# AN OSTEOPATHY RESEARCH Mobilization with Movement for management of Mechanical neck pain

Presented To

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For

# GRADUATION AS DOCTOR OF OSTEOPATHY

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#### Introduction

Mechanical chronic neck pain is very common musculoskeletal dysfunction among people, manifesting one or more pain-induced movements and disability impairments. The use of various methods of manual treatments such as exercise, mobilization, and manipulation is supported by many reviews on conservative treatments for mechanical Neck pain. Mulligan concept has positive effect in patients with mechanical neck pain. An immediate improvement in pain-free range of motion (ROM) in the involved joints is reposted as a result of applying this treatment approach.

#### **Main Body**

The Mulligan technique was introduced by Mulligan in 1999 and is performed by applying an accessory glide along the axis of the affected level facet joint while the patient is actively moved from the place of the weight bearing. The therapist applies the pressure over the spinous process in a cephalad direction. Mulligan Manual Therapy can be used to help treat a variety of injuries and pain including neck pain, back pain and upper and lower extremity injuries. Designed to reduce pain and improve the patient's range of motion the Mulligan technique involves Natural Apophyseal Glides (NAGS), Sustained Natural Apophyseal Glides (SNAGS) and Mobilization with Movement (MWM) for the treatment of musculoskeletal injuries.

#### **Correction of Pathomechanics:**

Using Manual Therapy, you are treating the pathomechanics of the joint, you are correcting the faulty biomechanics of the joint because of which the pain was being experienced by the patient.

#### **Neurophysiological Effect:**

We are all familiar with the "pain gate theory" given by Melzack & Wall, and are aware of the reason behind pain relief after vibrations or thermal therapy. These vibrations/thermal sensations arrive at the synapses in the substantia gelatinosa of the posterior horn of the spinal cord faster than the nociceptive stimulus, thereby inhibiting the pain sensations, and release neurotransmitters like endorphins and encephalins, because of which the patient experiences less pain. But to have these effects you should give vibration/ thermal therapy for several minutes. Here it's interesting to note that it is seen not only by me, but by many manual therapists that after a few glides of manual therapy, not only does the pain experienced by the patient reduces, but also there is an increase in range of motion of the joint being treated. Various schools of thought consider it as a neurophysiological effect of manual therapy. They consider manual therapy as an intense stimulation of the mechanoreceptors and proprioceptors, in and around the joints, which probably releases much stronger chemicals, which not only relieve pain but also increase the range of motion. May I suggest this as "Express highway theory" because these sensations of altered relationship of two joint surfaces probably reach the brain much faster.

#### **Joint Nutrition:**

We know that joint cartilage does not have blood supply. And therefore, even increasing the blood circulation levels (so called) with the help of other physical modalities (if at all they increase circulation significantly?) won't help it get the required nutrition. Cartilage gets nutrition through synovial fluid, by movement of synovial folds. The synovial folds move when the joint moves. To move the joint, we need to have some range of motion; and to have range of motion we need to have joint play. To restore joint play, we need to deliver accessory movements by manual therapy. So, with the help of manual therapy we provide nutrition to affected joint as well. And, whenever possible, always try to restore the jointrange of motion as early as possible (concept of early mobilisation!).

