RESEARCH ARTICLE

# Prevalence of Cervical Myofascial Pain Syndrome and its Correlation with the Severity of Pain and Disability in Patients with Chronic Non-specific Neck Pain

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## Abstract

**Background:** Nonspecific chronic neck pain is increasing according to work-related gestures and modern lifestyle. Myofascial pain syndrome is a common problem and may be a primary disease. This study was designed to evaluate the prevalence of cervical myofascial pain syndrome in patients with chronic non-specific neck pain with normal MRI. We also examined the correlation between patients' age as well as pain severity and duration.

**Methods:** Patients with neck pain radiating to their upper extremity were examined despite normal MRI findings. We evaluated 10 different muscles based on myofascial pain syndrome criteria and also recorded pain intensity and functional ability using visual analogue scale and neck disability index, respectively. A physical therapist with at least 10 years of clinical experience with myofascial pain syndrome performed all physical examinations

**Results:** A total of 126 patients (69 females and 57 males) participated in this study, out of whom, 14 patients (11.1%) had no muscular involvement, while 112 cases (88.9%) revealed at least one trigger point. The infraspinatus and scalene muscles were the most commonly involved muscles accounting for 38.9% and 34.9% of all the involvements, respectively. The severity of pain was significantly associated with the disability of the patients (r=0.64, *P<0.001*). However, the correlation between pain and the number of trigger points was not significant (r=-0.19, *P=0.31*). Finally, the least significantly correlated variables were disability and the number of trigger points (r=-0.17, *P=0.05*).
Patient's age was significantly correlated neither with the number of trigger points (r=-0.04, P=0.62), nor the pain duration (r=0.07, *P=0.39*).

**Conclusion:** Myofascial pain syndrome is a common disorder in patients with nonspecific chronic neck pain, despite normal MRI findings. Although, pain is not correlated with the number of trigger points in these patients, we demonstrated a small correlation between patients' disability and the latter variable.

**Level of evidence:** II

**Keywords:** Disability, Myofascial pain syndrome, Neck pain, Radiculopathy, Trigger point

## Introduction

Chronic neck pain is defined as a persistent neck discomfort for at least 3 months due to chronic mechanical stresses such as a bad neck posture as well as degenerative changes (1, 2). Non-specific neck pain results from mechanical disorders, head and neck deformities, and myofascial disorders (3). Myofascial

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pain syndrome (MPS) is considered as a common nonarticular musculoskeletal pain syndrome and an etiology for chronic neck pain. Patients with MPS have specific trigger points (TrPs) that are detectable on physical examination (4). A trigger point is a tender point within a tight muscular band which is stimulated by excessive pressure, tension, contraction, or loading. Upper trapezius and infraspinatus are two of the most prone muscles to having TrPs in patients with chronic neck pain. These points not only cause local discomfort, but also they are able to cause referral pain in remote areas (5). Likewise, cervical disc herniation can cause a referral pain in the upper extremity that can be confusing with MPS (3, 6).

Although many cervical spine disorders that cause chronic neck pain show detectable changes on MRI, patients with MPS may have normal MRIs (7-9).

The prevalence of TrPs in benign chronic headache, mechanical neck pain, whiplash injury, and cervical disc herniation has already been investigated. Likewise, we studied the TrPs in patients with MPS (10-15).

This study was designed to evaluate the prevalence of cervical myofascial pain syndrome in patients with chronic non-specific neck pain with normal MRI. We also examined the correlation between patients' age as well as pain severity and duration. Finally, we demonstrated the correlation between the number of patients' trigger points and their disability.

