LUMBAR RADICULOPATHY: RESULTS OF GRADE 3 AND 4 VERTICAL OSCILLATORY PRESSURE (VOP) IN PAIN MANAGEMENT IN A 32-YEAR-OLD FEMALE. A CASE REPORT

Article Review by Olukayode O Alewi, South Africa
(DPT, PhD Student of Texila American University)
Email: - physiokay@yahoo.com

BACKGROUND AND PURPOSE

Chronic low back pain is prevalent in the western world. Lumbar radiculopathy is a common presentation in physical therapy daily practice.[4] Large epidemiological studies show that: "20 to 30% of patients with chronic back pain suffer from a neuropathic pain component".[4,7] Its diagnosis and management remain an enigma. There is no conclusive evidence for the long-term efficacy of spinal manipulation for any type of low back pain.[3] There is no evidence that describes the efficacy of vertical oscillatory pressure (VOP) in the management of pain resulting from lumbar radiculopathy either. The few articles that report the effect of VOP did not quantify the intensity (grading) of the applied thrust to the spine.[3] This case report describes and observe the result of applying a submaximal and maximal central posterior-anterior thrust (grade 3 and 4) vertical oscillatory pressure to the lumbar spine in a 32-year-old female with lumbar radiculopathy. In his prospective study, Onuwe observed a statistically significant difference in pain perception before and after vertebral mobilization.[13] The purpose of this case report was to describe and observe the result of VOP in pain management of a 32-year-old female with lumbar radiculopathy.

PATIENT HISTORY AND SYSTEMS REVIEW

The patient was a 32-year-old black south African. She was a secondary school teacher, and a mother of 2. Her chief complaint was bilateral thigh and leg pain. Her pain was decribed as "burning paresthesia". The patient's Pain was reported to be aggravated by prolonged standing. She also complain of occasional lumbosacral pain, but her major concern was the pain in her lower limb. However, her personal care, sexual activity and sleeping were not affected by her pain. She is now psychologically depressed with her incessant pain, which according to her, has failed to be managed by orthodox medical interventions. She has visited six different medical

doctors in the past six months, i.e…. from January to june 2012. She has had 2 different plain radiographs of the lumbosacral area taken three month and last month respectively. The X-ray was without any pathological findings. At the time patient self-referred herself for physical therapy (precisely 3 weeks ago), she had been living with her lower limb pain for 6-months. Her past medical history was not significant. She had normal delivery and full term pregnancy on both occasion of her delivery, and labor was uneventful. No history of cancer in the family. At the time of presentation, patient was neither hypertensive, nor diabetic, nor pregnant. No active inflammation or infective arthritis. She was taking 400mg Ibuprofen, thrice daily for the management of the pain in both legs.

Goal of physical therapy intervention was to: (1) be pain free, (2) for paresthesia to stop, and (3) not to have any aggravating factor causing her symptoms of pain and paresthesia.

SYSTEMS REVIEW

Four major systems were reviewed, according to the guide. Cardiopulmonary system, CP, the heart rate HR was found to be 72 beats per minute. Blood pressure taking with analog sphygmomanometer and Litman's stethoscope was found to be 115/74mmHg. Respiratory rate was 20bpm. No pedal or peripheral edema was noted. There was full passive range of movement (PROM), and full active range of motion (AROM) of the lumbar spine during forward flexion. Active spinal extension of the lumbar was however, reduced by a difference of 0.5cm. Digital compression pressure (DCT) performed on the spinous processes of first lumbar vertebrae, L1 to fifth lumbar vertebrae, L5 was positive. Paresthesia and numbness was demonstrated on skin area corresponding to dermatome L2-L4 bilaterally. Patient was slightly overweight, with a body mass index (BMI) of 27.8kg/m^2, calculated from a height of 1.64 meters and weight of 75kilograms.

Neuromuscular system: good static and dynamic balance was demonstrated both in standing and seated positions. Deep tendon reflexes tested on both knees with the patella hammer were low. Muscle tone was globally normal. She however demonstrated a low strength on Oxford Muscle scale- a muscle power of 4. There was thermal sensory deficit to hot and cold modalities on dermatome corresponding to L2, L3 and L4.

