Original Artikel

Effectiveness of Dry Needling on Reducing Pain, Increasing Range of Motion of the Neck, and Increasing Craniovertebral Angle in Obese Patients with Cervical Myofascial Pain Syndrome

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ABSTRACT

Introduction: Obese patients often experience neck pain due to cervical myofascial pain syndrome. Dry needling is one of method to treat myofascial pain syndrome.

Methods: This study was a single-blind randomized controlled trial. Participants aged 18- 59 years with neck pain > 3 months caused by myofascial pain syndrome in the neck region. Patients were randomized into the dry needling group (n=16 subjects) and the control group (n=16 subjects). The dry needling group received dry needling therapy once a week for 4 weeks and exercise therapy three times a week for 4 weeks. The control group received exercise therapy only three times a week for 4 weeks.

Results: Participants had an average age of 41.4±11.2 years. Both groups experienced significant improvement in NRS, cervical ROM, and CVA between the pre-treatment assessment and the fourth week evaluation ($p<0.05$). The dry needling group experienced more significant improvements in NRS, cervical extension ROM, and CVA compared to the control group at the fourth week evaluation ($p<0.05$).

Conclusion: Dry needling combined with exercise or exercise therapy alone is effective in improving NRS, cervical ROM, and CVA in obese patients with cervical myofascial pain syndrome. However, dry needling combine with exercise therapy is superior to exercise therapy alone.

Keywords : Dry Needling, Obesity, Pain, Range of Motion in the Joint, Craniovertebral Angle, Myofascial Neck Pain Syndrome

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INTRODUCTION

Neck pain is a prevalent health issue among individuals with obesity and ranks as the fourth leading cause of disability worldwide. The prevalence of neck pain in adults ranges from 30% to 50%, contributing to 15% of the global health burden. Studies indicate that 60% of obese individuals experience myofascial pain

syndrome, with cases of neck pain and myofascial pain syndrome increasing towards the end of 2020 following the COVID-19 pandemic.[1]

The prevalence of obesity has risen significantly over the past three decades, with over 650 million people affected by obesity in 2016 according to the World Health Organization (WHO). In Indonesia, obesity prevalence increased from 14.8% in 2013 to 21.8% in 2018. Obesity poses a high risk for various health problems, including heart attacks, strokes, hypertension, diabetes mellitus, and musculoskeletal disorders such as knee pain, lower back pain, and neck pain. Obese individuals are also more likely to experience severe myofascial neck pain compared to those with normal weight, as inflammatory mediators can lower pain thresholds and increase the number of trigger points, thereby exacerbating pain and diminishing quality of life and work productivity.[2,3]

Myofascial neck pain syndrome in obese individuals is attributed to biomechanical disturbances resulting from shifts in the center of gravity, sedentary behavior, and postural issues. Obese patients often exhibit abdominal protrusion, which shifts the Center of Gravity (CG) anteriorly, affecting the curvature of the vertebrae and leading to forward head posture (FHP). This FHP increases the load on the neck extensor muscles, potentially causing microtrauma, spasms, and neck pain. The craniovertebral angle (CVA) measurement can be utilized to diagnose FHP, with smaller CVA values indicating the presence of myofascial neck pain.[4–7]

Forward head posture is associated with muscle imbalances in the neck, where the upper trapezius, pectoralis major, levator scapulae, and semispinalis capitis are tense, while the rhomboids, serratus, lower trapezius, middle trapezius, and neck flexors are weakened, a condition known as upper crossed syndrome. Continuous contraction of the neck extensor muscles can lead to microtrauma, ischemia, and adenosine triphosphate (ATP) energy crises, forming trigger points in myofascial pain syndrome. Research shows that individuals with FHP have a higher number of trigger points, particularly in the upper trapezius, levator scapulae, semispinalis capitis, and splenius cervicis muscles.[8–11]

Myofascial pain syndrome can be addressed through both pharmacological and non- pharmacological approaches. Pharmacological treatments include non-steroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, and antidepressants, while non-pharmacological management encompasses aerobic exercise, stretching, postural correction, stress management therapy, ultrasound, medication injections, wet needling, and dry needling (DN). For obese patients, weight loss is also crucial in alleviating symptoms of myofascial pain syndrome. Therapy typically involves diet, aerobic exercise, neck stretching, and postural correction. Dry needling is particularly recommended as it can reduce pain, enhance joint range of motion, and improve quality of life with lower risks of side effects compared to wet needling.[10,11]

