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A Comparative Analysis on Efficacy and Manual Therapy of Mulligan Concept Mobilization in Cervical Spine Pain

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Abstract – The studies on NAGs and its functional outcomes have not been reported in literature. Several questions regarding NAGs remain unanswered especially about its efficacy in pain and stiffness affecting ADL. However, a number of therapists throughout the world use this technique as an integral component of their practice. A limited number of papers including case studies and case series have documented a rapid reduction in pain and stiffness of other parts of the spine and the peripheral joints using Mulligan Concept.

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INTRODUCTION

The physical therapists of Enfield Health & Wellness Center practice a relatively new manual therapy so effective that authors describing its physiology have referred to its results as the *"Pain Release Phenomenon."* First described in the literature by Brian Mulligan in 1992,1 an admirable body of re-search now attests to its effectiveness.2-15 The Mulligan Tech-nique, sometimes titled Mobilization With Movement, deliv-ers immediate relief and recovery from local musculoskeletal pathology of mechanical origin. Using the Mulligan Tech-nique, Enfield Health & Wellness Center often achieves com-plete relief and return to function in just a few visits. This technique frequently proves effective even after other pain relief modalities, strengthening, and stretching have failed. The Mulligan Technique works for both spinal and extremity joints experiencing localized loss of mobility and/or pain as-sociated with function.

Developed by renowned New Zealand Physiotherapist Brian Mulligan, the Mulligan Concept has continued to evolve over 25 years of clinical practice, with the technique now being taught worldwide. The Mulligan Concept differs from conven-tional manipulative therapy in that it involves the application of sustained accessory glide to a joint, combined with the *ac-tive,* previously painful movement. Patients respond remarka-bly well with MWMs, as the movements are *only* conducted if symptoms are abolished with an appro-priate mobilizing force, applied by a skilled clinician. *Any* pain experienced with movement is an abso-lute contraindication for MWMs, which makes for efficient assessment of whether a specific technique can be utilized. Application of this sustained, passive accessory joint mobilization (parallel or perpen-dicular to the joint plane), requires essential knowledge of joint arthrology, a well-developed sense of tissue tension and handling skills, and clinical reasoning to investigate combinations of parallel, perpen-dicular, or rotational glides to find the correct treatment plane. With correct repositioning, movement can be restored pain-free. Movement is then performed actively by your patient in repetition to ensure a long-lasting effect. Patients are then commonly instructed on appropriate self-MWMs as home exer-cise programs. Taping techniques can also be administered to maintain this 'corrected' position. In addition, these techniques are extremely effective when combined with active muscular strengthening, endurance and facilitation-type exercise, depending on the patient's optimal rehabilitation goals.

Mulligan proposed that injuries or sprains might result in a minor positional fault to a joint thus causing restrictions in physiological movement. Unique to this concept is the mobilization of the spine whilst the spine is in a weight bearing position and directing the mobilization parallel to the spinal facet planes (Mulligan 1999). Passive oscillatory mobilizations called 'NAGs' (natural apophyseal glides) and sustained mobilisations with active movement 'SNAGs' (sustained natural apophyseal glides) are the mainstay of this concept's spinal treatment (Mulligan 1999). Mulligan proposed that when an increase in pain-free range of movement occurs with a SNAG it is primarily the correction of a positional fault at the zygapophyseal joint, although a SNAG also influences the entire spinal functional unit (SFU). Recently, the evolution of this concept has supported the use of a transverse glide applied to the spinous process with active spinal movement. A further development in the 1990s was spinal mobilizations

with limb movements (SMWLMs). Here a sustained transverse glide to the spinous process of a vertebra is applied while the restricted peripheral joint movement is performed actively or passively (Mulligan 1999). The mobilisation must result in a symptom-free movement. Mulligan (1999) proposed that their application was appropriate when peripheral joint limitation of movement could be spinal in origin. This has further evolved into simultaneous gliding of spinal and peripheral joints with movement.

Mobilisations with movements (MWMs) is the terminology used when applying an accessory glide to an active peripheral joint movement and is described in other texts. Literature on the efficacy of Mulligan's techniques is lacking and dominated by descriptive or case report publications (Wilson 2001; Exelby 2001). Recently, however, research measuring the neurophysiological or mechanical effects has been conducted. The majority of this research is confined to peripheral MWMs.

In this masterclass, the principles of examination and treatment are outlined and clinical examples are used to illustrate the concept's application to the spine and how it has evolved and been integrated into physiotherapy practice. New applications are described which can assist in the correction of dysfunctional movement.