#### Joint range of Motion:

To have a complete joint range of motion, the intra-articular joint structures need to be intact. The joint capsule should allow the desired movements and restrict undesirable movements. Ligaments should be intact to stabilize the joint in a proper position. The muscular system should be functional and work in synchrony, to move the joint effectively and in a coordinated way. Note that the above structures are useful only when the joint is mobile. Joint play is the most important component to achieve range of motion. Imagine a joint which is ankylosed and has resulted in complete immobility i.e. there is no range of motion. Will such a joint benefit by giving strengthening exercises or coordination exercises? Or can you do functional training etc.? Of course not! The protocols including strengthening exercises, functional training or coordination exercises are beneficial only if joint range of motion is present. Hence, before applying PNF techniques or muscle stretching/ strengthening/weight training protocols, joint gliding must be present. It is important to note that all joints have certain amount of joint play. and this joint play is directly proportional to the joint range of motion. The shoulder and sacroiliac joints are good examples to explain the same. Joints roll and glide upon each other during active and passive movements. If the joints do not glide, it leads to compression as well as injury. In addition, this decreased gliding component contributes to joint hypomobility. When a joint gets injured, operated or immobilised, the joint play/joint glide gets reduced, which can be easily restored with the help of passive accessory movements (manual therapy). It is essential to restore joint mobility along with other forms of physical therapy. In present era knowing manual therapy is a pre-requisite for every therapist

When the pathomechanics of the joints is corrected, the muscles around the joints get balanced. For example, it has already been documented by Jenny McConnell that when the person experiences pain in the shoulder joint, the head of the humerus is shifted anteriorly in the glenoid fossa from its normal anatomical position. Hence, the anterior capsule gets tightened up, the anterior structures become tight/shortened, while the structures on the posterior aspect get lax, making them physiologically insufficient. Even if they contract, they cannot produce an effective joint range of motion. At the same time, in such a case, if you are performing abduction, the anterior rotators need to work more to avoid impingement. This is the natural preventive mechanism of the body. When the anterior structures work more and there is insufficiency between anterior structures and posterior structures, then there are higher chances of getting tendinitis. So the joint should be in proper alignment and congruency. Manual therapy improves congruency and alignment of joint surfaces leading to correction of pathomechanics.

With manual therapy not only does the pathomechanics of joints get corrected, but also, there is an intense stimulation of the mechanoreceptors and the proprioceptors in and around the joints, which helps to relieve pain. In addition, the nutrition to the joints gets improved by movement of synovial fluid. It helps in increasing the joint play, thereby increasing the joint range of motion.

#### Yellow and Red Flags:

Some of the yellow flags are

- Osteopenia
- Hypermobility
- pregnancy
- if the patient is on anti-coagulant therapy.

Some of the red flags are

- osteoporosis,
- active inflammation,
- infection,
- tumour,
- metabolic bone diseases,
- myelopathies,
- neurological deficit,
- unstable joint/fracture site and a non- united fracture.

#### **Indications:**

- any neuromusculoskeletal pain (if not contraindicated)
- hypomobility (due to any post-operative/traumatic joint stiffness),
- to maintain mobility (arthritis/aging) and delaying the hypomobility (ankylosing spondylitis)

#### **The Positional Fault Theory:**

As described by Brian Mulligan, positional fault is a micro mal-alignment of the two joint surfaces which cannot be seen on radiological investigation. In my opinion if you can see it on the radiological investigations, it cannot be called as a positional fault. I'll call it either a subluxation or dislocation. So, if it is micro mal-alignment and the therapist corrects it, the patient will experience instant pain relief and increase in range of motion. It is like a wheel of a car. You are driving the car and you feel the vehicle going out of control. When you come out of the car and look at the wheels, they look pretty straight, but still the steering wheel of the car turns into one direction again and again and you can notice excessive and an uneven wear and tear of rubber on tyres. Then you decide to take it to the wheel alignment shop and the car mechanic puts a laser beam on the wheels and tells you that a particular wheel is out by two degrees. Then he fixes two or reports complete pain relief. Also there is an instant increase in the range of motion, the moment you put the joint in its place by correcting its positional fault.

There are few schools of thoughts which believe that it is not the positional fault that we are correcting, rather we are creating a temporary positional fault. We are changing the joint alignment and their relationship to each other. This change in joint relationship gives an intense stimulation to the mechanoreceptors and proprioceptors in and around the joints. Hence, achieving a strong neurophysiological effect helps in releasing a stronger chemical, which not only reduces pain but also increases range of motion.