Research on the effectiveness of dry needling for myofascial neck pain syndrome in obese patients remains limited and controversial due to the thickness of the subcutaneous layer, which can affect treatment outcomes. A study by Agung (2018) indicated that thicker subcutaneous layers in obese patients may influence the accuracy of needles and lasers in targeting muscles. Some studies, such as those by Botwin and Patel, have suggested using electromyography to enhance the accuracy of trigger point targeting in obese patients, while ultrasound is increasingly being utilized in dry needling techniques. Although many dry needling methods have been tested in the general population,

research on the effectiveness of dry needling in obese patients remains scarce.[8,9]

Studies on dry needling in obese individuals with myofascial pain syndrome generally focus on targeting techniques and guiding modalities, while in Indonesia, research has often been conducted on subjects with normal weight. The effectiveness of dry needling in obesity is still debated due to the subcutaneous fat thickness affecting needle precision in reaching trigger points. Given the significant morbidity and disability impacts, this study aims to evaluate the effectiveness of dry needling in obese patients with myofascial neck pain syndrome by assessing changes in pain scale, joint range of motion, and craniovertebral angle.

METHODS

This study is a randomized controlled trial utilizing a single-blind method. Participants aged 19 to 59 years with neck pain lasting at least three months due to myofascial pain syndrome in the neck area were included. Patients were randomly assigned to either the dry needling group (n=16 subjects) or the control group (n=16 subjects). The dry needling group received dry needling therapy once a week for four weeks, in addition to exercise therapy three times a week for four weeks. The control group received only exercise therapy three times a week for four weeks.

An experimental study was conducted after obtaining ethical approval from the Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia. The Indonesian version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF) was translated and validated for use in monitoring the physical activity of patients. Subject recruitment and data collection took place from January 2022 to March 2023 at Cipto Mangunkusumo Hospital, focusing on obese subjects with cervical myofascial pain syndrome. The minimum sample size was determined to be 32 individuals using a correlation sample size formula, with an expected correlation coefficient of 0.8 and a dropout rate of 20%. The sample was obtained through consecutive sampling. Inclusion criteria comprised male or female patients aged 19 to 59 years with a Body Mass Index (BMI) ≥ 25 kg/m², experiencing neck pain for at least three months, and meeting the criteria for myofascial pain syndrome. Participants were required to have trigger points in the upper trapezius, levator scapulae, or semispinalis capitis muscles, with a Numeric Rating Scale (NRS) pain score of at least 3, limitations due to trigger points, and a craniovertebral angle (CVA) of less than 53°. Exclusion criteria included patients with poor general health with myofascial pain syndrome, cervical radiculopathy, recent use of analgesics, steroids, or muscle relaxants, blood coagulation disorders with anticoagulant use within the last five days, postural abnormalities, and intolerance to needle insertion during dry needling therapy. Patients who had received or were undergoing medical rehabilitation for pain within the last two weeks were also excluded. Eligible subjects signed written informed consent prior to undergoing anamnesis and physical examination. Subjects then completed the Indonesian version of the IPAQ-SF on the day of examination.

Data obtained from the study were processed using SPSS version 22 for Windows. The results were presented in narrative form and tables. The first stage of data analysis involved conducting normality tests using variance calculations or the Shapiro-Wilk or Kolmogorov-Smirnov tests for numerical data. If the p-value was greater than 0.05, the data were considered normally distributed. Normally distributed data were analyzed using paired

t-tests, and the results were presented as means and standard deviations. Data that were not normally distributed were analyzed using the Mann-Whitney test, with results presented as medians along with minimum and maximum values. In this study, a significance level of $p < 0.05$ was considered significant, with a confidence interval set at 95%.

RESULTS

Characteristics of Study Subjects

Thirty-two individuals with myofascial pain syndrome participated in this study, with 16 subjects assigned to the intervention group and 16 subjects assigned to the control group. The characteristics of the study patients are presented in Table 1.

