



## COMBINATION OF ULTRASOUND THERAPY, MUSCLE ENERGY TECHNIQUE, AND SUSTAINED NATURAL APOPHYSEAL GLIDES IN NON-SPECIFIC NECK PAIN – A CASE SERIES

KOMBINASI ULTRASOUND THERAPY, MUSCLE ENERGY TECHNIQUE, DAN SUSTAINED NATURAL APOPHYSEAL GLIDES PADA NYERI LEHER NON-SPEKIFIK – SERIAL KASUS

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### ABSTRACT

**Background:** Non-specific neck pain is a common neuromusculoskeletal problem and affects about two thirds of people worldwide. **Purpose:** To find out the efficacy of the combination therapy in individuals with non-specific neck pain. **Case analysis:** The intervention was given in 12 sessions (3 times per week for 4 weeks) with the total duration of the therapy per session is 20 minutes. The sequence of interventions includes: ultrasound therapy, application of muscle energy techniques, and SNAGs mobilization. Evaluation of therapy in the form of pain was measured by a visual analogue scale and the range of motion of the cervical spine's lateral flexion was measured by a goniometer. **Result:** The results of the case series showed a decrease in pain scores from an average of 5.67 to 2.73. In the range of motion of the cervical spine's lateral flexion there was an increase from an average of 30 degrees to 36 degrees. **Conclusion:** The combination of ultrasound therapy, muscle energy technique, and sustained natural apophyseal glides provided benefits in reducing pain and increasing the range of motion of the cervical spine's lateral flexion in individuals with non-specific neck pain. This case series can be used as a preliminary study to develop further research with experimental methods in proving the effectiveness of the combination therapy in treating non-specific neck pain.

### ABSTRAK

**Latar belakang:** Nyeri leher non-spesifik merupakan masalah *neuromuskuloskeletal* yang umum dan memengaruhi sekitar dua pertiga orang di dunia. **Tujuan:** Untuk mengetahui efektivitas kombinasi terapi pada individu dengan nyeri leher non-spesifik. **Analisis kasus:** Intervensi diberikan sebanyak 12 sesi, (3 kali perminggu selama 4 minggu) dengan total durasi per sesi adalah 20 menit. Urutan pemberian intervensi meliputi *ultrasound therapy*, aplikasi *muscle energy technique*, serta mobilisasi SNAGs. Evaluasi terapi berupa nyeri diukur dengan visual *analogue scale* dan lingkup gerak sendi lateral fleksi leher diukur dengan goniometer. **Hasil:** Hasil seri kasus menunjukkan adanya penurunan skor nyeri dari rerata 5,67 menjadi 2,73. Pada lingkup gerak sendi pada arah lateral fleksi servikal terdapat peningkatan dari rerata 30 derajat menjadi 36 derajat. **Kesimpulan:** Kombinasi *ultrasound therapy*, *muscle energy technique*, dan *sustained natural apophyseal glides* memberikan manfaat dalam mengurangi nyeri dan meningkatkan lingkup gerak sendi pada arah lateral fleksi leher pada individu dengan nyeri leher non-spesifik. Seri kasus ini dapat dijadikan studi pendahuluan untuk mengembangkan penelitian lebih lanjut dengan metode eksperimental dalam membuktikan efektivitas kombinasi terapi dalam menangani nyeri leher non-spesifik.

### Case Study Studi Kasus

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## INTRODUCTION

Neck pain is a common neuromusculoskeletal problem. The prevalence rate of neck pain in 2017 reached 3.551 per 100.000 population (Kazeminasab *et al.*, 2022). Neck pain is more common in women (5.7%) than men (3.9%) (Ali *et al.*, 2014). *Non-Specific Neck Pain* (NSNP) is the most common of neck pain. Two thirds of people at some stage in their lives are affected by NSNP (Beltran-Alacreu *et al.*, 2018). Neck pain can arise due to poor posture, muscle tension in both the neck and upper back, and pinched nerves originating from the cervical spine (Ali *et al.*, 2014). Non-specific neck pain is a type of non-radicular pain characterized by a negative radicular pain provocation test result. Tests that can be applied include neck traction/distraction, spurling test, Valsalva maneuver, and shoulder abduction test, as well as upper limb tension test (Tsakitzidis *et al.*, 2013).