Neck pain is a significant contributor to worldwide disability and poses a considerable financial burden to its stakeholders. The prognosis for chronic neck pain is generally poor, and the associated disability seems to be more persistent than low back pain (William et al., 2010). Mechanical neck pain as reported by Côté et al. (2004) is a disabling condition with a course marked by periods of remission and exacerbation. Fejer et al. (2006) and Guez et al. (2002) reported that neck pain is more common in women and its prevalence gradually increases with age. They also stated that certain cervical movements like turning and bending results in unbearable pain, along with crunching sounds and a feel of neck stiffness. Along with neck pain, other disabling features of neck disorders are decrease in range of motion and altered position sense.

The Physiotherapy treatment of musckuloskeletal injuries has progressed from its foundation in remedial gymnastics and active exercise to therapist-applied passive physiological movement and on to therapist-applied accessory techniques. Brian Mulligan's concept of mobilizations with movement (MWMS) is the logical continuance of this evolution with the concurrent application of both therapist applied accessory and patient generated active physiological movements. These techniques were developed by Mulligan in New Zealand through his role as the principle clinical instructor for the New Zealand Manipulative Therapy Associations Graduate Diploma program and over 30 years in private clinical practice. First used in the cervical spine, MWMs quickly found their way into the treatment of peripheral joint dysfunctions and have undergone clinical refinement and expansion to all areas of the spine and most extremity joints.

Mulligan's other spinal manual therapy treatment techniques involve the concurrent application of both therapist applied accessory apophyseal joint gliding and end range active physiological movement on the part of the patient. As these techniques are sustained at the end of available pain-free range and still follow the plane of the apophyseal joints under treatment, they have gained the name "Sustained Natural Apophyseal Glides". "SNAGS" was of course the acronym of choice. Mobilizations with movement in the peripheral joints are also the simultaneous combination of therapist-applied accessory gliding techniques and patient and/or therapist generated physiological movements. They are applicable to most extremity joints and result in immediate and sustained improvement in mobility and function.

Mulligan's mobilisation techniques are thought to increase the range of movement (ROM) in patients with low back pain. The primary aim of this study was to investigate the application of the Mulligan's Sustained Natural Apophyseal Glide (SNAG) technique on lumbar flexion ROM. The secondary aim was to measure the intra- and inter-day reliability of lumbar ROM employing the same procedure.

MULLIGAN CONCEPT

Brian Mulligan, New Zealand, developed mulligan concept in 1960. Exelby (2002) documented that the Mulligan concept is an integral component of many manual physiotherapists' clinical practices around the world. These techniques are widely used for joint dysfunction by growing number of therapists and are an important addition to the field of Manual Therapy. It aims towards the restoration of normal biomechanics of the motion segment and is based on the positional fault theory (Exelby, 2002). Mulligan (2004) proposed that positional faults of articular surfaces might arise either from prolonged micro traumas or by a macro trauma at an instant.

In support to this, Lewit (1985) also stated that this mechanical block caused by the inert structures within a joint could also lead to reduce joint mobility. All the treatment techniques are directed towards correcting this fault. Mulligan (1999) suggested that technique restores the normal movement option to the joint, which may have both mechanical and neurological components. According to him whatever be the mechanism, the clinical result of the approach can be quite gratifying. Unbeaten applicability of Mulligan techniques depends on certain specific guiding principles, like passive accessory glides should never reproduce pain/symptoms. No joint compression should be there. Essentially, all the glides should be along the treatment plane. This necessitates the Mulligan practitioner to be well familiar with joint

anatomy more precisely direction of all spinal joints. Another imperative fact is that all the spinal mobilizations and Mobilisation with Movements (MWMs) are done in weight bearing. Mulligan (2004) says that in non-weight bearing technique, improvements gained are lost when the patient resumes an erect posture.

Mechanical neck pain is usually associated with zygoapophyseal joint maltracking and Mulligan (1999) suggested various treatment options including: Mobilization with movement (MWM), Natural Apophyseal Glides (NAGs) and Sustained Natural Apophyseal Glides (SNAGs). However, passive oscillatory movements called NAGs and sustained glides with active movements are the mainstay of Mulligan's spinal treatment concept (Mulligan, 1999).