Table 1. Characteristics of Study Subjects

Characteristic	Intervention Group (n=17) median (min-max) n%	Control Group (n=17) median (min-max) n%	P Value
Age, Median (min-max) years	50(28-56)	44 (26-58)	0,089[a]
Gender			
Male	6 (37,5)	7 (43,75)	0,719[b]
Female	10 (62,5)	9 (56,25)	
Nutritional Status			
Class 1 Obesity	9 (56,25)	13 (81,25)	0,127[b]
Class 2 Obesity	7 (43,75)	3 (18,75)	
Education			
Primary to Secondary (Elementary to High School)	8 (50)	5 (31,25)	0,280b
Higher Education (Diploma to Bachelor Degree)	8 (50)	11 (68,75)	
Occupation			
Housewives	9 (56,25)	6 (37,5)	
Office Employee	4 (25,0)	3 (18,8)	0,699[c]
Medical Doctor	3 (18,8)	7 (43,8)	
Onset	5, 1(4-6)	4,4 (3-6)	0,056[a]

Analysis method: [a]Mann-Whitney [b]Chi-Square [c]Kolmogorov-Smirnov
*P value is significant ($p<0.05$)

Pain Scale in the Intervention and Control Groups

The intervention group had a median Numeric Rating Scale (NRS) score of five prior to treatment. The NRS scores for the intervention group showed a decrease during the evaluations at weeks one, two, three, and four, with sequential median NRS scores of 3.5, 3, 2, and 1, respectively. The NRS scores at weeks one, two, three, and four were statistically significantly different from the pre-treatment NRS score, with a p-value of 0.001 (Table 2).

The control group also had a median NRS score of five prior to treatment. The NRS scores for the control group decreased during the evaluations at weeks one, two, three, and four, with sequential median NRS scores of 4, 4, 3, and 2, respectively.

The NRS scores at weeks one, two, three, and four were statistically significantly different from the pre-treatment NRS score, with a p-value of 0.001 (Table 2).

Table 2. Pain Scores (NRS) (Week 0) and Weekly Assessments in the Intervention and Control Groups

Pain Scale		Week 0 (Pre Treatment	Week 1 Evaluation	Week 2 Evaluation	Week 3 Evaluation	Week 4 Evaluation
Intervention	NRS median (min-max)	5 (5-6) [a]	3,5 (3-5) [a]	3 (2-4) [a]	2 (2-3) [a]	1 (2-3) [a]
	P-Value		0,001*	0,001*	0,001*	0,001*
Control	NRS median (min-max	5 (4-6) [a]	4 (3-5) [a]	4 (3-4) [a]	3 (2-4) [a]	2 (1-3) [a]
	P-Value		0,001*	0,001*	0,001*	0,001*

Description: Numeric rating scale (NRS). aWilcoxon test
*P value is significant (p<0.05)

The initial NRS values of both groups showed no statistically significant difference in pain scores between the intervention and control groups before treatment and at week one of therapy (p=0.075). However, the intervention and control groups began to show a statistically significant difference in NRS scores starting from week two (p=0.03). The difference in NRS scores between the intervention and control groups persisted at weeks three and four, with p=0.001 (Table 3).

Tabel 3. Comparison of Pain Scores (NRS) (Week 0) and Weekly Assessments Between the Intervention and Control Groups

Week (Pain Scale)	Median (Min-Max) Intervention Group	Median (Min-Max) Control Group	p Value*
Week 0	5 (5-6)	5 (4-6)	0,075[a]
Week 1 Evaluation	3,5 (3-5)	4 (3-5)	0,075[a]
Week 2 Evaluation	3 (2-4)	4 (3-4)	0,003[a*]
Week 3 Evaluation	2 (2-3)	3 (2-4)	0,001[a*]
Week 4 Evaluation	1 (1-3)	2 (1-3)	0,001[a*]

Analysis method: aMann-Whitney
*P value is significant (p<0.05

Neck Range of Motion in the Intervention and Control Groups

Both the intervention group and control group experienced improvements in neck range of motion (ROM) assessed using a goniometer after receiving therapy. Increases in ROM for flexion, extension, lateral flexion, and rotation were observed in both the intervention and control groups. The intervention and control groups showed improvements in flexion ROM during the week one evaluation. The median flexion ROM values at week one for both groups were also statistically significantly different from the median flexion ROM before treatment, with p=0.001. The median flexion ROM values at weeks two, three, and four in the intervention and control groups also increased and were statistically significant compared to the median flexion ROM before treatment, with p=0.001.

