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Original Research Article

Effectiveness of Sustained Natural Apophyseal Glides and Maitland Mobilization in Facet Joint Syndrome: A Single Blind Randomized Control Pilot Study

Deepak B. Anap[1], Subhash Khatri[2], Zambre B.R[3]

[1]Associate Professor & Ph.D. Scholar, PDVVPF, COPT, Ahmednagar
[2]Professor & Principal, COPT, PIMS, Loni, Maharashtra.
[3]Professor & HOD, Dept. of Anatomy, PDVVPF, Medical College, Ahmednagar, Maharashtra, India.

Corresponding Author: Deepak B. Anap

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ABSTRACT

Facet Syndrome is a common cause of low back pain. In 1933, Ghormley coined the term "facet syndrome", suggesting that hypertrophic changes secondary to osteoarthritis of the zygapophyseal processes led to lumbar nerve root entrapment, which caused low back pain. To our knowledge to date no study has assessed effect of three physiotherapy treatment protocols on Lumbar Facet syndrome. Hence this pilot study was undertaken to assess and compare effect of a) Mulligans Sustained Natural apophyseal Glides, therapeutic ultrasound and Spinal stabilization exercises, b) Maitland spinal mobilization , Therapeutic ultrasound and spinal stabilization exercises and C) Therapeutic ultrasound and Spinal stabilization exercises in cases of lumbar facet syndrome.

Design: Single Blind, Randomized Control Pilot Study.

Setting: Out Patient Department of Orthopedics and Department of Musculoskeletal Physiotherapy, PDVVPF, Ahmednagar.

Intervention: After baseline assessment participants (N=15)were randomly assigned to Group A which received Mulligans Sustained Natural Apophyseal glides (SNAG'S), Therapeutic ultrasound(Cont.1MHz, 2.0-W/cm2,10min) and Spinal stabilization exercises, Group B which received Maitland spinal(PA Glides), Therapeutic ultrasound(Cont.1MHz, 2.0-W/cm2,10min)and spinal stabilization exercises and Group C which received Therapeutic ultrasound(Cont.1MHz, 2.0-W/cm2,10min)and spinal stabilization exercises for the period of 2 weeks. Two participants left the study before completion of treatment protocol. Outcome

Measures: Participants underwent a first baseline assessment pre intervention, 2nd assessment at the end of 2nd Week and 3rd at the end follow up(i.e. 1 week) after the active intervention (3rd Week).Outcome measures included for the study were Modified Oswestry Low Back Disability Questionnaire (MODQ), Visual Analogue scale and Sorensen Test hold time.

Result: The ANOVA test showed that there is statistically highly significant difference in pain ($f=18.53, p<0.0001$),MODQ($f=21.85, 0<0.0001$) and Sorensen's test timing ($f=20.67, p<0.00010$) on comparison of outcomes between three groups at the end of 3rd week.

Conclusion: From our study we conclude that Sustained Natural apophyseal glide significantly decrease the Pain, Reduces the disability and improves the back muscle endurance in Lumbar facet syndrome

patients if compared with Ultrasound and Lumbar stabilization exercises and Maitland mobilization and Ultrasound group.

Key Words: Facet Syndrome, Sustained Natural Apophyseal Glides, Maitland Mobilisation

INTRODUCTION

Lumbar spinal facet joints were first suggested in the medical literature as a source of low back and lower extremity pain in 1911. [1] Since then, so-called "facetogenic back pain" has become a widely accepted, though still controversial entity in the radiologic and orthopedic literature. [2-10] Perhaps, the strongest circumstantial support comes from investigations reporting successful relief of back pain following intra-articular, or periarticular joint injections. [2,8] Estimates of the prevalence of lumbar facet joint pain based on single diagnostic blocks have been reported to range from 7.7 to 75% among patients reporting back pain. [11]

As early as 1933, Ghormley coined the phrase "the facet syndrome" stating that arthritic changes in the facets with interforaminal stenosis can lead to Sciatica. Following him, Badgley in 1941 supported his idea and showed that free bodies formation in the facet joint is akin to that of knee joint derangement. He laid special stress on the importance of the facet joints in low back pain and leg radiation.