MULLIGAN CONCEPT MOBILISATION WITH MOVEMENT FOR SHOULDER DYSFUNCTION

Shoulder dysfunction is a common problem in older adults reaching up to 21% of prevalence. Shoulder symptoms, such as pain and reduced shoulder active range of motion (AROM) and function, might be associated to chronic pain, disability and decline in physical performance over time. Upper limbs and shoulder joint proper functionality leads to an adequate independence in activities of daily living (ADL) and functional performance. Therefore, maintaining independence in ADL and functional well-being in older adults should be a priority target for health care. A successful therapeutic approach depends on the understanding that the aging process is the responsible of major changes involving muscle disorders and joint stiffness. Among the most common approaches to treating in¬dividuals with shoulder dysfunction, physiotherapy interven¬tion is often recommended as the first choice for a conservative treatment. Physiotherapy treatment usually includes therapeutic exercises, manual therapy, and various modalities and there are controversies about the most effective approach for pain reduc¬tion, increase in AROM and function, and decrease in disability in people with shoulder dysfunction. There is evidence about the effectiveness of thera¬peutic exercise, and the benefit of manual therapy for improvements in mobility and a trend in improving pain measures, while increases in function and quality of life are still questionable. Some evidence was found about the effects of therapeutic exercise programs for overall performance improvement in older adults, but not specifically shoulder dysfunction. Regarding manual therapy in elderly, Knebl et al. developed a study about the effectiveness of Spencer manipulative technique in shoulder pain and found an improvement in functionality, shoulder AROM and pain intensity. Van den Dolder et al. investigated the effect of soft tissue massage on shoulder ROM, pain and dysfunction in patients with a mean age of 64 years old and found statistically significant results. Therefore, manual therapy techniques may be an option for correcting joint mechanics, promoting adhesion removal and restoring passive shoulder mobility in older adults. Mobilisation with movement (MWM) is a manual therapy technique based on the analysis and correction of any minor positional fault in a joint. According to Mulligan, positional faults are due to various soft tissue and/or bone lesions in/around the joint and were explained in patients with shoulder pain by a kinematic study. This technique aims to realign joints positional faults by applying a manually specific oriented glide to a painful joint, assessing and adjusting force intensity, while the patient actively performs joint movement, so that patient's symptoms are immediately relieved and the maneuvers improve pain and movement. Therefore, when a correction mobilization is sustained, pain-free movement is restored and several repetitions are performed in order to get an improvement that lasts over time. The initial effects of MWM were assessed by Teys et al. in adults; who proved its effectiveness in increasing shoulder AROM and decreasing positional faults. Therefore, MWM may be an effective technique in physiotherapy treatment for shoulder dysfunction, as this it addresses passive and active shoulder structures. However, no studies about MWM effectiveness for shoulder dysfunction in older adults have been found. The purpose of this pilot clinical trial is to pilot the methods proposed to conduct a full randomized controlled clinical trial to determine the effect of Mulligan concept MWM for shoulder dysfunction in older adults. The primary objectives are to evaluate the feasibility of recruitment, randomisation, retention, assessment procedures, and implementation of Mulligan concept MWM intervention. A secondary aim is to undertake a preliminary comparison of patient reported-outcomes and to estimate the variability of these outcomes in older adults with shoulder dysfunction.

MANUAL THERAPY – SPINAL VERTEBRA MOBILISATION

Manual therapy consists of a range of interventions, including hands-on techniques such joint mobilisation. Joint mobilisation is thought to help maintain or improve extensibility and tensile strength of the articular tissues, reduce the effects of mechanical limitations, elongate hypomobile capsular, ligamentous and connective tissue. It also stimulates mechano-receptors and therefore may be responsible for inhibiting the transmission of nociceptive stimuli and in doing so, reduce pain perception.

Mulligan does not prescribe grades of movement or oscillatory movements. He prescribes taking the joint through its full range of movement and this entails taking it into resistance. The physiotherapist

superimposes an accessory movement onto the patient's active physiological movement with the aim of over-riding the obstruction and re-establishing correct alignment. The accessory movement takes the joint through what would be the normal physiological movement of the joint. The pre-injury joint tracking is re-established reasserting the 'joint memory' or prior conditioning of the healthy joint.

