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Assessment of Trigger Points therapy effectiveness with positional release method among office workers

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Abstract:
Introduction: Cervical spine pain is one of the most common health problems among adults. The factors contributing to cervical pain include: improper musculoskeletal system strain (lack of ergonomics), absence of active rest and proper prevention. Because of incorrect exploitation TrP (trigger points) creation occurs in soft tissues. One of the cervical spine pain healing methods is TrPs therapy with positional release method.
Aim: The aim of the study was assessment of the effectiveness of TrPs deactivation with positional release method within selected cervical spine and shoulder girdle muscles among office workers.
Material and methods: The study was carried out among 38 office workers of both sexes (44.74% male and 52.63% female) aged 26 to 61 reporting painfulness of cervical spine and shoulder girdle. In the study following methods, scales and tools were used: NDI (Neck Disability Index) to assess the degree of neck disability caused by cervical spine disorders, NRS (Numerical Rating Scale) to assess pain intensity and Wagner algometer to assess pain tolerance. The assessment was performed on: levator scapulae muscle, sternocleidomastoid

muscle, trapezius muscle, oblique superior muscle and rectus capitis posterior major muscle. Afterwards a TrPs therapy with positional release method was performed. After the therapy an assessment with NDI scale and an algometer was performed once again. The results were developed with use of Statistica 12 Programme. Pearson's correlation was used in the statistical analysis.
Results: 36.84% of the subjects were assumed to possess no disability, 44.74% possessed mild disability and 18.42% possessed moderate disability the NDI scale. After the levator scapulae muscle, sternocleidomastoid muscle, trapezius muscle, oblique superior muscle and rectus capitis posterior major muscle therapy pain intensity significantly decreased ($p<0.001$). TrPs therapy caused also statistically significant difference in algometer assessment in levator scapulae muscle, rectus capitis posterior major muscle and trapezius muscle ($p<0.001$). In oblique superior muscle decrease of pain intensity is not statistically significant on the right side ($p=0.223$) and on the left side ($p=0.068$).
Conclusions: Static overload of cervical spine among office workers causes the creation of TrPs in soft tissues. TrPs therapy using positional release method reduces the pain intensity in cervical spine. TrPs therapy using positional release method increases range of motion of the cervical spine. Physiotherapeutic prevention should be implemented among office workers in order to minimize cervical spine disorders.

Keywords: pain, trigger points, cervical spine.

Introduction

Cervical spine pain is considered civilization disease on account of its ailments having become more common. According to World Health Organisation over 33 million people all over the world are afflicted with cervical spine pain [1]. Main causes for cervical spine diseases include: improper musculoskeletal system strain, absence of active rest and proper prevention. Primary factor leading to spinal disorders is summing up of spine segments overload due to work conditions and lack of rest. As effect microtrauma including trigger points (TrPs) occurs in soft tissues. There is a number of healing treatment aiming to suppress spinal pain. One of them is TrPs relaxation with positional release method [2, 3, 4].

Myofascial trigger points are the spots where skeletal muscle bundles activity is increased. They can occur i.a. in muscle tissue and/or fascia [2, 3]. Trigger points can be divided into active and latent. Both types may transform into another. The difference between them is that latent TrPs do not cause any pain while at rest [2, 5]. Another division differentiates primary and satellite trigger points. Primary trigger point leads to satellite trigger points creation. Deactivation of the primary point causes dissipation of its satellite trigger points. The main difference between them is that the primary TrP upon pressuring causes maximal and radiating pain, whereas satellite - lesser and non-radiating pain [2].
In addition to pain TrPS are responsible for other ailments. Even inactive may reduce function of the muscle where it resides as well as other functionally related muscles. The reason for that is because TrP originates from a prolonged high muscle tension. Upon creation of a TrPs the tension continues to increase due to a deteriorated blood flow and initiation of anaerobic glycolysis in the muscle [2]. It results in transferring the tension onto tendons and tendon-periosteal transitions changing the function of joints affected by the tense muscles. Muscles antagonist to those affected by TrPs are also weakened [2]. In effect joints, movement of which depends on the muscles in the vicinity of TrPs, have their range of motion reduced [6].

