

Therapeutic efficacy of hydro-kinesiotherapy Programs in lumbar spondylosis

Botezan Ana-Maria¹, Dogaru Gabriela^{2,3}

1. Complex social and medical services Maria Beatrice , Alba Iulia
2. "Iuliu Hatieganu" University of Medicine and Pharmacy Cluj-Napoca
3. Clinical Rehabilitation Hospital Cluj-Napoca

Abstract

Lumbar spondylarthrosis is a degenerative disease that affects the joint structures of the lumbar spine. In the course of time, numerous studies on the role of hydro-kinesiotherapy in the treatment of lumbar spondylosis have been conducted. The aim of this research is motivated by the significantly high number of patients with chronic pain in the lumbar spine due to lumbar spondylosis, as well as by the negative impact on their quality of life through the impairment of the activities of daily living. The prospective longitudinal study was carried out at the Clinical Rehabilitation Hospital Cluj-Napoca.

The study included 35 patients with chronic low back pain and mobility limitation in the lumbar spine. The patients were assigned to two groups: the study group formed by 20 patients and the control group consisting of 15 patients aged between 40-70 years. The treatment of the patients included in the study was performed over a two week period and consisted of a hydro-kinesiotherapy program, for the patients of the study group, the duration of a treatment session being 40 minutes. Both the subjects of the study group and of the control group also benefited from sedative massage of the lumbosacral spine, kinesiotherapy, laser therapy of the lumbar spine. The patients were evaluated using Schober's test, the Visual Analogue Scale, the Oswestry index. These evaluation methods were applied to the patients of both groups at the beginning of the rehabilitation programs and after two weeks. The results of the study demonstrated the therapeutic efficacy of the medical rehabilitation programs that included hydro-kinesiotherapy programs. The patients of both groups had improvements through a decrease of lumbar pain, an increase in lumbar spine mobility, as well as in the patients' ability to organize themselves in the activities of daily living. However, the patients of the study group, with a hydro-kinesiotherapy program performed for two weeks, had better scores regarding lumbar pain, disability (from 45 to 25 points on the Oswestry scale) and joint mobility (from 13.5 to 14.5 cm using Schober's test). There is strong scientific evidence of the beneficial potential of hydro-kinesiotherapy in chronic lumbar pain.

Key words: lumbar spondylarthrosis, hydro-kinesiotherapy

Introduction

Lumbar spondylosis is a degenerative arthropathy of the lumbar spine, characterized by the progressive degradation of the joint cartilage,

accompanied by a hypertrophic reaction of the subchondral bone, which results in the formation of new bone and varied reactions of the other joint structures,

expressed by characteristic clinical and radiological changes.

This disease is frequently found among the adult and elderly population. The degenerative process may involve discovertebral joints, when pain during the anterior flexion of the spine occurs, as well as interapophyseal joints, characterized by an exacerbation of pain during extension [1].

In 27-37% of the cases, lumbar spondylosis is asymptomatic. At international level, lumbar spondylosis may develop even in young 20-year-old persons, but with age, the increase in the number of cases is inevitable. About 84% of men and 74% of women have vertebral osteophytes, particularly in vertebrae T9-T10 and L3. Approximately 30% of men and 28% of women aged between 55-64 years, and 20% of men and 22% of women aged between 45-64 years have osteophytes of the lumbar vertebrae [2].

In the course of time, numerous studies on the role of hydro-kinesiotherapy in the treatment of lumbar spondylosis, and particularly on its role on low back pain have been performed, the majority of the studies being aimed at improving pain and increasing joint mobility.

In the research "Hydrotherapy and chronic lower back pain", Smit TE and Harrison R carried out a pilot study in 1991, published in The Australian Journal of Physiotherapy, with the purpose to evidence the effects of hydrotherapy in the management of lumbar spondylosis. The study was performed on a group of 20 persons with chronic low back pain. Hydrotherapy treatment lasted for 4 weeks. The group was evaluated before and after the hydrotherapy treatment, and each person filled in a questionnaire 3 months after

the completion of treatment. The results demonstrated a reduction of pain and suggested an improvement of thoracolumbar mobility. The results of the questionnaire showed the fact that the benefits of hydrotherapy were not effective in the long term, suggesting the need to continue the treatment sessions for the maintenance of mobility and the reduction of pain [3].