So it could be "neurophysiological effect" or the "positional fault theory" or both. Whatever may apply, this movement with mobilisation (MWM) is very rewarding if delivered correctly with a correct force, angle and direction etc.

While applying "MWMS" as an assessment, the therapist should look for <u>PILL</u> response to use the same as a Treatment .

- **P** Pain free
- I- Instant result.
- LL- Long Lasting.

If there is No PILL response, that technique should not be advocated. The second principle is <u>**CROCKS**</u>

- C- Contra-indications (No PILL response is a contraindication)
- **R** Repetitions (Only three reps on the day one)
- **O** Over pressure
- C- Communications
- **K** Knowledge (of treatment planes and pathology

#### **Mulligan Techniques for Cervical Spine**

- 1.1. Natural Apophyseal Glides (NAGs)
- 1.2. Reverse NAGS
- 1.3. Sustained Natural Apophyseal Glides (SNAGs)
- 1.4. Functional SNAGs/Cervical MWMs
- 1.5. Fist Traction
- 1.6. Segmental Traction for Cervical Spine
- 1.7. Forearm Traction for Cervical Spine
- 1.8. Assessment of Cervicogenic Headache
- 1.9. Headache SNAGs with Headache
- 1.10. Reverse Headache SNAGs with Headache
- 1.11. Headache SNAGs without Headache
- 1.12. Vertigo SNAGS
- 1.13. Self-SNAGS

# Cervical spine

1.1. Natural Apophyseal Glides (NAGs)





Illus. 1.1.2 : Cervical Spine and its Treatment Plane



Illus. 1.1.4 : Hand Placement of Therapist on Spine for Central and Unilateral NAGs

# NAGS

• NAGs are small amplitude, multiple, rhythmic, mid to end range gentle oscillatory glides which can be applied to the cervical spine from C2to C7

• These are the mildest form of manual therapy

• These are small gentle glides and should always be pain-free for the patients. If these are painful in spite of applying correctly, then all other means would be painful.

# Indications

- Gross restriction in cervical range of motion.
- These can be used in the case of elderly patients having severe spondylitic changes.
- To relieve post-manipulative soreness.
- To check irritability of the cervical spine.

#### **Patient Position**

• Sitting upright at the edge of a chair without armrest

• Head of the patient should be held in neutral position (neck may be kept in slightly flexed position in order to have better palpation, if pain-free)

#### **Therapist Position**

• Walk stance standing antero-lateral to the patient with weight evenly distributed on both the feet

• Therapist's lower torso remains in contact with the antero-lateral surface of the patient's shoulder

• Therapist cradles the patient's head with his hand, forearm and antero-lateral side of the torso.



## **Hand Placement**

#### (a) Stabilizing hand

• Therapist grasps the patient's base of the head and all vertebrae above the level of mobilization with his index, middle and ring fingers of one hand (except little finger which is to be used for mobilization).

• Middle phalanx of little finger of the same hand is placed under the spinous process, i.e. hooking the spinous process to the desired level (vertebra to be mobilized).

(b) Mobilizing hand

• Small gap should be maintained between little and ring finger

• Lateral border of thenar eminence of the other hand is placed obliquely under the little finger in order to push it towards the eye ball of the patient (as per treatment plane).

• Mobilizing hand should be in mid-prone position with the wrist in slight ulnar deviation.

## Mobilization

• The glide is given by pushing the middle phalanx of little finger of stabilizing hand with the thenar eminence of mobilizing hand antero-cranially (towards the eyeball of patient) along the treatment plane

• Unilateral NAGs for cervical facet joints are given antero- cranially towards the opposite eyeball

• 2-3 oscillations are performed per second.

• Glides are performed rhythmically through mid to end range after taking up the slack.

## Variations

• Traction to the cervical segments can also be provided during the above technique.

