumbar spinal range of movements, occasional pins and needles sensation in the right foot and functional activities limitation due to disc herniation at L4/L5 and at L5/S1.

VIII. Rationale For The Interventions

Following our initial examination it was hypothesized the disc bulging might be the cause for the associated lower back pain and the posterior right lower limb pain. A decision was made to attempt a side lying alternate manipulative thrust to reduce the disc bulge and relieve the patients discomfort. We also proposed acupuncture treatment to resolve pain possibly arising from nerve root sleeve oedema and other inflammatory responses around the disc material. Spinal instability test was positive for this patient, thus, core stability exercise was carried out to increase spinal segmental stiffness and increase movement control in the lumbopelvic region.

IX. Aims Of The Treatment

The main aims of the treatment were to reduce the back and leg pain from 6/10 to 0-2/10 and abolish associated pins and needles within six weeks of treatment and to increase lumbar spine range of motion to full range in all direction without pain. The patient's goal was to return to pain free prolonged sitting as patients work involves prolonged period of being in a seated position within 6 weeks of treatment.

X. Interventions

Patient was treated with lumbar spine manipulation, spinal stabilisation exercises and acupuncture twice weekly for 5 weeks. Acupuncture treatment and core stability muscle exercise training and lumbar spine manipulation were carried out by a specialist physiotherapist who was a certified acupuncturist (by Acupuncture Association of Chartered Physiotherapist, UK) and also has more than 18 years of clinical experience of physiotherapy practice of using core stability exercises in the management of low back disorders.

Lumbar spine manipulation

Alternate side lying lumbar spine manipulation technique was performed with the patient positioned in left side lying . The upper trunk of the patient was rotated to the left by gently pulling the lower arm until L4 is felt to move. The patients left leg was flexed at the hip and the knee with the foot resting on the right knee. The right leg which was extended was gently moved forward to induce flexion until L5 is felt to move. The left hand of the therapist was taken under the left arm of the patient and the forearm of the therapist passed under the armpit of the patient, the left hand middle finger of the therapist was used to block the transverse process of L5 on the superior aspect. The right forearm of the therapist was placed on the left hip of the patient and the right middle finger was used to block the transverse process of L4 on the inferior aspect. The therapist then asked the patient to breathe in, as the patient breathes out, the therapist exert a downward pressure using the left forearm to rotate lumbar spine towards the left [Figure 1]. If a pop sound was produced, patient lumbar spine active range of motion [ROM] was reassessed to know if the treatment is successful[14]. A successful treatment is when the lumbar spine ROM before the treatment was increased following manipulation. The manipulation was repeated all over again 3 times at the same level [L4] before proceeding to the next spinal levels [L5]. If not patient was repositioned and the technique was reapplied; only. This treatment was carried out twice weekly for 5 weeks

Acupuncture treatment

The patient was properly instructed on what to expect in terms of the acupuncture treatment, some possible side effects and contra indications to acupuncture treatment. Patient informed consent was obtained prior to treatment. Patient was position comfortably in prone lying with proper pillow support. Patient received acupuncture treatment at selected acupuncture points for 20 minutes on the low back pain area. The selected acupuncture points used in the present study are widely accepted for treating LBP[15], namely Shensu [BL25],

Dachangshu [BL26], Ciliao [BL32], Weizhong [BL40] and Kunlum[BL62]. At each point, the skin was wiped with alcohol and the therapist hands were clean with alcohol gel prior to needle insertion. Disposable stainless steel needles [0.2mmx40mm, Seirin co Ltd] were inserted into a muscle to a depth of 10mm using sparrow pecking acupuncture technique [alternate pushing and pulling of the needle]. The needle manipulation was stopped when the subject felt dull pain or acupuncture sensation [de qi: numbness, soreness and or radiating sensation] and the needle was left in position for another 20 minutes [15] [Figure 2]. This treatment was carried out twice weekly for 5 weeks.