In the study "Therapeutic aquatic exercise in the treatment of low back pain", Waller B, Lambeck J and Daly D conducted a research based on a systematic analysis, published in January 2009 in the Clinical Rehabilitation journal. The objective of this study was to determine the effectiveness of hydro-kinesiotherapy programs in the treatment of low back pain. The evaluation scales used were: the Oswestry Disability Index, the McGill Pain Questionnaire, the Visual Analogue Scale and the number of working days lost as a direct consequence of back pain. The target group was formed by adults suffering from low back pain, and the comparison was made with all clinical studies using a control group. The results showed that 37 studies were found and 7 were accepted in this systematic analysis. Hydro-kinesiotherapy had a beneficial effect, but it was not more efficient than other therapeutic interventions. The quality of the protocols was considered low in all the included studies. The variation in the number of subjects, the duration of symptoms, the intervention and the results obtained in the studies excluded the possibility of a thorough meta-analysis of the results. In conclusion, there was sufficient evidence to suggest that hydro-kinesiotherapy has a beneficial potential for patients

suffering from chronic back pain and back pain during pregnancy; however, further high-quality studies are needed to support the use of hydro-kinesiotherapy in clinical practice [4].

"Effects of different frequencies (2-3 days/week) of aquatic therapy program in adults with chronic low back pain" by Baena-Beato PA, Artero EG, Arroyo-Morales M, Robles-Fuentes A, Gatto-Cardia MC, Delgado-Fernandez M. was a comparative non-randomized study, published in the "Pain Medicine" journal in January 2013, carried out in order to demonstrate the effects of hydro-kinesiotherapy programs with different frequencies, 2 and 3 days a week, respectively, in chronic lumbar pain. The scales used in this study were: the Visual Analogue Scale of Pain, the Oswestry Disability Index, the Quality of Life Scale (Quality Short-Form Health Survey 36), the body mass index (BMI) and the Healthy Lifestyle Index (the Rockport 1-mile walk test). The study included 54 adults aged between 48.9 ± 10 years, suffering from chronic lumbar pain, who were divided into two target groups: one attending the hydro-kinesiotherapy program with a frequency of 2 days/week, and the other one with a frequency of 3 days/week. The results of the study showed that both target groups had significant improvements in lumbar pain and disability ($P < 0.001$), compared to the control group. The group attending the hydro-kinesiotherapy program 3 days/week obtained significantly higher benefits regarding the Visual Analogue Scale, mobility and disability ($P < 0.001$) than the group attending the hydro-kinesiotherapy program 2 days/week. In conclusion, the eight weeks during which the patients with chronic low back pain attended the hydro-kinesiotherapy programs with

different frequencies led to the following results: a decrease of lumbar pain and disability, an increase in the quality of life and the improvement of health, of a healthy lifestyle. However, higher benefits were obtained for some parameters in patients who had a frequency of 3 days/week compared to those with a frequency of 2 days/week [5].

The study "Disability predictors in chronic low back pain after aquatic exercise" was carried out by Baena-Beato PÁ, Delgado-Fernández M, Artero EG, Robles-Fuentes A, Gatto-Cardia MC, Arroyo-Morales M. This was a prospective study published in "American Journal of Physical Medicine and Rehabilitation" in July 2014, with the purpose to better understand the changes in disability occurring after hydro-kinesiotherapy programs. The study included 60 patients with chronic low back pain (30 men and 30 women), aged between 50-60 years, with a body mass index of $27.21 (5.20) \text{ kg/m}^2$. The hydro-kinesiotherapy program lasted for 8 weeks and was carried out in a 25×6 m indoor swimming pool, with a water depth of 140 cm, and a water temperature of $30^\circ\text{C} (1^\circ\text{C})$, where the patients performed the exercise program 2-5 days a week. Each hydro-kinesiotherapy session lasted for 55-60 minutes (10 minutes warm-up, 20-25 minutes aerobic exercise, 15-20 minutes endurance exercise and 10 minutes cool-down/ending). The evaluation scales used were: the Oswestry Disability Index for the evaluation of disability, the Visual Analogue Scale of Pain for the quality of life (Short Form 36), abdominal muscle resistance (curl-up), resting heart rate and the body mass index; variable results were obtained.

The results of the study evidenced significant correlations regarding disability and the Visual Analogue Scale (variations between -0.353 and 0.582, all having the P index <0.01). After the hydro-kinesiotherapy program, changes in pain and abdominal muscle resistance occurred, which represent significant predictors of change in disability [6].

Material and method

The motivation of this study is represented by the significantly high number of patients with chronic lumbar spine pain due to lumbar spondylosis, as well as by the negative impact on their quality of life through the impairment of daily activities.

This prospective longitudinal study was carried out at the Clinical Rehabilitation Hospital Cluj-Napoca in the period November 2014 – May 2015. The study included 35 patients with chronic low back pain and mobility limitation in the lumbar spine, diagnosed with lumbar spondylosis by radiological examination. The patients were assigned to two groups: the study group consisting of 20 patients, 12 women and 8 men, and the control group consisting of 15 patients, 13 women and 2 men, aged between 40-70 years.