• The therapist applies traction to the cervical spine by gaining his height and shifting the weight from his front foot to the back foot and then the glide can be performed at the desired level

• In the case of patients with an exaggerated cervical lordosis, the therapist can perform the above glide after the patient is instructed to do chin retraction.

• For unilateral NAGs, little finger is placed on the facet joint of the affected side by moving it little laterally from the spinous process

# **Precautions To Be Taken**

- Do not block airway of the patient.
- Any rotation, side-flexion of the neck should be avoided

• Female therapist is advised to use a pillow or a thick towel between the patient's head and her breast. Patient's trunk should be properly stabilized

• Therapist should use brachioradialis for giving the glide and not the pronators of the mobilizing forearm

## Reasoning

• Inferior facet of the superior vertebra glides cranially on the superior facet of the inferior vertebra (to treat C4-5 segment, facet joint/spinous process of C4 is mobilized).

• Mobilization induced movement helps to provide nutrition to the facet joints and disc.

• It might correct the positional fault between affected facets.





1.2. Reverse NAGS



Illus. 1.2.1 : Cervical and Thoracic Spine and its Treatment Plane for Reverse NAGs



## Indications

- When NAGs have not been found to be effective.
- Involvement of the cervico-thoracic junction. Pain in inter-scapular area.
- Patients with protruded chin.
- Patients with sitting job or using computers for prolonged periods of time.
- Patients with a hump neck.

#### **Patient Position**

- Sitting upright on the edge of a chair without armrest
- Head held in neutral position

## **Therapist Position**

- Walk stance, standing antero-lateral to the patient.
- Therapist's lower torso remains in contact with the antero-lateral surface of the patient's shoulder
- Therapist cradles the patient's head with his hand, forearm and antero-lateral side of the torso

#### Hand Placement

For C5-C6 –C6-7 and C7-T1 vertebrae

- Key hold grip (V grip) is used
- Forearm of mobilizing hand should be prone.
- (a) Stabilizing hand

• Fingers of other hand wrap around the occiput and all vertebrae above the level of mobilization in order to stabilize it

(b) Mobilizing hand

• The interphalangeal (IP) joints of the index finger are flexed and the metacarpophal- angeal (MCP) joints of the thumb and index finger are kept in slight extended position to form a "V"

• The V is placed under the spinous process of the desired vertebra to be mobilized. • Therapist's shoulders are abducted and internally rotated in such a way that the mobilizing hand comes at the back of the patient at a correct angle along the treatment plane.

For T2-T6 vertebrae

• Pistol hold grip is used.

# Mobilizing hand

• The thumb and index fingers are positioned as in holding a pistol, which will allow making contact with the wider transverse processes on each side of the thoracic vertebrae (T2-T6).

• Head of the patient is slightly flexed and rests on the therapist's arm which is stabilizing the opposite shoulder.

• Therapist's forearm of mobilizing hand should be in mid-prone position

# Stabilizing hand

• Therapist puts his stabilizing hand on the patient's shoulders to stabilize the thoracic spine/torso of the patient. Therapist's groin/abdomen stabilizes the other side of the patient's shoulder.



## Mobilization

• The glide is given in antero-cranial direction along the treatment plane, i.e., towards the eyeball

• For C6-T1 level, force is applied through the knuckles to the spinous process

• For T2-T6 level, force is applied through the shaft of the middle phalanx of the index finger and pulp of the thumb to the transverse process

• Glides are performed rhythmically through mid to end range after taking up the slack.

# Variations

• Altering pressure on one side of the transverse process and increasing the amount of force on it will result in performing unilateral glides (Unilateral Reverse NAGs).

# **Precautions To Be Taken**

- Protract the scapula of the patient slightly in order to palpate the transverse process easily
- Any rotation, side-flexion of the head and neck should be avoided.
- Patient's trunk should be properly stabilized

# Reasoning

• The superior facet of the inferior vertebra glides cranially under the inferior facet of the superior vertebra (to treat T2-3 segment, facet joint/transverse process of T3 is mobilized).