## Materials and Methods

A total of 126 patients with chronic nonspecific neck pain radiating to the upper extremity were enrolled in this observational cross-sectional study at a referral center from July 2018 to June 2019. The study was approved by the medical research ethics committee and all patients signed an informed consent form. The sample size in this study was calculated by the following formula as the standard method for cross sectional studies:

$$Sample\ size = \frac{Z^2 \times P \times (1-P)}{d^2}$$

Where:

Z is the standard normal variate with 5% type 1 error ($P<0.01$)

P is the expected general population proportion according to the previous studies

D is the absolute error that is decided by the researcher

The demographic characteristics (age, gender, weight, height, and pain duration) of all patients were recorded. An expert neurosurgeon examined all patients initially. Based on the ACR criteria for performing an MRI study, all patients were evaluated with MRI study and the imagings were matched with their clinical findings. Patients with normal MRI findings were referred to a physical therapist for further assessment.

The inclusion criteria were: age between 20 to 60 years, chronic neck pain for at least 3

months, and normal MRI findings. The exclusion criteria were: fibromyalgia based on the American College of Rheumatology criteria (1990), previous neck or shoulder surgery, previous local steroid injection or acupuncture, and degenerative changes or other abnormalities such as cervical spine spondylolisthesis, disc protrusion, extrusion or sequestration in MRI.

A physical therapist (KE) with at least 10 years of clinical experience on MPS performed all physical examinations such as palpating the related muscles to find the TrPs. Visual analogue scale (VAS) was used to indicate the pain intensity during the last week on a scale ranging from zero (no pain) to 10 (worst pain imaginable). The neck disability index (NDI) was also used to measure the functional ability of the patients. The NDI consists of ten items consisting pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. Each item scores from zero (no pain or limitation) to five (as much pain as possible or maximal functional limitation). The total NDI score ranges from zero to 50. Higher scores indicate more disability (16).

We evaluated the following ten muscles based on Simon and Travell instructions:

Infraspinatus, latissimus dorsi, subscapularis, coracobrachialis, scalenes, pectoralis major,

pectoralis minor, serratus anterior, serratus posterior superior, and subclavius. All these

muscles can cause pain from the cervicothoracic region to the upper extremity (3, 6). MPS was diagnosed on the following three criteria: the presence of tight band, tenderness, and pain (3, 6).

### *Statistical analysis*

The Shapiro–Wilks test was used to analyze the normal distribution of the data. Also, frequency and descriptive analysis were performed to check all relevant characteristics of the data. Spearman's correlation test (data without normal distribution) was used to estimate the correlation among age, VAS, neck disability, pain duration, and number of TrPs. SPSS software (ver.19) was used to analyze all data.

## Results

Females and males constituted 54.8% (n=69) and 45.2% (n=57) of the subjects, respectively. The demographic and clinical characteristics of all patients are demonstrated in Table 1.

Only 14 patients (11.1%) had no muscular involvement;

**Table 1. Demographic and clinical features of the patients with chronic nonspecific neck pain (SD: standard deviation, VAS: visual analogue scale, NDI: Neck disability index)**

| | Minimum | Maximum | Mean ± SD |
|---|---|---|---|
| **Age (years)** | 20 | 60 | 34.47±11.951 |
| **Weight (kg)** | 47 | 91 | 69.59±9.965 |
| **Height (cm)** | 155 | 182 | 168.41±6.332 |
| **Pain duration (m)** | 3 | 264 | 16.04±28.075 |
| **VAS** | 1 | 8 | 5.66±1.129 |
| **NDI** | 19 | 44 | 32.79±5.841 |

**Table 2. Muscles causing myofascial pain syndrome in patients with chronic nonspecific**

| | Frequency (n=126 ) | Percentage (%) |
|---|---|---|
| **Infraspinatous** | 49 | 38.9 |
| **Latisimus dorsi** | 18 | 14.3 |
| **Subscapularis** | 40 | 31.7 |
| **Coracobrachialis** | 9 | 7.1 |
| **Scalenes** | 44 | 34.9 |
| **Pectoralis major** | 14 | 11.1 |
| **Pectoralis minor** | 10 | 7.9 |
| **Subclavius** | 7 | 5.6 |
| **Serratus posterior superior** | 23 | 18.3 |
| **Serratus anterior** | 14 | 11.1 |

while, 112 cases (88.9%) revealed at least one trigger point in physical examination. On the one hand, majority of the patients (99 cases) experienced a gradual onset of neck pain without a history of trauma. Twenty seven patients reported a prior trauma. Approximately one-third of patients (35.7%, n=45) had only one involved muscle. Infraspinatus and scalene were the most involved muscles with the prevalence of 38.9% (n=49) and 34.9%(n=44), respectively. The exact amount of all ten muscle involvements are represented on [Table 2].