Movement and function problems that arise from NSNP include neck pain, limitation of range of motion in cervical spine, as well as an increase in disability accompanied by a decrease in functional ability to carry out daily activities (Fejer and Hartvigsen, 2008). *Ultrasound Therapy* (UST) can be given to overcome problems in terms of pain and decreased functional ability of the neck (Antari *et al.*, 2021; Dundar *et al.*, 2010; Matthews and Stretanski, 2022). Previous studies have described the effectiveness of UST in reducing pain and the level of pain sensitivity in the neck region by increasing the *Pain Pressure Threshold* (PPT) and subsequently positively influencing functional status by increasing the range of motion of the cervical spine at three planes (Celik *et al.*, 2013). Prolonged unilateral neck muscle contractions can increase the sensitivity of the cervical proprioceptors. It has an impact in the work of lateral flexor muscle that could be a variable associated with changes in neck pain (Mehdikhani *et al.*, 2019).

The *Muscle Energy Technique* (MET) technique consists of *Post-Isometric Relaxation* (PIR) and *Reciprocal Inhibition* (RI) techniques. The PIR technique applies isometric contractions to agonist or stiff muscles with the aim of reducing muscle tone after the isometric contraction. In the RI technique, the muscle that is not the target is contracted isometrically and induced the muscle to be blocked and experience a decrease in muscle tone in the target muscle (Nugraha *et al.*, 2020). In addition, MET plays a role in overcoming NSNP problems. A systematic review explains that MET provides benefits in improving pain threshold, lowering pain scores, increasing joint range of motion, reducing neck disability, and increasing muscle thickness (Nugraha *et al.*, 2020).

Other symptoms of NSNP, can be caused by hypomobility of the zygapophyseal joint or uncovertebral joint. This causes limitations in the range of motion of the cervical spine (Sudaryanto, 2014). *Sustained Natural Apophyseal Glides* (SNAGs) are a passive accessory glide joint mobilization technique performed for active movement through a range of motion that was

previously painful (Seo *et al.*, 2020). Previous research has shown that giving SNAGs followed by isometric exercise training for 6 weeks can reduce neck pain and disability in NSNP (Ali *et al.*, 2014).

## CASE STUDY

The case studies were conducted in independent physiotherapy practices in the cities of Denpasar and Badung in June–July 2022. Research participants were selected based on inclusion and exclusion criteria. Inclusion criteria included (1) Patients belonging to the category of non-specific neck pain based on physiotherapy examination procedures, (2) Patient age between 20-45 years, (3) *Visual Analogue Scale* (VAS) examination scores from 3-6, (4) Experienced neck pain in 4-12 weeks. Exclusion criteria included (1) Patients who were positive for pain radiating to the arm based on the results of the spurling's compression test, or proven to have herniated nucleus pulposus/HNP based on magnetic resonance imaging/MRI results, (2) Positive pain radiating to the arm based on the results of *Thoracic Outlet Syndrome* (TOS) examination, and (3) Patients who have a history of fracture, severe trauma (whiplash injury), rheumatoid arthritis or ankylosing spondylitis, cancer, tuberculosis infection, symptoms of *Vertebrobasilar Insufficiency* (VBI), and unstable upper or lower cervical spine.

The ultrasound therapy intervention was applied with a dose of 3 MHz in frequency, 0.4 W/cm<sup>2</sup> in intensity, 1 : 2 in pulsed ration, 3 treatment areas with duration of 9 minutes (Watson, 2017). MET was applied with the PIR technique on the upper trapezius and levator scapulae muscles. The function of the trapezius muscle is to move the neck in a lateral flexion, internally rotating the arm, and elevating and depressing the shoulders (Ourieff *et al.*, 2022). The main action of the levator scapula is to elevate the scapula, while its secondary actions are to assist in extension, ipsilateral rotation, and lateral flexion of the neck (Henry and Munakomi, 2022).

The repetitions were performed 5 times with isometric contraction. After application of PIR, physiotherapist applied stretching for 20 seconds (Phadke *et al.*, 2016). Application of SNAGs with mobilization in the cervical spine in which passive accessory gliding is applied to the segment and the patient performs active movements with it. Gliding is performed parallel to the plane of the perceived facet and the degree of gliding is determined by the patient's active movement response (Singh and Rayjade, 2019). The intervention was given in 12 sessions (3 times a week for 4 weeks), with the total duration of therapy per session is 20 minutes. Subjects are educated to perform active stretching techniques at home when they are not receiving therapy sessions. Evaluation of therapy in the form of pain was measured by VAS (Boonstra *et al.*, 2008) and the range of motion of the cervical spine's lateral flexion was measured by goniometer (Farooq *et al.*, 2016; Won *et al.*, 2019).

