Effectiveness of sustained natural apophyseal glides and scapular strengthening exercises in the patients with chronic cervical dysfunction

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ABSTRACT

Introduction and Aim: Cervical spine dysfunction is a cause of neck pain. It is a common neuro musculoskeletal problem affecting about two thirds of the world population at some point in their lifetime. Aim of the study is to determine the effect of sustain natural apophyseal glides along with scapular strengthening exercises in reducing neck pain by the pre and post analysis.

Materials and Methods: Experimental study was used in this study, and this study was conducted in Saveetha hospital, Chennai. Thirty subjects both male and female diagnosed with neck pain with the age group of 20 to 60 years were recruited and divided into two groups with 15 subjects in each (Group A : 15 subjects, Group B: 15 subjects). Group A was given sustained natural apophyseal glides and scapular strengthening exercises along with interferential therapy, in sets of 5 to 10, 15 minutes per session, 3 days/week for 4 weeks and Group B was given conventional physiotherapy i.e. Resisted neck isometric exercises with interferential therapy 10 repetitions and 3 days/week for 4 weeks duration.

Results: At the end of the study data was analysed and there was a reduction in neck pain.

Conclusion: This study concluded that patients with chronic cervical dysfunction had relieve in pain through sustained natural apophyseal glides and scapular strengthening exercises along with interferential therapy compared to the patients who were given conventional physiotherapy i.e. resisted neck isometric exercises with interferential therapy.

Keywords: Chronic cervical dysfunction; sustained natural apophyseal glides; scapular strengthening exercises; resisted neck isometrics.

INTRODUCTION

Cervical spine dysfunction is a cause of neck pain. The cause for it is believed to be a disorder (most likely malalignment) of the pain-sensitive facet joints (which may also be due to disc disruption). Dysfunction can also cause secondary muscle spasm, which can may lead to more pain and stiffness. The cervical spine consists of 7 cervical vertebrae (back bones) which connect the base of the skull to the thoracic (rib) cage. These vertebrae articulate with one another via intervertebral joints – these include the discs and the facet joints (1).

Neck pain or cervicalgia is a common neuro musculo-skeletal problem, according to the available statistics with two-thirds of the population have neck pain at some point in their lives. Neck pain affects about 330 million people globally as of 2010 (4.9% of the population). It is more common in women (5.7%) than men (3.9%). It is less common than low back pain. Neck pain is defined as the sensation of discomfort in the neck area, it is generalized neck or shoulder pain provoked by sustained neck postures, neck movement, or palpation of the cervical musculature, bad posture, muscular tightness in both the neck and upper back, and pinching of the nerves emanating from the cervical vertebrae. Joints or muscles problems in the neck cause neck pain, upper back or upper extremity and it also arises from numerous different conditions and is sometimes referred to as cervical pain (2). The common symptoms of localized or radicular pain are tenderness, spasm, associated with functional disability. Neck pain is usually felt in the neck, but can be caused by numerous other spinal problems.

Physical therapy is an important component of conservative management of neck pain and post-surgical rehabilitation after neck surgeries. The conservative physical therapy management includes; muscle strengthening, flexibility, and stabilization exercises, mobilization, manipulation, and mechanical traction procedures (2). Joint mobilization is a treatment technique which can be used to manage musculoskeletal dysfunction, by restoring the motion in the respective joint. The techniques are performed by physiotherapists and fall under the category of manual therapy. Spinal mobilization is described in

terms of improving mobility in areas of the spine that are restricted, such restriction may be found in joints, connective tissues or muscles. By removing the restriction by mobilization, the source of pain is reduced and the patient experiences symptomatic relief. This results in gentle mobilizations being used for pain relief while more forceful, deeper mobilizations are effective for decreasing joint stiffness. Mulligan proposed that injuries or sprains might result in a minor "positional fault" to a joint causing restriction in physiological movement. The techniques have been developed to overcome joint `tracking' problems or `positional faults', i.e. joints with subtle biomechanical changes (3).

