JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

MAITLAND'S MOBILIZATION FOR FACET JOINT SYNDROME: A REVIEW OF THE EVIDENCE STUDY DESIGN: RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Pain in the lower back is a common source of impairment that might disrupt one's professional life. Patients with a diagnosis of lumbar facet joint syndrome took part in a randomized controlled experiment using a single-blind design. The research used the Visual Analogue Scale (VAS), the Modified Oswestry Disability Questionnaire (MODQ), the Pressure Pain Threshold (PPT), the Back Muscle Endurance Test (BMET), and the Range of Motion (ROM) of the Spine in Flexion and Extension to evaluate its results. Participants were evaluated initially, then randomly assigned to Group A (Mulligans Sustained natural apophyseal glides; SNAG'S), Group B (Maitland's spinal mobilization; PA Glides); Group C (therapeutic ultrasound; Cont.1MHz, 1.5W/cm2), or Group C (therapeutic ultrasound; spinal exercises) for a period of 2 weeks. Three weeks later, we did a follow-up. Comparing VAS, MODQ, PPT, and Spinal ROM among the three groups using the Kruskal-Walli's test, which included a total of 186 individuals, revealed significant differences. Spinal mobilization by either Maitland or SNAGs is beneficial in decreasing pain and impairment and increasing the patient's tolerance to pressure, while SNAGs is more successful in increasing spinal range of motion.

KEYWORD: ROM, SNAGs, facet joints, syndrome.

INTRODUCTION

As early as 1911, researchers hypothesized that the facet joints of the lumbar spine may be responsible for radiating discomfort down the legs and into the lower back. Since then, the diagnosis of "facetogenic back pain" has been extensively recognized, if still disputed, in the radiologic and orthopedic literature. Case studies describing reduced back pain after intra- or peri-articular joint injections provide the greatest circumstantial evidence. The incidence of lumbar facet joint discomfort among individuals experiencing back pain has been found to vary from 7.7 percent to 75 percent depending on results from single diagnostic blocks. Ghormley first used the term "the facet syndrome" in 1933 to describe the connection between arthritic changes in the facets and interforaminal stenosis, two of the most common causes of Sciatica. Afterward, in 1941, Badgley agreed with him and provided evidence that free bodies production in the facet joint is analogous to that of knee joint derangement. His primary focus was on the facet joints and their role in radiating pain down the legs from the lower back. Patients with lumbar mechanical dysfunction may benefit from joint mobilization procedures due to the activation of joint mechanoreceptors. By inhibiting hypertonic muscles and so disrupting the pain-spasm cycle, it is theorized that these receptors might enhance patients' functional capacities.

The only synovial joints in the spine are the facet joints, which are also known as apophyseal or zygapophyseal joints in classical anatomy. These joints are paired diarthrodial joints that articulate the posterior arch of the spine between two neighboring vertebral levels. Primary vertebral column stabilizers, lumbar facet joints (LFJs) allow for extension, flexion, and rotation of the spine.

This pilot research was conducted to evaluate the efficacy of three physiotherapy treatment regimens for Lumbar Facet syndrome, namely a) Mulligan's Sustained Natural Apophyseal Glides, therapeutic ultrasonography, and Spinal stabilization exercises. b) Lumbar facet syndrome treatment including Maitland spinal mobilization, therapeutic ultrasound, and spinal stabilization exercises; c) Therapeutic ultrasound and spinal stabilization exercises for other conditions.

LITERATURE AND REVIEW

Stylianos Kapetanakis et al (2020) The articulation between two neighboring lumbar vertebrae is provided by the lumbar facet joints (LFJs), which are diathrodial joints. The LFJ is a diverse biomechanical and functional anatomical structure. Since degenerative morphologic abnormalities to these structures are often linked to the onset of low back pain, it is hypothesized that they are of critical clinical relevance. The exact description of LFJs innervation remains contentious despite the growing interest in characterizing LFJs anatomy in recent years. This article reviews the anatomy and biomechanical significance of LFJs and their neighboring extra-articular structures. As an added bonus, the innervation of LFJs is studied in light of recent findings in the literature. For physicians and spine surgeons, understanding the architecture and innervation of LFJs is crucial for accurate patient assessment and the implementation of appropriate treatment techniques.