Integumentary system shows normal skin integrity, normal consistency, and normal skin color. Patient demonstrates good communication ability. She was fully oriented in time, place and person. Her learning style was found to be auditory.

TESTS AND MEASURE

This includes, digital compression test (DCT) on the spinous processes of the first through the fifth lumbar vertebra, L1-L5. This compression test was found to reproduces patients pain.

Vertebral artery insufficiency test was done on both sides of the spine. With the patient in a supine position, the head was aligned at the edge of the bed. The neck was extended, laterally rotated and bend sideways; first to the right and then to the left. Each position was maintained for 60 seconds. There was no dizziness or any complaint from the patient. This suggest a negative outcome for vertebrae artery insufficiency[11].

Visual analog scale (VAS), score= 7, while the Oswetry disability index (ODI) score was 30%.

CLINICAL IMPRESSION #1

Based on the data collected so far on this patient, there was no contraindication to vertical oscillatory pressure (VOP), which include: "pregnancy, osteoporosis, active inflammation, infective arthritis, malignancy, fracture, joint ankylosis, rheumatoid collagen necrosis, and vertebral artery insufficiency"[11,13]. According to a prospective study by Onuwe, he observed a statistically significant difference in pain perception before and after vertebral mobilization in the management of mechanical low back pain[13]. The fact that pharmacological intervention has not helped much in relieving her pain and symptoms warrant a second opinion in terms of physical therapy. Based on the patient's history, systems review, and tests and measure (examination), especially as regards to the sensory and motor deficits on the L2-L4 dermatome, a clinical impression of **Lumbar radiculopathy** was made.

PLAN FOR EXAMINATION

Plan for examination, was to rule out any of the above mentioned contraindication to spinal mobilization. Vertebral artery insufficieny test was carried out on both sides of the spine, and was found to be negative. Brief vertebral distraction was observed to relieve her symptoms. Straight - leg raise (SLR), test assessed in supine position was positive bilaterally, suggesting a neuropathy. Supine SLR was found to be more sensitive for lumbar radiculopathy as compared to SLR in sitting position[15].

EXAMINATION AND CLINICAL IMPRESSION 2

The following tests and measures were used to confirm that the patient is appropriate for vertical oscillatory pressure (VOP); vertebral artery test, digital compression test (DCT), straight leg-raising test (SLR), visual analog scale (VAS), and Oswestry disability index (ODI).

TESTS

Vertebral artery insufficiency test was performed with the patient in the supine position, with the clinician cradling the cranium while seated at the head of the plinth. The cervical spine was slowly extended, rotated, and laterally flexed bilaterally. Each manipulation was held for 30 seconds. Patient was observed for dizziness, nystagmus, and blurred vision. Results were negative indicating that there was no partial or complete occlusion of the vertebral arteries on

both side of the cervical spine[9,11]. Positive findings to the vertebral artery insufficiency test is a contraindication for traction and joint mobilizations[9].

Straight leg-raising was performed with the patient in the supine position. Standard goniometric measurement ensured that the test was completed at 70 degrees hip flexion. The standard plastic goniometer is illustrated in fig. 1. The SLR is arguably the most commonly employed orthopedic test[2].