## RESULT

The results of the study in the form of subject characteristics and evaluation of therapy are described in Table 1 and Table 2. Table 1 shows the characteristics of the study subjects who were dominated by a normal body mass index, subjects who came from the administrative officer profession, with an average age of 36 years, and with a duration of complaining of neck pain for more than 4 weeks. Meanwhile, Table 2 presents data on a decrease in the average pain of 2.94 and an increase in the cervical lateral flexion *Range of Motion* (ROM) by 6 degrees.

**Table 1.** Research subject characteristics

Variables	Frequency (n = 3)	Percentage (%)
<b>Gender</b>		
Male	0	0
Female	3	100
<b>Body mass index</b>		
Normal	2	66.67
Overweight	1	33.33
<b>Occupation</b>		
Administrative officer	2	66.67
Housewife	1	33.33
<b>Age (mean ± SD) years</b>	36.33 ± 1.53	
<b>Duration of complaining neck pain (mean ± SD) weeks</b>	4.67 ± 0.577	

**Table 2.** Therapy evaluation

Variables	Pre-test (n = 3)	Post-test (n = 3)
Pain (VAS)	5.67 ± 0.38	2.73 ± 0.42
Lateral flexion ROM (Goniometer)	30 ± 1.63	36 ± 1.63

\* Visual Analogue Scale (VAS); Range of Motion (ROM)

## DISCUSSION

Neck pain is associated with several risk factors, such as female gender, older age, socioeconomic, and physical factors from activities carried out at work (Mahmoud *et al.*, 2019). Previous study showed that cervical ROM in lateral flexion was the only variable associated with changes in neck pain. This could be due to prolonged unilateral neck muscle contractions which can increase the sensitivity of the cervical proprioceptors (Mehdikhani *et al.*, 2019).

The results of the case series on 3 respondents showed that the combination of ultrasound therapy, muscle energy technique, and SNAGs provided benefits in reducing pain and increasing joint range of motion in cervical spine's lateral flexion in individuals with non-specific neck pain. Ultrasound therapy applies the use of acoustic energy with a frequency of 1-3 MHz with thermal or non-thermal effects on the target tissue (Burdette, E. Clif Lichtenstiger *et al.*, 2011; Denegar *et al.*, 2009; Hayes *et al.*, 2004). The benefits of using the UST thermal effect, include increased local blood flow, tissue temperature, and extensibility of collagen fibers (Morishit *et al.*, 2014; Papadopoulos and Mani, 2020; Sung *et al.*, 2022). Meanwhile, the non-thermal effect is related to ultrasonic cavitation. An experimental study explained that the application of low-intensity pulsed UST has a biostimulating effect on fibroblast cells which was confirmed by the appearance of mediators of tissue repair at the initiation stage (Perrucini *et al.*, 2020).

In this case series, the PIR technique is applied to the upper trapezius and levator scapulae muscles. The repetitions were performed 5 times with isometric contraction. After application of PIR, physiotherapist applied stretching for 20 seconds (Phadke *et al.*, 2016). The PIR technique applies isometric contractions to agonist or stiff muscles with the aim of reducing muscle tone after the isometric contraction. When given an isometric contraction of the agonist muscle, afferent nerve impulses in the Golgi tendon enter the dorsal root of the spinal cord and react with inhibitory motor neurons. This inhibitory property affects motor neurons in agonist muscles and causes a decrease in muscle tension or tone (Nugraha *et al.*, 2020).

In the 1980s Brian Mulligan developed the techniques of SNAGs. Sustained natural apophyseal glides are accessory glides performed on active movement through a previously painful range of motion (Pal and Misra, 2019). Previous research has shown that giving SNAGs followed by isometric exercise training for 6 weeks can reduce neck pain and disability in NSNP (Ali *et al.*, 2014). This study was also supported by Singh and Rayjade (2019) who concluded that administering SNAGs was beneficial in improving pain scores, neck disability, and range of motion of cervical spine in NSNP.

## CONCLUSION

The combination of ultrasound therapy, muscle energy technique, and SNAGs provides benefits in reducing pain and increasing range of motion in the lateral flexion of cervical spine in individuals with non-specific neck pain. This is a preliminary study and can be used to develop further research with experimental methods to prove the effectiveness of the combination therapy.

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