'SNAGS' is an acronym for 'Sustained Natural Apophyseal Glides'. They are mobilizations which are combined with active or passive movements and at the end of an active range over pressure are applied. There are different Mobilization techniques for neck pain, and mulligan's technique is one of them. It has two techniques: SNAGS and Natural Apophyseal Glides (NAGS). The biomechanical effects of both the accessory and physiological movement components of a cervical SNAG applied ipsilateral to the side of pain when treating painfully restricted cervical rotation. The use of flexion and extension SNAGS, and rotation SNAGS performed contralateral to the side of pain are not considered. A cervical SNAG may clinically be able to resolve painfully restricted cervical spine movement and able to improve the functional activities. Scapulothoracic (ST) muscle impairment has been associated with neck pain. There is evidence of weakness or altered activity in the middle trapezius (MT), lower trapezius (LT) and serratus anterior (SA) muscles in patients with neck pain (4). Specifically, the guidelines state that weakness in the MT, LT and SA may be present in patients with certain types of neck pain. Upper extremity strengthening has been shown to help alleviate neck pain symptoms, with the potential for long term benefits (5, 6). The traditional physiotherapy modalities used for the management of neck pain includes IFT, TENS, ultrasound and the exercise program selected for the scapulothoracic muscles (Serratus anterior, Trapezius, Levator scapulae, Rhomboids). Interferential therapy is electro therapeutic modality used to treat pain. Interferential Therapy decreases musculoskeletal pain by increasing the circulation, promoting an efflux of pain inducing chemical from the site and bye gate control therapy.

It is common to find stiffness and reduced cervical range of movement (ROM) in clinical presentations of mechanical neck pain, cervical spine dysfunction, with a limited ability to perform movements of cervical spine. Normal joints have been designed in such a way that the shape of the articular surfaces, the thickness of the cartilage, the orientation of the fibres of ligaments and capsule, the direction of pull of muscles and tendons, facilitate free but controlled movement while simultaneously minimizing the compressive forces generated by that movement. Neck pain generates psychological problems by decreasing work efficiency, causing troubles in business because of discomfort in the neck, patients with neck pain cannot exercise properly. Therapeutic interventions for neck pain make use of positional exercise, strengthening exercise to muscles, education, rest and intensified training of proprioceptive sensibility under the management & instructions of therapists. Spinal mobilization is described in terms of improving mobility in areas of the spine that are restricted. Such restriction may be found in joints, connective tissues or muscles. These restrictions can occur due to muscle spasm, reduced joint mobility, reduced muscle flexibility etc., By removing the restriction by mobilization, the source of pain is reduced and the patient experiences symptomatic relief. Hence, Mulligan technique plays vital role to reduce pain and increase range of motion in patients with neck pain which will improve patient's functional capability.

MATERIALS AND METHODS

With ethical clearance obtained from the Institute, study was conducted in Saveetha Medical College, Physiotherapy outpatient department, with study design as Quasi experimental study, sampling method as random block method, and sample size of 30 subjects divided into two groups with 15 subjects in each group. Subjects were included into study based on the inclusion criteria as both male and female subjects diagnosed with neck pain with the age group of 20 to 60yrs and subjects were excluded from study if there was any (a) contraindication to spinal mobilization like inflammation, infection, advanced degeneration, congenital mal formation, trauma, cerebrovascular abnormalities; (b) Positive neurological examination, (presence of positive motor reflex, or sensory abnormalities indicating spinal root compression); (c) cervical spine surgery or stenosis, metabolic or systemic disorders or cancer; (d) Associated pathology of the upper cervical region or upper limb that may cause overlapping with the clinical finding as referred pain from cost-transverse joint, rotator cuff tendonitis, and cervical rib syndrome (7); (e) History spinal surgeries; (f) Deformities of spine and upper limb; (g) Prior history of cancer, infection; (h) Prosthesis fitness. Materials used for the study are Interferential unit (calibrated), weights (for resistance) and treatment couch.