Core stability exercises

Researcher demonstrated location of core stability muscle in the body and how to activate the main core stability muscles to the patient. The techniques of core stability muscle activation used in this study were as described by Sokunbi et al[16]. Core stability exercises were carried out for 20 minutes twice daily for 5 weeks. Patient was also advised and encouraged to carry out core stability exercises as home exercise program.

XI. Outcome Of Intervention

The patient only experience marginal pain relief for the first 3 weeks of treatment with only 1 point reduction in NPRS scores [Figure 3] however, remarkable improvement with pain reduction was recorded after 4 weeks of treatment when NPRS scores was reduced to zero at which point patient reported no pain [figure 3]. This improvement was maintained at 5 week assessment. A steady decline in Oswestry disability index score right from pre-treatment values of 70% to 50% at the end of second week of treatment and further reduction to 16% at the end of the 5th week [Figure 3]. Table 1 shows that lumbar forward flexion, left side flexion and left rotation were not affected by the disc Prolapse of the subject in this study. However, lumbar extension which measured 6.17cm at prior to intervention increased to 18.5 cm at the end of 5 week treatment. Similarly, right rotation which was 3.7cm before the commencement of treatment increased to 11cm at the end of 5 week treatment [Table 1]. In addition to the result presented above, patient also reported good compliance with home exercise program. At the 4 week of treatment patient reported that he no longer experienced pain aggravation first in the morning and following prolonged sitting and standing, which were also maintained in the 5th week[Figure 3].

XII. Discussion

The result of our case study demonstrated that through the use of side lying alternate lumbar spine manipulation, acupuncture and core stability exercises, there was a clinically significant improvement with pain reduction, increase active lumbar range of movements and reduction in disability index of a patient with multiple disc herniation and low back pain. Evidence abounds concerning the efficacy of manipulation in the management of patient with disc herniation and low back pain.

Nwuga[17] reported that lumbar, side posture, rotation manipulation was superior to conventional conservative medical care when he demonstrated that patients who received manipulation showed significantly greater improvement of spinal mobility and straight leg-raising than patients in the physiotherapy group. Several prospective studies[18, 19, 20, 21], has shown that 50-80% of patients with lumbar disc herniation are relieved by side-posture manipulation. The largest, by Kuo and Loh[19], involved a series of 517 patients over an eight year study period. All had a diagnosis of lumbar disc protrusion and were referred for manipulative therapy, 77% had a favourable response, defined as relief of pain at least to the extent that the patient could perform daily activities of living. Cassidy et al[7] also reported on a series of 15 patients who received side-posture manipulation for lumbar disc herniation with a view to reducing pain through improved mobility of the spine. Their results showed that 14 of the 15 obtained significant clinical improvement and relief of pain after a 2-3 week course of manipulation.

Several studies have reported the success of acupuncture in the treatment of inflammatory and degenerative disorders. Possible therapeutic effects of acupuncture could be linked to enhancing activation of A-δ and C afferent fibres in muscle during needle stimulation of acupuncture points thus, signals are transmitted to the spinal cord, and via afferent pathways to the midbrain[22]. The resulting flow and integration of this information among specific brain areas will leads to a change in the perception of pain via descending pain modulatory system. Acupuncture analgesia improved the noxious descending inhibitory controls and pain gate mechanism and therefore helped to reduce the patients' pain levels [22]. The evidence for the mediation of acupuncture analgesia by endorphin is very strong, while that of the involvement of monoamines need more work to verify the possible synergism of serotonin and nor epinephrine[22].

Other studies have shown that in the short-term, acupuncture does have a positive effect on pain relief for chronic low back pain but when compared to conventional or alternative therapies, it was found to be no more effective in reducing pain[23,24].