The neck extension ROM in both the intervention and control groups demonstrated an increase at week one compared to the extension ROM before treatment (week 0), with a p-value of 0.001. The extension ROM values at weeks two, three, and four in both groups also showed significant improvements compared to the extension ROM before treatment, with p=0.001 (Table 4).

Table 4. Neck Range of Motion Before Treatment (Week 0) and Weekly Assessment in The Intervention and Control Groups

Flexion Value	Range of Motion	Evaluation Week 0	Evaluation Week 1	Evaluation Week 2	Evaluation Week 3	Evaluation Week 4
Intervention	ROM median (min-max)	40 (30-40)[a]	50 (40-55)[a]	50 (40-55)[a]	55 (50-60)[a]	60 (55-60)[a]
	P-Value		0,001*	0,001*	0,001*	0,001*
Control	ROM median (min-max)	40 (30-45)[a]	45 (40-55)[a]	50 (45-60)[a]	55 (45-60)[a]	57,5 (50-60)[a]
	P-Value		0,001*	0,001*	0,001*	0,001*
Extension Range of Motion Value						
Intervention	ROM median (min-max)	40 (30-45)[a]	55 (40-70)[a]	65 (55-75)[a]	70 (60-80)[a]	80 (70-80)[a]
	P-Value		0,001*	0,001*	0,001*	0,001*
Control	ROM median (min-max)	40 (30-45)[a]	50 (40-65)[a]	62,5 (50-70)[a]	70 (60-70)[a]	75 (70-80)[a]
	P-Value		0,001*	0,001*	0,001*	0,001*

Analysis method: [a]Wilcoxon test
*P value is significant (p<0.05)

The comparison of flexion ROM values between the intervention group and control group at the initial assessment before treatment showed no significant difference in flexion ROM between the two groups (p=0.549). Both groups experienced improvements in flexion ROM during the week four evaluation compared to the initial assessment. The median flexion ROM values for the intervention group were not significantly different from the

control group at the week one, two, three, or four evaluations (p>0.05) (Table 5).

The initial assessment of neck extension ROM in both the intervention and control groups indicated no significant difference, with a p-value of 0.079. The extension ROM in both groups did not differ significantly at the week one, two, and three evaluations (p>0.05). However, the extension ROM between the intervention and control groups showed a significant difference at week four. The intervention group exhibited a greater extension ROM compared to the control group, with a statistically significant difference at week four (p=0.004) (table 5).

The lateral flexion ROM improved in both the intervention and control groups from the week one evaluation through the final week. Both groups had relatively similar ROM values, and no significant differences were found in lateral flexion ROM between the two groups at the week one, two, three, or four evaluations (p>0.05) (Table 5).

The rotation ROM improved in both the intervention and control groups from the week one evaluation through week four. Both groups exhibited relatively similar ROM values, and no significant differences were found in rotation ROM between the two groups at the week one, two, three, or four evaluations (p>0.05) (Table 5).

Tabel 5. Comparison of Neck Range of Motion Before Treatment (Week 0) and Weekly Assessments Between the Intervention and Control Groups

Week	Median (Min-Max) Intervention Group	Median (Min-Max) Control Group	p Value*
Flexion Range of Motion Value			
Week 0	40 (30-40)	40 (30-45)	0,549[a]
Week 1 Evaluation	50 (40-55)	45 (40-55)	0,077[a]
Week 2 Evaluation	50 (40-55)	50 (45-60)	0,968[a]
Week 3 Evaluation	55 (50-60)	55 (45-60)	0,778[a]
Week 4 Evaluation	60 (55-60)	57,5 (50-60)	0,052[a]
Extension Range of Motion Value			
Week 0	40 (30-45)	40 (30-45)	0,079[a]
Week 1 Evaluation	55 (40-70)	50 (40-65)	0,121[a]
Week 2 Evaluation	65 (55-75)	62,5 (50-70)	0,206[a]
Week 3 Evaluation	70 (60-80)	70 (60-70)	0,241[a]
Week 4 Evaluation	80 (70-80)	75 (70-80)	0,004[a]*
Neck Lateral Range of Motion			
Week 0	30 (25-35)	30 (25-35)	0,08[a]
Week 1 Evaluation	40 (30-45)	40 (35-45)	0,88[a]
Week 2 Evaluation	40 (30-45)	40 (35-45)	0,22[a]
Week 3 Evaluation	45 (40-45)	45 (35-45)	0,96[a]
Week 4 Evaluation	45 (40-45)	45 (40-45)	0,71[a]
Neck Rotation Range of Motion			
Week 0	35 (30-45)	35 (30-40)	0,63[a]
Week 1 Evaluation	50 (40-60)	50 (50-55)	0,92[a]
Week 2 Evaluation	60 (50-65)	60 (55-65)	0,80[a]
Week 3 Evaluation	67,5 (60-75)	65 (65-70)	0,93[a]
Week 4 Evaluation	75 (70-75)	75 (70-75)	0,47[a]