- Mobilization induced movement helps to provide nutrition to the facet joints and disc.
- It might correct the positional fault taken place in opposite direction between affected facets.
- It might release an entrapped meniscoid between facet joints, if any.
- It might stimulate mechanoreceptors and proprioceptors in and around the joints.
- It helps to release muscles around the joints.
- 1.3. Sustained Natural Apophyseal Glides (SNAGs)

# Indications

- Pain and/or restricted cervical range of motion.
- Pain/movement loss in single plane.
- Central SNAGS used in the case of bilateral pain/stiffness.
- Unilateral SNAGS used in the case of unilateral pain/stiffness.





## **Patient Position**

• Sitting upright on a chair.

# **Therapist Position**

• Standing behind the patient in stride stance

## **Hand Placement**

For Central SNAGS

Stabilizing hand

• Therapist places medial border of the distal phalanx of the thumb obliquely, under the spinous process of the desired level of vertebra

## Mobilizing hand

• Therapist places pulp of the thumb of his other hand reinforcing the lateral side of the thumb placed earlier

• The other fingers are placed comfortably on the mandible/temporomandibular joint









# For Unilateral SNAGS

• Therapist places medial border of the distal phalanx of the thumb at the facet joint of the vertebra

• If SNAGs are given on the right side, right thumb is placed on the facet joint, which is reinforced by the left thumb, i.e., right side right thumb beneath.

• If SNAGs are given on the left side, left thumb is placed on the facet joint which is reinforced by the right thumb, i.e., left side left thumb beneath.

• The other fingers are placed comfortably on the mandible/temporomandibular joint.

# Mobilization

For Central SNAGS

- The glide is given under the spinous process by pushing it towards the eyeball
- Patient is asked to perform the painful or restricted movement (offending movement)
- Therapist moves his hands along with the movement of spine to sustain the glide along



For Unilateral SNAGS

• The glide is given over the affected facet (sometimes on the contra-lateral facet)

towards the same eyeball

• Patient is asked to perform the restricted or painful movement.

## Variations

• Passive overpressure should be applied at the available end range (only if pain-free) by the patient himself to enhance the efficacy of SNAGS.

• Self-SNAGs can be taught to the patient using a self-SNAG strap (explained subsequently in this chapter)

# **Precautions To Be Taken**

• The glide should be sustained throughout the movement until the head returns to the starting position.

• Therapist should also move along with the movement of the head to sustain the glide along the treatment plane.

• Use medial side of the contact thumb only and not the pulp, so that only a single facet is mobilized

#### Reasoning

• Inferior facet of the superior vertebra glides cranially on the superior facet of the inferior vertebra (to treat Cos segment, spinous process/facet joint of Cis mobilized).

• It might unlock the jammed facet. It helps in stretching the structures on the convex side of the offending movement, and opens the intervertebral foramen on the convex side.

• Mobilization induced movement helps to provide nutrition to the facet joints and disc.

• It might correct the positional fault between affected facets, hence, correcting the biomechanics of the joints.

• It might release an entrapped meniscoid between facet joints if any.

• It might stimulate mechanoreceptors and proprioceptors in and around the joints. It helps to release muscles around the joints.

## 1.4. Functional SNAGs/Cervical MWMs

## Indications

- Combined motion loss at cervical spine, e.g. extension and side-flexion.
- Pain and stiffness in two or more than two planes.
- Radiating pain in the arms due to involvement of lower cervical spine.
- Stiffness at lower cervical and/or upper thoracic spine.

## **Patient Position**

• Sitting upright on a chair.

## **Therapist Position**

• Standing behind the patient.



#### Hand Placement

To mobilize C5-6 spinal segment

- Tip of the thumb of one hand is placed 2-3 cm. lateral to the spinous process of a vertebra
- Tip of the thumb of other hand is also placed 2-3 cm. lateral to the spinous process of vertebra

# Mobilization

- Both thumbs are moved transversely across, to perform the glide
- While the glide is maintained, patient performs the offending movement.