Office workers are a specific occupational group which remains constantly in a sitting position during their working hours. It is difficult to maintain a correct position, which promotes increased neck and shoulder girdle muscles tension. Office workers are therefore vulnerable to the creation of trigger points within spinal muscles area. For that reason it is vital to perform a TrPs therapy promptly in order to avoid any further ailments connected with the pain and increased neck and shoulder girdle muscle tension.

Aim

The aim of the study was assessment of the effectiveness of TrPs deactivation with positional release method within selected cervical spine and shoulder girdle muscles among office workers. The aim was being carried out by answering the following questions:

1. **Do office workers suffer from TrPs in cervical spine and shoulder girdle muscles?**
2. **Does the deactivation of TrPs affect the pain intensity in cervical spine?**
3. **Does the deactivation of TrPs affect the cervical spine range of motion improvement?**

Material and methods

The study was carried out among office workers in Szczecin, Poland. It included 38 people of both sexes (44.74% male and 52.63% female) aged 26 to 61 complaining about painfulness of cervical spine and shoulder girdle. Study has been approved by Komisja Bioetyczna Pomorskiego Uniwersytetu Medycznego w Szczecinie (nr KB-0012/142/18).

Each subject had subject research and physical examination performed.

Subject research

______Subject research included information from study survey concerning: current pain ailments of cervical spine and shoulder girdle, assessment of lifestyle and physical activity.

In order to assess the degree of neck disability caused by cervical spine disorders a standardized NDI scale was used.

Among all the subjects cervical spine pain intensity assessment was performed with the use of NRS scale (*Numerical Rating Scale*), where each stimulus is being rated from 0 to 10 (where level ‘0’ means no pain and ‘10’ means strongest imaginable pain). Pain intensity assessment was performed before and after therapy.

Secondly among all subjects physical examination was performed which consisted of:

1. Body Mass Index assessment (BMI). BMI is calculated by dividing body mass [kg] by height [m] squared.
2. Palpation of five chosen muscles in cervical spine and shoulder girdle area.
    a. levator scapulae muscle - in the origin area - scapula superior angle and superior part of medial border (Fig.1)
    b. sternocleidomastoid muscle - on muscle belly of sternal head and on muscle belly of clavicular head (Fig. 2)
    c. trapezius muscle - on muscle belly near origin on acromial extremity (Fig. 3)
    d. superior oblique muscle- on muscle belly (Fig. 4)
    e. rectus capitis posterior major muscle - on muscle belly (Fig. 5)

Fig. 1 - levator scapulae muscle
(ANATOMY.TV - Primal Pictures 3D)

Fig. 2 - sternocleidomastoid muscle
(ANATOMY.TV - Primal Pictures 3D)

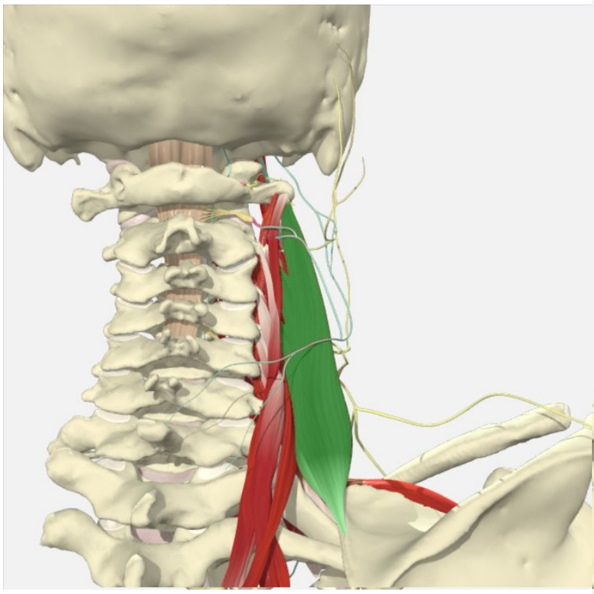

Fig. 3 - descending fibres of trapezius muscle
(ANATOMY.TV - Primal Pictures 3D)