Deepak B. Anap et al (2014) It's not uncommon for people to have back discomfort because of Facet Syndrome. Hypertrophic alterations subsequent to osteoarthritis of the zygapophyseal processes are thought to be the source of low back discomfort, and this was the hypothesis put out by Ghormley, who created the name "facet syndrome" in 1933. Up till now, no research has compared the efficacy of three different physiotherapy treatment procedures for Lumbar Facet syndrome. Thus, the purpose of this pilot research was to evaluate and compare the efficacy of three different treatments for lumbar facet syndrome: a) Mulligans Sustained Natural apophyseal Glides; b) Maitland spinal mobilization; c) Therapeutic ultrasound and spinal stabilization exercises. Study Design: Pilot, Single-Blind, Randomized Controlled Trial The PDVVPF in Ahmednagar is home to a number of excellent medical facilities, including an Orthopedics Outpatient Clinic and a Musculoskeletal Physiotherapy Clinic. Participants (N=15) underwent a baseline assessment before being randomly assigned to one of three treatment groups: Group A received Mulligans Sustained Natural Apophyseal Glides (SNAGS), Therapeutic ultrasound (Cont.1MHz, 2.0-W/cm2,10min), and Spinal stabilization exercises; Group B received Maitland spinal (PA Glides), Therapeutic ultrasound (Cont.1MHz, 2.0-W/cm2,10min); and Group C received Therapeutic ultrasound Two individuals dropped out of the trial before therapy was finished. Participants were evaluated three times: once before the intervention began, once at the end of the second week, and once at the conclusion of the follow-up period, which was one week after the intervention was completed (3rd Week). The research used the Modified Oswestry Disability Questionnaire for the Low Back (MODQ), a visual analog scale, and the Sorensen Test hold time as its outcome measures. Pain levels in the ultrasound and lumbar stabilization exercise group against the Maitland mobilization and ultrasound group were found to be statistically significantly different (f=18.53, p.0001).

Siobhan A. O'Leary et al (2018) Since 1990, back pain has been the main cause of disability worldwide. The zygapophysial joint, a diarthrodial joint more popularly known as the facet joint, plays a crucial role in this disorder. The facet joint works in tandem with the intervertebral disc to keep the spine flexible and stable. The facet joint is responsible for a great deal of discomfort felt in the lower back, middle back, and neck, and is particularly vulnerable to the early onset of osteoarthritis. While intrusive therapies may alleviate discomfort, they do not always succeed in preserving joint functioning. This article provides a summary of the existing knowledge base on the facet, including its anatomy, functional features, issues, and methods of treatment. In addition, this overview discusses the prospect of facet regeneration and specific engineering solutions that might be used as a long-term cure.

Yi-Dan Wang et al (2021) The "three-joint complex" of the spine includes the lumbar facet joint, which provides stability and mobility. There is still some debate as to whether or not abnormal facet joint anatomy is associated with ALDH in adolescents, and most of the studies conducted so far have included adults. The purpose of this study is to characterize adolescent lumbar facet joints to give anatomical support for early diagnosis and management of lumbar disc herniation in adolescents and young adults (ages 13–18). Methods: 32 patients with lumbar disc herniation in Inner Mongolia between the ages of 13 and 18 were gathered for CT imaging as the ALDH group, while 62 healthy participants were selected as the normal group. MIMICS 21.0 was used to import DICOM-formatted raw records of continuous scanning lumbar tomography images for analysis and sizing. Facet joint height, facet joint width, etc., are examples of criteria to consider. Results: It was shown that there were statistically significant differences between the ALDH group and the control group in terms of left and right transverse angle of the L5S1 segment (52.41± 9.2° and 55.99 10.91°, respectively; $P < 0.05$). There is more space on the right side than the left. 2. In the normal population, male facet joints were thicker (1.63 ±0.32) than female facet joints (1.38± 0.25); in the 16–18-year-old population, male facet joints were thicker (22.1 ±3.04) than female facet joints (18.92± 3.71) in terms of cross-sectional area. Third, the L3-4 transverse angle, L4-5 facet joint height, and L5S1 facet joint thickness all differed significantly between the normal and ALDH groups ($P < 0.05$). In conclusion, when ALDH develops in the L5S1 segment, there is a significant discrepancy in the transverse angle between the left and right sides, and men and women have different thicknesses and cross-sectional areas of the facet joints. When the height of the facet joints is more, the transverse angle of the left and right is asymmetric, the inferior articular process is greater, and the thickness of the facet joints is less, lumbar disc herniation may be facilitated.