Analysis method: [a]Mann-Whitney
*P value is significant (p<0.05

Craniovertebral Angle Between the Intervention and Control Groups

The intervention group experienced a statistically significant increase in mean CVA values at week one compared to the mean baseline CVA before treatment, with p=0.001. The mean CVA values at weeks two, three, and four also increased significantly compared to the pre-treatment mean CVA values, with p=0.001.The control group showed a statistically significant increase in mean CVA values at week one compared to the baseline mean CVA before treatment, with p=0.001. The mean CVA values at weeks two, three, and four also increased significantly compared to the pre-treatment mean CVA values, with p=0.001 (Table 6).

The comparison of mean craniovertebral angle (CVA) values before treatment indicated no statistically significant difference between the intervention and control groups, with a p-value of 0.282. The CVA values for both groups began to increase starting from the week one evaluation.

The CVA values in the intervention group started to show a statistically significant difference compared to the control group at the week two evaluation. The intervention group exhibited a greater CVA compared to the control group, with statistically significant differences at week two (p=0.047), week three (p=0.021), and week four (p=0.01) (Table 7).

Table 6. Mean CVA Values Before Treatment (Week 0) and Weekly Assessments in the Intervention Group

		Week 0 (Pre Treatment)	Week 1 Evaluation	Week 2 Evaluation	Week 3 Evaluation	Week 4 Evaluation
Intervention	Mean Craniovertebral Angle (Standard Deviation)	42,7 ± 1,16[a]	45,5 ± 1,90[a]	48,1± 1,90[a]	50,7 ± 1,65[a]	53,9 ± 1,21[a]
	P-Value		0,001*	0,001*	0,001*	0,001*
Control	Mean Craniovertebral Angle (Standard Deviation)	42,9 ± 1,20[a]	45,4 ± 1,30[a]	46,9 ± 1,23[a]	49,5 ± 1,24[a]	52,6 ± 1,31[a]
	P-Value		0,001*	0,001*	0,001*	0,001*

Analysis method: [a]Paired t test
*P value is significant (p<0.05)

Table 7. Comparison of Mean (Median) Craniovertebral Angle Before Treatment (Week 0) and Weekly Assessments Between the Intervention and Control Groups

Week	Median (Min-Max) Rotation ROM flexion Intervention Group	Median (Min-Max) Rotation ROM flexion Control Group	p Value*
Week 0	42,7 ± 1,16	42,9 ± 1,20	0,282[a]
Week 1 Evaluation	45,5 ± 1,90	45,4 ± 1,30	0,206[a]
Week 2 Evaluation	48,1 ± 1,90	46,9 ± 1,23	0,047[a]*
Week 3 Evaluation	50,7 ± 1,65	49,5 ± 1,24	0,021[a]*
Week 4 Evaluation	53,9 ± 1,21	52,6 ± 1,31	0,01[a]*

Analysis method: [a]Unpaired t test
*P value is significant (p<0.05)

DISCUSSION

Characteristics of Study Subjects

This study included 32 subjects aged between 26 and 58 years, consistent with the findings of Agung (2018)10, which indicated that individuals with myofascial pain syndrome typically fall within the age range of 20 to 54 years. Myofascial pain syndrome is most commonly observed in sedentary individuals aged 27.5 to 50 years.[1] This age group, which represents the productive years of life, often engages in repetitive activities and maintains non-ergonomic postures while working, thereby increasing the risk of developing myofascial pain syndrome.[1]