Joint mobilization techniques are thought to benefit patients with lumbar mechanical dysfunction through the stimulation of joint mechanoreceptors. These receptors are believed to alter the pain-spasm cycle through the presynaptic inhibition of nociceptive fibers in associated structures and the inhibition of hypertonic muscles, which ultimately improves functional abilities. [12]

Therapeutic ultrasound (US) is frequently used in the management of musculoskeletal disorders. [13] It has been demonstrated that US exerts thermal and mechanical effects which leads to an increase in blood flow and metabolic activity, thus enhancing the regeneration and elasticity of the target tissue. [14]

Fatigue can affect the ability of people with low back pain to respond to the demands of an unexpected load. Fatigue after repetitive loading also leads to a loss of control and precision, which may predispose an individual to developing low back pain. *(Parnianpour et al, 1988).* Therefore, trunk muscle endurance training has been recommended to elevate fatigue threshold and improve performance, thus reducing disability. The stimulation of nociceptors in the supraspinous ligament has been shown to result in increased levels of multifidi muscle activation. [26] Strengthening and neuromuscular re-education of the core musculature is thought to play a significant role in restoring stability to the spinal column and in turn minimizing pain associated instability. [15] The main emphasis of core strengthening is focused on muscular stabilization of abdominal, paraspinal and gluteal musculature. [16]

To our knowledge to date no study has assessed effect of three physiotherapy treatment protocols on Lumbar Facet syndrome, hence this pilot study was undertaken to assess effect of a) Mulligans Sustained Natural apophyseal Glides ,therapeutic ultrasound and Spinal stabilization exercises. b) Maitland spinal mobilization, Therapeutic ultrasound and spinal stabilization exercises, c) Therapeutic ultrasound and Spinal stabilization exercises in cases of lumbar facet syndrome.

MATERIALS AND METHODS

Research Design

This study was randomized controlled trial single blind pilot study, 15 subjects diagnosed with lumbar facet syndrome were randomized to three groups.

Subjects

Subjects were recruited from Out Patient Department of Orthopedics and Department of Musculoskeletal Physiotherapy, PDVVPF, Ahmednagar. Subjects selected were screened for eligibility and written informed consent was obtained from each participant. Inclusion Criteria for the participants in this pilot study were i) Participants diagnosed with facetal arthropathy on MRI, ii) Localized unilateral lumbar pain iv) Replication or aggravation of pain by unilateral pressure over the facet joint, v)Pain eased in flexion, Pain in extension, Lateral flexion or rotation to the ipsilateral side vi)Patients willing to participate in the study and exclusion Criteria were i) Spinal Surgery, ii)Trauma to the spine, iii) Manipulation under anesthesia, iv)Metabolic Disorders – Osteoporosis, v)Spinal Tumors

Procedure:

Patients were investigated by the principle investigator to determine study eligibility. Outcome measures for the study were assessed pre intervention, 2nd week and follow up at 3rd week.

Study outcomes:

Modified Oswestry Low Back Disability Questionnaire.

The Oswestry Disability Questionnaire was originally described in1980. [17] The questionnaire consists of 10 items addressing different aspects of function. Each item is scored from 0 to 5. The point total from each section is summed and the then divided by the total number of questions answered and multiplied by 100 to create a percentage disability. The scores range from 0-100% with lower scores meaningless disability.