• If right side-flexion and extension is restricted, therapist glides from the right side and from the left side







#### Variations

• May include multiple segments in one glide (by adding more force) to treat multiple levels, out it may make the glide less effective for a specific segment.

• Overpressure can be applied at the end range by the patient himself (only if required).

## **Precautions To Be Taken**

• There should be no pain throughout the movement.

- Angle of forearm should be maintained horizontally
- Slack of the muscle mass should be taken up before the glide is performed.

• Adequate soft tissue slack should be taken, so as to avoid undesirable mobilization of the soft tissue.

• Thumbs should not cross over to other side

#### Reasoning

• Improving coupled movements (rotation) between the locked vertebrae/ facet joints. Facilitating movement between the two facet joints by gliding them transversely.

• Helps in stretching the structures on the opposite side of the offending movement. It might unlock the jammed facet. It relatively keeps the intervertebral foramen open on the convex side and the side to which the vertebral body is rotated.

• Mobilization induced movement helps to provide nutrition to the facet joints and disc.

• It might correct the positional fault between affected facets, hence, correcting the biomechanics of the joints.

• It might release an entrapped meniscoid between facet joints, if any.

• It might stimulate mechanoreceptors and proprioceptors in and around the joints. It helps to release muscles around the joints.

• It helps in increasing movement at the desired level.

# 1.5. Fist Traction







#### Indications

- For mobilizing the segments from C6 to T3 vertebrae.
- Involvement of the cervico-thoracic junction.
- Pain in inter-scapular area.
- Protruded chin.
- Restriction of end range of flexion.

• Acute locking of facet joints.

## **Patient Position**

• Sitting upright on a chair without armrest.

## Hand Placement of Therapist and Patient.

• Therapist places pulp of his one thumb reinforced by the other thumb on the desired segment

• Patient makes a closed fist with the lateral side up, and places curled little finger and hypothenar side on upper edge of sternum.

• The chin of the patient rests on the circular plateau formed by the index finger and thumb of the fist.

• The other hand of the patient comes from the front to be placed at the base of the occiput

#### Mobilization

• Patient pulls his occiput in forward and downward direction (parabolic movement).

• Traction is maintained for 10-15 seconds.

• SNAGs can be added along with traction using the pulp of the thumb on the desired spinous process towards the eyeball

#### Variations

• Fist Traction can be given along with SNAGS at the desired level such that end range flexion can be achieved.

• Towel or a book can be placed between the sternal notch and base of the fist to make it less painful, as it may be uncomfortable due to lack of fat and fascia.

• By altering thickness of towel or book, level of traction can be changed. Thicker the book/towel, higher would be the level of traction

## **Precautions To Be Taken**

• The traction should be painless.

• Make sure that the patient performs the offending movement at the desired level and not at mid-thoracic or lumbar spine.

• Make sure that the upper spine stays in flexion and patient does not protrude the chin which may block the desired flexion movement.

## Reasoning

• Distraction of the facet joints takes place in the lower cervical and upper thoracic spine.

• It might unlock the jammed facet. Helps in stretching the posterior structures, and opens the intervertebral foramen.

- Mobilization induced movement helps to provide nutrition to the facet joints and disc.
- It might correct the positional fault between affected facets, hence, correcting the

biomechanics of the joints.

• It might release an entrapped meniscoid between facet joints, if any.

• it might stimulate mechanoreceptors and proprioceptors in and around the joints. It helps to release muscles around the joints.

• It helps in increasing movement at the desired level.

#### Conclusion

The most important outcome of the Mulligan technique can be safely applied in adults with neck pain without harming the patients in different conditions. In addition, functional limitations in adults with neck pain were reduced, and pain-free ROM was obtained.

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