GONIOMETER

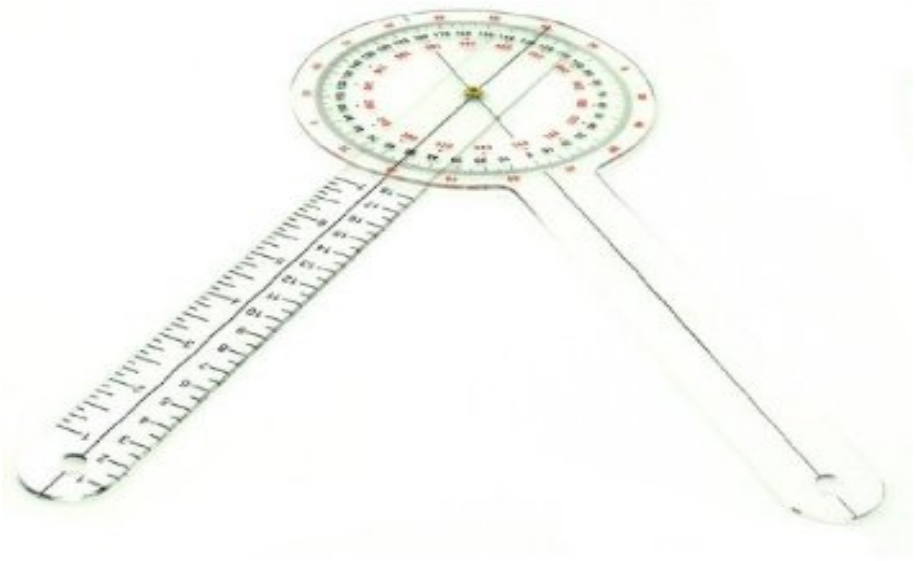

Figure 1.

The stationary arm of the goniometer was placed parallel to the edge of the plinth, while the moving arm was aligned along the lateral midline of, first the right thigh, and the axis was over the greater tronchanter. Patient leg was actively raised, keeping the knee straight, until pain/discomfort was felt along the thigh, buttock and calf. Pain was reported by the patient at an angle of 40 degree. At this point, the ipsilateral ankle was dorsiflexed. There was an additional increase in pain level or discomfort with this manipulation. The SLR or Lasegue's test is said to be positive if the angle at which pain or discomfort is reported by the patient is between 30 degree and 70 degree or if dorsiflexing the foot at pain level increases the pain[2,9,16]. This positive findings implied that there was lumbosacral nerve root irritation. This test is a neural tension test. Because it put a tensile stress on the nerve root and dura matter surrounding the nerve root[16].

Digital compression test (DCT), a provocative test, used for identification of radiculopathy was performed on the spinous processes of the lumbar vertebrae (L1-L5). Pain provocative tests are found by Sheffinger *et al* to be most reliable compared to spinal palpatory procedures in diagnosing etiology of back and neck[17]. There was a reproduction of the lower limb pain at L2-L4 segment. A positive finding to this test is indicative of nerve root irritation.

VISUAL ANALOG SCALE

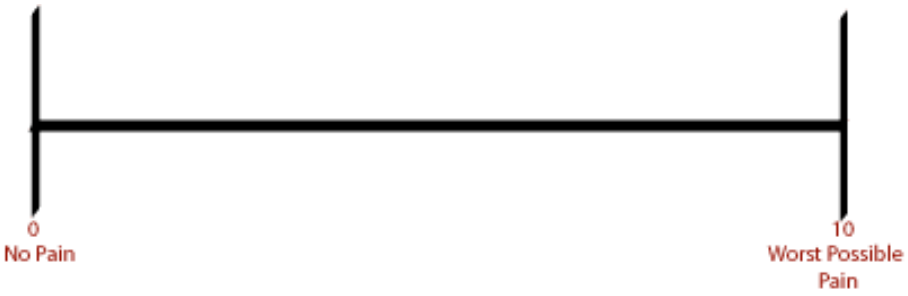

Figure 2.

Figure 2, is a visual analog scale (VAS)[5]. Operationally, this scale is usually 100mm in length, drawn horizontally with word descriptors at each end. It was used subjectively to quantify the patient's pain perception. The patient reported a pain rating of 7 on the visual analog scale indicating severe pain[5].

Oswestry disability index (ODI) was employed to assess the patient's level of disability in terms of activity performance. This measures patient's impairment, and how the pain level/intensity has affected her life. The ODI is refer to as the "gold standard" of low back pain outcome measure[14]. The patient had a total score of 30%. Calculated using the following formula: point total/50 x 100 = % disability[14]. Patient indicated a score of 5 on lifting ability, 5 on social life, and 5 on standing. A percent disability score of 30% on the ODI implies that this patient has moderate disability.