Pain

The level of current pain perception was measured using a visual analogue scale (VAS). The pain VAS consisted of a 10 cm horizontal line anchored at one end by the words ‘no pain' and at the other end by the words 'worst pain'. The reliability of this VAS has been previously demonstrated. [18]

Back Endurance Testing : Sorensen Test

Biering-Sorensen [19] describes this method of testing isometric back endurance; it measures how long (to a maximum of 240 seconds) the subject can keep the unsupported trunk (from the upper border of the iliac crest) horizontal while prone on an examination table (Figure 4). According to the literature, the Sorensen procedure appears to provide a global measure of back extension endurance capacity.Published studies demonstrate that the test assesses the endurance of all the Muscles involved in extension of the trunk, which include not only the paraspinal muscles, but notably the multifidus muscle. [19]

Randomization:

After Baseline assessment, subjects were randomly assigned in three groups.

Intervention:

Group A: Study participants received Mulligans Sustained Natural Apophyseal glides (SNAG’S) [Figure 1], Therapeutic ultrasound (Cont.1MHz, 2.0-W/cm2,10min) and Spinal stabilization exercises.

Group B: Study participants received Maitland spinal mobilization [Figure 2], Therapeutic ultrasound (Cont.1MHz, 2.0-W/cm2,10min)and spinal stabilization exercises.

Group C: Participants received Therapeutic ultrasound (Cont.1MHz, 2.0-W/cm2,10min) and Spinal stabilization exercises.

All interventions were given for the period of 2 weeks. Post treatment outcomes were assessed at the end of two weeks and at the end of follow up (3rd week)

Figure1: Subject Receiving SNAGs

Figure 2: Subject receiving Maitland Mobilisation

Follow up: 1 week after last intervention session.

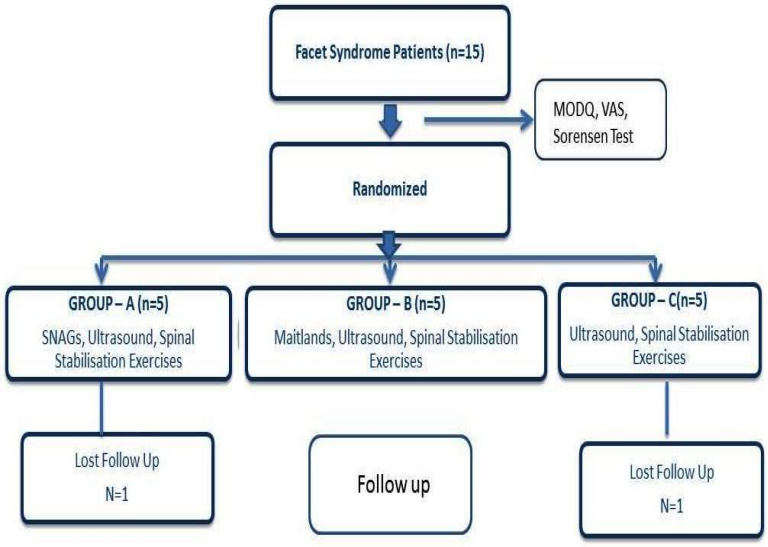

Figure 3: Flow chart of the study.

RESULTS

We used descriptive statistics to check the difference between the groups. Mean age of participants was 56.0 ± 6.7 years. One participant from SNAG's group and one from Control group lost follow up due to their refusal to participate in any further evaluations, hence they were not considered for analysis.

Table 1: Comparison between three groups.

Outcome	Group A(SNAGs)			Group B (Maitlands)			Group C(Ultrasound)		
	Pre Treat	2nd Wk	3rd Wk	Pre Treat	2nd Wk	3rd Wk	Pre Treat	2nd Wk	3rd Wk
Pain	8.4	6.5	3.2	8.6	6.4	4.2	8.2	7.6	5.6
MODQ (%)	33.5	20	13	33.2	23.6	17.6	33	24	19.5
Sorens Test Score	75	83	90	78	85	88	73	75	81

