Review Article

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Efficacy of Neural Mobilisation in Hamstring Strain Injury: Current Update

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Abstract

The nervous system mobilization has emerged as a significant addition to the treatment of different musculoskeletal injuries. There are different techniques directed at restoring normal neural physiology andbiomechanics. There are studies suggest one of the factor of recurrent hamstring strain is altered neural tissue mobility. Studies have also shown the effectiveness of neural mobilisation technique to increase hamstring flexibility.

Keywords: Neural Mobilisation; Hamstring Strain; Stretching; Flexibility.

Flexibility is said to be essential in the maintenance and improvement of correct posture, promotion of appropriate and elegant behaviour, and promotion and development of motor skills(Ogura Y et al 2006). Limited flexibility has adverse effect on normal biodynamic balance and function and causes musculoskeletaldamage, pain due to overuse, and reduction in physical performance(Halbertsma JP et al 1996, Hartig DE et al 1999). It is one of the major factors that predisposes the hamstring muscle into strain injuries. The hamstring muscles play an important role in the performanceof daily activities such as controlled movement of the trunk, walking, running, and jumping, and it is an important muscle involved in maintaining balance and posture in standing position. The hamstrings significantly affect flexibility of the body, and reduced hamstring flexibility results in decreases in trunk stability and balance due to improper adjustment of the gluteus maximus and abdominal muscles. Hamstring strain injuries are common problem within elite and recreational sport, regularly resulting in frequent occurrence and lengthy time off sport. These injuries occurs in wide range of sports that involve high speed running like football, soccer, sprtinting, rugby (Bahr & Holme, 2003; Davis, et al 2005; Decoster,et al 2005; Malliaropoulos, et al 2004). The hamstring strain injuries are characterized by acute pain in the posterior thigh and disruption of fibres in the hamstring muscle, these are the most common injury sustained in sports (Orchard and Seward, 2010; Woods et al., 2004; Drezner et al., 2005) andre-occurrence rates are also very high (Orchard and Seward, 2010).The most significant risk factor for future injury is the combination of high rate of injury and a previous hamstring strain (Arnason et al., 2004),this proposes that our understanding of the neuromuscular maladaptations that occur following hamstring strain requires further attention.

There are various predisposing factors for hamstring injury have been suggested within the literature that includes: muscle imbalance (Croisier, 2004; Croisier, et al, 2002);insufficient warm-up (Safran, et al, 1988); neural tension (Turl& George, 1998); poor flexibility (Witvrouw, Danneels, et al 2003); and previous injuries (Bennell et al., 1998; Verrall, et al 2001). Amongst risk factors for hamstring injury, inadequate extensibility within the posterior thigh compartment seems to be one of the more commonly accepted causes (Davis et al., 2005; Decoster, et al 2004) and it has been recommended that stretching afore physical activity could increase extensibility of the stretched muscle, fascia and neural tissues, which could in turn decrease the chance for injury (Halbertsma & Eisma, 1999; Hartig & Henderson, 1999; Ross, 1999). It has also been proposedthat pain occurs due to neural tissue involvement is one factor includes in the etiology and differential diagnosis of grade I hamstring strains.

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Adverse neural tension described as abnormal physiological and mechanical responses produced from the nervous system structures when their normal range of movement and stretch capabilities are tested (Butler DS.1989). This alteration can either be extraneural (ie., an interface problem between the nerve and the tissue that it runs through) and/or intraneural (ie., changes within the nerve). With the close proximity of the sciatic nerve to the hamstrings, adverse neural tension may provide an alternate or additional factor in the etiology of single and/or repetitive hamstring strain. It is possible that repeated injury to the hamstrings could produce inflammation and possible scarring, which could interfere with normal mobility and nutritional well-being of the sciatic nerve, producing clinical sips of adverse neural tension.The impact of strain injuries on the neural function of the involved muscle has been largely overlooked.