CLINICAL IMPRESSION

The examination data indicate that the patient was appropriate for grade 3 and 4 vertical oscillatory pressure (VOP). No contraindications to joint mobilization were noted in the examination. VOP is also indicated when there is no history of malignancy, osteoporosis, fracture, pregnancy and active inflammation[9]. Patient's clinical presentation and history is consistent with lumbar radiculopathy. As radiculopathy means compression of the spinal nerve root.

It therefore follows that, if the VOP is successful, the radicular symptoms and pain should completely disappear within 2-6 sessions of the intervention.

INTERVENTION OUTCOME AND DISCUSSION

The patient was treated using grade 3 and 4 vertical oscillatory pressure (VOP). VOP is a slow passive oscillatory movement employed to increase joint mobility and decrease pain. My decision was based on the outcome of the tests and measure performed; on the patient's clinical presentations which were consistent with musculoskeletal dysfunction, and on study by Sipila on the rationale for joint mobilization[18].

Patient was positioned on the treatment plinth in prone, adequately draped, with only the back exposed. The lumbar spine was in a closed pack position, i.e. resting position. The treatment plane was perpendicular to the movement. Patient and therapist were relaxed. Using both thumbs, grade 3 VOP was applied to the patient's spinous processes, from L1-L5. Based on surface anatomy, the 10th rib was palpated and 3 vertebral levels below this corresponds to the L1. A large amplitude movement performed up to the limit of the range was applied with a speed of 3-4 thrust per second. An average of 30 seconds was spent on each vertebrae. This mobilization was carried out with the PT standing on a stool in a comfortable height with the upper limbs straighten out. Force was generated from the shoulder down through the thumbs. Grade 4 (small amplitude movement performed at the limit of the range) was applied from L1-L5 with the same frequency, duration and speed.

Patient was concurrently using 400mg Ibuprofen, thrice daily, but has reported no changes in her pain and associated radiculopathy with the use of this pharmacological agent. She had 2-sessions of VOP, with lumbar active range of motion (AROM) exercise as home program.

OUTCOME

Patient was evaluated with the visual analog scale pre and post intervention. As shown in table 1 and table 2,initial assessment indicate a score of 7. After two treatment sessions, at 3 days interval patient scored 0!

Oswetry disability index was found to be 30% before treatment. After treatment it was 5%.

According to a study by Boonstra *et al* on the reliability and validity of the VAS, using a test-retest and cross-sectional design respectively for disability in patients with chronic musculoskeletal pain, it was found that reliability of the VAS for disability is moderate to good[1].

DISCUSSION

Epidemiologically, back pain causes at least 10% of the adult population to consult a physician, physical therapist, or chiropractor each year. Low back pain, was found to be the most common form of back pain and primarily affects people between the age 30 and 70[12]. It therefore follows that adequate skill is needed on the part of the PT's to manage effectively cases of back pain in general, and low back pain in particular. Leininger *et al* reported a moderate evidence of

effectiveness of spinal manipulation for the treatment of lumbar radiculopathy[10]. Similar study by Onuwe[5] found similar result with vertebrae mobilization techniques. Interestingly, in this case report, just 2-session of grade 3 and 4 VOP was able to alleviate the patient's radicular pain completely. Further studies should compare which of the grade 1-4 vertical oscillatory pressure is more effective in treating lumbar radiculopathy as compared to only grade 3 and 4 VOP.

REFERENCES

1. Boonstra AM, Schiphorst Preuper HR, Reneman MF, Posthumus JB, Stewart RE. Reliability and validity of the visual analog scale for disability in patients with chronic musculoskeletal pain. *Int J Rehabil Res.* 2008; 31(2): 165-9. http://www.ncbi.nlm.nih.gov/pubmed/1846793. Accessed November 19, 2012.

2. Briggs DR. The Straight Leg Raise Test. *Dynamic Chiropractic*. 2012; 30(23). http://www.dynamicchiropractic.com/mpacms. Accessed November 2, 2012.