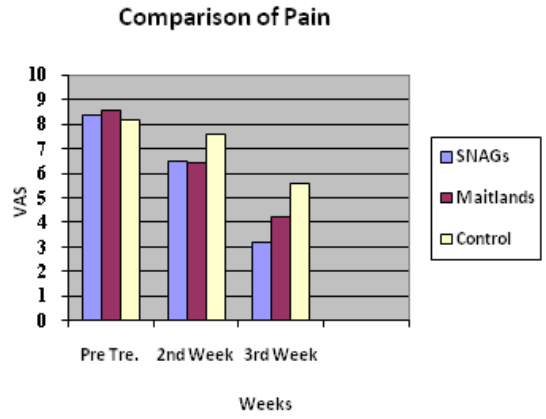

Figure 4: Comparison of pain.

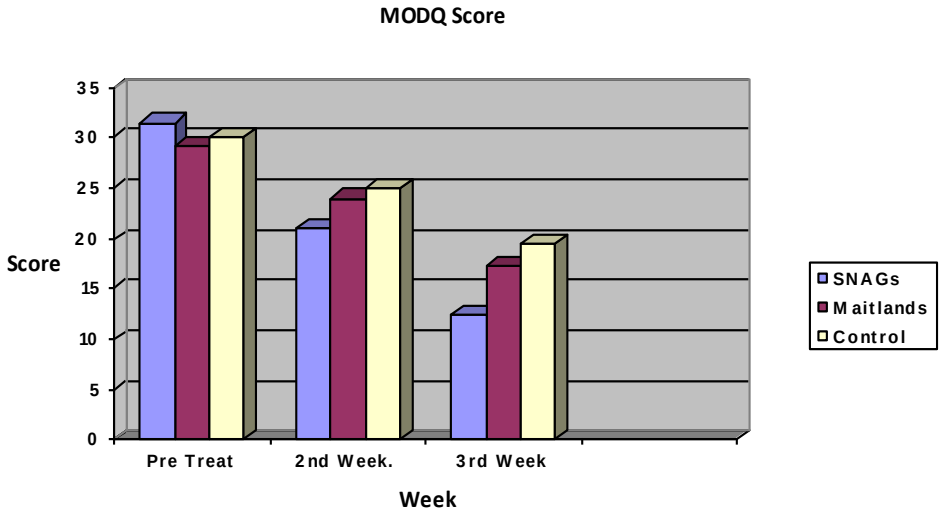

Figure 5: MODQ Score.

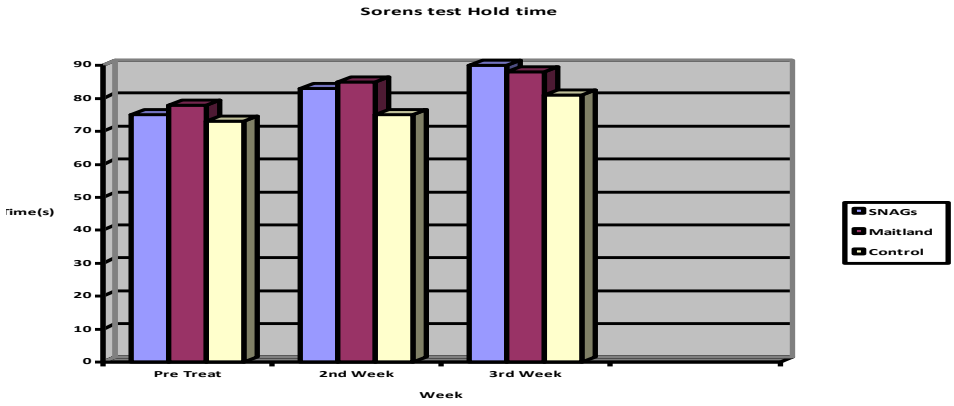

Figure 6: Sorensen test hold time.