The study population had a higher proportion of female subjects. Females are reported to experience myofascial pain syndrome more frequently than males. This observation aligns with studies by Agung (2018)[10], which indicate that the majority of individuals suffering from myofascial pain syndrome are women. This may be attributed to repetitive activities and poor posture among women, as well as smaller muscle size and strength in the neck compared to men, increasing their risk of developing myofascial pain syndrome.[10]

Obesity can affect the accuracy and reach of the needle during dry needling (DN) due to the thickness of subcutaneous fat. In this study, subjects had a body mass index (BMI) ranging from 25.51 to 34.9 kg/m², with an average subcutaneous thickness of 12.3 mm. To ensure the needle reached the target muscle, subcutaneous thickness was measured using ultrasound. According to Agung (2018)[10], obesity is also associated with an increased number of trigger points (TP) and a decreased pain threshold. The study sample comprised 68.75% with class 1 obesity and 31.25% with class 2 obesity, with no significant differences between the intervention and control groups.

Forward Head Posture and Its Impact on Neck Pain, jobs that require a forward head posture (FHP), such as administrative tasks and repetitive screen use, can increase the risk of neck pain and myofascial pain syndrome. Office workers and healthcare professionals who frequently use devices and computers are at high risk for experiencing this type of pain, particularly during the COVID-19 pandemic, which saw an increase in the use of electronic medical records. A study by

Budianto (2022)[12] found that 69.4% of medical students used devices for more than 10 hours a day during the pandemic, leading to a threefold increase in the incidence of neck pain.

Research conducted by Hamid (2022)[13] indicated that homemakers often engage in repetitive activities and have increased device usage, particularly for social media browsing, during the pandemic. A study by Saeed et al. (2019)[14] demonstrated a strong correlation between repetitive activities and the use of computers and devices with the occurrence of myofascial neck pain. These findings support the notion that job type can be a confounding factor in the management of myofascial neck pain.

The onset of neck pain symptoms in this study ranged from 3 to 6 months, with no significant differences between the intervention and control groups. Agung (2017)[15] also found a similar onset period for complaints related to myofascial pain syndrome. This characteristic of onset suggests that myofascial neck pain can be chronic in nature.[5]

Comparison of the Effectiveness of Dry Needling Therapy Combined with Exercise Versus Exercise Therapy Alone on Pain Reduction At the initial assessment, the Numeric Rating Scale (NRS) pain scores for both the intervention and control groups were identical at five, indicating moderate pain. This chronic myofascial pain can be exacerbated by repetitive activities, such as slouching while using a computer or device. Chronic pain is often accompanied by central sensitization, which intensifies the perception of pain. Additionally, individuals with obesity experience increased synthesis of pro-inflammatory cytokines from adipose tissue, further complicating pain sensations and making pain management more challenging.[8,16]

This study found a significant reduction in pain between the intervention and control groups. The difference in NRS scores of 1.3 is considered clinically important according to the minimal clinically important difference (MCID) for chronic neck pain.[108] A significant reduction in pain was observed in the intervention group by week two, while the control group only showed a reduction by week three. At week two, the NRS score for the intervention group (3) was lower than that of the control group (4), with a p-value of 0.003. The faster reduction in pain in the intervention group may be attributed to the additional dry needling therapy alongside standard treatment.

A study by Mejuto-Vazquez et al. (2014)[17] reported that dry needling therapy for myofascial pain syndrome in the upper trapezius muscle significantly reduced pain levels at the first and second assessments following dry needling therapy. Aydin (2019)[18] compared the effectiveness of dry needling combined with exercise therapy to exercise therapy alone for myofascial pain syndrome in the upper trapezius. The results indicated that both therapies effectively alleviated pain; however, the combination of dry needling and exercise was superior to exercise therapy alone. Aydin's findings align with this study, as both the intervention and control groups experienced a reduction in pain levels, but the intervention group receiving dry needling experienced a more rapid and greater reduction in pain compared to the control group receiving standard therapy.