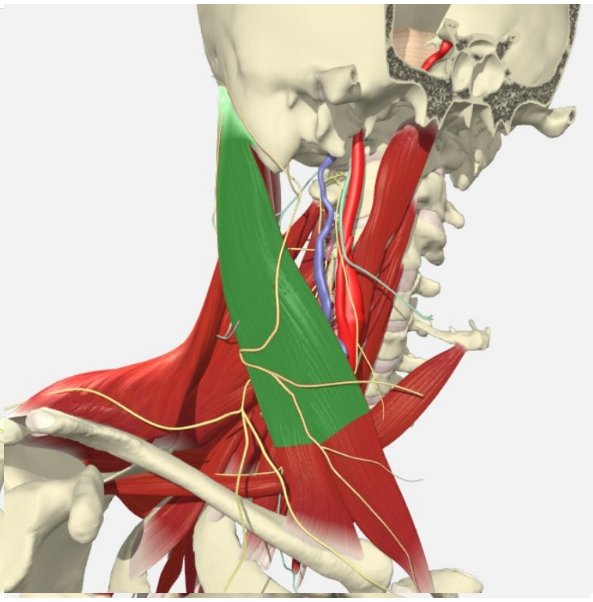

Fig. 4 - superior oblique muscle
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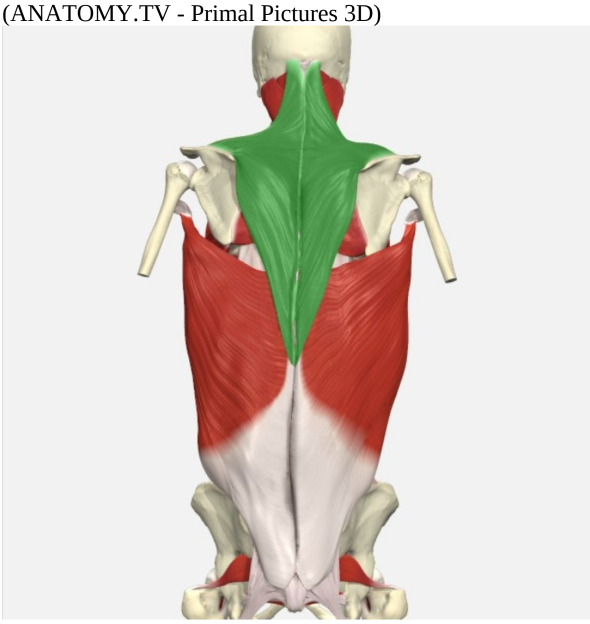