Table 2: A) Pain One-way ANOVA: C1, C2, C3

Sources of Variance	Degrees of Freedom	Sums of Squares	Mean Squares	F-Statistic	P-Value
Factor	2	6.672	3.336	18.53	P <0.0001
Error	10	1.800	0.180		
Total	12	8.472			

Table 3: B) MODQ: One-way ANOVA:

Sources of Variance	Degrees of Freedom	Sums of Squares	Mean Squares	F-Statistic	P-Value
Factor	2	90.11	45.05	21.29	P <0.0001
Error	10	20.21	2.02		
Total	12	110.32			

Table 4: C) Sorensens Test : One-way ANOVA: C1, C2, C3

Sources of Variance	Degrees of Freedom	Sums of Squares	Mean Squares	F-Statistic	P-Value
Factor	2	36.173	18.087	20.67	P<0.0001
Error	10	8.750	0.875		
Total	12	44.923			

The ANOVA test showed that there is statistically highly significant difference in pain ($f=18.53$, $p<0.0001$), MODQ ($f=21.29$, $0<0.0001$) and Sorensen's test timing ($f=20.67$,$p<0.00010$) on comparison of outcomes between three groups at the end of 3rd week. From the graph it is seen that reduction in pain was more in SNAGs group as compared to Maitland and Control group. MODQ score was also more reduced in SNAGs group as compared to other two groups.

DISCUSSION

The objective of this pilot study was to investigate effectiveness of Sustained Natural Apophyseal glides and Maitland's mobilization in Facet joint syndrome. To our knowledge, this is the first study that illustrates effectiveness of Sustained Natural Apophyseal glides and Maitland's mobilization in Facet joint syndrome.

In present study we found that pain reduction was more with SNAGs group as compare to other two groups. This is accordance with Mechanism explained in previous studies on SNAGs and Mobilisation with movement technique of Mulligans. Among the SNAG's basic principles of clinical management is an immediate reduction or cessation of pain and an increase in range of motion (ROM). [20-22] The mechanism by which this MWM exerts its ameliorative effects in clinical practice remains somewhat of an enigma; however biomechanical and neurophysiological mechanisms may be involved. [20,21] The MWM was largely conducted in a weight-bearing position and patients received simultaneous feedback of painless joint movements. This feedback might modulate psychological features such as fear of movements, resulting in an increased activity level. [23] Biomechanically it was proposed that MWM may address joint partner bone alignment (i.e., position fault) [24] and positional faults. [25] Potential neurophysiological mechanisms include changes in descending pain inhibitory systems and, and changes in central pain-processing mechanisms. [25]

Reduction in pain levels with MWMs could potentially decrease muscle spasm and thus facilitate range of movement. As per this study as the pain reduced there was reduction in MODQ score. This could be because of reduction in Pain, Improvement in range and Muscle strength. This result is in accordance with Schein et al [26] article which stated that the pain relief afforded by MWM would be associated with improvements of disability level.

In addition, MWM in a weight-bearing position requires muscle activity, which might have resulted in improved motor performance and increase in strength of core muscles when applied along with core stabilisation exercises.

In regards to spinal instability, Panjabi described a neutral zone in which the interplay between the spine's passive, active, and neutral elements function in concert to control motion between intervertebral segments. If one of the elements is compromised through disc degeneration, spinal injury, or muscular dysfunction, a resultant lack of control occurs within the neutral zone and instability results. [27] Panjabi hypothesized that it is through regaining neutral control of the muscles that provide segmental stabilization to the spine that instability can be managed.

The muscles which are reflexly inhibited (shutdown) in low back pain patients (mainly lumbar multifidus and transverses abdominis), do not spontaneously recover even if the patients are pain free with a return to normal activity level. [28] This leads to recurring episodes of pain. Despite the stability provided by osseous-ligamentous structures, the spinal column devoid of musculature is incapable of carrying normal physiological loads. [28] The large movement of the spine, especially when under load requires stabilization and protection of many individual joints. This relies on the coordinated contraction of many muscles (muscles of abdominal wall and paravertebral muscles) working in fine balance to provide the background stabilization while at the same time allows smooth coordinated functional movement.