Myofascial pain syndrome is characterized by the presence of taut bands and trigger points (TP) in muscles that are in spasm or tight. The pain experienced at the trigger points in myofascial pain syndrome can be attributed to the compression of nerve endings and the release of pro- inflammatory compounds that modulate pain, such as neuropeptides, cytokines, substance P, calcitonin gene-related peptide (CGRP), IL-1a, and

bradykinin.[8,16] The release of these chemical compounds is more pronounced in individuals with obesity, which can exacerbate pain conditions in obese patients suffering from myofascial neck pain.[16]

Therapy for myofascial pain syndrome focuses on eliminating trigger points and taut bands while restoring tense muscles to their normal condition. This can be achieved through muscle stretching exercises to relieve tension, as well as dry needling (DN) therapy to disrupt the trigger points that cause pain. DN needles target fibrotic trigger points that compress nerve endings, thereby helping to alleviate muscle tension and taut bands. According to Simons, DN therapy provides mechanical stimulation to trigger points and taut bands, resulting in local stretching of the contracted cytoskeletal structures, which reduces muscle tension.[8]

The mechanical pressure applied through DN needles can induce electrical polarization in the muscles and surrounding connective tissues, converting mechanical energy into electrical energy that aids in tissue healing. DN can also stimulate alpha nerve fibers for up to 72 hours, activating the enkephalinergic system and opioid-mediated pain inhibition. Furthermore, DN increases inflammatory mediators such as neuropeptides, cytokines, substance P, CGRP, IL-1a, and bradykinin, which normalize after a local twitch response (LTR), thus reducing muscle pain. The physical trauma from DN also eliminates fibrotic tissue, enhances local bleeding, and mobilizes growth factors for tissue regeneration.[8]

DN is performed by inserting needles into the muscle. The needles used in DN can be either syringe needles or monofilament/filiform needles commonly used in acupuncture.[8] Mejuto- Vazquez et al. (2014) employed acupuncture needles sized 0.25×25 mm for DN therapy in myofascial pain syndrome of the upper trapezius muscle. Agung (2018) used a syringe needle sized 0.5×25 mm for DN therapy in myofascial pain syndrome affecting the upper trapezius muscle. The use of different needle types did not result in significant differences in DN therapy outcomes regarding pain reduction. Taofik (2015) compared 25G needles and acupuncture needles for DN therapy in myofascial pain syndrome and concluded that there was no difference in pain reduction effects between the 25G needle and acupuncture needles.[19]

Aerobic exercise therapy provided in this study also proved beneficial in managing pain for obese patients with myofascial pain syndrome. Aerobic exercise results in increased energy output, which is advantageous for weight loss. Additionally, aerobic exercise can help reduce pain by lowering levels of pro-inflammatory cytokines, thereby controlling pain modulation and pain thresholds in obese patients. [20] Ahmed et al. (2018) stated in a systematic review that aerobic exercise can also help decrease pain and reduce the number of trigger points in myofascial neck pain syndrome.[20]

This study indicates that the NRS (pain scale) values in the intervention group were lower and decreased more rapidly compared to the control group. The more significant pain reduction observed in the intervention group may be attributed to the effects of DN therapy, which works by alleviating pressure on nerve endings caused by fibrotic trigger points, normalizing pro- inflammatory mediators, and triggering the release of endogenous opioids through needle stimulation. The elimination of fibrotic trigger points also relieves the contracture of cytoskeletal structures, thereby helping to reduce muscle tension. These findings support the notion that DN therapy combined with standard treatment is more effective in reducing pain compared to standard

treatment alone in obese patients with myofascial neck pain syndrome.

Comparison of the Effectiveness of Dry Needling Therapy Combined with Exercise Versus Exercise Therapy Alone on the Improvement of Craniovertebral Angle

The initial assessment of the craniovertebral angle (CVA) revealed a mean CVA of 42.7° in the intervention group. The control group had a mean CVA of 42.9° at baseline. There was no significant difference in the craniovertebral angle between the two groups at the initial assessment (p=0.282). Normal CVA values vary across studies, typically ranging from >48° to 53°. Shaghayegh (2016) indicated that a CVA <48° is indicative of forward head posture (FHP). The study by Fernandez-De-Laz-Penaz noted that a CVA >49° to 51° can be considered normal and not indicative of FHP.

The mean CVA values for both the intervention and control groups at baseline indicated that all subjects had a CVA <48°. This finding suggests that all study subjects, who were obese, experienced postural issues characterized by FHP. A systematic review by Mahmoud (2019)6 also reported that lower CVA values are associated with the occurrence of FHP and myofascial neck pain, indicating that interventions aimed at improving CVA could be a target for treating myofascial pain syndrome in obese patients.