Fig. 5 - rectus capitis posterior major muscle
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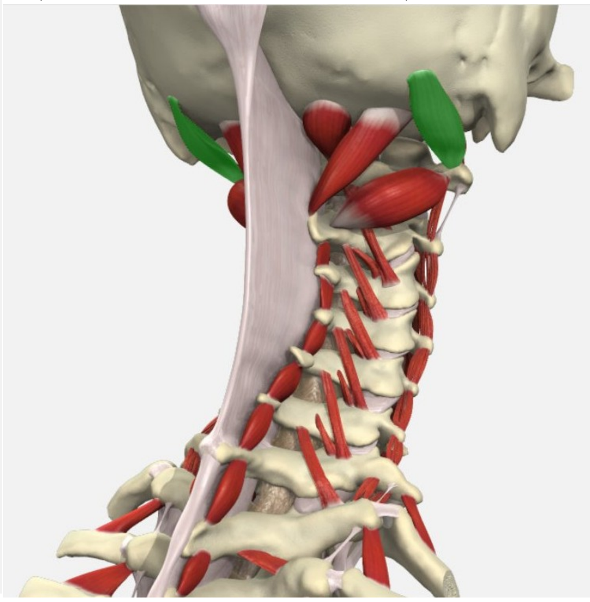
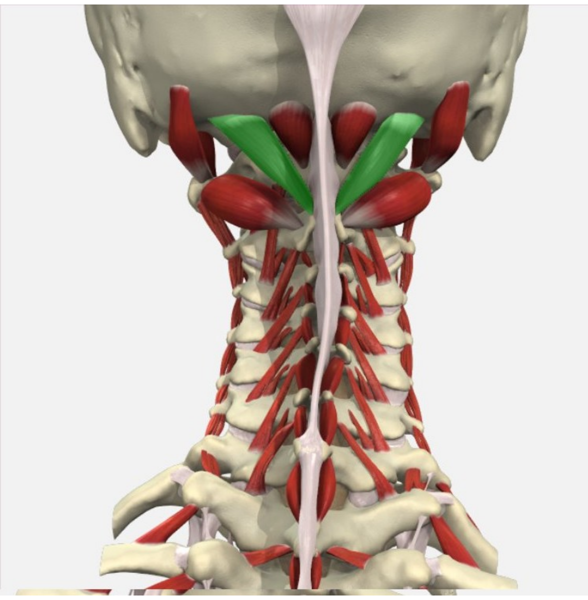




3. Assessment of pain tolerance using WAGNER algometer (Fig 6).

The assessment was performed on following muscles: levator scapulae muscle, sternocleidomastoid muscle, trapezius muscle, oblique superior muscle, rectus capitis posterior major muscle.

Algometer was applied to the most painful spot in muscle belly area determined during palpation. Therapist applied the algometer with gradually increasing force to the point, when a subject stopped feeling the pressure and started experiencing pain. Value returned by the algometer at the point when the subject reported feeling pain was taken into consideration.

Fig. 6 - Algometer WAGNER (own source).

4. Cervical spine range of motion assessment.

Measurements were taken with the use of a measuring tape accordingly with Zembaty [7] methodology. Following cervical spine movements were rated: flexion, extension, rotation (left and right), lateral flexion (left and right).

Assessment of pain tolerance using algometer, cervical spine range of motion measurement and pain intensity assessment in NRS scale were repeated directly after the therapy.

After conducting subject research and physical examination among all subjects a trigger points therapy was performed. During the therapy utilizing positional release technique, the subject remained in a lying position. Afterwards the subject was asked to describe the intensity of pain using only numerical values from 0 to 10 and to inform whenever the pain would intensify or subside. After TrPs localization it was pressed by the therapist. Then the therapist performed a passive movement of the subject's head in order to move the treated muscle origins closer to each other. If the movement caused reduction of pain intensity following movements were added: lateral flexion and rotation in the treated TrP direction. Therapist ended changing of subject's head position when subject reported his pain intensity drop to level 3 or lower. Treatment of a singular TrP proceeded for 2 minutes. During that time a chosen position was being maintained. After the time has passed the head was being slowly returned to the neutral position. All the procedures were performed upon every located TrP separately. The overall therapy duration depended on the amount of TrPs found in each subject.

Each of the subjects was informed about work ergonomics and instructed how to stretch muscles to avoid TrPs creation.

Statistical analysis was performed with Statistica 12 programme.

Results

The average value of cervical spine pain intensity occurring spontaneously during the day amounted to 3.63 in NRS scale. Four of the subjects reported the pain occurring all the time whereas the remaining group only experienced pain for 2.34 hours daily on average. 47.37 % of the subjects practiced sports. 7.89% practiced sport once a week, 34.21% from 2 up to 3 times a week and 5.26% practiced sport 4 or more times a week. Average amount of time spent daily in work equaled 7.68 hours. 39.47% sought professional physiotherapeutic help because of cervical spine pain.