Goldby et al [29] report that ten 1-hour spine-stabilization exercise sessions led to better results than a 10-session manual therapy program or an education program over a 1-year period. However, both the manual therapy and the spine-stabilization groups experienced significant pain reduction.

Ferreira et al found that in the short term use of either manual therapy or lumbar-stabilization exercises led to significantly better improvements in function and global perception outcomes than were found in a general exercise group. [30]

Although our study did not address the mechanism by which pain and motion were influenced by the manual therapy interventions, it is interesting to consider what changes may have occurred during both manual therapy treatment procedures. Both mechanical and neurophysiological mechanisms have been described to explain pain reduction and improved mobility following joint motion or mobilization, and it is conceivable that both mechanisms played a role in the findings of the present study.

This study provides one step forward in the knowledge concerning the long-term effects of conservative management for Lumbar facet syndrome patients. While the very small number of subjects involved in this study makes it difficult to draw clear conclusions, we may highlight some trends: 1) physiotherapy treatment delivered for facet syndrome is a feasible contingent; 2) physiotherapy treatment seems to be effective in reducing disability and improving strength of back muscles.

CONCLUSION

From our study we conclude that Sustained Natural apophyseal glide along with Ultrasound and Lumbar stabilization exercises significantly decrease the Pain, Reduces the disability and improves the back muscle strength in Lumbar facet syndrome patients if compared with Maitland mobilization and Ultrasound group.

Limitations

It is important to recognize that there are a number of limitations to this pilot study. Firstly, the sample size was small, with only 13 subjects; hence the potential for error is much greater than that in a larger sample. We recommend that subsequent

studies should investigate a larger sample to verify these results.

Disclosure

The authors declare no conflict of interest. The authors alone are responsible for the content and writing of the manuscript.

REFERENCES

1. Lawrence RC, Helmick CG, Arnett FC: Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. Arthritis Rheum 1998, 41:778-799.
2. Manchikanti L, Staats PS, Singh V, Schultz DM, Vilims BD, Jasper JF,Kloth DS, Trescot AM, Hansen HC, Falasca TD, Racz GB, Deer T, Burton AW, Helm S, Lou L, Bakhit CE, Dunbar EE, Atluri SL, Calodney AK, Hassenbusch S, Feler CA: Evidence-based practice guidelines for interventional techniques in the management of chronic spinal pain. Pain Physician 2003, 6:3-80
3. Linton SJ, Hellsing AL, Hallden K: A population based study of spinal pain among 35–45-year old individuals. Spine 1998,23:1457-1463.
4. Manchikanti L, Pampati V: Research designs in interventional pain management: Is randomization superior, desirable or essential? Pain Physician 2002, 5:275-284
5. Deyo RA, Weinstein JN: Low back pain. N Engl J Med 2001,344:363-370.
6. Kirwan EO: Back pain. In Text Book of Pain 2nd edition. Edited by Wall PD, Melzack R. Edinburgh: Churchill Livingstone; 1989:335-340.
7. Deyo RA, Rainville J, Kent DL: What can the history and physical examination tell us about low back pain? JAMA 1992, 268:760-765.
8. Bogduk N, McGuirk B: Causes and sources of chronic low back pain. In Medical Management of Acute and Chronic Low Back pain. An Evidence-Based Approach: Pain Research and Clinical Management Volume 13. Edited by: Bogduk N, McGuirk B. Amsterdam: Elsevier Science BV; 2002:115-126.
9. Bogduk N, McGuirk B: An algorithm for precision diagnosis. In Medical Management of Acute and Chronic Low Back pain. An Evidence- Based Approach: Pain Research and Clinical Management Volume 13. Edited by: Bogduk N, McGuirk B. Amsterdam: Elsevier Science BV; 2002:177-186.
10. Bogduk N: Low back pain. In Clinical Anatomy of the Lumbar Spine and Sacrum 3rd edition. Edited by: Bogduk N. New York: Churchill Livingstone; 1997:187-214.
11. Bogduk N: The clinical anatomy of the cervical dorsal rami. Spine 1982, 7:35-45.
12. Solomonow M, Zhou BH, Harris M, Lu Y, Baratta RV. The ligamentomuscular stabilizing system of the spine. *Spine.* 1998;23:2552–2562.
13. Van der Windt DA, van der Heijden GJ, van den Berg SG, ter Riet G, de winter AF, Bouter LM. Ultrasound therapy for musculoskeletal disorders: a systematic review. Pain 1999; 81: 257-71.
14. Maxwell L. Therapeutic ultrasound: its effects on the cellular and molecular mechanisms of inflammation and repair, Physiotherapy 1992; 78: 421-6.
15. Kibler, B.W., Press, J., & Sciascia, A. The role of core stability in athletic function. Sports Medicine.2006; 36 (3), 189-198.
16. Nadler, S.F., Malanga, G.A., Bartoli, L.A., Feinberg, J.H., Prybicien, M.,& DePrince, M.Hip muscle imbalance and low back pain in athletes: Influence of core strengthening. Medicine & Science in Sports & Exercise.2002; 34(1), 9-16
17. Fair bank JC, CouperJ, DaviesJB, O'BrienJP. The Oswestry Low Back Pain Disability Questionnaire. Physiotherapy,1980;66:271–273.
18. Stratford P, Levy D, Gowland C, Evaluative properties of measures used to assess patients with lateral

