" EFFECTIVENESS OF MANUAL THERAPY TECHNIQUES IN CHRONIC NECK PAIN- A CLINICAL TRIAL"

A Dissertation

Submitted

In Partial Fulfillment of the Requirements

for the Degree of

MASTER OF PHYSIOTHERAPY

In

Musculoskeletal

Submitted by

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Under the Supervision of

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May, 2022

Annexure-I

CERTIFICATE SUPERVISOR

This is to certify that **Mr. /Miss. Hera Eqbal** (Enroll. No.-1500100849) ha**s** carried out the research work presented in the thesis titled "**Effectiveness of Manual Therapy Techniques in chronic Neck Pain-A Clinical Trial"** submitted for partial fulfillment for the award of the **Degree of Master of Physiotherapy in Musculoskeletal** from **Integral University, Lucknow** under my supervision.

It is also certified that:

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This is to certify that **Mr. /Miss. Hera Eqbal** (Enroll. No. 1500100849) ha**s** carried out the research work presented in the thesis titled "**Effectiveness of Manual Therapy Techniques in chronic Neck Pain-A Clinical Trial"** submitted for partial fulfillment for the award of the **Degree of Master of Physiotherapy in Musculoskeletal** from **Integral University, Lucknow.**

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CERTIFICATE (HEAD OF DEPARTMENT)

I hereby recommend that the project prepared under my supervision by **Hera Eqbal** (Enroll. No. 1500100849) ha**s** carried out the research work presented in the thesis titled "**Effectiveness of Manual Therapy Techniques in chronic Neck Pain-A Clinical Trial"** submitted for partial fulfillment for the award of the **Degree of Master of Physiotherapy in Musculoskeletal** from **Integral University, Lucknow.**

Dr. Abdur Raheem khan: _____

Annexure-III

DECLARATION

I hereby declare that the thesis titled "**Effectiveness of Manual Therapy Techniques in chronic Neck Pain-A Clinical Trial"** is an authentic record of the research work carried out by me under the supervision of Prof. ((Dr.) Abdur Raheem Khan, Dr. A. M. H. Inam (PT), Department of Physiotherapy, for the period from January 2022 to May, 2022 at Integral University, Lucknow. No part of this thesis has been presented elsewhere for any other degree or diploma earlier.

I declare that I have faithfully acknowledged and referred to the works of other researchers wherever their published works have been cited in the thesis. I further certify that I have not willfully taken other's work, para, text, data, results, tables, figures etc. reported in the journals, books, magazines, reports, dissertations, theses, etc., or available at web-sites without their permission, and have not included those in this M.P.T. dissertation citing as my own work.

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Annexure-IV

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Annexure-V

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I certainly owe my gratitude to my **PARENTS,** my **BROTHER &**my **GRANDMOTHERS,** for their never ending love and support and being there as a strong and unshakable force now and forever this work is dedicated to them.

Date:

Place: Lucknow **Hera Eqbal**

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LIST OF ABBREVIATIONS USE

Cms	- Centimeters
EMG	- Electromyography
HMP	- Hot moist pack
Lt	- Left
MWM	- Movement with Mobilization NAGS
	- Natural Apophyseal Glides NDI
	- Neck Disability Index
RCT	- Randomized clinical trial
ROM	- Range of motion
Rt	- Right
SNAGS	- Sustain ed Natural Apophyseal Glides SPSS-
	Statistical package social sciences TENS
	- Transcutaneous electrical nerve
stimulation	
VAS	- Visual analogue scale

ABSTRACT

TITLE

"Effectiveness of Manual Therapy Techniques in chronic Neck Pain-A Clinical Trial"

Background and Objectives

Chronic pain is defined as the pain that continues even after the stimulus is removed or the tissue damage heals. Physiologically, chronic pain is believed to result from hypersensitization of the pain receptors and enlargement of the receptor field in response to the localized inflammation that follows tissue damage. Chronic pain is poorly localized and has an ill-defined time of onset. The effects of pain experience extend beyond the individual and affect the family, the workplace and the social sphere of the individual. It is characterized by Loss of normal cervical lordosis with severe muscle spasm, neck pain exacerbate with any movement of neck, restriction of range of motion, neck pain which radiates till the shoulder etc.

As Natural Apophyseal Glides & Sustained Natural Apophyseal Glides are the fascinating manual therapy approach in the treatment of chronic neck pain, very few studies have proved effectiveness of these manual approaches. The objectives of the present study were to study the effectiveness of NAGS & SNAGS & to compare the effectiveness of NAGS & SNAGS in chronic neck pain.

Materials and Method

The present randomized clinical trial was conducted among 40 participants which included both male and female symptomatic individuals between the age of 20 to 60 years with chronic neck pain. Pre-interventional and post-interventional outcome measurements were taken in the form of visual analogue scale, cervical range of motion of flexion, extension, lateral flexion and rotation and Neck Disability Index(NDI).

RESULT

In the present study, within group analysis showed that pain relief, improved range of motion and reduced disability was statistically significant in both the groups ($p<0.0001$) whereas considering the reliability and validity of neck disability index, the between group analysis revealed that Group B (Sustained Natural Apophyseal Glides) was statistically significant as compared to Group A (Natural Apophyseal Glides). And in pain relief Group B (SNAGS) showed statistical significance over Group A (NAGS).

CONCLUSION

The present study demonstrates that both the groups viz Natural Apophyseal Glides & Sustained Natural Apophyseal Glides are effective in relieving pain, improving cervical range of motion and reducing disability in subjects with chronic neck pain. Further it was observed that Sustained Natural Apophyseal Glides technique was more effective than the Natural Apophyseal Glides techniques in reducing pain & disability in subjects with chronic neck pain.

Key Words: Chronic neck pain; NAGS, SNAGS, NDI.

CHAPTER-1

INTRODUCTION

Human spine acts as a flexible column extending the length of the torso. Cervical spine supports the head, provides attachment for the muscles of the neck and the upper extremity. As humans have achieved erect posture, the cervical spine has evolved to obtain a remarkable degree of mobility and flexibility. Normally, neck moves over 600 times an hour.[1] whether the person is awake or asleep.

Spine consists of 33 vertebrae with different shapes and functions of each of the five regions. When viewed laterally, the spine forms five major curves; which correspond to the different lesions of the column of which cervical curve is the least marked and is present in the cervical spine with convexity anteriorly.[2,3] The cervical portion of the human spine comprises of seven body segments, typically referred to as C-1 to C-7, with cartilaginous discs between each vertebral body. The mobility of spine depends on an anatomical integrity. As cervical spine has got more mobility and poor anatomical support, it may lead to early pathological changes and which in turn give rise to neckpain.[4]

The neck supports the weight of the head and protects the nerves that travel from the brain down to the rest of the body. Neck motion occurring by the movement of each cervical function unit consists of muscles, ligaments, bones, joints and nerve roots. Restriction of any of these functional units can lead to neck pain, which is the second largest cause of time off work after low back pain.[5,6]

In a systematic review of the incidence of neck pain in populations around the world the point prevalence varied from 5.9% to 38.7%, the annual prevalence ranged from 16.7% to 75.1%.[7] In a summary, approximately 10% to 20% of the population report neck problems at a given point in time and up to 70% will experience neck pain at some point in their lives.[8,9]

Neck pain and its related disability cause an important socioeconomic burden to society. According to etiological and temporal variation neck pain is broadly classified into two categories, specific or non-specific and acute or chronic neck pain respectively.

Specific neck pain includes cervical spondylosis, spondylolisthesis, ankylosing spondylitis, cervical myelopathy etc. Non-specific neck pain includes neck strain, sprain, mechanical neck disorders, whiplash and neck-and-shoulder pain due to occupational stress and because of acquired abnormal posture which is influenced by daily activities.[10] Limited range of motion and a subjective feeling of stiffness may accompany neck pain, which is often precipitated or aggravated by neck movements or sustained neck posture. Although history taking and diagnostic examination can suggest a potential cause, in most cases the pathologic basis for neck pain is unclear so the pain is labeled non-specific.

Acute neck pain is usually the result of injury or accident, most often road vehicle accident associated with whiplash. Whiplash as described by Spitzer is an acceleration-deceleration mechanism of energy transfer to the neck. It may result from rear-end or side-impact motor vehicle collisions, but can also occur during driving or other mishaps.[11] The impact may result in bony or soft tissue injuries which in turn may lead to a variety of clinical manifestations. This condition is more common in western societies and metropolitan areas with greater concentrations of automobiles. Whiplash injuries are the most frequent cause of cervical sprains and strains which leads to a traumatic overstretching or tearing of ligaments or tendons respectively.

Some prognostic studies have suggested that chronic neck pain is related to repetitive a working condition which leads to postural strain due to faulty sitting posture or excessive desk or computer work. Neck pain usually becomes chronic as it progresses. It is defined as the pain that continues even after the stimulus is removed or the tissue damage heals.[12] Physiologically, chronic pain is believed to result from hypersensitization of the pain receptors and enlargement of the receptor field in response to the localized inflammation that follows tissue damage. Chronic pain is poorly localized and has an ill-defined time of onset. The effects of pain experience extend beyond the individual and affect the family, the workplace and the social sphere of the individual.

A number of factors are commonly thought to increase the risk of neck pain. It is more common in females. Prevalence is known to increase with age due to wear and tear phenomenon causing a loss of the shock absorbing capacity of the intervertebral disc spaces. Most uncomplicated neck pains are associated with poor posture, anxiety, depression, neck strain and occupational injuries. The social nature of the work environment is the strongest risk factor for neck pain.[13]

When job demands repeatedly, exceeds the biomechanical capacity of the worker, the activities become trauma inducing.[14] Hence traumatogens are workplace sources of biomechanical strain that contribute to the onset of injuries affecting the musculoskeletal system. Some job workers who need operating computer and viewing the screen acquire forward head posture. When head posture is optimal, the apex of the lordotic curve is usually at C4-C5 and head's centre of gravity is at a point just anterior to the cervical spine and superior to Temporomandibular joint but when head is held forward, this changes the lower cervical segments flex for the head to looking forward so the apex of the cervical lordosis shifts upward. This may result in increased compression forces on the lower cervical segments, which can lead to pathology of the lower cervicalsegment.[15]

Neck pain is one of the most common conditions for referral to a physiotherapist. Physical therapy is a popular non-surgical approach which is relatively safe and possibly effective in the management of patients with neck pain. It includes passive treatment such as massage, low level laser therapy, interferential therapy, cervical traction, heat application, cold spray etc. Active treatment such as range of motion exercises, proprioceptive exercises, strengthening and stretching programme. But clinically useful information is lacking with regard to effectiveness of non-surgical treatment approaches.[16]

Moist heat is often used prior to other forms of treatment. Heating modalities create local and reflex effects. The local response is an increase in tissue temperature and metabolic rate and the reflex effects includes regional and generalized responses.

. The regional responses include increase blood flow to the treated area and muscle relaxation. The generalized responses include increased blood flow to contralateral limb, sedation, and sweating and body thermoregulation.[17]

Heat can be delivered in the form of conduction, convection and conversion according to their primary mode of transfer. Superficial heating by conduction occur whenever two objects of differing temperature come in contact with each other. Hydrocollater pack, paraffin bath, electric heating modalities comes under conduction category. The commercial hot pack is a conductive means of delivering moist heat to the patient. The pack is made of canvas and filled with silica gel. It is immersed in water of about 170^0F in a thermostatically controlled heater. Moist heat therapy of 10-15 minutes of duration is adequate. Its therapeutic effects include reduction of muscle spasm, relaxation of the muscles, pain relief & sedation, facilitation of joint motion & preparation of tissues for rehabilitation. Moist heat may increase the extensibility of connective tissue. It is due to the effect of heat on the elastic tissues.[18]

Therapeutic exercises also have been widely incorporated to relieve pain, increase the mobility and strengthen the musculature. Isometric exercise is a static form of exercise that occurs when a muscle contracts without appreciable change in length of the muscle or without visible joint motion. Isometric exercise is commonly used to increase the muscle performance. Although no joint movement occurs it is considered functional because it provides a strength base for dynamic exercise and because many postural muscles work primarily in an isometric fashion.[19]

Manual therapy has been known to supplement and contribute to other medical specialties especially in a field of conservative orthopaedics, physical medicine, neurologic and rheumatologic rehabilitation. Osteopathic manipulative therapy, the hallmark of osteopathic treatment as developed by Still is used in patient care which is recognized as having beneficial effects not only in the treatment of pain but also to decrease physiologic stress and assist the body's self healing mechanism.

Manual therapy used by physiotherapists in treating neck pain which involves joint mobilization technique. These mobilization techniques are often used to modulate and treat joint dysfunction that limits range of motion by specifically addressing the altered mechanics of thejoint.[20]

The altered mechanics may be from pain and muscle guarding, from joint effusions, from contractures or adhesions in the joint capsule, or supporting ligamentsor from malalignment, or subluxation of bony surfaces. Various mobilization techniques used in physiotherapy practice are Mulligan's, Maitland, Mckenzie, Kaltenborn, Cyraix, Alexander, Feldenkrais etc.