During the first week of evaluation, CVA values increased in both the intervention and control groups, but no significant differences were observed. A significant difference emerged in the second week, with the intervention group showing a higher CVA (48.1°) compared to the control group (46.9°), with p=0.047. This difference persisted through the third and fourth weeks, coinciding with improvements in the Numeric Rating Scale (NRS) for pain. The effects of dry needling (DN) are believed to accelerate pain reduction and enhance neck muscle movement, thereby improving FHP, consistent with findings by Laroshevskyi (2019), which demonstrated the effectiveness of DN in addressing myofascial pain and FHP.[11]

Various studies have shown that exercise is effective in improving forward head posture (FHP). Laroshevskyi (2019) found an increase in CVA of 3° to 10° after 10 days of therapy. Ruivo (2017) reported that postural education and neck muscle exercises increased CVA by up to 2.5°. Sheikhhoseini (2018) conducted a systematic review that found exercise programs lasting 4 to 32 weeks could improve CVA by an average of 4.5° and reduce neck pain due to myofascial pain syndrome.[11]

FHP is commonly observed in obese individuals due to changes in body composition, particularly the accumulation of fat in the abdominal area. This adipose accumulation causes the abdomen to protrude, shifting the body's center of gravity forward. To compensate for these changes, the body undergoes adjustments, resulting in increased lumbar lordosis, thoracic kyphosis, and cervical lordosis, ultimately leading to FHP. FHP causes a forward shift in head position, moving the head's center of gravity away from the base of the neck. This increases the moment arm and adds load to the neck extensor muscles, leading to excessive contraction. Prolonged FHP can result in microtrauma to the neck muscles, a reduction in the number of sarcomeres, and shortening of muscle fibers. This condition can also trigger spasms and taut bands, causing pain associated with myofascial pain syndrome and limiting functional movement in the head and neck region.[4]

FHP in obese patients often leads to upper cross syndrome, which triggers

muscle imbalances in the neck. Muscles such as the upper trapezius, pectoralis major, levator scapulae, and semispinalis capitis become tense, while the rhomboids, serratus, lower and middle trapezius, and neck flexors weaken.[8] Continuous contraction of the neck extensors can cause microtrauma, ischemia, hypoxia, and ATP energy crises, leading to the formation of trigger points (TP) that cause myofascial pain syndrome.[28] The study by De-Las-Penas indicated that individuals with FHP have a higher number of trigger points compared to those without FHP, suggesting that obese individuals, who generally tend to have FHP, may also experience an increased number of trigger points leading to myofascial neck pain.[3]

FHP can occur not only in obese individuals but also in those who work in non-ergonomic positions or engage in activities with poor posture, such as working at a computer or using devices. This condition is particularly prevalent among administrative staff, homemakers, and healthcare professionals.[17,56] Poor ergonomic posture can increase the repetitive activity of neck muscles, especially in supporting the head, thereby triggering neck pain.[8]

Neck stretching exercises and postural correction are effective in addressing muscle imbalances associated with upper cross syndrome. Neck stretching alleviates tension in the overactive extensor muscles, such as the upper trapezius, levator scapulae, and semispinalis capitis, resulting from FHP. Strengthening exercises for the back extensors help reinforce the thoracic stabilizer muscles and posterior neck muscles, enabling better support for the head and maintaining good posture for longer periods.[21]
Postural correction exercises generally require a significant duration, typically around 4 to 32 weeks, to achieve consistent improvements in posture. This is because postural correction involves not only stretching tight muscles and strengthening weak ones but also establishing new postural patterns to ensure long-lasting corrections.[21]

This study provided an intervention consisting of a DN program and therapeutic exercises over four weeks to the intervention group, including neck stretching, postural correction, chin tuck exercises, and trunk extensions. These exercises helped reduce muscle tension and strengthen the neck and back muscles. The results indicated that the combination of DN therapy and standard treatment significantly improved CVA and corrected FHP compared to the control group, which received only standard therapy.

CONCLUSION

The reduction in pain was significantly greater in the intervention group receiving DN therapy compared to the control group. Additionally, there was a more pronounced increase in neck extension range of motion in the intervention group. The craniovertebral angle also showed a significant improvement in the intervention group compared to the control group.

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