The spinal stabilization exercise model is an active approach to low back pain based on a motor control exercises program. The main aim of this program is to re-establish the impairment or deficit in motor control around the neutral zone of the spinal motion segment by restoring the normal function of the local stabilizer muscles[24]. Stabilization exercise program has become the most popular treatment method in spinal rehabilitation since it has shown its effectiveness in some aspects related to pain and disability[23, 24]. Despite stabilization exercises have become a major focus in spinal rehabilitation as well as in prophylactic care such as injury prevention[25], the therapeutic evidences in terms of its effectiveness in relieving pain and improving functions in patients with disc herniation and low back pain have not been well documented.

Conclusion

The current case study indicates that side lying alternate lumbar spine manipulation, acupuncture and core stability exercises may help in management of patient with disc herniation and low back pain.

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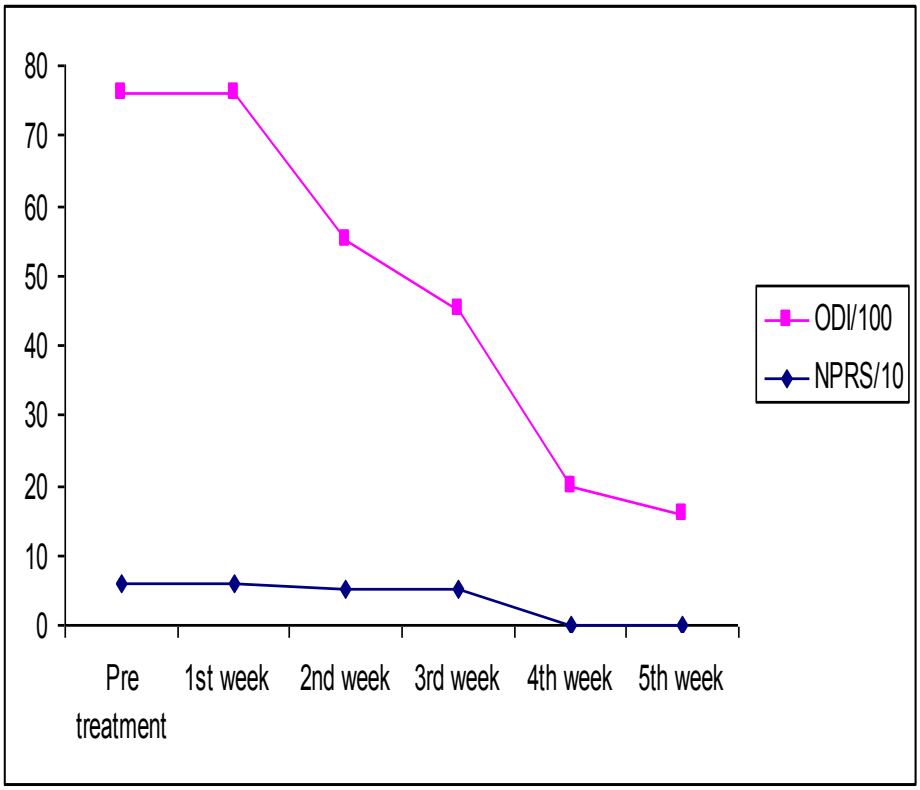
Table 1: Lumbar spine range of movements

Lumbar spinal Range of Movements	Pre treatment	1st week	2nd week	3rd week	4th week	5th week
Flexion (cm)	23.8	24	24	24.3	24.3	24.3
Extension (cm)	6.17	7	10	15	18.5	18.5
Left side flexion(cm)	12.5	12.5	12.5	12.5	12.5	12.8
Right side flexion(cm)	4.3	4.5	9.6	10.5	10.9	12.9
Left rotation(cm)	11	11	10.9	11	10.8	11
Right rotation(cm)	3.7	3.7	7.8	10	11	11

Figure 1; Alternate side lying lumbar spine manipulation

Figure 2: Acupuncture treatment

Figure 3: NPRS and ODI scores over 5 weeks of treatment



ODI: Oswestry Disability Index
NPRS: Numerical Pain Rating Scale