Procedure

According to inclusion and exclusion criteria prior to the study, the principal researchers explained the procedures to all of the subjects and inform consent was obtained, using random block method, 30 patients were selected from Physiotherapy–out patient department and were allocated to two groups namely control and experimental with 15 patients in each group. After recruitment on eligibility, informed consent will be obtained on explaining the treatment to be given. Group A: Experimental group-sustained natural apophyseal glides (SNAGS) and scapular strengthening exercises with interferential therapy. Interferential therapy – with Parameters -Intensity: maximum sensory, mild motor sensation, frequency of machine: 1-100 Hz and Duration: 15 minutes per session. SNAGs mobilization: The patients in Group 1 received the specialized SNAGs technique (8-11). Patient position: The patient was seated in a supportive low back chair; thus the cervical spine was in a vertical position (i.e. weight bearing position) Therapist position: The therapist's position behind the patient. Procedure: The therapist used the medial border of one thumb's distal phalanx reinforced by the pad of the other thumb to apply an antero-superior accessory glide through the superior spinous process, the therapist's contact points are central on the spine unless notated otherwise. Documentation must stipulate whether the therapist's contact position is on the right or left of the spinal segment as a SNAG may be ipsilateral or contralateral to the active movement. As the patient progressed through the increasing physiological range, the therapist tracked the spinous process to maintain his glide parallel to the changing treatment plane. The end-range physiological movement was sustained for several seconds. Overpressure was given at the end of the range by the patient to enhance the effect.

The patient returned to the starting position actively while the therapist maintained the gliding. The procedures were repeated in sets of 5 to 10, with a duration of 15 minutes per session frequency of treatment: 3 days/week for 4 weeks.

Scapular strengthening exercises

Scapular strengthening exercises will be individualised focusing on Serratus anterior, trapezius, Levator scapulae, Rhomboids. Based on assessment of power, resistance added accordingly for strengthening protocol. Serratus anterior-dynamic hug, push-up plus, scaption with external rotation, diagonal PNF (shoulder flexion, horizontal flexion, external rotation), Trapezius - Upper trapezius: unilateral shoulder shrug, rowing, forward shoulder flexion, scaption with external rotation, shoulder abduction in scapular plane above 120 degrees. Middle trapezius: prone shoulder horizontal abduction, scaption, horizontal abduction with external rotation and for Lower trapezius: unilateral scapular retraction, prone bilateral shoulder external rotation at 90 degrees of abduction, prone shoulder abduction. Levator Scapulae - Rowing, horizontal abduction, shrug, horizontal abduction with ER, prone shoulder extension. Rhomboids - ER at 90° of abduction, ER at 0° of abduction, horizontal abduction, shoulder extension, scaption. Each exercise with 15 repetitions for each set- 3sets/day, 3 days /week for 4 weeks. Group B: Control Group - Control group will be given the conventional physiotherapy i.e. Resisted neck isometric exercises with interferential therapy. Subject is instructed to sit in a chair with his back straight. Patient is asked to hold the resistance for 10 seconds and relaxed. Dosage: This was done for 10 repetitions and 3 days/week / 4 weeks duration.

Statistical analysis

The data was statistically analysed using "t" test. Paired t test was used to analyse the pre-test and post-test values within the group. Student's 't' test was used to analyse the pre and post-test values between the groups.

Table1: Pre-test and Post-test values of group A-Experimental group

Group A		Mean in%	Standard deviation in%	t value	p value
Neck Disability Index (NDI) in %	Pre-test	17.00	4.74	24.55	<0.0001
	Post test	14.77	9.02		

The data from the above table shows the pre-test and post-test values of neck disability index in Group-A Subjects. The pre-test mean value of NDI is 17.00% with Standard deviation 4.74 and post-test mean value is 14.77 with SD 9.02, this shows that NDI score are gradually increasing with the P value (0.0001) statistically significant.

Table 2: Pre-test and Post-test values of group B- control group

Group A		Mean in%	Standard deviation in%	t value	p value
Neck Disability Index (NDI) in %	Pre-test	20.27	1.91	14.560	0.0001
	Post test	13.80	2.57		

The data from above table shows the pre-test and post-test values of NDI in Group-B Subjects. The pre-test mean value of NDI is 20.27 with SD 1.91 and post-test mean value is 13.80 with SD 2.57 this shows that NDI score are gradually increasing with the P value (0.0001) statistically significant.

