

## RESEARCH REPORT

### **WHICH OF THE THREE PHYSIOTHERAPEUTIC METHODS MOST OFTEN DESCRIBED IN THE LITERATURE AND USED IN CERVICAL SPINE PAIN SYNDROMES CAUSED BY OSTEOARTHRITIS HAS THE HIGHEST THERAPEUTIC EFFICACY?**

**KTÓRA Z TRZECH METOD FIZJOTERAPEUTYCZNYCH NAJCZĘŚCIEJ OPISYWANYCH W LITERATURZE, STOSOWANYCH W ZESPOŁACH BÓLOWYCH KRĘGOSŁUPA SZYJNEGO SPOWODOWANYCH CHOROBA ZWYRODNIENIOWĄ STAWÓW, WYKAZUJE NAJWYŻSZĄ SKUTECZNOŚĆ TERAPEUTYCZNĄ?**

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## ABSTRACT

### **Introduction**

Numerous physiotherapeutic techniques for the treatment of cervical spine degenerative disease have been described in the literature. Due to the multifactorial cause of pain, it is difficult to choose the optimal method of treatment.

### **Aim**

The aim of this work was to define, based on the analysis of the literature, most often therapeutic methods used in the treatment of patients with cervical osteoarthritis and then compare the effectiveness of the three most commonly used in practice and described in the literature therapeutic methods for the treatment of cervical osteoarthritis.

### **Material and methods**

The most frequently described in the literature methods were the manual therapy, muscle energy techniques and exercises that increase the range of movement. Own research was carried out comparing these the three most common forms of therapy in a homogeneous groups of 60 patients randomly selected up to three equally-sized groups. The control group consisted of 20 patients without reported symptoms such as pain and limitation of cervical spine mobility.

### **Results**

After analyzing the results obtained in the study, it can be concluded that each of three methods led to changes in the patient's clinical status. This was observed both in terms of changes in pain intensity and range of motion obtained after therapy ( $p$  value < 0.05). In all groups, the level of satisfaction with the conducted therapy and the desire to continue were also found in the majority of patients (I – 89%, II – 74%, III – 62%).

### **Conclusion**

It is difficult to clearly indicate which forms of therapy is the most effective in the treatment of patients with degenerative cervical spondylosis, so it can be concluded that an attempt to

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create an algorithm for therapeutic treatment that would combine all scientifically proven methods of treatment would be appropriate.

**Key words:** cervical spine pain, osteoarthritis, manual therapy, range of motion exercises, muscle energy techniques

## STRESZCZENIE

### Wstęp

W literaturze opisywanych jest wiele technik leczenia choroby zwyrodnieniowej kręgosłupa szyjnego. Ze względu na wieloczynnikową przyczynę bólu trudno jest dobrać optymalną metodę leczenia.

### Cel

Celem pracy było określenie w oparciu o analizę piśmiennictwa, najczęściej stosowanych w leczeniu pacjentów z chorobą zwyrodnieniową kręgosłupa szyjnego metod terapeutycznych, a następnie porównanie skuteczności trzech najczęściej stosowanych w praktyce i opisywanych metod w leczeniu choroby zwyrodnieniowej stawów kręgosłupa szyjnego.

### Materiał i metody

Najczęściej opisywanymi w literaturze metodami są terapia manualna, techniki energizacji mięśni i ćwiczenia zwiększające zakres ruchu. Przeprowadzono badania własne porównujące te trzy najpopularniejsze formy terapii na jednorodnej grupie 60 chorych losowo zakwalifikowanych do trzech równo liczebnych grup. Grupa kontrolna składała się z 20 pacjentów bez objawów bólowych oraz ograniczeń ruchomości kręgosłupa szyjnego.

### Wyniki

Po przeanalizowaniu uzyskanych w badaniach wyników można stwierdzić, że każda z trzech metod doprowadziła do zmiany stanu klinicznego pacjenta. Zaobserwowano to zarówno odnośnie zmiany natężenia bólu jak i uzyskiwanych po terapii zakresów ruchu ( $p < 0.05$ ). We wszystkich grupach zanotowano także u większości pacjentów zadowalający poziom satysfakcji z przeprowadzonych zabiegów oraz chęć ich kontynuowania (I – 89%, II – 74%, III – 62%).

### Wnioski

Trudno jednoznacznie określić, które formy terapii są najskuteczniejsze w leczeniu pacjentów z chorobą zwyrodnieniową kręgosłupa szyjnego. Można więc wywnioskować, że właściwa byłaby próba stworzenia algorytmu postępowania terapeutycznego, który łączyłby wszystkie naukowo udowodnione metody leczenia.