Brian Mulligan has developed a most ingenious complication of manual techniques. His principle techniques are NAGS, SNAGS, SMWAMS and MWM. NAGS are Natural apophyseal accessory glides applied to the cervical spine, SNAGS are Sustained natural apophyseal glides where patient actively moves a painful or stiff joint through its range of motion, SMWAMS is Spinal mobilization with arm movement and MWM refers to Mobilization with movement.[21] His techniques are articular in nature and are thought to produce both a biomechanical and neurological effect. Like Kaltenborn, Mulligan's treatment concept is based on appropriate treatment plane of the joint. Pain-free movement is achieved when mobilization is performed at a right angle or parallel to the treatment plane and is sustained throughout the movement. Unlike other mobilization procedures, Mulligan performed his techniques on patients while they were moving, either actively or passively, or while they were performing a resisted muscle contraction. This technique is performed in symptom free range of motion, a factor that probably makes it safer than many other manual therapyapproaches.[22]

A study conducted on mulligan's mobilization with movement concluded that it has an immediate positive effect on substantial pain reduction accompanied by improved function.[23]

Although a combination of manual therapy or physical therapy that includes exercises appears to be effective for neck pain, these therapies have not been studied in sufficient detail to draw firm conclusion and methodologic quality of most trials on neck pain is rather low.

So it is important from physiotherapeutic point of view to use an effective manual approach that gives highest relief of pain, restores mobility and thereby maximum restoration of function. Hence the present study is intended to compare the effectiveness of SNAGS and NAGS in treatment of chronic neck pain.

OBJECTIVES

1. To study the effectiveness of SNAGS in subjects with chronic neck pain.
2. To study the effectiveness of NAGS in subjects with chronic neck pain.
3. To compare the effectiveness of SNAGS & NAGS in subjects with chronic neck pain.

HYPOTHESES

1) Null Hypothesis{H_0}:

There will be no difference between the outcome measures for subjects treated by SNAGS and NAGS in terms of pain and range of motion and functional disability.

2) Alternative Hypothesis {H_a}:

There will be difference between the outcome measures for subjects treated by SNAGS and NAGS in terms of pain and range of motion and functional disability.

CHAPTER-2
REVIEW OF LITERATURE

Neck pain is a common regional pain syndrome. It may arise from the muscles, nerves, joints, tendons, soft tissues or bones, neural tissue, periosteum, ligaments. The pain that continues even after the stimulus is removed or the tissue damage heals is called as chronic neck pain. There is no consistent clinical classification system for neck pain or cervical pain in the literature.[2]

Definitions of commonly used nomenclature:

Non-specific neck pain: Is defined as pain in the neck area, with or without radiation to the extremities or neck pain due to strain of muscle and joints rather than to some serious problem such as broken bone. It is a kind of neck pain where no specific cause can be identified. Neck strain, sprain, mechanical neck disorders, neck-and-shoulder pain due to occupational stress and because of acquired abnormal posture which is influenced by daily activities included in non-specific neck pain. Whiplash may be included in this definition.[24]

Mechanical Neck Disorders: is described as neck pain with or without referral to a proximal extremity and includes conditions with muscles, joint, ligaments or disc.[25]

Uncomplicated Neck pain: is a neck pain that may or may not radiate to the arms, base of the skull, upper back, face or scalp. The pain is poorly localized. It has multifactorial causes and the natural history is poorly understood.[26]

Cervical Spinal pain of unknown origin (CPUO) : When serious pathology and specific disease have been excluded, the anatomical source of symptom is difficult toestablish in many patients with neck pain. Consequently, the term cervical spinal pain of unknown origin has been recommended for this patient group.[27]

Categories of neck pain:

Temporal classification by **Nachemson AL. and Jonsson** is as follows. Acute neck pain : 0-3 wks duration of pain/disability.

Sub-acute neck pain: 4-12 wks duration of pain/disability. Chronic neck pain : more than 12 wks duration of pain/disability.

Most of the literature divides neck pain into categories determined by the duration of the symptoms is as follows:[26]

Acute neck pain:is from its onset through to 30 days of symptoms (< 4 wks) Sub -acute neck pain:is symptoms that lasts from 30 days to 90 days.

Chronic neck pain:is pain lasting greater than 90 days.

There is no broad consensus in the defining of neck pain categories. In much of the medical literature neck pain is divided into only 2 categories: Acute pain may be defined as neck pain that lasts less than or equal to 6 weeks and chronic neck pain may be defined as neck pain that lasts longer than 6 weeks.

Chronic pain in prevalent. The American Pain Society reports that 45% of all Americans seek medical care for chronic pain at some point in their lives.[12]

Classification on the basis of dominant pain-aggravating activity[27] and on the pain response to active movement test is,

Loading Disorder: reported their pain is being primarily aggravated by sustained positions or postures and on examination there was no pain reproduction with active or repeated movements in any direction.

Movement Disorder: reported their pain as being primarily associated with single or repeated movement activities and on examination their pain was reproduced with active or repeated movements in at least one direction.

Epidemiology:

Neck pain is the second largest cause of time off work after low back pain & millions of people experience neck pain at some point in their life.[5,6] Although the prevalence of neck & back disorders appears to vary among different nations, the situation is essentially the same, at least in the industrialized nations.

In a systemic review of the incidence of neck pain in populations around the world the point prevalence varied from 5.9% to 38.7%, the annual prevalence ranged from 16.7% to

75.1%. In a summary, approximately 10% to 20% of the population report neck problems at a given point in time and up to 70% will experience neck pain at some point in their lives.[7]

Study done by **Hagberg et al** found high prevalences in groups of workers exposed to static contraction of the shoulder & neck muscles and or use of force & repetition. The prevalence ranged from 14 to 61% of workers with odd ratios ranging from 2 to 7. Reported rates were higher in women.[28]

A study showed that, approximately 10% to 20% of the population report neck problems at a given point in time & up to 70% will experience neck pain in some point in their lives. Incidence of neck pain in the uninjured orpre-injured general population has been estimated to be about 7 %. In a more recent report Bland reports that about 12% of women & 9% of men have neck pain at any given time.[29]

A study done by **Hardin & Halla et al** stated that at one time or another neck pain may affect 1/3rd of the adult population. In 10-15% of affected patients it can persist for 6 months orlonger.[30]

Cervical radiculopathy is a lesion of the cervical spinal nerve root with reported prevalence of 3.3 cases per 1000 people; peak annual incidence is 2.1 cases per 1000 and occurs in the fourth and fifth decades of life. Nerve root injury has the potential to produce significant functional limitations and disability.

The average annual age adjusted incidence rates per 100,000 populations for cervical radiculopathy in Rochester were 83.2 for the total, 107.3 for males and 63.5 for females. The age specific annual incidence rate per 100,000 populations reached a peak of 202.9 for the age group 50 – 54 years. Reported involvement of nerve roots C7 in 69 to 70% of cases, C6 in 19 to 25% and C5 2 % of radiculopathycases.[31]

Ayman Ali Gallom et al [2005] – Suggested that the the symptoms of cervical spondylosis may appear in those as young as 30 years & more commonly in those aged 40-60 years. Morbidity ages from chronic neck pain, radicular pain, diminished range of motion,

headache, weakness & impaired fine motor coordination. Both sexes are affected equally. When cervical spondylosis develops in young individuals it is almost always secondary to a predisposing abnormality in one of the joints between cervical vertebras probably as a result of previous mildtrauma.[32]

Following car accidents, about 30% of car occupants suffer from neck pain; many remain symptomatic for a prolong period. Although a majority of individualswith neck pain experience mild neck pain, most people with neck disorders experience low level of disability & less than 5% population is disabled withit.Neck pain is commonly a recurrent condition with remissions & exacerbation that do not completely resolve. A history of previous injury to the neck including whiplash, sports & work injuries increases the likelihood of chronic pain. As one ages, more chronic neck painpersists.[33]

Aetiology:

Postural defect, muscle imbalance, abnormal movement, overuse are manifested in the form of neck strain or sprain.

Risk Factors:

History of previous neck injury or trauma.

Occupational injuries:

Strong evidence is in the favor of working groups with high levels of static contraction, prolonged static loads or extreme working postures involving the neck/shoulder musculoskeletal disorders. Twenty-seven out of thirty- one studies found a statistically significant association between posture & neck/shoulder musculoskeletal disorders.[34]

Work Posture:

Have been identified with an increased incidence of injury. Head & neck postures will be compromised by visual demands; upper limb posture will be compromised if the hands are used. The difficulties start to become apparent when people do stereotyped, repetitive movements or they sustain postures that are physiologically demanding.

Study done by **Sankarvenkat et al** revealed work related risk factors for neck pain among library professionals in an academic library & concluded that, The prevalence of neck pain among library professionals was found to be 56 percent. Wrong neck posture, inadequate breaks, presence of psychological distress, increased duration of daily sitting at work and female gender were the risk factors among the library professionals.

Overuse Injuries:

Constitutes an important component in over 50% of musculoskeletal injuries which is characterized by poor posture, muscle imbalance & strain. Approximately 25% of all sick-leave taken in the work place being due to such problems.[35]

According to Robert S Wainner, cervical radiculopathy is said to be of non-traumatic origin and occurs spontaneously in the majority of the cases. It is related with a history of physical exertion or trauma oroverstress.[36]

Study done by **Hochanadel CD** revealed that with the advent of the computer & its introduction into a broad spectrum of work environments on an unprecedented scale, there has been a substantial increase in overuse injuries to body parts associated with computer use.[37]
There are certain areas of high biomechanical strain, notably the junction of the neck & cranium, & the cervicothoracic & lumbosacral junctions.

Ergonomic Consideration at workplace:

Computer work:

Villanueva et al studied neck flexion angle & EMG readings in healthy subjects performing a mouse-driven VDU task at 3 different screen heights of 80cm, 100cm &120cm. The postural analysis showed that neck posture became more erect at higher screen heights, & this correlated with significantly decreased EMG readings of the cervicalextensors.[38]

Reading & writing task:

For writing tasks there is a trade-off between improving visual angles & creating elevated

& unsupported postures for the arm when writing. These can increase tension in the upper arm & scapular stabilizing musculature. The low, flat desk demands a poor flexed posture for the neck & spine for reading & writing tasks.

There is evidence that small amount of slope can have a significant effect on posture.

Kerstin Ekberg stated that there is a lack of rehabilitation programs that also involve the workplace as a significant variable. Epidemiologic studies have pointed out aspects of the work environment that are risk factors for developing musculoskeletal disorders, delaying return to work, and for promoting relapse. An understanding of risk factors and the ability to identify and alter them is the basis for effective rehabilitation and prevention programs.[39]

Psychosocial aspects: Includes job satisfaction levels, work stress, control over work, social support, anxiety, depressionetc.[40]

Also sleeping habit, Pillow, increasing time spent on telephone with neck greater than 15 degrees of flexion & upper arm greater than 60 degrees of abduction, bifocal use in data processing, smoking habit, poor diet & nutritional practices, physical inactivity, past history of low back pain are some risk factors which has to be taken into consideration.[41]

Pathology:

Several structures have been shown to cause pain in the neck and shoulder area: bones, nerves, discs, longitudinal ligaments, muscles, facet joints, and dura are capable of evoking pain, when irritated or inflamed. The pain can be classified as nociceptive, neuropathic, or idiopathic in origin, of which nociceptive pain appears most often. During the acute phase, the pain is often of nociceptive origin, but when it progresses toward a chronic phase, the influence of psychologic and social factors becomes more marked.[42]

Eight levels of the neck along the vertebral column from C1 down to C8 can be affected by overuse, sport, age, postural positions and soon.

Physiologically, chronic pain is believed to result from hypersensitization of the pain receptors and enlargement of the receptor field in response to the localized inflammation that follows tissue damage.[42]

CLINICAL FEATURES:

Chronic neck pain can occur at any age, & the patient can usually cite the trauma involved. It is defined as the pain that continues even after the stimulus is removed or the tissue damage heals.

1. Neck pain which may radiate to the shoulders, interscapular region or to the base of the skull. Such unusual sensations in the upper extremity has sclerotomal reference rather than dermatomal type typically seen in radiculopathy.[43]
2. Loss of normal cervical lordosis with severe muscle spasm.
3. Neck pain exacerbate with any movement of neck.
4. Restriction of range of motion.
5. Neck pain which radiates till the shoulder.
6. The patient frequently complains of headache especially after Whiplash injuries.

INVESTIGATIONS:

1. **RADIOGRAPHS:** The radiographic examination of the cervical spine is valuable first step in the radiologic evaluation of a patient with cervical disc disease. It is a rapid, inexpensive way to screen for unsuspected bony pathology, degenerative changes, the destructive effects of infection or tumour, cervical canal dimensions and as well as vertebral disc heights.[44]
2. **MYELOGRAPHY:** The major advantage of water- soluble contrast myelography is its capacity to demonstrate spinal cord dimensions and nerve root sleeve configurations throughout the cervical region. The goal of myelography is to establish conclusive evidence of compressive pathology impinging on nerve roots or the spinal cord.
3. **MAGNETIC RESONANCE IMAGING:** Disruption of the anterior & posterior longitudinal ligament, ligamentum flavum have been documented by magnetic resonance imaging.