From performed results analysis data acquired from NDI questionnaire was presented first.

Tab. 1 Results based on Neck Disability Index.

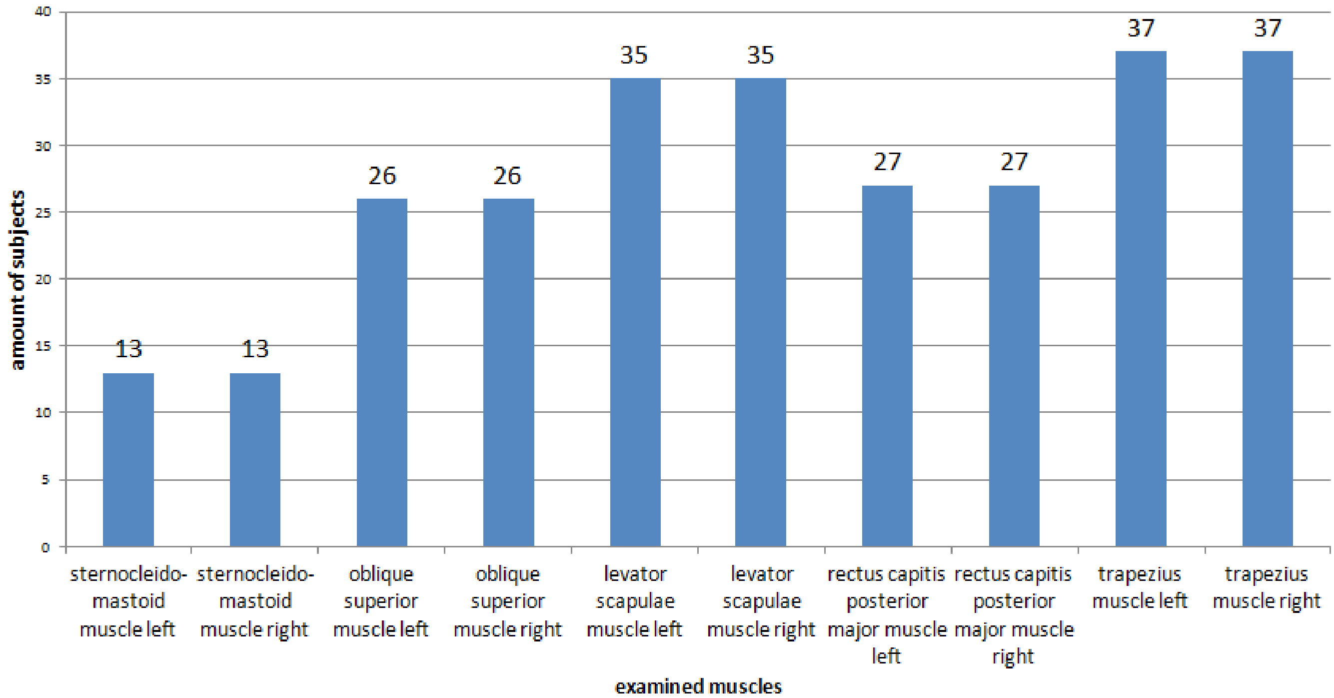
Points	DISABILITY	n=38	%
0-4 pt	no disability	14	36.84%
5-15 pt	mild disability	17	44.74%
15-24 pt	moderate disability	7	18.42%
25-34 pt	severe disability	0	0%
35-50 pt	complete disability	0	0%

Legend: n - group quantity

According to Tab.1 36.84% of the subjects were assumed to possess no disability, 44.74% possessed mild disability and 18.42% possessed moderate disability. None of the subjects possessed severe disability or complete disability.