According to Table 3 pain was significantly associated with the disability of the patients (r=0.64, *P0.001*>). However, the correlation between pain and the number of TrPs was not significant (r=-0.19, *P=0.31*). Finally, the least significant correlated variables were the disability of patients and the number of their TrPs (r=-0.17, *P=0.05*). Other variables such as age and number of TrPs (r=-0.04, *P=0.62*), age and pain duration (r=0.07, *P=0.39*), and pain severity and duration (r=-0.02, *P=0.81*) were not significantly correlated.

## Discussion

Chronic nonspecific neck pain is an increasing disorder which causes great disability and economic costs (1, 3). The differentiation between radicular and referral pain to the upper extremity is crucial for planning an appropriate treatment protocol. MPS (as a main etiology for the mentioned problem) causes pain and dysfunction of the musculoskeletal system which may be overlooked (4).

Recent research demonstrates an association between disc herniation and MPS (15, 17). Contrastingly, we believed MPS could happen in individuals with a rather normal cervical MRI study; thus, in the present study, we evaluated MPS in patients with no disc herniation or other abnormalities confirmed by a normal MRI study. Demonstrating that MPS can also occur in patients who did not have a clear history of prior trauma and suffered from a gradual onset of neck pain (78.6%). They usually give a history of habitual head and neck bad postures, or a

**Table 3. The correlation between age, pain severity, disability, and pain duration with the number of trigger points in patients with chronic non-specific neck pain**

| | r | *P value* |
|---|---|---|
| **Pain and number of involved muscles** | -0.19 | 0.31 |
| **Pain and disability** | 0.64 | <0.001 |
| **Disability and number of involved muscles** | -0.17 | 0.05 |
| **Age and number of involved muscles** | -0.04 | 0.62 |
| **Age and pain duration** | 0.07 | 0.39 |
| **Pain and pain duration** | -0.02 | 0.81 |

vault position according to their jobs. With regards to the mentioned correlation of our patients' life styles and the prevalence of MPS and neck pain, Hoy et al. illustrated that occupational demands, sedentary postures, and poor physical work environments are the major risk factors for chronic neck pain (1).

In the present study, 49 (out of 126) patients showed some kind of infraspinatus muscle

involvement. Considering the fact that this muscle is involved in many daily activities i.e. arm swings, upper limb sudden jerks, backward movements of the arm. This high prevalence seems logical (3, 6). Daub et al. demonstrated that the reason for a patient's neck pain radiating to the upper extremity could be exclusively caused by an active trigger point in the infraspinatus muscle. The patient in their case study was neurologically intact and the pain- referring to upper extremity was only reproduced by palpation of an active trigger point in the infraspinatus muscle (7). The second most commonly involved muscle in this study was scalene. Scalenes also play an important role in daily activities such as lifting or pulling objects, most hand-crafted activities, playing musical instruments, and sports such as swimming. In addition, these muscles play an important role in respiratory distress, coughing, sleeping in inappropriate conditions, uneven shoulder heights, and patients with scoliosis (3). Scalene muscles TrP usually accompanies with unilateral neck and shoulder pain radiating to upper extremity on the radial side of the forearm as well as the thumb and index fingers (matching C6 dermatome) (3).