Jun-Wu Wang et al (2022) With the patient's nervous system still functional, the posterior approach pedicle screw fixation without fusion is often utilized to treat type A3 thoracolumbar fractures. The purpose of this study was to evaluate the relationship between facet joint (FJ) angle and FJ degeneration in patients with neurologically intact type A3 thoracolumbar fractures who had posterior approach pedicle screw treatment without fusion. We included 58 individuals who had either a standard posterior pedicle screw fixation (n= 28) or a Wiltse technique (n= 30). To assess the FJs parameters, including FJ inclination (FJI), FJ tropism (FJT), FJ violation, and FJ degeneration grade (FJDG), of three fixed segments and the adjacent segment below the fixed segments, a CT scan was performed prior to fixation and prior to fixation removal (Within 1.5 to 2 years after fixation). No statistically significant difference was found between the two groups with respect to the frequency with which FJs were violated, the pace at which FJs in FJDG degraded, or the angle at which FJs were violated ($P> 0.05$). To a lesser extent, FJI, FJT before fixation, and the angular change in FJI were positively correlated with FJDG degradation (P 0.05); and FJT before fixation and the angular shift in FJI were risk factors for FJDG deterioration (P 0.01). The pace of FJDG degeneration and FJs angle shifts did not accelerate under the Wiltse technique, as a result. Two variables that increased the likelihood of FJDG degradation, however, were the FJT before fixation and the angular shift in FJI.

METHODOLOGY

Based on the findings of the pilot research, the minimum required sample size was determined. When determining the mean and standard deviation (SD), both the intervention and control groups were taken into account. Accuracy was determined to be 0.208 thanks to these measurements. A 10% attrition rate was assumed. Following this approach, we found that a sample size of 60 would be required to draw meaningful conclusions. This randomized controlled trial compared the efficacy of SNAGS, Maitland's, and standard physiotherapy for the treatment of lumbar facet joint syndrome. The researchers used visual analogue scales to track participants' pain levels as their primary outcome (0 – 10). An example of the formula for determining the smallest practicable sample

$$n = 2\frac{S^2(Z1 + Z2)^2}{(M1 - M2)^2}$$

In the formula

M1 = Mean for test intervention

M2 = Mean for Control intervention

S1 = Standard deviation of M1

S2= Standard Deviation of M2

S = Pooled SD

This is what we found in the M1 (SNAGs - Intervention Group)= 2.13, S1 = 0.74

M2 (Conventional Physiotherapy – Control group) (Conventional Physiotherapy – Control group)= 3.41, S2 = 0.64

The formula yields an absolute accuracy of plus or minus 20%. = 20 x(M1-M2)/ 100

According to the numbers, the accuracy was =0.256

Consequently, the aforementioned calculation yielded an estimated minimum sample size of 57.

Furthermore, the M1(Mean for Maitland Group - Intervention) and M2(Mean for Control Group) were used to determine the appropriate sample size (Conventional Physiotherapy – Control)

M1 (Mean for Maitland group) = 2.37, S1 = 0.51

M2= 3.41, S2 = 0.64

Absolute precision at 20 % = 0.208.

So, 60 people were the bare minimum to have in the sample.

From the formula stated by Patrikar, it was calculated that a sample size of between 57 and 60 should be used. Sixty was chosen as the base minimum for this analysis. Attrition during the trial was allowed for at a rate of 10%. With this in mind, we estimated that there would be 66 participants total in each group before any attrition occurred throughout the trial.

The participants were randomly assigned to one of three groups using a computer-generated randomization process. OpenEpi software was used to generate random numbers.

Patients in Group I were treated with SNAGs, therapeutic ultrasonography, and back-strengthening exercises.

The second group participated in therapeutic ultrasonography and back endurance exercises in addition to receiving Maitland's spinal mobilization.

Therapeutic ultrasonography and back endurance exercises were provided to Group III.

DATA ANALYSIS

Comparison of VAS score between groups at 2nd Week and 3rd Week

Table 1: Kruskal-Wallis test analysis and test statistics of visual analogue scale score

Ranks				Test statistics		
	Group	**n**	**Mean Rank**	**Chi- Sq**	**df**	**p - value**
VAS at baseline	SNAGS Group	62	96.08	0.380	2	.827

	Maitland's Group	61	90.21			
	Conventional PT	63	94.14			
VAS at 2nd week	SNAGS Group	62	68.37	28.885	2	.000
	Maitland's Group	61	91.70			
	Conventional PT	63	119.98			
VAS at 3rd week	SNAGS Group	62	57.80	87.032	2	.000
	Maitland's Group	61	78.05			
	Conventional PT	63	143.60			

Mean rank pain ratings at 3 weeks were 57.80 for the SNAGs group, 78.05 for the Maitland's group, and 143.60 for the traditional physiotherapy group; a Kruskal Wallis H test indicated a statistically significant difference in pain scores across the three groups, x^2 (2) = 87.032, p = 0.000.