Among the subjects 44.74% had normal BMI, 39.47% were overweight and 15.79% were obese. 46.15% of the subjects practise sport. On average the subjects rated their cervical neck and shoulder girdle pain as 4 in the NRS scale. Average value of cervical neck pain intensity during the diagnosis procedure equaled 7.58. In the Fig.7 the amount of existing TrPs based on manual examination of the right and left side muscles of cervical neck and shoulder girdle was presented.

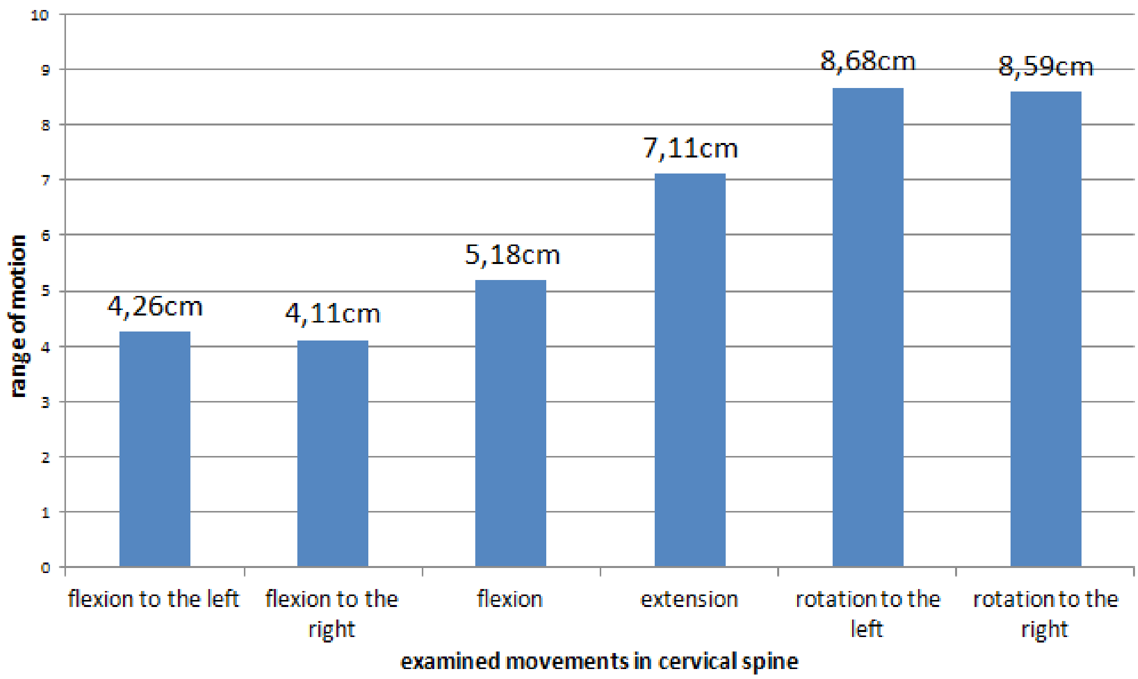
Fig. 7 Amount of subjects with TrPs detected in particular muscles



The greatest amount of TrPs was observed in trapezius muscle, followed by levator scapulae muscle, rectus capitis posterior major muscle, oblique superior muscle, sternocleidomastoid muscle.

In the sternocleidomastoid muscle case TrPs were found in 47.37% of the subjects. In obliquus superior muscle a TrP occured in 71.05% subjects. TrPs in trapezius muscle occured in 97.37% subjects. Levator scapulae muscle hosted a TrP in 92.11% of the cases and rectus capitis posterior major muscle in 76.32% of the cases.

Fig. 8 Average range of cervical spine motion



According to Fig.8 the range of motion of lateral flexion to the left and to the right is comparable in the diagnostic test. Lateral flexion to the left equaled 4.26cm and to the right 4.11cm. Similar results may be observed when studying rotation. Rotation to the left equaled

8.69cm, and to the right 8.59cm. Average value of flexion equaled 5.18cm and extension 7.11cm.