epicondylitis at the elbow. Physiotherapy Canada 1993;45:160-164.
19. Demoulin, C.; Vanderthommen, M.; Duysens, C. & Crielaard, J.M. (2006b). Spinal muscle evaluation using the Sorensen test: a critical appraisal of the literature. Joint Bone Spine, Vol.73, No.1, pp. 43-50
20. Mulligan BR: Manual Therapy: "Nags", "Snags" "Mwms". 4th edition. New Zealand: Wellington; 2004.
21. Wilson E: The Mulligan concept: NAGS, SNAGS and mobilizations with movement. Journal of Bodywork and Movement Therapies 2001, 5:81-88.
22. Exelby L: The Mulligan concept: Its application in the management of spinal conditions. Man Ther 2002,7:64-70.
23. Vicenzino B, Hall T, Hing W, Rivett D 2011 A new proposed model of the mechanisms of action of mobilisation with movement. In: Vicenzino B, Hall T, Hing W, and Rivett D (eds) Mobilisation with Movement: The Art and the Science, pp 75–85. London, Churchill Livingston
24. Mulligan BR 2004 Manual Therapy NAGS SNAGS MWMS etc. Wellington, Plane View Services
25. Paungmali A, O'Leary S, Souvlis T, Vicenzino B 2004 Naloxone fails to antagonize initial hypoalgesic effect of a manual therapy treatment for lateral epicondylalgia. Journal of Manipulative and Physiological Therapeutics 27: 180–185
26. Schein JR, Kosinski MR, Janagap-Benson C, Gajria K, Lin P, Freedman JD 2008 Functionality and health-status benefits associated with reduction of osteoarthritis pain. Current Medical Research and Opinion 24: 1255–1265
27. Panjabi M, Abumi K, Duranceau J, Oxland T, Spine,.1989, 14, 194
28. Mok NW, Brauer SG, Hodges PW, Spine, 2011, 36, E45.
29. Goldby LJ, Moore AP, Doust J, Trew ME. A randomized controlled trial investigating the efficiency of musculoskeletal physiotherapy on chronic low back disorder. Spine. 2006;31:1083–1093.
30. Ferreira ML, Ferreira PH, Latimer J, et al. Comparison of general exercise, motor control exercise and spinal manipulative therapy for chronic low back pain: a randomized trial. Pain. 2007;131:31–37.

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