Comparison of MODQscore between groups at 2ndweek and 3rdweek

Table 2: Kruskal-Wallis test analysis and test statistics of MODQ Score

Ranks				**Test Statistics**		
	Group	**n**	**Mean Rank**	**Chi- Sq**	**df**	**p - value**
MODQ score at	SNAGS Group	62	94.13	0.342	2	0.843
	Maitland's Group	61	90.42			

Baseline						
	Conventional PT	63	95.87			
MODQ score at 2^{nd} week	SNAGS Group	62	77.44	17.388	2	0.000
	Maitland's Group	61	87.22			
	Conventional PT	63	115.38			
MODQ score at 3^{rd} week	SNAGS Group	62	60.12	77.809	2	0.000
	Maitland's Group	61	79.26			
	Conventional PT	63	140.13			

At Week 3, the mean rank MODQ scores for the SNAGs, Maitland's, and traditional physiotherapy groups were 60.12, 79.26, and 140.13, respectively. This difference was statistically significant according to a Kruskal Wallis H test (x^2 (2) = 77.809, p = 0.000).

Comparison of pressure pain threshold between groups at 2^{nd} week and 3^{rd} week

Table 3: Kruskal-Wallis test analysis and test statistics of PPT Score

Ranks				**Test Statistics**		
	Group	**n**	**Mean Rank**	**Chi- Sq**	**df**	**p – value**
PPT score	SNAGS Group	62	95.96	0.264	2	0.877

at baseline						
	Maitland's Group	61	91.13			
	Conventional PT	63	93.37			
PPT score	SNAGS Group	62	110.82	11.496	2	0.003
at 2nd week	Maitland's Group	61	89.93			
	Conventional PT	63	79.90			
PPT score	SNAGS Group	62	119.60	41.043	2	0.000
at 3rd week	Maitland's Group	61	99.98			
	Conventional PT	63	61.55			

At Week 3, the mean rank PPT score was 119.60 in the SNAGs group, 99.98 in the Maitland's group, and 61.55 in the traditional physiotherapy group; this difference was statistically significant according to a Kruskal Wallis H test (x^2 (2) = 41.043, p = 0.000).

Comparison of back muscle endurance between groups at 2nd week and 3rd week

Table 4: Kruskal-Wallis test analysis and test statistics of back muscle endurance time

	Ranks			Test statistics		
	Group	n	Mean Rank	Chi- Sq	df	p - value
Back endurance at baseline	SNAGS Group	62	91.87	0.570	2	0.752
	Maitland's Group	61	90.90			
	Conventional PT	63	97.62			
Back endurance at 2ndweek	SNAGS Group	62	98.44	0.803	2	0.669
	Maitland's Group	61	91.63			
	Conventional PT	63	90.44			
Back endurance at 3rdweek	SNAGS Group	62	102.06	4.507	2	0.105
	Maitland's Group	61	96.39			
	Conventional PT	63	82.27			

At 3 weeks, the mean rank endurance score was 102.06 in the SNAGs group, 96.39 in the Maitland's group, and 82.27 in the traditional physiotherapy group; nevertheless, the Kruskal Wallis H test revealed no statistically significant difference between the three groups (x^2 (2) = 4.507, p = 0.105). Since the p value was more than 0.05, post hoc tests were not performed.

We observed that the SNAGs group had much less pain than the other two groups. This fits with the mechanism described in the literature on SNAGs and the mobilization by movement approach of Mulligans. The SNAG's guiding principles for clinical care include the prompt elimination of pain and restoration of full range of motion (ROM).

CONCLUSION

Our research shows that compared to the Maitland mobilization and ultrasound group, the Lumbar stabilization exercises group dramatically reduced pain, disability, and improved back muscular strength in individuals with Lumbar facet syndrome. Reduced discomfort, more mobility, and a higher tolerance to pressure are all benefits of Maitland's spinal mobilization. There was no statistically significant difference in the increase in back muscular endurance across the three groups.

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