4. **CT SCAN:** CT scanning provides good visualization of bony elements. The accuracy of CT imaging of cervical spine ranges from 72-91% in the diagnosis of disc disease. The accuracy has approached 96% when combining CT scanning with myelography. The addition of contrast material allows for the visualization of subarachnoid space and assessment of the spinal cord and nerve roots. Because of the improved soft tissue visualization provided by magnetic resonance imaging (MRI), CT scanning is being replaced by MRI for most cervical spine disorders.

TREATMENT

1. **Pharmacological Interventions:**

Oral psychotrophic agents: Cyclobenzaprine, diazepam, tetrazepam to reduce muscle spasm.

NSAIDS: Oral anti-inflammatory & analgesics.

Intra-muscular injections of multivitamins: Neurotrat

Melatonin: Oral medication aiming to improve sleep & reduce pain. Local treatment with

Anaesthetic: Intra-muscular injections of lidocaine

Local treatment with epidural steroids: Epidural injections with methyl prednisolone & lidocaine.

Local treatment with Botulinum toxin: Intra-muscular injection of Botox 'A'.

Subcutaneous injections: Injections of CO2, aiming to reduce pain by vasodilatation.

Intravenous Glucocorticoid: Methyl prednisolone & lidocaine.

Rehabilitative Intervention: is a multimodal approach which includes physical therapy along with hands-on technique in the form of manualtherapy.

Chronic neck pain is one of the most common conditions for referral to a Physiotherapist. Physical therapy approach is a popular non-surgical approach which is relatively safe & possibly effective in the management of patient with neck pain.[16]

Study done by **Weinhardt et al** concluded that Physiotherapy is much more effective than just immobilization with the help of soft collar or absolute no treatment for a patients with chronic neck pain.[45]

Exercises are used in conjunction with electrotherapeutic modalities in the treatment of chronic neck pain. A wild array of physical modalities like TENS, ultrasound, short-wave diathermy, interferential therapy, corsets & collars. There is limited evidence to suggest that electrotherapy is not effective in reducing chronic neck pain. However, dependency on physical modalities could encourage passivity, inactivity, & disability behaviour. The use of these modalities as a sole treatment for acute or chronic neck pain is not recommended in international guidelines.

Sarig-Barat et al revealed strong evidence for proprioceptive exercises & dynamic resisted strengthening exercises for chronic neck disorders & moderate evidence for early mobilizing exercises in acute whiplash while no evidence to support benefit from group exercises, neck school or single session of extension- retractionexercise.[46]

Study done by **Kroeling et al** stated lack of evidence for effect of electrotherapeutic modalities which includes Galvanic current (direct/pulsed), Iontophoresis, Transcutaneous Electrical Nerve Stimulation (TENS), Electrical Muscle Stimulation (EMS) &Magnetotherapy.[47]

Philadelphia Panel Evidence - Based Clinical Practice Guidelines is in favor of proprioceptive & therapeutic strengthening exercises for chronic neck pain which have been shown in one or more controlled trials to provide a clinically important benefit. There is hardly any study which considered exercises for acute or sub acute conditions. [48]

Types of exercises, intensity & progression need to be clarified according to patient specific classification of physical dysfunction, needs, treatment goals & outcomes.

Also there is a lack of evidence at present regarding whether to include/exclude thermotherapy, therapeutic massage, EMG biofeedback, mechanical traction, therapeutic ultrasound, TENS, electrical stimulation & combined rehabilitation interventions in the daily practice of physical rehabilitation of patients with acute/chronic neck pain.

Moist heat is often used prior to other forms of treatment like muscle stretching, traction, joint mobilization or massage. Its therapeutic effects include reduction of muscle spasm, relaxation of the muscles, pain relief and sedation, facilitation of joint motion and preparation of tissues for rehabilitation.

Moist heat may increase the extensibility of connective tissue. It is due to the effect of heat on the elastic tissues. Thus effect is more if it is combined with stretching. Application of heat, whether moist or dry, is effective in getting maximum results from the exercises.[17,18]

Review on superficial heat or cold for low back pain revealed that there is moderate evidence in a small number of trials that heat wrap therapy provides a smallshort-term reduction in pain and disability in a population with a mix of acute and sub acute low back pain.[49]

Isometric exercise in the generation of muscle exertion against fixed resistance without allowing joint movement to occur. If adaptive changes in muscle, such as increase in strength and endurance are to occur isometric contractions should be held against resistance for at least 6 seconds. This allows time for peak tension to develop and for metabolic changes to occur in the muscle with each contraction. Isometric exercise is a static form of exercise that occurs when a muscle contracts without applicable change in length of the muscle or without visible joint motion. Isometric exercise is commonly used to increase the muscle performance. Although no joint movement occurs it is considered functional because it provides a strength base for dynamic exercise and because many postural muscles work primarily in an isometric fashion.[19]

Jari Ylinen MD et al (2003) - conducted a study to evaluate the efficacy of intensive isometric neck strength training of neck muscles on pain and disability in women with chronic, non specific neck pain. The results showed that both strength and endurance training for 12 month was effective method for decreasing pain and disability in women with chronic, non specific neckpain.[50]

MANUAL THERAPY:

Manual therapy has been an approach in the management of patients with various disorders dating back to ancient times & continuous to play a significant role in current health care.

According to International federation of manual therapies, Orthopaedic manual therapy is a specialization within physical therapy and provides comprehensive conservative management of pain and other symptoms of neuro- musculo-articular dysfunction in the spine and extremities. Today, different manual therapy approaches are applied by various health professionals, including medical persons, physical therapists, massage therapists, manual therapists, chiropractitioners and osteopaths. Review of trails involving manual therapy or physical therapy show that most interventions of these categories are characterized by a combination of both passive and activecomponents.

A study on effects of Manual therapy, Physical therapy or continued care by a General practitioner for patients with neck pain done by **Hoving JL.,Henrica CW. et al** stated that in daily practice , manual therapy is a favorable treatment option for patients with neck pain.[9]

Study done by **Cesar F., Palomeque L., Miangolarra JC. et al** on effect of manipulative treatment Vs conventional Physiotherapy & came to conclusion that, improvement in manipulative group achieved with fewer treatment sessions & was greater than the improvement in conventional physiotherapy group.[51]

Manual therapy used by physiotherapists in treating neck pain involves joint mobilization technique. Various mobilization techniques used in physiotherapy practice are Mulligan's, Maitland, Mckenzie, Kaltenborn, Cyraix, Alexander, Feldenkrais etc.

Brian Mulligan has developed a most ingenious complication of manual techniques.

A review of literature on current concepts on mulligan's mobilization with movement, positional faults & pain relief concluded that an immediate positive effect on substantial pain reduction accompanied by improved function.[21]

Study conducted on effectiveness of Self SNAGS over conventional physiotherapy management in chronic neck pain among computer professionals stated that Self SNAGS were effective in reducing the neck pain.[52]

Susan AR, et.al. studied whether SNAGS are an effective treatment for cervicogenic dizziness & concluded that SNAG treatment had an immediate clinically & statistically significant sustained effect in reducing dizziness, cervical dysfunction.[53]

Subjects treated with REVERSE NAGS for neck pain showed immediate positive effect on pain reduction and increased range of motion.[54]

Brian Mulligan's concept of Mobilisation with Movement (MWM) is the logical continuance of this evolution with the concurrent application of both therapist applied accessory movement 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.[55]

The MWM group of techniques are claimed to achieve a rapid improvement in persistent musculoskeletal pain states that have been recalcitrant to other forms of therapy.[56]

The basic concept of Mulligan’s Mobilisation with Movement is that a painless gliding translation pressure is applied by the practitioner, almost always at right angles to the plane of movement in which restriction is noted, while the patient actively (or sometimes the practitioner passively) moves the joint in the direction of restriction orpain.[57]

A review of literature on current concepts on mulligan’s mobilization with movement, positional faults & pain relief concluded that an immediate positive effect on substantial pain reduction accompanied by improved function.[23]

Mobilisation with Movements enable the therapist to perform treatments in more dynamic, weight-bearing, functional positions. As the aggravating movement is used, treatment is specific and the results are often dramatic.[58]

A study conducted on initial effects of mulligan's mobilization with movement technique on range of motion and pressure pain threshold in pain limited shoulders stated that this manual therapy technique has an immediate positive effect on range of motion & pain in subjects with painful limitation of shouldermovement.[59]

There are an increasing number of reports espousing the clinically beneficial effects of Mulligan's Mobilisation-with-Movement (MWM) treatment techniques. The most frequent reported effect is immediate and substantial pain reduction accompanied by improvedfunction.[60]

MAIN OUTCOME MEASURES VAS

The visual analogue scale (VAS) is a simple and frequently used method for the assessment of variations in intensity of pain, and has been widely used in human clinical and psychological research to assess subjective states.

Wilkie et al concluded that VAS is used to measure the intensity of pain. Reliability of the data obtained with the VAS is reported to be high [r=0.99], with high construct validity.[61]

GONIOMETRY

Goniometric measurement of cervical spine motion examines movement in all planes separately while motion in other planes is controlled. These motions are not especially functional but lend themselves to reliable measurement more than other functional movements. While both intratester and intertester reliability were found acceptable for clinical application of goniometric measurement, intratester reliability is usuallyhigher.[62]

Youdas JW et al stated that goniometric measurements of active range of motion of the cervical spine had interclass co-relation coefficient [ICC] greater than80.[63]

NECK DISABILITY INDEX

The Neck disability index is a commonly utilized outcome measure to capture perceived disability in patients with neck pain.

A study of reliability and validity demonstrated that the Neck Disability Index achieved a high degree of reliability and internal consistency.[64]

Howard Vernon, DC (1991)- Gave that the Neck Disability Index has become a standard instrument for measuring self rated disability due to neck pain and is used by clinicians and researchers alike. Scoring intervals for interpretations as follows 0- 4=no disability, 5-14=mild, 15-24=moderate, 25-34=severe, above34=complete.

Riddle and Stratford identified a significant association between the NDI and both the physical and mental health components of the SF-36. The authors also identified that the NDI possesses adequate sensitivity as compared to the magnitude of change that occurred for patients reaching their functional goals, work status, and if the was currently inlitigation.

CHAPTER-3
METHODOLOGY

Study was conducted to know the more beneficial of the two techniques of mulligans mobilization in the treatment of chronic neck pain.

Source of Data:

Data was collected from physiotherapy OPD of, Integral Institute of Medical Sciences and Research (IIMS&R), Integral University, Lucknow, during the study period from January 2022 to May 2022.

Method of Data Collection:

The method of data collection used for this study was a primary method.

Study Design:

It was a clinical trial.

Sample Size:

The sample size used for this research study was 40. It was calculated on the basis of record of number of participants attended physiotherapy department in last three years.

Study Sample:

The study sample included male and female participants referred to the physiotherapy outpatient department with clinical diagnosis chronic neck pain.

Sampling Design:

Sampling design used for this study was simple random sampling. For this purpose the participants were assigned to 2 groups using Envelope method.

Participants:

Participants with clinical diagnosis of chronic neck pain who were referred to physiotherapy department and willing to take treatment for 7 consecutive days were recruited for the study.

Inclusion Criteria

1. Participants between the ages of 20 - 60years.
2. Duration of pain for more than3months.
3. Those who are willing to participate in the study.

Exclusion criteria

1. Subjects with congenital deformities.
2. Subjects with retrolisthesis of spine.
3. Subjects with any neurological deficit.
4. Subjects with osteoporosis.
5. Subjects with history of spinal surgeries.
6. Subjects with traumatic neck injury, fractures &dislocations.
7. Subjects suffering from any psychiatric disorders.
8. Subjects who have recently received hydrocortisone.
9. Red flags of manual therapy for neck: vertebrobasilar artery insufficiency, Alar ligament insufficiency.

Materials:

1. Couch
2. Consent form
3. Data collection sheet
4. Neck disability index.

Apparatus and Equipments

Measuring Tape:

A measuring tape of total length of 60 inches/152 centimeters was used to measure the height of each participant. The participant was made to stand against wall head and heel touching the wall and mark was made on the wall at the vertex of the head. The distance between the floor and the mark was measured in centimeters and considered as a height of the participant.

Weighing Machine:

A standard bathroom weighing machine with 1 kg increment was used to measure the

weight of each participant in kilograms.

Therapeutic Modality:

1. Moist Heat Therapy: (Photograph no 2)

Commercial hot packs were used with temperature of pack when applied was in between 70-75^{0}C and was wrapped in 6-8 layers of dry terry towel. Moist heattherapy was given as conventional treatment for period of 15 minutes, 1 session/day for 7 consecutive days prior to the actual manual therapy approach.

MAIN OUTCOME MEASURES

1. Visual Analogue Scale:

A horizontal visual analogue scale was used. A 10 cm line was drawn on a paper and participants were asked to mark a point on the line that best defined the present pain level, where zero indicated no pain and 10 indicated severe pain.