Tab.2 presents the assessment of TrPs appearance and pain intensity before and after the therapy. In case of sternocleidomastoid muscle pain intensity has been statistically significantly reduced both on the left and the right side after the therapy ($p<0.001$). TrPs therapy on obliquus superior muscle reduced the amount of pain in NRS scale on the left and the right side statistically significantly ($p<0.001$). The reduction of pain intensity measured with an algometer proved statistically insignificant both on the left ($p=0.068$) and the right side ($p=0.223$). In all the remaining examined muscles (levator scapulae muscle, rectus capitis posterior major muscle, trapezius muscle) TrPs therapy resulted in a statistically significant difference in the pain intensity level both in NRS scale and the algometer assessment ($p=0.001$).

Tab 2. Pain intensity level NRS scale

Muscle	Right side					Left side				
	Before therapy		After therapy		Significance level	Before therapy		After therapy		Significance level
	X	SD	X	SD		X	SD	X	SD	
sternocleidomastoid muscle 1	3.553	4.005	1.895	2.142	**<0.001**	3.658	4.042	1.895	2.346	**<0.001**
sternocleidomastoid muscle 2	2.605	3.824	1.474	2.275	**<0.001**	2.553	3.681	1.395	2.237	**<0.001**
oblique superior muscle	5.342	3.892	3.342	2.822	**<0.001**	5.132	3.807	2.684	2.569	**<0.001**
levator scapulae muscle	7.237	2.583	4.000	2.206	**<0.001**	6.947	2.460	4.342	2.070	**<0.001**
rectus capitis posterior major muscle	5.289	3.661	3.421	1.003	**<0.001**	5.289	3.661	2.974	2.666	**<0.001**
trapezius muscle	7.447	2.101	7.447	2.101	**<0.001**	7.684	1.919	3.868	1.961	**<0.001**

Tab 3. Pain tolerance assessment with algometer.

Muscle	Right side					Left side				
	Before therapy		After therapy		Significance level	Before therapy		After therapy		Significance level
	X	SD	X	SD		X	SD	X	SD	
oblique superior muscle	1.289	1.803	1.371	1.318	0.223	1.042	0.766	1136.561	6997.516	0.068
levator scapulae muscle	2.050	0.956	2.503	1.049	<**0.001**	2.095	0.899	4.342	2.070	<**0.001**
rectus capitis posterior major muscle	1.224	0.901	1.468	1.078	<**0.001**	1.147	0.817	1.421	1.003	<**0.001**
trapezius muscle	2.050	1.141	2.384	0.788	<**0.001**	1.813	0.628	2.300	0.711	<**0.001**

Following a performed therapy changes in motion range in cervical spine increased statistically significantly while lateral flexing, rotating and flexing (p=0.001). Only extension remained unaffected by the therapy comparing to the original state.

Tab 4. Changes in range of motion assessment after therapy.

Tested movement	Before therapy		After therapy		Significance level
	X	SD	X	SD	
Lateral flexion to the left	4.263	1.703	5.316	1.714	**0.001**
Lateral flexion to the right	4.105	1.685	5.145	1.664	**0.001**
Flexion	5.184	1.591	5.895	1.556	**0.001**
Extension	7.105	1.956	8.842	6.262	0.705
Rotation to the left	8.684	1.297	10.237	1.125	**0.001**
Rotation to the right	8.592	1.262	10.079	1.148	**0.001**

Discussion

In the past 10 years trigger points topic was often taken into consideration by many scientists, especially in context of elimination back pain [8, 9, 10, 11]. In studies performed by Kashyap R. et al. manual pressure and muscle energy technique both turned out to be effective in reducing pain and muscle tenderness and for improving neck disability and range of rotation [8]. Similar results were obtained while testing manual pressure and manual pressure with kinesiotaping effectiveness. Pain reduction was not statistically different between both groups, but muscle stiffness reduction and increase of contraction amplitude was greater in group treated with both therapies [9]. Better therapeutic effect was also obtained combining stabilization exercises with manual therapy compared to using exercises only [10]. It seems to be beneficial to combine different therapies in clinical practice in order to obtain better therapeutic effects.