Table 3: Comparison between group A-Experimental group and group B- Control group

Parameter	Post Test Values				't' test	P value
	Group A		Group B			
	Mean	Standard deviation	Mean	Standard deviation		
Neck Disability Index (NDI) in%	12.00	3.36	13.80	2.57	1.6484	<0.0001

The data from above table shows the post-test values of NDI in group A and group B. The post-test mean value of NDI in group- A is 12.00% with SD 3.36 and post-test mean value of NDI in Group-B is 13.80% with SD 2.57.

RESULTS

From statistical analysis made with the quantitative data revealed significant difference ($p<0.0001$) between the pre-test and post-test values of Neck Disability Index (NDI) with SNAGs, scapular strengthening exercises, IFT and resisted neck isometrics with IFT.

The pre-test value of NDI with SNAGs, scapular strengthening exercises, IFT (Group-A) was Mean value 17.00 (SD=4.74). The post-test value of NDI with SNAGs, scapular strengthening exercises, IFT (Group-A) was Mean value 14.77 (SD=9.02). This shows that Neck Disability Index (NDI) in post-test values are comparatively less than pre-test value-$p<0.0001$ and t-value was 24.55. The pre-test value of NDI with Resisted neck isometrics and IFT (Group-B) was Mean value 20.27 (SD=1.91). The post-test value of NDI with Resisted neck isometrics and IFT (Group-B), was Mean value 13.80 (SD=1.91). This shows that NDI in post-test values are comparatively less than pre-test value-p-0.0001 and t-value was 14.56.

The Post-test mean value of NDI in group A is 12.00 (SD=3.36) and in group B is 13.80. (SD=2.57) This shows that NDI in Group B disability value were comparatively more than Group A disability value, $P<0.0001$and t-value 1.64. Statistical Analysis of post-test, NDI revealed that there is high statistically significant difference of $p<0.0001$ seen between group A and group B.

DISCUSSION

The present study was conducted to study the effectiveness of mulligan technique combined with scapular strengthening exercises and interferential therapy in treatment of chronic cervical spine dysfunction by comparing with resisted neck isometrics with interferential therapy. Both treatments were done for 3 days per week for 4 weeks. NDI was used to measure outcome. The results of this study demonstrated that SNAGS followed by scapular strengthening exercises with interferential therapy can better manage pain and disability as compared with resisted neck isometric exercises with interferential therapy alone in the management of chronic cervical spine dysfunction. The current study rigorously tested mulligan technique to determine whether this technique is effective in cervical spine dysfunction (neck pain). The study results showed statistically and clinically significantly reducing neck pain. The traditional physiotherapy modalities used for the management of neck pain includes and the traditional exercise program selected results for scapular muscles focusing on Serratus anterior, Trapezius, Levator Scapulae, Rhomboids based on assessment of power, resistance added accordingly for strengthening protocol. ST muscle impairment has been associated with neck pain. There is evidence of weakness or altered activity in the MT, LT and SA muscles in patients with neck pain (12). Specifically, the guidelines state that weakness in the MT, LT and SA may be present in patients with certain types of neck pain. Upper extremity strengthening has been shown to help alleviate neck pain symptoms, with the potential for long-term benefits (13). Patients who came with neck pain, cervical movement restriction and other activities which were limiting their functional movements had an immediate relief from pain and restricted range of motion who underwent SNAGs sessions, although few patients had reported mild pain at end range of movements. Patient had difficulty in holding weights during exercise sessions due to pain in the neck.

CONCLUSION

This study shows better improvement in reducing cervical spine dysfunction (neck pain) in Mulligan technique and scapular strengthening exercise than resisted neck isometrics. Both the techniques can be used in clinical practice.

CONFLICT OF INTEREST

All contributing authors declare that there is no conflicts of interest.

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