2. Range of Motion:

Active range of cervical flexion, extension, lateral flexion and rotation was measured using standard technique of measuring range of motion of cervical spine with the help of Universal Goniometer.

3. Functional Disability:

Measured in terms of Neck disability index. It is a functional index comprising of 10 items. With 7 items related to activities of daily living, 2 items related to pain and 1 item related to concentration. Each item is scored from 0 to 5 and the total score is expressed as a percentage, with higher score corresponding to greater disability.

INTERVENTIONS:

All the participants with chronic neck pain who reported to physiotherapy outpatient department were screened. The participants were requested to participate in the study, by considering inclusion and exclusion criteria. Those willing to participate in the study were given brief idea about the nature of the study and the intervention.

Prior to the commencement of the interventions, written inform consent was given by all the participants entering the study. The demographic data including age, gender, height, weight, side affected was collected through data collection sheet. Initial evaluation of pain intensity was done using Visual analogue scale (VAS). Active range of cervical flexion, extension, lateral flexion and cervical rotation was measured and functional disability was scored using Neck Disability Index as a pre- interventional outcome measures.

The participants were then randomly allocated to 2 groups. Group A (Natural apophyseal glides) & Group B (Sustained natural apophyseal glides) using envelop method.

For Group A participants, intervention was given in the form of moist heat therapy for 15 minutes and Natural apophyseal glides which were repeated 6 times and Isometric neck exercises.

For Group B participants, intervention given in the form of moist heat therapy for 15 minutes and sustained natural apophyseal glides which were repeated 6 times and Isometric neck exercises.

PROCEDURE:

Prior to the commencement of the procedure, informed written consent was taken from the participants.

Group A:

Group A participants were treated with Natural Apophyceal Glides (NAGS). Participants in this group were made to sit comfortably on a stool or chair. Therapist was standing at the right side of the subject, so that the therapist's lower trunk was in contact with the antero-lateral surface of the subject's right shoulder. This is to stabilize the trunk of the subject when the mobilization is carried out. Subjects head was cradled against the therapists upper abdomen and chest, comfortably held there with the right forearm diagonally positioned across the subject's left temporo- mandibular joint. The middle phalanx of the therapists right little finger was hooked around the spinous process of the vertebra on top of the joint to be mobilized. The right index, third and fourth fingers were wraped around the occiput. When the head was securely held, a gentle and useful distraction was applied to the cervical spine.

The lateral border of the thinner eminence of therapist's left hand was then placed more under than over the little finger of the therapist's right hand. The required glide along the treatment plane was then given via therapists attached little finger by pushing up and forward with the left hand towards the eyeball. The little finger had to be relaxed so that it only was being moved being moved by the other hand during mobilization. The glides were rhythmical (three per second) and were undertaken through a mid to end range. The mobilization was repeated 6 times and movements were reassessed.

Group B:

Group B participants were treated with Sustained Natural Apophyseal Glides (SNAGS). Participants in this group were treated in sitting position with therapist standing behind him. Therapist's thumbs were used on the upper spinous process of the cervical segment involved. Subject was then asked to do cervical movement as per therapist's instruction. Therapist pushed up along the facet treatment plane and maintained this glide until neck returned to the neutral position. The technique was repeated 6 times for every cervical movement that is for flexion, extension, lateral flexion and rotation and movements were reassessed.

Isometric neck exercises were given to both the groups after mobilization, with 5 repetitions & 10 seconds hold.

The post-interventional responses were recorded on 7^{th} day of treatment in the form of VAS, Cervical ROM and Neck Disability Index.

To record pain intensity by using visual analogue scale VAS, the participant were asked to mark their intensity of pain on a 10 cm long line marked with numbers 0 to 10 where 0 represents no pain and 10 is for maximum pain.

The active range of cervical flexion with the help of Universal Goniometer was measured with the participant sitting on a chair with back well supported and head in centre. The fulcrum of the goniometer was placed over the external auditory meatus. Stable arm was perpendicular to the ground and movable arm was aligned with the base of the nares. The participant was then asked to slowly bend the neck. At the same time movable arm was moved along with the movement of the neck and reading was recorded in degrees.

The active range of cervical extension, the participant sitting on a chair with back well supported. The fulcrum of the goniometer was placed over the external auditory meatus. Stable arm was perpendicular to the ground and movable arm was aligned with the base of the nares. The participant was then asked to slowly extend the neck. At the same time movable arm was moved along with the movement of the neck and reading was recorded in degrees.

The active range of cervical lateral flexion with the help of Universal Goniometer was measured with the participant sitting on a chair with back well supported and head in centre. The fulcrum of the goniometer was placed over the spinous process of the C7 vertebra. Stable arm was perpendicular to the ground and movable arm was aligned with the dorsal midline of the head, the participant was then asked to slowly side bend the neck to the affected side without extending the neck or depressing the shoulder to the limit of motion. At the same time movable arm was moved along with the movement of the neck and aligned with the dorsal midline of the head and reading was recorded in degrees. Same procedure was repeated to the other side and readings were taken.

For active cervical range of rotation, participant was sitting on a chair with back well supported and head in centre. The fulcrum of goniometer was placed over the center of the cranial aspect of the head. Stable arm was placed parallel to an imaginary line between the two acromial processes and movable arm was aligned to the tip of the nose, the participant was then asked to slowly rotate the neck without flexing or extending it within the limit of motion to one side. At the same time movable arm was moved along with neck movement and again aligned it with the tip of the nose and reading was recorded in degrees. Same procedure was repeated to the other side and readings were taken.

Neck disability scoring for all the 10 items was done by asking the participants to mark his/her ability to perform each of the 10 activities.

Thus the outcome measures measured pre and post treatment were subjected to statistical analysis for significance.

CHAPTER-4

RESULTS

The present study was done to compare the effects of Sustained Natural Apophyseal Glides & Natural Apophyseal Glides in chronic neck pain. The study included 40 patients out of which 20 participated in Group A & were treated with moist heat therapy for 15 minutes and Natural Apophyseal Glides. The mobilizations were repeated 6 times along with isometric neck exercises which were repeated 5 times with 10 sec hold. While the other 20 patients participated in Group B & were treated with moist heat therapy for 15 minutes and Sustained Natural Apophyseal Glides. The mobilization was repeated 6 times along with isometric neck exercises which were repeated 5 times with 10 sec. hold.

Statistical analysis

Statistical analysis was done by the SPSS and also manually which was done to cross check the outcomes. Statistical measures such as paired & unpaired't' test were used to analyze the data. Probability values less than 0.05 were considered statistically significant and probability values less than 0.0001 were considered highly significant.

DEMOGRAPHIC PROFILE

Age Distribution

The age of the participants was 20 to 60 years. The average age of the participants in NAGS group (Group A) was 46.95±7.149 years, and in SNAGS (Group B) was 45.6±7.9. There was no significant difference between the mean age of the participants in both the groups.

Sex Distribution

There were total 40 participants who participated in the study. Out of which 19 were males and 21 were females. There were 9 males and 11 females in Group A, & 10 males and 10 females in Group B.

OUTCOME MEASUREMENTS

VAS Score:

The pre-interventional values of Visual analogue score within the group was

6.54±1.28, & 6.9±0.73 in Group A & B respectively whereas post-interventional values of Visual analogue score was 2.82±1.27, & 1.8±0.57 in Group A & B respectively.

The mean reduction in Visual analogue score was 3.72±0.55, & 5.1±0.38, in Group A & B respectively. Changes in the visual analogue scores revealed statistically significant reduction in pain post interventionally for both the groups i.e. NAGS & SNAGS ($p < 0.0001$).

This was done using student's paired't' test. Both the groups were effective in reducing pain post interventionally. When the inter group analysis were done, Group B had shown statistical significance over Group A. This was done by using student's unpaired 't' test.

Neck Disability Index:

In the present study the pre-interventional values of neck disability index within the groups was 30.55±8.88 & 31.8±6.45, in Group A & B respectively. Where as post-interventional values of neck disability index was 13.12±3.15, & 11.05±3.15, in Group A & B respectively. The mean reduction in neck disability index was 16.9±7.56 & 20.8±6.60, in Group A & B respectively.

On comparing pre- interventional values with post- interventional values using paired 't' test showed highly statistically significant difference in both the groups post interventionally. ($p<0.0001$)

The between group analysis for neck disability index done using unpaired 't' test was statistically significant ($p=0.0375$)

RANGE OF MOTION OF CERVICAL SPINE:

Flexion

In the present study pre-interventional flexion measurement within the Groups was 37.75±5.94 & 37.5±4.84 in Groups A & B respectively. Whereas post interventional flexion measurement was 45.6±4.53 & 47.1±3.49 degrees in Group A & B respectively.

Mean increase in range of motion was 8.2 ±3.96 degrees & 9.6±3.64 degrees in Groups A & B respectively. On comparing pre-interventional values with post-interventional values using paired t test showed highly statistically significant difference in both the groups post-interventionally ($p<0.0001$). The between group analysis for active range of motion of flexion done using unpaired 't' test showed no statistically significant difference between the two groups.

Extension

In the present study pre-interventional extension measurement within the groups was 40.3±5.52 degrees & 41.6±4.55 degrees in Groups A & B respectively. Whereas post interventional extension measurement was 51.6±3.99 degrees & 53.15±3.29 degrees in Group A & B respectively. Mean increase in range of motion was 10.8±4.87 degrees & 11.6±4.26 degrees in Groups A & B respectively. On comparing pre-interventional values with post-interventional values using paired t test showed highly statistically significant difference in both the groups post-interventionally ($p<0.0001$). The between group analysis for active range of motion of extension done using unpaired 't' test showed no statistically significant difference between the two groups.

Lateral Flexion:

Right

In the present study pre-interventional lateral flexion on the right side measurement within the groups was 34.2± 4.74 degrees & 33.4±4.7 degrees in Groups A & B respectively whereas post interventional lateral flexion measurement was 39.85± 3.24 degrees & 40.55±3.18 degrees, in Groups A & B respectively. Mean increase in range of motion was 5.7± 2.78 degrees, 7.4± 3.59 degrees in Groups A &B respectively. On comparing pre-interventional values with post-interventional values using paired t test showed highly statistically significant difference in both the Groups post-interventionally ($p<0.0001$).

The between group analysis for active range of motion of lateral flexion done using unpaired ‘t’ test showed no statistically significant difference between the two groups.

Left

In the present study pre-interventional lateral flexion on the left side measurement within the groups was 32.65±4.25 degrees & 30.9±3.49 degrees in Groups A & B respectively whereas post interventional lateral flexion measurement was 39.55±3.47 degrees & 39.55±2.92 degrees, in Groups A & B respectively. Mean increase in range of motion was 7.4± 3.50 degrees & 9.0±3.69 degrees in Groups A & B respectively. On comparing pre-interventional values with post-interventional values using paired t test showed highly statistically significant difference in both the groups post-interventionally ($p<0.0001$). The between group analysis for active range of motion of lateral flexion done using unpaired ‘t’ test showed no statistically significant difference between the two groups.

Cervical Rotation

Right

In the present study pre-interventional cervical rotation measurement within the groups was 59.05±7.91 degrees & 61.25±7.67 degrees in Groups A & B respectively whereas post interventional cervical rotation measurement was 70±5.161 degrees & 71.5±4.2 degrees, in Groups A & B respectively. Mean increase in range of motion was 10.97±4.81 degrees & 11.1±5.45 degrees in Groups A & B respectively.

On comparing pre-interventional values with post-interventional values using paired t test showed highly statistically significant difference in both the groups post-interventionally ($p<0.0001$). The between group analysis for active range of motion of cervical rotation done using unpaired ‘t’ test showed no statistically significant difference between the two groups.

Left

In the present study pre-interventional cervical rotation measurement within the groups was 56.3±7.75 degrees & 54.85±6.10 degrees in Groups A & B respectively whereas post interventional cervical rotation measurement was 67.45±6.21 degrees & 67.75±4.33 degrees, in Groups A & B respectively. Mean increase in range of motion was 10.8±5.42 degrees & 13±5.13 degrees in Groups A & B respectively.

On comparing pre-interventional values with post-interventional values using paired t test showed highly statistically significant difference in both the groups post-interventionally ($p<0.0001$). The between group analysis for active range of motion of cervical rotation done using unpaired 't' test showed no statistically significant difference between the two groups.

CHAPTER-5
DISCUSSION

The present clinical trial was conducted to compare the effectiveness of Natural Apophyseal Glides & Sustained Natural Apophyseal Glides in chronic neck pain, with a common treatment of moist heat therapy and Isometric neck exercises to both the groups.

In present study Group A received Moist Heat therapy, NAGS and Isometric neck exercises whereas Group B received Moist Heat therapy, SNAGS and Isometric neck exercises. Both the groups had an equal number of participants.

In present study outcome measures taken in the form of pain which was assessed by Visual analogue scale, active cervical range of motion of flexion, extension, lateral flexion & rotation was quantified by universal goniometer and Neck disability index was used to assess level of disability in participants with chronic neck pain.