Nerve adhesions in the hamstring may alter neurodynamics and cause abnormal mechano sensitivity of the sciatic nerve; which could influence hamstring flexibility. Changes in mechanosensitivity of the neural tissue have been shown to limit hamstring length in normal healthy individuals (Lew and Briggs, 1997; McHugh et al. 2012) and in individuals with previous hamstring injuries(Kornberg & Lew, 1989; Turl and George, 1998). Any mechanical or physiological alterations in the nerve can result in mechanosensitivitywhich is the sensitivity of a nerve to movement (Boyd et al., 2009) and can contribute to pain during movement or sustained postures (Shacklock, 2005). Research has stated a positive slump test in 57%–76% of subjects with a grade I hamstring strain(Turl SE, George KP. 1998). Alternatively, the protective muscle contraction of the hamstring muscles found in the presence of neural mechanosensitivity(Hall T, Zusman M, Elvey R. 1998) might result in hamstrings inflexibility and thereby predispose the muscle to followingstrain injury. In fact, as neural sliding intervention can decrease neural mechanosensitivity, (Hall T, Zusman M, Elvey R. 1998) it is possible that addition of these interventions for the management of muscle tissues would be useful. Neuromeningeal mechano sensitivity presenting clinically as positive adverse neural tension signs is a probable yet only retrospectively studied possible risk factor for or potential differential diagnosis to be considered in hamstring strain injury (Gabbe BJ et al., 2005). The research evidence for stretching as mean of prevention of hamstring strain injuries is equivocal, yet stretching is used commonly for just this purpose.

Neural mobilization techniques have been shown to be effective adjunct interventions in the rehabilitation of patients with grade I hamstring injury (Kornberg C, Lew P., 1989). The principle of neural mobilization is that changes in the mechanics or the physiology of the nervous system can result in other system dysfunctions or dysfunctions of the musculoskeletal structures that receive its innervations. Nowadays *Neurodynamics* is a more recognised term referring to the integrated physiological, biomechanical, and morphological functions of the nervous system. Irrespective of the underlying construct, it is vital that the nervous system is able to adapt to mechanical loads, and it must undergo distinct mechanical events such as elongation, sliding, cross-sectional change, angulation, and compression. If these dynamic protective mechanisms fail, the nervous system is vulnerable to neural edema, ischaemia, fibrosis, and hypoxia, which may cause altered neurodynamics.

When neural mobilization is used for treatment of adverse neurodynamics, the primary theoretical objective is to attempt to restore the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces, thereby allowing reduced intrinsic pressures on the neural tissue and thus promoting optimum physiologic function. The theorized benefits from such techniques include facilitation of nerve gliding, reduction of nerve adherence, dispersion of noxious fluids, increased neural vascularity, and improvement of axoplasmic flow.

When applying neurodynamics, tension occurs in the nervous system, and pressure within the nerve increases due to the decrease of the cross-sectional area, and the axonal transport system lengthens the sciatic nerve after shortening because of the influence of the surrounding related structures and hamstring flexibility. After extension of the nerve and muscle, muscle performance is improved because of increases in the number of muscle fibre segments and cross-sectional area of muscle fibers. Shacklock describes neurodynamic treatment for restricted sciatic nerve mobility in the hamstring in the form of a sliding dysfunction and tension dysfunction. Neurodynamic slider is a type of neural mobilization where one end of the neural system is elongated and other end is slackened. It produces a sliding movement of neural structures relative to their surrounding tissues. Neurodynamic tensioner is the second type of neural mobilization where joint movements are performed simultaneously in order to lengthen the nerve bed, which applies a tensile load to the nerve structures. It relies on the natural viscoelasticity of the nervous system.

Méndez-Sánchez *et al*. applied a neurodynamic sliding technique to the hamstrings of healthy male soccer players, observing a greater improvement in ROM than that after general stretching, and Castellote-Caballero *et al*. also applied a neurodynamic sliding technique to 28 healthy football players, with a significant increase in ROM demonstrated using the passive SLR test. These findings were consistent with the results of this study. These findings can beexplained as follows. If tension is applied to the nervous system while applying neurodynamics, the reduction of the cross-sectional area and increase in pressure in the nerve result in extension and movement of the sciatic nerve together with the hamstring and compliance of the nerve, resulting in increased flexibility.

Conclusion

Hamstring strain injuries are common both in athletic population and general population. Neural mobilisation methodology has been to improve the outcome measures in terms of pain and range of motion. Adverse neurodynamic tension tests(ANDT) are helpful in diagnosing the involvement of neural component in hamstring injury. Neural mobilisation provide facilitation of nerve gliding, reduction of nerve adherence, dispersion of noxious fluids, increased neural vascularity, and improvement of axoplasmic flow. Above this also helps in decreasing the number of AIGS (abnormal impulse generating sites). This thing along with the tensioning component in neural mobilisation helps in management of hamstring injuries.

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