In Seong-Joong Kim et al. studies it was proved that sternocleidomastoid muscle therapy and suboccipital muscles therapy has influence on reduction of trapezius muscle pain. The most effective therapy proved to be sternocleidomastoid muscle therapy, which influence on trapezius muscle was caused by the same innervation of both muscles [11]. It may be the reason why a relatively small amount of TrPs were detected in sternocleidomastoid muscle among the subjects in own study. Trapezius muscle therapy was always carried out before sternocleidomastoid muscle therapy, which could affect sternocleidomastoid muscle relaxation before therapy on that muscle began.

Most commonly studied therapy of the past years was the alternative method of TrPs treatment using dry needling. This method seems to be as effective comparing to other treatment methods [12]. In Gerber LH et al. study 56 subjects with shoulder girdle pain were examined. They had one active TrP therapy performed three times a week. Among 41 subjects the TrP turned from active to latent which caused a reduction of the pain intensity [13]. Cerezo-Téllez E. et al. studied effectiveness of dry needling therapy on office workers in quadratus lumborum muscle area. After the therapy the intensity of pain was reduced and the range of motion of cervical spine and muscle strength was improved [14]. This result does not fully agree with Doraisamy MA. study in which muscle strength of subjects with TrPs in quadratus lumborum muscle area was not lesser compared to people without TrPs [15].

Abbaszadeh-Amirdehi M. et al. studied TrPs reaction on dry needling monitoring pain intensity and pain threshold, as well as neuromuscular junction response and sympathetic skin response. The conducted therapy reduced the hyperactivity of sympathetic nervous system and pain intensity [16]. It would seem well founded to find out whether the choice of TrPs therapy method e. g. dry needling and positional release is a significant factor in the final therapeutic effect.

TrPs treatment using dry needling method proved to be also effective on patients suffering from Nonspecific Shoulder Pain [17, 18] and fibromyalgia [19]. However, dry needling method has no effect on electromyographic activity in quadratus lumborum muscle [20]. Study of the positional release method should be widened to subjects suffering from similar ailments.

Thanks to a dynamic development of physical diagnosis additional instrumental measuring methods are being used for therapy effects assessment. Infrared imaging method was tested in relation to the assessment of TrPs occurrence. This method proves to be reliable and sufficient for both clinical practise and studies [21]. During the ultrasonography of the TrPs area it was proved that they are not only local lesions, but they also affect tissues surrounding the TrP [22, 23]. Because of a worsened blood flow the TrPs were also visible during ultrasonography as spots of increased temperature compared to surrounding tissues [24]. Shear wave elastography method with entropy filtering allowed to assess TrPs occurrence and differentiation between active and passive [25]. Active TrPs usually possess an irregular shape, which reveals diversity of muscle environment in 3D imaging. Such imaging may allow for further understanding of TrPs occurrence as a process in the whole muscle area and not only in the direct area of the TrP in a later point of time. Color Doppler and spectral Doppler imaging revealed that in TrP environment blood vessels were beginning the process of remodeling. This phenomenon is especially intensified among subjects suffering from acute neck pain [22]. These discoveries allowed for further studying of etiology, amplification, and perpetuation mechanisms of Myofascial Pain Syndrome. That would allow for further focusing on the mechanisms contributing to the creation of TrPs and Myofascial Pain Syndrome in the therapy [23].

Conclusions

1. Static overload of cervical spine among office workers may be the cause of TrPs creation in soft tissues.
2. TrPs therapy using positional release method reduces the pain intensity in cervical spine.
3. TrPs therapy using positional release method increases range of motion of the cervical spine.
4. Physiotherapeutic prevention should be implemented among office workers in order to minimize cervical spine disorders.

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