Moist heat therapy which is a superficial entity helps to relieve pain by reducing spasm and also produce a relaxing effect. By reducing the viscosity of viscoelastic collagen, heat increases tissue extensibility and makes connective tissue less resistant to active or passive stretch. Moist heat is used oftenly to reduce neck pain or muscle spasm, but there is no such study available which proved that this superficial heating really helps.

It gives immediate relief and comfort but long lasting effect of it is always questionable.[34] Even though most studies agree that heat reduces spasm, the mechanisms involved are not fully understood. One theory contends that superficial heating increases the firing rate of golgi tendon organs (inhibitors) and decreases the firing rate of muscle spindle cells (facilators). When reflex inhibition exceeds reflex facilitation, muscles get relaxed. The belief that heater lieves spasm by reducing pain appears to have some merit, since heat reduces pain by elevating the pain threshold, and pain is known to cause conditions such as muscle guarding or splinting that involve spasm. Even so, many patient experience pains without spasm or spasm without pain. Of the two possibilities, finding pain without spasm is more common.[65]

Isometric exercises, increase intramuscular coordination by enhancing motor unit activation, synchronization and/or firing rate within a given muscle. A static contraction generates higher level of tension than concentric contraction. This will lead to increase in muscle strength and improve mobility.[66]

Isometric exercise is commonly used to increase the muscle performance. Although no joint movement occurs, it is considered functional because it provides a strength base for dynamic exercise and because many postural muscles work primarily in an isometric fashion. Although the present study did not evaluate the neck muscles strength before and after the interventions, isometric neck exercises were part of the physical therapy in the study which could have improved the neck muscle strength and there by improving range and associated disability. If adaptive changes in muscle, such as increase in strength and endurance are to occur, isometric contractions should be held against resistance for at least 6 seconds. This allows time for peak tension to develop and for metabolic changes to occur in the muscle with eachcontraction.[66]

Jari Ylinen MD et al (2003) - conducted a study to evaluate the efficacy of intensive isometric neck strength training of neck muscles on pain and disability in women with chronic, non specific neck pain. The results showed that both strength and endurance training for 12 month was effective method for decreasing pain and disability in women with chronic, non specific neck pain.[50]

When the mean reduction values of VAS in the present study were analysed within groups, it was statistically significant ($P<0.0001$) in both the groups, pre to post-intervention but when inter group analysis were done, Group B had shown statistical significance over Group A.

In the present study, active cervical flexion, extension, lateral flexion and rotation which was measured using universal goniometer, the result of that showed statistically significant($P<0.0001$) increase in values of both the groups post- interventonally.

But when inter group analysis were done there was no statistical difference in between the two groups.

The present study demonstrated that the application of Mulligan Mobilisation had shown significant change in pain, range of motion as well as in physical functional outcome. However, these findings are consistent with studies conducted in other joints of the body that have shown similar effects with the Mobilisation with Movement techniques. Wright in 1995 has postulated that the mechanisms responsible for manual therapy treatment results in increase in range of motion and decrease in pain on VAS. The results also showed changes in joint, muscle, pain and motor controlsystems.[67]

Mulligan (2004) stated that the MWM technique must be pain-free during its application. This tenet of an MWM is questionable, as it is more of an alteration to pain with a reduction or elimination, and thus not always 'pain-free' as indicated by Mulligan.[54] Majority of studies (86%), have reported pain-free application, conversely other studies review did not state whether their MWM technique reduces or eliminated pain.[68,69] It is pertinent to the application and effectiveness of an MWM that a reduction or an elimination of pain are achieved throughout the technique, with appropriate adaptation of the technique in relation to pain response. Adaptation or't weak anology' as described by Mulligan, is essential to perform if the technique does not positively improve pain behavior.[70]

Primarily this includes the direction or angle of the accessory glide, and the amount of force. This also raises the importance of adaptation in response to pain behaviour during the MWM. Few studies explained the particular method of adapting the MWM application to alter pain and recommended that MWM is repeated several times, only if there is a substantial decrease in pain, and if the pain relief has not occurred then glides at different angles should be attempted; up to a maximum of fourtimes.[71,72]

Two studies can favorably be compared with our present studies which were also done

to study the effectiveness of Mulligan's technique for pain and function.

Reid SA, et al.(2007) studied whether sustained natural apophyseal glides are an effective treatment for cervicogenic dizziness and concluded that SNAG treatment had an immediate, clinically and statistically significant sustained effect in reducing dizziness and cervical dysfunction in subjects with cervicogenic dizziness.[53]

A critical review of literature on current concepts conducted by Bill V, et al.(2006) on a Mulligan's mobilization – with – movement, positional faults and pain relief, concluded that the most frequent reported effect after Mulligan's Mobilization is an immediate.
Subjects treated with NAGS for neck pain showed increase in pain intensity while when treated with REVERSE NAGS showed immediate positive effect on pain reduction and increased range of motion.[54]

Abbott et al. also stated that four attempts of the glide direction are permitted in order to determine which best eliminates the pain. If the pain was not eliminated or it returned during treatment, no further repetitions were performed. However, the pain relief mechanism was hypothesized to be due to changes in nociceptive and motor system dysfunction, possibly implying the role of hypoalgesia.[73]

Lewit in 1985 has shown that reduced joint mobility can often be a result of a mechanical block from the inert structures with in the joint. Joint afferent discharge and optimal muscle recruitment are often closely linked. Joint mobility can thus be reduced as a result of reflex muscle splinting which prevents further damage and reduces nociceptor discharge from the joint by holding it in the midrange position. It is suggested that treatment directed at the joint will have an effect on muscle activity and vice versa. Hence to affect muscle activity reflexively via the joint afferents the mobilization technique must beperformed.[74]

Neck disability index which is a comprehensive measure of neck pain specifically designed to measure reduced activities of daily living in patients with neck pain.

The test /re test eliability was found, in a suitable ample of subjects to be 0.89.The total cronbach'salpha, which is measure internal reproducibilitywas0.80 and all of the items achieved alpha levels above 0.75.[75]

Vernon H and Mior S evaluated the NDI to study its reliability and validity in comparison to McGill pain questionnaire and achieved a high degree of reliability and internal consistency with the NDI scores. Therefore the NDI was used to assess the functional disability in the present study to confirm the results of the past studies.

In present study, when the mean reduction in NDI was analysed within- groups, it was found statistically significant in both the groups, whereas comparisondone between groups showed highly statistical significant reduction in SNAGS (Group B).

The present study could not establish any direct linkage between pain and disability which was quantified by NDI. The findings does not hold good with usual assumption that pain is a primary factor in limiting function of the patients with non- specific neck pain. In addition, pain was also found not to be associated with range of motion. These findings can be explained on the basis that pain is the subjective phenomenon and the perception of pain can be subjectively modified by the past experiences and expectations.

In present study we have included participants with chronic neck pain. As the chronic neck pain conditions are of a multidimensional nature, for all benefits, only manual therapy is not the final answer. Aker et al concluded that, there is early evidence to support the use of manual treatment in combination with other treatment for short term pain relief. So these techniques may held good in early stages of dysfunction where reduction in pain is a prime importance which in turn gain co- operation of participants for further exercise sessions. Evidence showed that, combining manual therapy techniques and exercise therapy in a multimodal intervention is effective.[76]

Overall, a comprehensive program incorporating flexibility, range of motion, postural correction with strengthening and also ergonomic consideration assist in long term management of patients with chronic neck pain.

Limitations:

1. Small sample size.
2. Subjects could not be followed up for longer period of time.
3. Duration of the study was short.
4. The data for this study was collected from only two hospitals.

Recommendations:

1. Studies with larger sample size and with longer follow-up period are recommended.
2. The data collection should be done by a blinded examiner to decrease the chance of examination bias.
3. Strength of the study lies in the two different types of interventions used which have fewer evidences and have been hardly compared in the past.

CHAPTER-6

CONCLUSION

The present study demonstrates that both the groups viz Natural Apophyseal Glides & Sustained Natural Apophyseal Glides are effective in relieving pain, improving range of motion and reducing disability in subjects with chronic neck pain. Further it was observed that Sustained Natural Apophyseal Glides technique was more effective than the Natural Apophyseal Glides techniques in reducing pain & disability in subjects with chronic neck pain.

SUMMARY

This research was done to compare the effectiveness of Sustained Natural Apophyseal Glides & Natural Apophyseal Glides in chronic neck pain. 40 participants between age group of 20-60 years with clinical diagnosis of chronic neck pain (more than 3 months) were randomly allocated into two groups i.e. Group A & B, each group comprising of 20 participants.

Group A was treated with Natural Apophyseal Glides & Group B was treated with Sustained Natural Apophyseal Glides. Both the groups received moist heat therapy and Isometric neck exercises. Outcome was measured in terms of visual analogue scale for pain, Cervical ROM was measured by Universal Goniometer and disability was measured by using Neck disability index (NDI). Paired‘t’ test, & unpaired‘t’ test were used for statistical analysis. In the present study with-in group analysis showed that pain relief, improved ROM and reduced disability was statistically significant in both the groups ($p=0.005$).

Between group analysis revealed that Group B (Sustained Natural Apophyseal Glides) was highly significant ($p<0.0001$) in reducing pain compared to Group A (Natural Apophyseal Glides). Considering the reliability and validity of neck disability index, the between group analysis revealed that Group B (Sustained Natural Apophyseal Glides) was highly significant ($p<0.0001$) as compared to Group A (Natural ApophysealGlides).

Hence based on the results of the present study it can be concluded that both the manual therapy techniques viz Natural Apophyseal Glides & Sustained Natural Apophyseal Glides are effective in relieving pain, improving range of motion and reducing disability in subjects with chronic neck pain. Further it was observed that Sustained Natural Apophyseal Glides was more effective than Natural Apophyseal Glides in reducing pain & disability in subjects with chronic neck pain.

CHAPTER-7

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CHAPTER-8

APPENDICES

ANNEXURE – I: TABLES

Table no 1

Age distributions

Groups	Mean Age (Yrs) ± SD
Group(A)	46.95 ± 7.14
Group(B)	45.6 ± 7.9

Table no. 2

Sex distribution

Groups	Males	Females	Total
Group(A)	11	9	20
Group(B)	10	10	20

Table no. 3

Visual analog scale (VAS) score (in centimeters)

Intra – group comparison (Paired 't' test)

Groups	Pre-interventional	Post-interventional	Mean reduction	p Value	Inference
Group(A)	6.54 ± 1.28	2.82 ± 1.27	3.72 ± 0.55	<0.0001	Statistically significant
Group(B)	6.9 ± 0.73	1.8 ± 0.57	5.1 ± 0.38	<0.0001	Statistical significant

Table no. 4

Visual analog scale (VAS) score (in centimeters)

Inter – groups comparison (Unpaired 't' test)

Groups	Pre-interventional	Post-interventional	Mean reduction	Inference
Group (A)	6.54 ± 1.28	2.82 ± 1.27	3.72 ± 0.55	Statisticallysignificant pain reduction in group (B) as compared tothe group (A)
Group(B)	6.9 ± 0.73	1.8 ± 0.57	5.1 ± 0.38	
P Value	< 0.0001			

Table no. 5

Neck disability index (NDI) scores

Intra – group comparison (Paired 't' test)

Groups	Pre-interventional	Post-interventional	Mean reduction	p Value	Inference
Group(A)	30.55 ± 8.88	13.12 ± 3.15	16.9 ± 7.56	<0.0001	Statistically significant
Group (B)	31.8 ± 6.45	11.05 ± 3.15	20.8 ±6.60	<0.0001	Statistically significant

Table no. 6

Neck disability index (NDI) scores

Inter – groups comparison (Unpaired

Groups	**Pre-interventional**	**Post-interventional**	**Mean reduction**	**Inference**
Group (A)	30.55± 8.88	13.12 ± 3.15	16.9 ± 7.56	Statistically significant reduction in disability in group (B) as compared to group (A)
Group(B)	31.8 ± 6.45	11.05 ± 3.15	20.8 ± 6.60	
p Value	0.0375			

Table no.7- Cervical range of motion (ROM) in degrees

Intra – group comparison (Paired 't' test)

Group(A)

Movements	Pre-interventional	Post-interventional	Mean increase	p Value	Inference
Flexion	37.75º ± 5.94º	45.6º ± 4.53º	8.2º ± 3.96º	<0.0001	Statistically significant
Extension	40.3º ± 5.52º	51.6º ± 3.99º	10.8º ± 4.87º	<0.0001	Statistically significant
Left lateral flexion	32.65º ± 4.25º	39.55º ± 3.47º	7.4º ± 3.50º	<0.0001	Statistically significant
Right lateral flexion	34.2º ± 4.74º	39.85º ± 3.24º	5.7º ± 2.78º	<0.0001	Statistically significant
Left rotation	56.3º ± 7.75º	67.45º ± 6.21º	10.8º ± 5.42º	<0.0001	Statistically significant
Right rotation	59.05º ± 7.91º	70º ± 5.16º	10.97º ± 4.81º	<0.0001	Statistically significant

Table no.8- Cervical range of motion (ROM) in degrees

Intra – group comparison (Paired 't' test)