**Słowa kluczowe:** ból kręgosłupa szyjnego, choroba zwyrodnieniowa stawów, terapia manualna, ćwiczenia zakresu ruchu, techniki energizacji mięśni

## Introduction

In clinical practice, various therapeutic methods are used in the treatment of patients with degenerative cervical spondylosis also called cervical osteoarthritis (OA) (Rogers *et al.*, 2010,

Aliyev, 2011, Hey *et al.*, 2012). The question to be clarified is which one is the most effective. The literature describes the therapeutic effectiveness of individually used joint mobilization

and manipulation (Yu *et al.*, 2011, Szulc *et al.* 2012), muscle energy techniques (Kay *et al.*, 2012, Childress, 2017), exercises that increase the range of movement (Rogers *et al.*, 2010) and selected physical treatments (Chow *et al.*, 2009, Trinh *et al.*, 2016). The author's professional experience shows that the origin of pain in these patients is complex and multifactorial. The overall pattern of pain is constituted by the tensed reflective muscles (O'Leary *et al.*, 2009, Schomacher *et al.* 2013), the 'blocked' joints of the spine (Scheer *et al.*, 2013), the constricted joint capsules (Hage, 2009) and the damaged intervertebral discs (Munigangaiah, 2014). The question arises whether there is one method that comprehensively solves these problems? In the literature, analysis of this kind are quoted, which unfortunately were carried out on small groups of patients (Miller *et al.*, 2010, Cho *et al.*, 2017, Galindez-Ibarbengoetxea *et al.*, 2017).

### **Aim**

The aim of this work was to define, based on the literature, most often therapeutic methods used in the treatment of patients with cervical osteoarthritis and then compare the effectiveness of the three most commonly used in practice and described in the literature therapeutic methods for the treatment of cervical osteoarthritis.

### **Material and methods**

For the purpose of this project, the articles from the PubMed database were analyzed from 2006 to 2018. The following words were used as keywords: cervical spine pain, degeneration, physical therapy, exercise, range of movement.

The research was conducted on a homogeneous group of 60 patients randomly selected up to three equally-sized groups with a different treatment method, in terms of sex, age and professional activity. The following inclusion criteria were established: age between 50 and 70 years, diagnosed on the basis of X-ray degenerative cervical spondylosis, cervical spine pain, no previous spinal injuries, no previous neurosurgical spine procedures.

In the order consistent with the data from the literature, these were: manual therapy – group 1, muscle energy techniques (MET) – group 2 and range of motion (ROM) exercises – group 3. The control group consisted of 20 patients, without diagnosis of cervical osteoarthritis based on X-ray, without reported pain symptoms and no functional limitations of the cervical spine. This group did not differ in terms of age, sex and activity in relation to the three groups studied. In each group the level of pain and the range of motion in three anatomical planes were examined. The modified VAS – GRS scale was used for the pain assessment (Haefeli *et al.*, 2006, MacDowall *et al.*, 2018). Movement ranges were measured by a medical measure in accordance with recognized standards (Calatayud *et al.*, 2015). At the end of the therapy, the researcher re-examined the intensity of pain and the range of motion of the cervical spine, and the patients were additionally questioned about the level of satisfaction with the treatment and the likelihood of continuing it (Aliyev, 2011, Kay *et al.*, 2012). In each group, patients were treated for the period of 10 days.

The calculations were made using Statistica version 12 and MS Excel from the Microsoft Office 2007 suite. Data were analyzed using the following tests: Mann-Whitney U test, Wilcoxon signed-rank test, McNemar test and chi-square test (p value < 0.05).

### **Results**

Analyzing the obtained results, it was registered that in all three groups the therapy was effective in reducing pain (Table 1).

However, only in the first group (manual therapy) a complete normalization in the scope of the analyzed parameters were observed in relation to the control group. In the group in which the manual therapy was performed, the level of pain in motion and in rest significantly decreased (p < 0.0001, p < 0.0001), and the change in pain was the most pronounced. A significant improvement in the range of motion in all directions was obtained and the biggest difference was

**Table 1.** The effects of three methods of therapy (pain). P-value refers to the significance between the pre-post-norm difference at  $p < 0.05$

	Group 1		Group 2		Group 3	
	Median	P value	Median	P value	Median	P value
Pain at rest*	3*	0.0001	2*	0.0003	1*	0.005
Pain on movement*	2*	0.0001	2*	0.0004	1*	0.005

\* means the median change in the intensity of pain after the therapy

observed in rotation movements (Table 2). In the group which used the muscle energy technique, the level of pain in motion and at rest also significantly decreased ( $p < 0.0003$ ,  $p < 0.0004$ ). The range of movement of the cervical spine increased in all values except for the left lateral flexion, and the biggest difference was in the flexion movement. In the group in which the patients performed general exercises improving the level of pain on movement and at rest also significantly decreased ( $p < 0.005$ ,  $p < 0.005$ ). The range of movement increased only in the rotation movement towards the left. The greatest improvement in the range of movement in all planes was observed in patients who received manual therapy. In the same group of examined patients, the highest level of satisfaction with the conducted therapy and the desire to continue it was noted – 89%, in other groups it was respectively: for muscle energy techniques 74% and for exercises increasing the range of movement 62%.