3. Bronfort G. Spinal Manipulation: Current State of Reasearch and its indications. 1999; 17(1): 91-111.doi: 10.1016/s0733-8619(05) 70116-x

4. Colloca CJ, Keller TS, Gunzburg R. Biomechanical and neurophysiological responses to spinal manipulation in patients with lumbar radiculopathy. *Journal of Manipulation and Physiological Therapeutics*. 2004; 27(1);1-15. Doi: 10.101b/j.jmpt.2003.11.021.

5. Cox JM, Davison A. The visual analog scale as a tool for self-reporting of subjective phenomena in the medical radiation sciences. *Education Today.* 2012; 12(3). http://www.minniscomms.com.au/educationto. Accessed October 30, 2012.

6. Einhaupl KM, Failli V, Klingebiel R, Pruss H, Schwab JM, Siebert E. Lumbar spinal stenosis: Syndrome, diagnostics and treatments. *Nature Reviews Neurology*. 2009; 5(7): 392. Doi: 10.1038/nrneurol.2009.90

7. Freynhagen R, Baron R. The evaluation of neuropathic components in low back pain. *Current Pain and Headache Reports*. 2009;13(3): 185-190. Doi: 10.1007/s11916-009-0032-y.

8. Goodman CC, Synder TEK. Differential Diagnosis for Physical Therapists: Screening for Referral. St. Louis, Missouri: Sanders Elsevier, 2007.

9. Hall SJ. Fundamentals of Maitland Mobilizations. *Morphopedics.* http://morphopedics.wikidot.com/fundamentals. Accessed September 30, 2012.

10. Leininger B, Bronfort G, Evans R, Reiter T. Spinal manipulation or mobilization for radiculopathy: a systematic review. *Phys Med Rehabil Clin N Am.* 2011; 22(1); 105-25.

http://www.ncbi.nlm-nih.gov/pubmed/2129214. Epubished 30 December 2010. Accessed November 30 2012.

11. Maitland GD. Maitland's Vertebral Manipulation. 7th ed. Philadelphia, PA: Elsevier; 2005.
12. Moore KL, Dally AF. Clinically Oriented Anatomy. 5TH edition. Baltimore: Lippincolt Williams & Wilkins; 2006.
13. Onuwe HAK. Relative therapeutic efficiency of vertebrae mobilization technique in the management of mechanical low back pain. *Journal of Medicine in the Tropics*. 2004: 6(2).
14. Oswestry Disability Index: Version 2.0. http://www.chirogeek.com/001_oswestry_20.htm. Accessed September 21, 2012.
15. Rabin A, gerszten PC, Karausky P, Bunker CH, Potter DM, Welch WC. The sensitivity of the seated staright-leg raise test compared with the supine straight-leg raise test in patients presenting with magnetic resonance imaging evidence of lumbar nerve root compression. *Arch Phys Med Rehabil.* 2007; 88(7):840-3. http://www.ncbi.nlm.nih.gov/pubmed/1760146. Accessed October 25, 2012.
16. Rehab Students. Straight Leg Raise (SLR) Test. http://videos.rehabstudents.com/straight-leg-ra. Updated April 10, 2010. Accessed November 10, 2012.
17. Sheffinger MA, Najim WI, Mishra SI. Reliability of Spinal Palpation for Diagnosis of Back and Neck Pain: A Systematic Review of the Literature. *Spine*. 2004; 29(19): 413-425. http://www.westrenupatientcarecenter.com/bin/. Accessed November 3, 2012.
18. Sipila VP. The Rationale for Joint Mobilization as a Manual Technique. http://www.orthosportonline.com/veli-s-Corne. Accessed November 19, 2012.
19. Sizer PS jr, Phelps V, Matthijs O. Pain Generators of the Lumbar Spine. *Pain Practice*. 2001; 1(3): 255-273.doi:10.1111/j.1533-2500.2001.01027.x

VISUAL ANALOG SCALE

Table 1.

VAS PRE RX	VAS POST RX
7	0

Table 2.

ODI PRE RX	ODI POST RX
30%	5%