Group (B)

Movements	Pre-interventional	Post-interventional	Mean increase	p Value	Inference
Flexion	37.5º ± 4.84	47.1º ± 3.49º	9.6º ± 3.64º	<0.0001	Statistically significant
Extension	41.6º ± 4.55º	53.15º ± 3.29º	11.6º ± 4.26º	<0.0001	Statistically significant
Left lateral flexion	30.9º ± 3.49º	39.55º ± 2.92º	9.0º ± 3.69º	<0.0001	Statistically significant
Right lateral flexion	33.4º ± 4.7º	40.55º ± 3.18º	7.4º ± 3.59º	<0.0001	Statistically significant
Left rotation	54.85º ± 6.10º	67.75º ± 4.33º	13º ± 5.13º	<0.0001	Statistically significant
Right rotation	61.25º ± 7.67º	71.5º ± 4.2º	11.1º ± 5.45º	<0.0001	Statistically significant

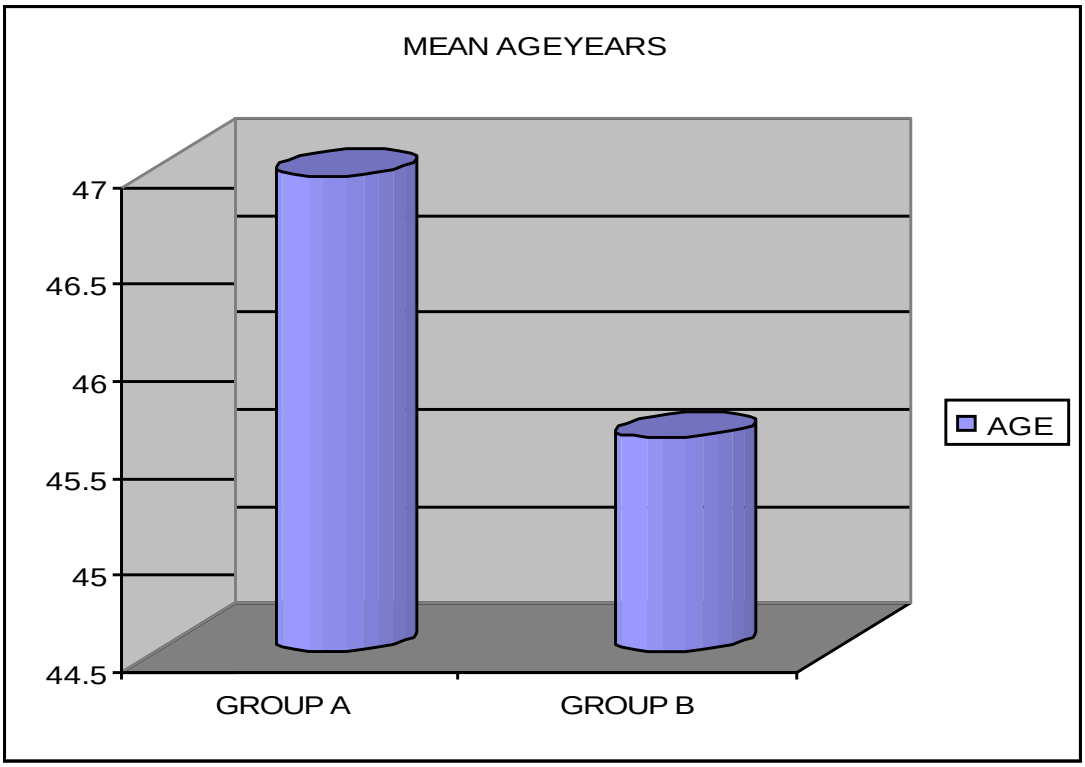
Table no.9- cervical ROM Control group v/s experimental group

Inter – group comparison (Unpaired 't' test)

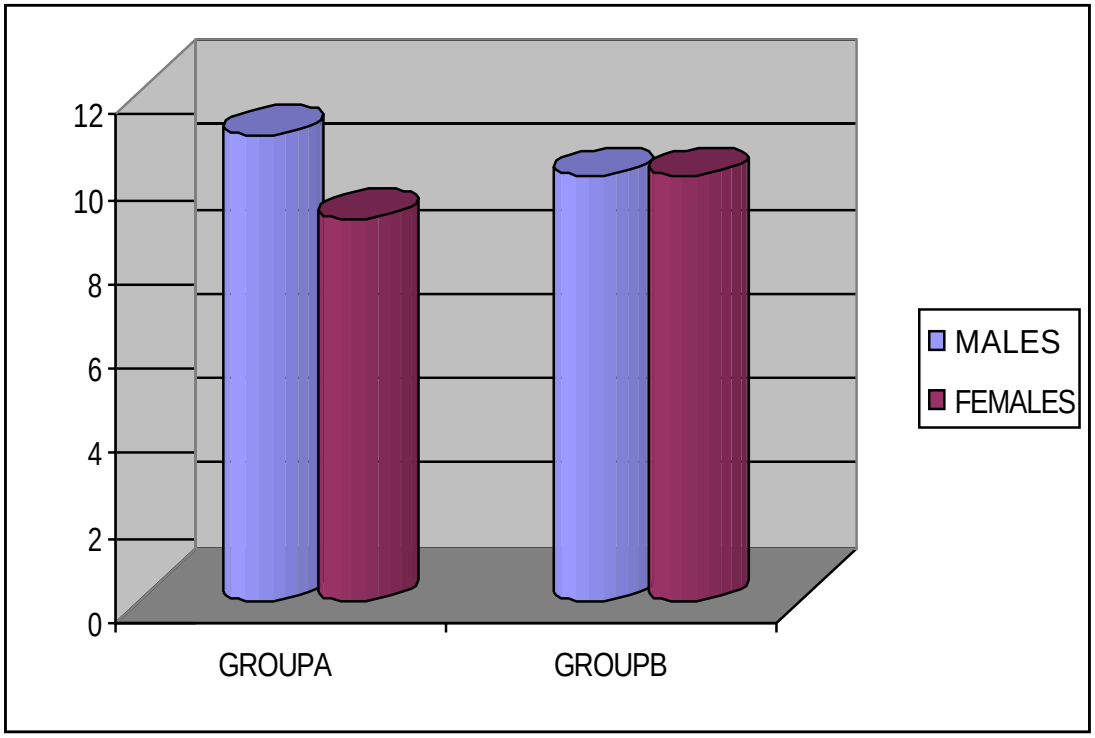
Movements	Group (A) v/s Group (B) p Value	Inference
Flexion	P=0.1544	Statistically not significant
Extension	P=0.864	Statistically not significant
Left lateral flexion	P=0.133	Statistically not significant
Right lateral flexion	P=0.14	Statistically not significant
Left rotation	P=0.26	Statistically not significant
Right rotation	P=0.647	Statistically not significant