Mulligan's principle techniques are NAGS, SNAGS and MWMs. NAGS are Natural Apophyseal accessory Glides applied to the cervical spine with the patient passive. SNAGS are Sustained Natural Apophyseal accessory Glides whereby the patient attempts to actively move a painful or stiff joint through its range of motion whilst the therapist overlays an accessory glide parallel with the treatment plane. MWMs are Mobilisations With Movement and are applied to the peripheral joints. The underlying principle to MWMs is derived from Kaltenborn (1989 in Exelby 1995) who argued that joint surfaces are not fully congruent, physiological movements are a combination of rotation and glide, and glide is essential to pain free movement. Glide occurs in the direction of bone lever movement where its articulating surface is concave and in the opposite direction when convex. The treatment plane lies at a ninety-degree angle to the concave articulating surface of the bone and treatment is applied parallel to the treatment plane. The anterior-posterior and posterior-anterior movements used in Maitland's techniques follow the same planes in peripheral joints.

SNAGS FOR CERVICAL EXTENSION

A commonly seen clinical presentation is the patient who following acceleration rear-end auto collision experiences an ongoing painful and significant loss of active and passive cervical extension. Practitioners familiar with the system of treatment advocated by McKenzie may wish to use the patient's own forces in this direction to centralize symptoms and "reduce a posterior derangement".

Unfortunately attempts to do so are often met with resistance on the part of the patient due to unacceptable levels of central cervical pain and/or an increase in their peripheral symptoms particularly in the acute phase. SNAGS for extension are a reliable means to safely and efficiently restore the range of cervical extension and decrease the pain associated with this maneuver. The treating therapist will of course have completed a full orthopaedic and neurological scan of the patient ensuring that this is an appropriate candidate for the application of manual therapy techniques.

In order to accomplish one or both of the desired tasks of pain reduction and recovery of function, the patient is seated in a supportive low back chair with the therapist positioned behind. It may be useful to have the patient sit facing a large wall mounted mirror as it allows the therapist to observe the patients facial expression and therefore reaction during the early stages of the technique.

The current range of cervical extension (the comparable sign) is checked for range, rhythm, deviation and limiting factors such as; increasing pain during range, pain at end of the available range or painless stiffness at the end of a reduced range of motion.

The therapist uses the medial border of one thumb reinforced by the pad of the other thumb to apply an anterosuperior accessory glide through the superior spinous process of the involved motion segment. The direction of this mobilization must follow the plane described by the surfaces of the apophyseal joints under treatment. The cervical apophyseal joint planes are directed antero-superiorly with the inclination increasing at lower levels. A general rule of thumb is that the planes of the cervical apophyseal joints converge at or near to the eyes of the patient.

While sustaining this pain-free accessory glide, the patient is instructed to actively perform the comparable sign of cervical extension. The expectation is that the range displayed will significantly increase and any pain previously experienced will be virtually abolished.

As the patient progresses through the increasing physiological range, the therapist must "track" with the spinous process to maintain his/her glide parallel to the changing treatment plane. As such, the therapist's forearms circumscribe an arc whose apex faces antero-superiorly. The end range physiological movement is sustained for several seconds. Overpressure may be given at the end of range by the patient to enhance the effect and the procedure is repeated in sets of five to ten.

The patient's post-treatment range should now be re-evaluated to observe the overall gain without the application of the mobilization component. The therapist should have a clear concept of the patients level of irritability and perform between one to four sets depending on this assessment. One of the most exciting aspects of SNAGS mobilizations is the ability to treat a patient dynamically through a range of movement. Painful arcs or deviations of movement may be addressed dynamically through the affected range as opposed to statically in a series of positions. The possibilities for treatment of combined movements with SNAGS are most rewarding.

CONCLUSION

NAGs are an effective technique for treating cervical spine pain. It has been found to provide immediate pain relief. Subjects in all the three experimental groups reported immediate reduction of pain after the administration of NAGs, while control group had gradual recovery.

Increase in the range of motion, decrease in pain and improved activities of daily living have a positive impact on the anxiety level of the subjects. The STAI scores reduced as the level of anxiety decreased. This has been observed in all the four groups under study. The anxiety level of the subjects in all the four groups reduced systematically as a function of trials. The reduction in pain, increase in the range of motion, and decreased NDI scores had a direct effect on anxiety (STAI score) level of the subjects in all the groups. It has been concluded that whatever be the nature of treatment, the resulting perception of relief results in reduced anxiety levels.

It may, thus, be concluded that NAGs is an effective treatment technique for treating cervical spine pain and stiffness and associated disability. This will serve as evidence in establishing effectiveness of employing the technique as a treatment of cervical spine pain and stiffness. The present study related to NAGs may be considered as an integrated source of evidence based information that bridges the gap between research and best practices.

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