Scalenes MPS can be both primary- due to excessive work, weak muscles, and repetitive microtrauma- or a secondary disorder- as a result of osteoarthritis and some systemic diseases (3, 6). Jalil et al. reported two cases with neck pain as a result of MPS of the scalenes and concluded that scalenes MPS can mimic cervical radiculopathies, which are frequently underdiagnosed by physicians (18). Furthermore, Cannon et al. performed an EMG-NCV study on patients with upper limb radiculopathy symptoms. They indicated that 69% of the patients had a normal EMG-NCV study, while 42% of them were affected by some kind of musculoskeletal disorders i.e. MPS, impingement syndrome, and lateral epicondylitis. Thus, they concluded that referral pain of the upper extremity is more commonly caused by musculoskeletal disorders than nerve root compression in the cervical

spine which is in line with our findings (19). Also, they indicated that the prevalence of MPS in patients with a normal EMG-NCV study was higher than those with confirmed cervical radiculopathy. However, unlike our study, they did not mention the involved muscles in theirs (19). Ozturk et al. studied patients with cervical disc herniation and achieved similar results to Cannon et al. (15, 19). They demonstrated that the development of MPS does not necessarily correlate with cervical nerve root compression that is similar to our study results. They emphasized that inappropriate physical activities most commonly cause MPS (15, 19). We performed our study on patients with no disc herniation or any other cervical spine abnormalities, and concluded that the majority of the patients (89%) with chronic non-specific neck pain suffered from MPS. Therefore, it is logical to indicate that MPS is more common among patients having chronic neck pain with a healthy cervical spine compared with patients suffering from cervical spine pathologies. The subclavius and coracobrachialis muscles showed the lowest involvement among other muscles in our study. The subclavius was the least commonly involved muscle in only seven patients. The subclavius is located near the clavicular portion of pectoralis major and functions in conjunction with it (3). This muscle plays a minor role in daily activities; regarding this issue, the low prevalence of its involvement can be explained (6). The second least commonly involved muscle in our study was coracobrachialis muscle accounting for the involvement of nine cases. Since this muscle alone plays a minor role in the neck and shoulder girdle; with the similar logics, we justify the low prevalence of its involvement (3, 6).

Pain severity and duration, disability and patients' age did not have significant correlations with the the number of TrPs in our study. However, Fernandez et al. illustrated that active TrPs in cervical muscles were associated with pain intensity and duration compared to those with latent TrPs in chronic tension-type headache (20).

There could be a number of limitations to the present study. First of all, it is impossible to state a cause-effect relationship between the muscular TrPs and neck pain (19). Consequently, it is not possible to find the primary and secondary causes of neck pain. Therefore, further research is needed to indicate the effect of trigger point interventions on neck symptoms recovery. We evaluated the prevalence of MPS in patients with chronic non-specific neck pain in one site, therefore, the results may not necessarily demonstrate the exact prevalence in the general population. Additionally, not differentiating between the TrPs as a primary or secondary one, was also a limitation to this study. Regards to the fact that in many cases, more than one muscle was involved (53.1%) and finding the primary TrPs responsible for patients' discomfort is challenging (3, 15).

According to the American College of Radiology (ACR), MRI is the gold standard imaging study for the evaluation of musculoskeletal pains (9). The sensitivity of MRI in detecting nerve root compression is quite low but its specificity is relatively high (21). In this study, we included patients with a normal MRI study. Other imaging techniques e.g. CT scan and ultrasonography may be required for further confirmation of healthy tissues (22, 23).

MPS is a common musculoskeletal disorder in patients with nonspecific chronic neck pain with normal cervical spine MRI findings. Infraspinatus and scalenes were the most commonly involved muscles in these patients. In terms of the correlation between the number of trigger points and patients' pain and disability; Although, pain is not correlated with the number of trigger points in these patients, we demonstrated a small correlation between patients' disability and the latter variable.

***Conflicts of Interest*:** The authors declare no conflict of interest with respect to the research, authorship and/or publication of this research.

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