ANNEXURE-II: GRAPHS

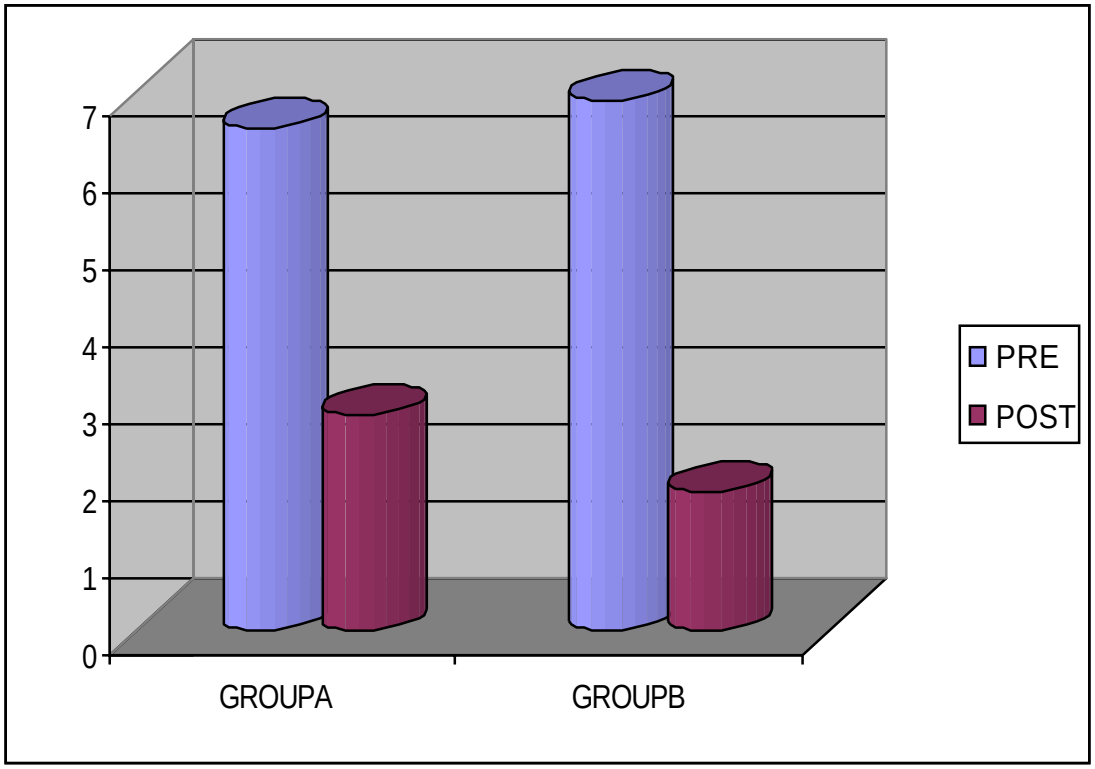
GRAPH NO. 1: AGE



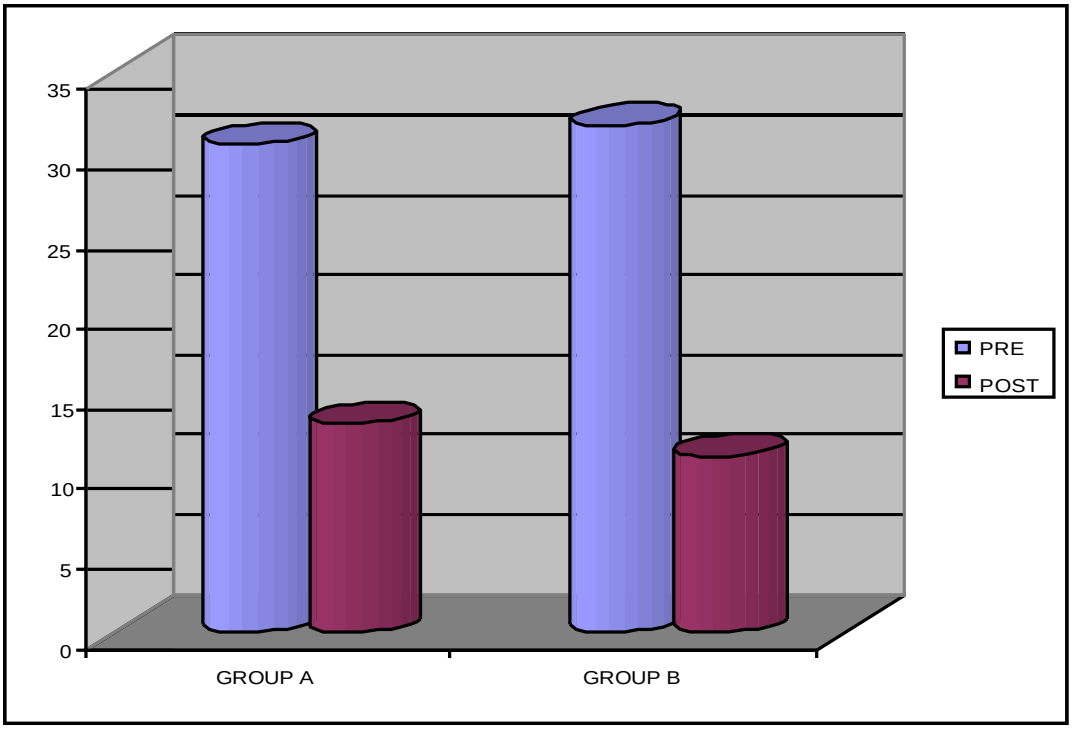
GRAPH NO. 2: SEX DISTRIBUTION

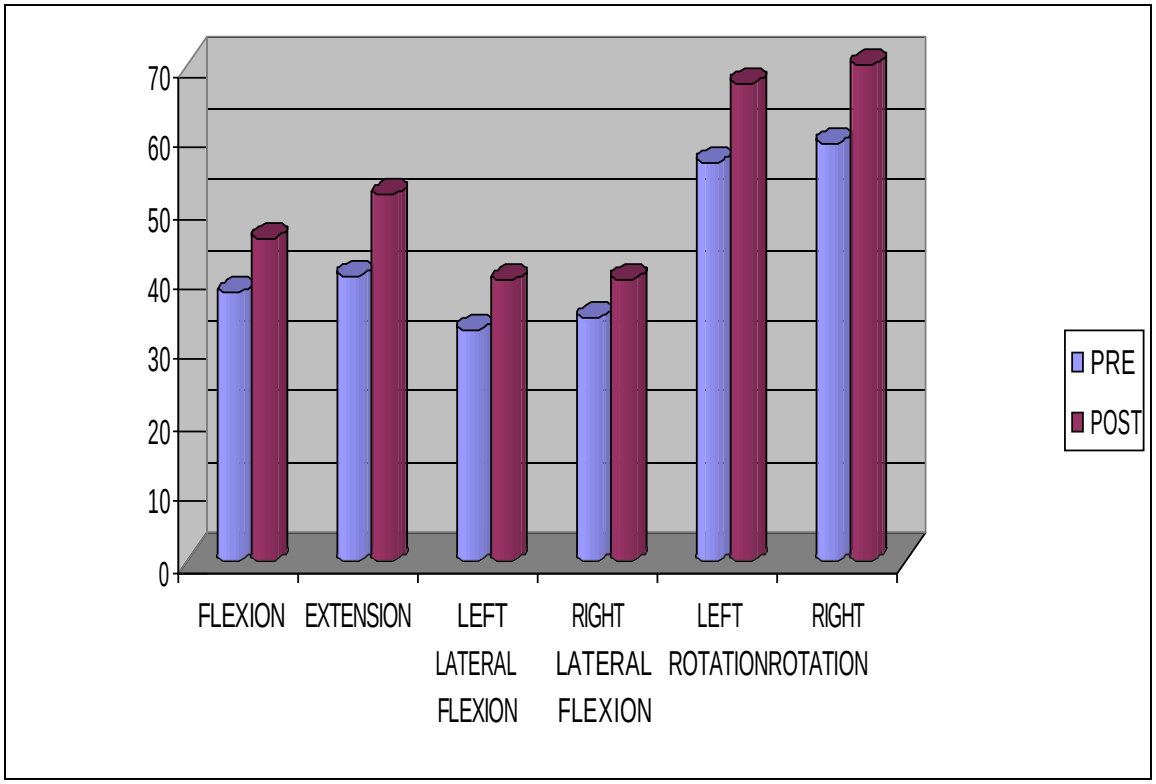

12
10
8
6
4
2
0
GROUPA
GROUPB
MALES
FEMALES

GRAPH NO. 3: VISUAL ANALOG SCORE INTRA-GROUP COMPARISON

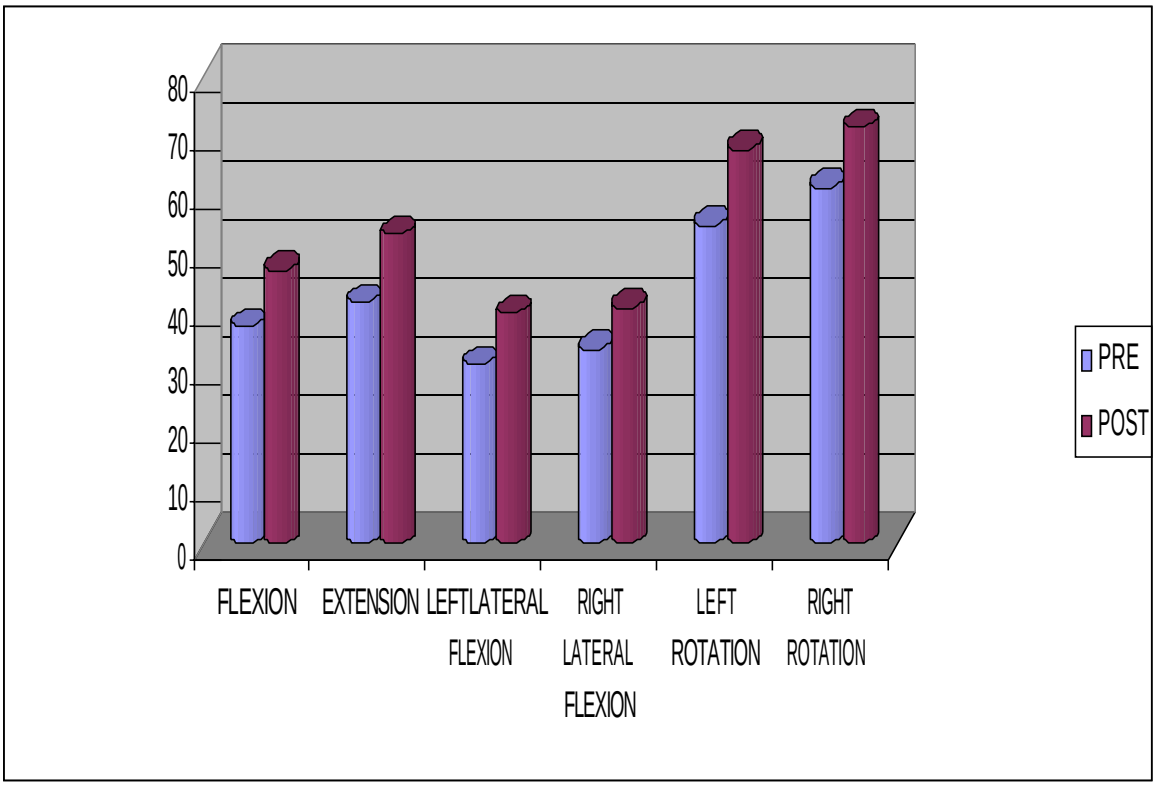


GRAPH NO. 4: NDI INTRA GROUP COMPARISON



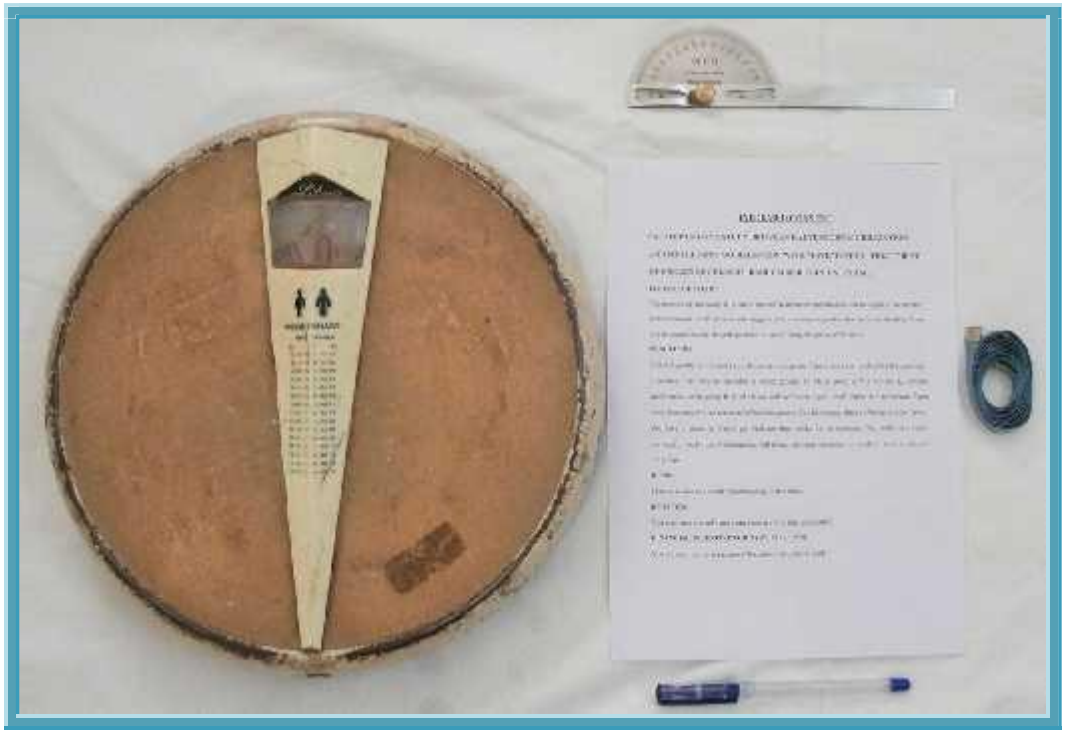


GRAPH NO. 5: RANGE OF MOTION INTRA-GROUP COMPARISON GROUPA



GRAPH NO. 6: RANGE OF MOTION INTRA-GROUP COMPARISON GROUPB

ANNEXURE-III: PHOTOGRAPHS

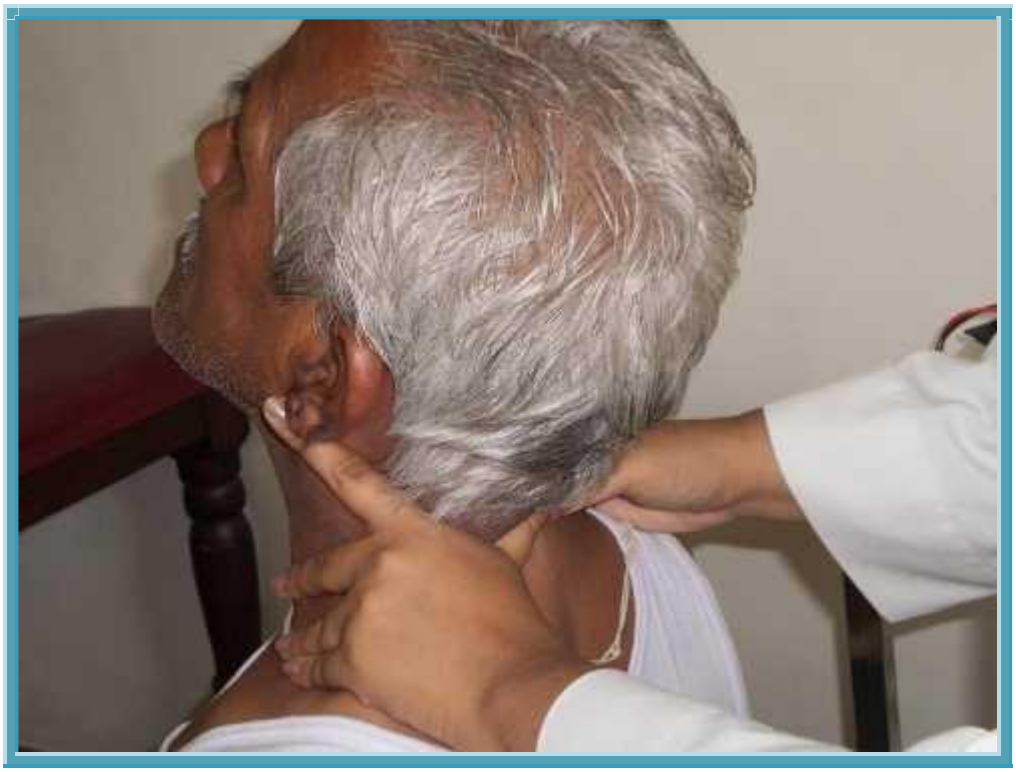


Photograph No.1: Instruments

Photograph No.2: Hot Moist Heat Therapy

Photograph No.3: Natural Apophyseal Glides

Photograph No.4: Sustained Natural Apophyseal Glides(Flexion)



Photograph No.5: Sustained Natural Apophyseal Glides (Extension)

Photograph No.6: Sustained Natural Apophyseal Glides(Lateral Flexion)

Photograph No.7: Sustained Natural Apophyseal Glides(Rotation)

Photograph No.8: Isometric Neck Exercises

ANNEXURE-IV: INFORMED CONSENT

"Comparative Effectiveness of Natural Apophyseal Glides and Sustained Natural Apophyseal Glides in Chronic Neck Pain."- A Clinical Trial.

Purpose of study:

The purpose of this study to compare the effectiveness of NAGS and SNAGS in chronic neck pain. There will be approximately 40 participants in the study during the period of 9 months.

Procedure:

You will qualify for the study only if you have complaint of pain in neck which is chronic in nature. You will be explained about procedure and its effects before commencement of the study. You will be randomly taken into any of the 2 treatment groups. You will have equal chance of being in any of the 2 groups. You will be either in group A in which you will receive NAGS or the group B, in which you will receive SNAGS. Moist heat therapy will be common for both groups. You have to come for 7 days for the treatment. Pre and post interventional tests will be conducted using visual analogue scale (VAS) to know severity of pain, Range of motion of neck flexion, extension, rotation and lateral flexion using universal goniometer and functional disability using neck disability index. The health care that is provided to you by the physiotherapist will remain the same regardless of whether you are in any of the study group.

Risks:

There is no risk as a result of participating in this study**.**

Benefits:

You may have a speedy and better recovery with this intervention in the form of pain reduction, improved range of motion and functional ability.

Financial Incentive for Participation:

You will not receive any payment for participating in this study.

Alternatives:

If you decide not to participate in this study, physiotherapist will provide you the usual standard care during your treatment.

Authorization to publish results:

Results of this study may be published for scientific purposes or presented to scientific groups; however you will not be identified.

Voluntary participation:

Your participation in this study is voluntary. You are free to discontinue participation in this study at any time and for any reason. In case, you need any further information regarding your rights as study participant, you may please contact to my Guide for further clarification.

Statement of Consent:

I volunteer and consent to participate in this study. I have read the consent or it has been read to me. The study has been fully explained to me and I may ask questions at anytime.