## Discussion

After the analysis of own results, it can be stated that manual therapy was very effective in the treatment of patients with degenerative changes. Similar conclusions were presented in the works of Szulc *et al.*, (2012) and Vernon *et al.*, (2007). In the studies of Gross *et al.*, (2015) they proved the effectiveness of muscle energy techniques. Reports on this subject were also confirmed by Childress (2017) and Oh *et al.*, (2016), which was also observed in the presented research. As to the effectiveness of the therapeutic exercises, one can notice the non-unification in the results, because they differ in individual researchers. Some authors like Gross *et al.*, (2015) question the effectiveness of exercise in therapy, while Rogers *et al.*, (2010), however, shows the effectiveness of these exercises. In the presented own research it can be noted, however, that in the group of patients with exercises the cervical spine movement ranges showed the smallest change from the control group. This

**Table 2.** The effects of three methods of therapy (range of motion) P-value refers to the significance between the pre-post-norm difference at  $p < 0.05$

Group	N	Difference in average	Median	Min – max	P value
<b>C – spine flexion</b>					
Group 1	20	1.56 ± 0.89	1.85	0–3	0.001
Group 2	20	2.13 ± 0.92	2.25	0–4	0.001
Group 3	20	0.75 ± 0.58	0.5	0–2	0.1204
<b>C – spine extension</b>					
Group 1	20	1.50 ± 1.28	1	-1–5	0.009
Group 2	20	0.55 ± 0.42	0.5	0–1.5	0.032
Group 3	20	-0.10 ± 0.46	0	-1–1	0.769
<b>C – spine left lateral flexion</b>					
Group 1	20	1.63 ± 0.95	1.5	0–4	0.001
Group 2	20	0.73 ± 0.46	0.5	0–1.5	0.014
Group 3	20	0.3 ± 0.46	0.5	-0.5–1.5	0.354

**Table 2. cont.** The effects of three methods of therapy (range of motion) P-value refers to the significance between the pre-post-norm difference at  $p < 0.05$ 

Group	N	Difference in average	Median	Min – max	P value
<b>C – spine right lateral flexion</b>					
Group 1	20	1.63 ± 1.05	1.5	0,5–5	0.001
Group 2	20	0.43 ± 0.62	0.5	-1–2	0.098
Group 3	20	0.20 ± 0.37	0.5	-0,50–0,50	0.090
<b>C – spine rotation towards left</b>					
Group 1	20	2.10 ± 1.28	2.0	0–6	0.014
Group 2	20	1.59 ± 0.93	2.0	0–3	0.007
Group 3	20	1.03 ± 0.89	1,0	0–3	0.044
<b>C – spine rotation towards right</b>					
Group 1	20	2.24 ± 1.4	2.0	0–5	0.014
Group 2	20	1.35 ± 0.78	1	0–2,5	0.012
Group 3	20	0.33 ± 0.58	0.5	-1–1	0.453

could indicate that the patient exercising alone is not able to independently increase the range of movement in the cervical spine in a satisfactory way.

In addition, previous papers designed to check the effectiveness of selected therapeutic techniques have described the effects of selectively selected methods and have been conducted on relatively small groups of patients. Few of these works were characterized by a comprehensive therapeutic approach, and in the literature of the subject there are practically no papers describing the use of complex therapeutic algorithms. Only two papers were found describing comprehensive management of degenerative cervical spine disease, including Aliyev (2011), and the work of Hey *et al.*, (2012) was carried out on a small number of patients. It would be optimal to create a treatment system for patients oriented to the complex origin of the pain problem, because the results described in the literature and obtained in presented research are not satisfactory. In addition, the presented assessment included only 10 days of therapy and the author had no knowledge about the long-term effects of therapy. The parameters examined checked only the pain, range of movement and the level of satisfaction with the therapy. For a more complete clinical assessment, it would be worth using a larger number of tests to evaluate, among others, muscle tone (Michiels *et al.*, 2015), dizziness (L'Heureux-Lebeau, *et al.*, 2014),

tinnitus (Michiels *et al.*, 2015), blood flow in the vertebral arteries (Windschall *et al.*, 2016) and complete neurological examination (Corey *et al.*, 2014). Next, the author of this paper plans to conduct research on the treatment of cervical spine osteoarthritis, including full clinical evaluation.

It can be assumed that it would be appropriate to establish an algorithm for comprehensive patient treatment. Therefore, in the future, it was decided by the author to propose own algorithm for treating patients with cervical spine pain due to degenerative disease. The treatment plan would be based on the use in the right order and configuration methods of manual therapy, exercises improving the range of movement and overall physical fitness and muscle energy techniques. The whole procedure could perhaps be supplemented by physiotherapeutic treatments (Radl *et al.*, 2013) used as a preparation for manual procedures or applied to quicken the reduction of physiological symptoms after procedure and more effective regeneration. This would require further research conducted on more numerous groups of patients.

### Conclusion

There is an abundance of evidence in the literature showing the effectiveness of individual therapeutic techniques in cervical spine pain due to osteoarthritis. Due to the large discrepancies in the effectiveness of these methods, it would be beneficial to try



to formulate a therapeutic algorithm that will combine all methods demonstrating the effectiveness of treatment. Thanks to this, it would be possible to achieve the full therapeutic effect.

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