_____ _____

Name (Volunteer Subject) Signature or

Left Hand Thumb Impression

_____ _____

Name(Witness) Signature

_____ _____

Investigator Signature Guide Signature

Date:

ANNEXURE-V: DATA COLLECTION SHEET

Date: Subject No.:

Name: I.P/O.P.No.

Age:

Sex: Male☐ Female ale □

Height: Weigh: BMI:

Study Group: A ☐ B ☐

Address and contact number:

Duration of symptoms:

Onset: Sudden: □ Gradual:□

Tenderness: Present:□ Absent:□

Specify: X-ray/CT Scan/ MRI

Outcome Measures:

1) Pain assessment by VAS

a. Pre treatment VAS

No Pain Maximum pain

b. Post treatment VAS

No Pain Maximum pain

2) Range of motion by Universal Goniometer:

	ROM Flexion	**ROM extension**	**ROM Lateral Flexion**		**ROM Rotation**	
			Rt	**Lt**	**Rt**	**Lt**
Pre treatment 1st Day						
Post treatment 7thDay						

3) Functional Assessment by Neck Disability Index:

Pre:

Post:

Remarks:

Name of the participant

_____

Date and Signature/Lt thumb impression

_____

Name of the witness

_____

Date and signature (witness)

_____

Name of the investigator

_____

Date and signature (Investigator)

_____

Guide

_____

Date and Signature

_____

Functional Assessment by Neck Disability Index

Neck Disability Index (NDI):

This questionnaire is designed to enable us to understand how much your neck pain has affected your ability to manage in everyday life. Please answer every section and mark in each section only once, which applies to you. We realize you may consider that two of the statements in any section may relate to you, but please just mark one which most closely described your problem.

Section 1 : Pain Intensity	PRE	POST
0. I have no pain at the movement.		
1. The pain is very mild at the movement.		
2. The pain is moderate at the movement.		
3. The pain is fairly severe at the movement.		
4. The pain is very severe at the movement.		
5. The pain is the worst imaginable at the movement.		
Section 2 : Personal Care		
0. I can look after myself normally without causing extra pain.		
1. I can look after myself normally but it causes extra pain.		
2. It is painful to look after myself and I am slow and careful.		
3. I need some help but manage most of my personal care.		
4. I need help everyday in most aspects of self care.		
5. I do not get dressed; I wash with difficulty and stay in bed.		
Section 3 : Lifting (Skip if you have not attempted lifting since the onset of your neck pain)		
0. I can lift heavy weights without extra pain.		
1. I can lift heavy weights but it gives extra pain.		
2. Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned eg. On a table.		
3. Pain prevents me from lifting heavy weights but I can manage light to medium weight if they are conveniently positioned.		
4. I can only lift very light weights.		

5. I cannot lift or carry anything at all.		
Section 4 : Reading		
0. I can read as much as I want to with no pain in my neck.		
1. I can read as much as I want to with slight pain in my neck.		
2. I can read as much as I want with moderate pain in my neck.		
3. I cannot read as much as I want because of moderate pain in my neck.		
4. I can hardly read at all because of severe pain in my neck.		
5. I cannot read at all.		
Section 5 : Headache	PRE	POST
0. I have no headaches at all.		
1. I have slight headaches that come infrequently.		
2. I have moderate headaches which come infrequently.		
3. I have moderate headaches which come frequently.		
4. I have severe headaches which come frequently		
5. I have headache almost all the time.		
Section 6 : Concentration		
0. I can concentrate fully when I want to with no difficulty.		
1. I can concentrate fully when I want to with slight difficulty.		
2. I have a fair degree of difficulty in concentrating when I want to.		
3. I have a lot of difficulty in concentrating when I want to.		
4. I have a great deal of difficulty in concentrating when I want to.		
5. I cannot concentrate at all.		
Section 7 : Work		
0. I can do as much work as I want to.		
1. I can do my usual work, but no more.		
2. I can do most of my usual work, but no more.		
3. I cannot do my usual work.		
4. I can hardly do any work at all.		
5. I cannot do any work at all.		
Section 8 : Driving		
0. I can drive my car without any neck pain.		
1. I can drive my car as long as I want with slight pain in my neck.		

2. I can drive my car as long as I want with moderate pain in my neck.		
3.I cannot drive my car as long as I want because of moderate pain in my neck.		
4. I can hardly drive at all because of severe pain in my neck.		
5. I cannot drive my car at all.		
Section 9 : Sleeping		
0. I have no trouble sleeping.		
1. My sleep is slightly disturbed (less than 1 hr sleepless).		
2. My sleep is mildly disturbed (1-2 hrs of sleepless).		
3. My sleep is moderately disturbed (2-3 hrs of sleepless).		
4. My sleep is greatly disturbed (3-5 hrs of sleepless).		
5. My sleep is completely disturbed (5-7 hrs of sleepless).		
Section 10 : Recreation		
0. I am able to engage in all my recreation activities with no neck pain at all.		
1. I am able to engage in all my recreation activities, with some pain in my neck.		
2. I am able to engage in most, but not all of my recreation activities because of pain in my neck.		
3. I am able to engage in a few of my usual recreation activities because of pain in my neck		
4. I can hardly do any recreation activities because of pain in my neck.		
6. I cannot do any recreation activities at all.		
TOTAL SCORE		

NDI SCORING

Each of the 10 sections is scored separately (0 to 5 points each) and then added up (max.total=50)

EXAMPLE:

Section 1. Pain Intensity Point Value

A. _____	I have no pain at the movement	0
B. _____	The pain is very mild at the movement	1
C. _____	The pain is moderate at the movement	2
D. _____	The pain is fairly severs at the movement	3
E. _____	The pain is very severe at the movement	4
F. _____	The pain is worst imaginable	5

If all 10 sections are complete, simply double the patients score.

If a section is omitted, divide the patient's total score by the number of sections

Completed times 5.

FORMULA: PATIENT'SSCORE X100=_____% DISABILITY

OF SECTIONS COMPLETED X5

Name of the participant Date and Signature/Lt thumb impression

_____ _____

Name of the witness Date and signature (witness)

_____ _____

Name of the investigator Date and signature (Investigator)

_____ _____

Guide Date and Signature

_____ _____

GROUP(A) - NAGS																									
SI NO	AGE	SEX	VAS			ROM																		NDI		
			PRE	POST	DIFF	FLEXION			EXTENSION			LT LAT FLEX			RT LAT FLEX			LT ROTN			RT ROTN					
						PRE	POST	DIFF	PRE	POST	DIFF	PRE	POST	DIFF	PRE	POST	DIFF	PRE	POST	DIFF	PRE	POST	DIFF	PRE	POST	DIFF
1	50	F	4.2	1.4	2.8	27	35	8	39	50	11	36	43	7	38	44	6	67	74	7	56	74	18	14	6	8
2	57	F	8.7	4.6	4.1	32	49	17	47	55	8	27	34	7	26	32	6	54	64	10	54	69	15	50	15	35
3	48	F	6.5	4.1	2.4	44	50	6	45	51	6	29	34	5	33	36	3	49	69	20	62	71	9	20	8	12
4	38	M	5	2.1	2.9	41	46	5	50	54	4	38	39	1	40	43	3	46	48	2	67	70	3	35	15	20
5	54	F	4.8	1.3	3.5	45	50	5	40	49	9	26	36	10	35	40	5	56	67	11	60	73	13	26	15	11
6	41	F	6.3	1.7	3.4	39	44	5	36	50	14	34	41	7	30	38	8	54	67	13	64	74	10	23	10	13
7	53	M	7.2	3	4.2	42	45	3	44	51	7	32	41	9	26	35	9	44	65	23	44	61	17	36	16	20

8	46	F	4.5	1.2	3.5	45	49	4	39	47	8	34	39	5	40	45	5	56	66	10	56	70	14	20	10	10
9	42	M	8.3	5.1	3.2	30	39	9	30	40	10	41	44	3	37	41	4	58	69	11	58	69	11	43	14	29
10	31	M	7.1	4.3	2.8	38	45	7	43	55	12	33	36	5	25	39	14	49	61	12	49	63	14	34	10	24
11	40	F	5.2	1.5	3.7	40	48	8	39	48	9	28	43	15	33	40	7	56	72	12	56	71	15	22	14	8
12	52	M	6.1	2	4.1	33	47	14	46	56	10	39	44	5	35	39	4	47	60	13	47	65	18	28	16	12
13	55	F	5.9	2.2	3.7	45	50	5	35	53	18	30	36	6	40	43	3	49	68	19	64	73	9	26	14	12
14	48	F	6.2	2.2	4	41	48	7	40	55	15	31	35	4	38	43	5	60	66	6	72	77	5	26	10	16
15	53	M	7.5	3.8	3.7	42	48	6	42	50	8	30	43	13	35	39	4	63	70	7	68	74	6	37	15	22
16	35	M	6.4	2.2	4.2	38	50	12	45	58	13	34	44	10	36	43	7	55	68	13	59	66	7	35	15	20
17	48	F	8.1	4.9	3.2	34	39	5	33	55	22	30	38	8	37	40	3	64	74	10	60	76	16	41	12	29
18	45	M	7.2	3.8	3.4	40	49	9	44	53	9	33	39	6	38	41	3	72	74	2	72	76	4	33	15	18
19	54	F	6.9	2.8	4.1	33	39	6	38	50	12	39	42	3	32	37	5	68	74	6	49	58	9	27	16	11
20	49	M	7.7	3.4	4.3	26	42	16	30	52	22	29	40	11	30	39	9	59	73	14	64	70	6	35	18	17

GROUP(B) - SNAGS																										
SI NO	**AGE**	**SEX**	**VAS**			**ROM**																			**NDI**		
						FLEXION			**EXTENSION**			**LT LAT FLEX**			**RT LAT FLEX**			**LT ROTN**			**RT ROTN**					
			PRE	**POST**	**DIFF**	**PRE**	**POST**	**DIFF**	**PRE**	**POST**	**DIFF**	**PRE**	**POST**	**DIFF**	**PRE**	**POST**	**DIFF**	**PRE**	**POST**	**DIFF**	**PRE**	**POST**	**DIFF**	**PRE**	**POST**	**DIFF**
1	41	M	7.7	1.6	6.1	40	48	8	39	48	9	31	42	11	38	43	5	54	70	16	72	76	4	34	10	24
2	58	F	5.2	0.9	4.3	33	47	14	43	56	13	30	36	6	35	45	10	42	64	22	49	73	24	22	14	8
3	44	M	6.7	1.9	4.8	45	50	5	35	53	18	34	41	7	36	43	7	54	64	10	64	70	6	28	16	12
4	40	F	6.6	1.4	5.2	41	48	7	40	55	15	29	42	13	32	42	10	67	72	5	70	76	6	26	14	12
5	55	F	7.4	2.3	5.1	42	48	6	44	53	9	33	38	5	26	37	11	52	75	23	60	71	11	40	10	30
6	38	M	5.8	1	4.8	38	50	12	38	50	12	34	39	5	32	43	11	54	65	11	66	70	4	35	12	23
7	43	F	6.3	1.1	5.2	34	39	5	30	52	22	30	44	14	38	42	4	55	68	13	58	75	17	30	5	25

8	38	M	6.7	1.9	4.8	40	49	9	42	50	8	33	36	5	33	40	7	64	74	10	49	63	14	28	14	14
9	45	F	7.1	1.9	5.2	33	45	12	45	58	13	26	36	10	35	39	4	57	65	8	56	71	15	42	14	28
10	50	M	6.2	1.1	5.1	35	46	11	48	55	7	39	40	1	33	43	10	56	66	10	65	75	10	25	10	15
11	38	M	7.2	2.1	5.1	33	48	15	39	58	19	29	42	13	26	32	6	49	69	20	62	71	9	26	8	18
12	54	F	8.3	3	5.3	42	50	8	45	55	10	25	39	14	33	36	3	52	58	7	67	70	3	37	10	27
13	33	M	6.8	1.1	5.7	40	47	7	42	55	13	26	36	10	40	43	3	56	67	11	60	73	13	35	10	25
14	48	M	7.4	2.3	5.1	43	50	7	46	55	9	34	41	7	35	40	5	54	67	13	64	74	10	41	12	29
15	60	F	6.4	1.8	4.6	38	47	9	48	57	9	32	41	9	30	38	8	60	70	10	44	61	17	33	15	18
16	53	F	7.5	2.4	5.1	33	46	13	38	46	8	31	35	4	26	40	14	49	68	19	56	70	14	27	6	21
17	44	F	7.2	2.1	5.1	45	50	5	43	54	11	30	43	13	40	45	5	45	60	15	64	73	9	35	10	25
18	36	M	6.3	1.2	5.1	29	37	8	44	50	6	34	44	10	37	41	4	63	70	7	72	77	5	32	8	24
19	40	M	7.5	1.9	5.6	36	50	14	45	53	8	32	40	8	25	39	14	60	72	12	68	74	6	40	15	25
20	53	F	6.1	1.2	4.9	30	47	17	37	50	13	26	36	10	37	40	3	54	71	17	59	66	7	20	8	12