Treatment was administered to the patients included in the study over a two week period and comprised a hydro-kinesiotherapy program with a series of exercises specific to lumbar disease, for patients in the study group. The subjects carried out this program in the swimming pool of the hospital's treatment facility, with a water temperature of 36-37°C, the duration of a treatment session being 30-40 min. Both the patients of the study group and those of the control group also benefited from sedative massage of the

lumbosacral spine, kinesiotherapy, laser therapy of the lumbar spine for the analgesic effect.

The program of rehabilitation by hydro-kinesiotherapy – exercises performed in the swimming pool by the patients of the study group:

Exercise 1: Flexibility exercises in floating position with a vest and/or floaters on the limbs, the legs are fixed and the lumbar spine is mobilized.

Exercise 2: Exercises to increase the strength of the trunk and pelvis, in a corrected position with reference to a vertical dorsal support plane or without reference, in floating position.

Exercise 3: Water traction programs for the lumbar spine in a horizontal or intermediate position, with a slowly increasing, then decreasing force of 10-20 kg.

Exercise 4: With legs apart, arms stretched horizontally, shoulders in the water, bring the arms towards the body horizontally (10 repeats) – (Figure 1).





Fig. 1 – Representation of exercise no. 4
Exercise 5: With legs apart, shoulders in the water, arms stretched forward, bring the arms to the sides, right - left (10 repeats) – (Figure 2).



Fig. 2 – Representation of exercise no. 5

Exercise 6: With legs apart, hands forward, push the water backward, then forward (10 repeats) – (Figure 3).

Exercise 7: Holding the bar at the side of the swimming pool with the hands, perform half push-ups (10 repeats) – (Figure 4).



Fig. 3 – Representation of exercise no. 6

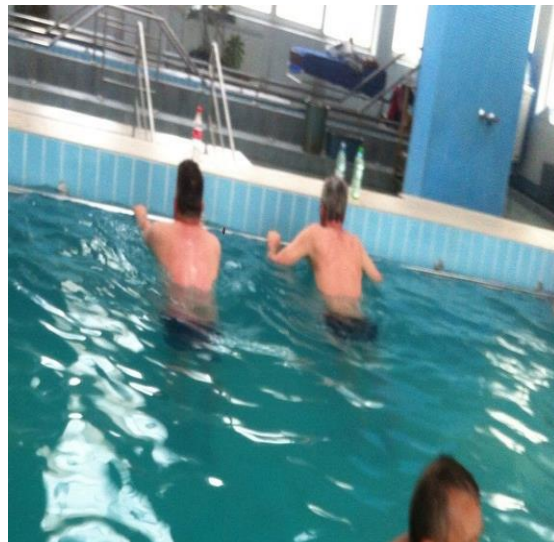


Fig. 4 – Representation of exercise no. 7

Exercise 8: Holding the support bar with one hand laterally, the other hand on the



Fig. 5 – Representation of exercise no. 8

Exercise 9: Holding the support bar with one hand laterally, raise the knee and lower it (8 repeats with each leg) – (Figure 6).



Fig. 6 – Representation of exercise no. 9

hip, raise the leg laterally (8 repeats with each lower limb) (Figure 5).

Exercise 10: Holding the support bar with one hand laterally, the other hand on the hip, raise the knee and move the thigh laterally (8 repeats with each lower limb).



Fig. 7 – Representation of exercise no. 10

Exercise 11: Facing the support bar and holding it with the hands, with the soles on the wall, move the chest towards the bar, bend the knees and regain the initial position (10 repeats). This exercise should not be performed if the patient has a hip prosthesis.



Fig. 8 – Representation of exercise no. 11

Exercise 12: Holding the support bar, with the soles on the wall, move the legs apart and perform lunges to the left - right (10 repeats).



Fig. 9 – Representation of exercise no. 12

Exercise 13: With the back to the support bar, the neck on the bar, raise the legs and bring them to the chest (10 repeats).



Fig. 10 – Representation of exercise no. 13

Exercise 14: Holding the bar with a hand and the other hand on the hip, move the leg backward (8 repeats with each leg).

The images belong to our personal archive and were taken with the patients' consent.

The patients were evaluated using: the joint test (Schober's test) for the measurement of the joint mobility of the lumbar spine; the Visual Analogue Scale (for the subjective measurement of pain); the Oswestry index – a questionnaire providing information about the patient's impairment/disability due to lumbar pain and about the patient's ability to carry out the activities of daily living.

These evaluation methods were applied to the patients of both groups at the beginning of the rehabilitation programs (day 1) and at their completion (day 10).

Statistical analysis was performed using the t-Test: Paired Two Sample for Means, in order to determine the statistical significance of the study and identify the confidence interval. Differences were

considered statistically significant if $p < 0.01$ with a 99% confidence interval; and $p < 0.05$, with a 95% confidence interval.

Results

1. Influence of treatment on pain

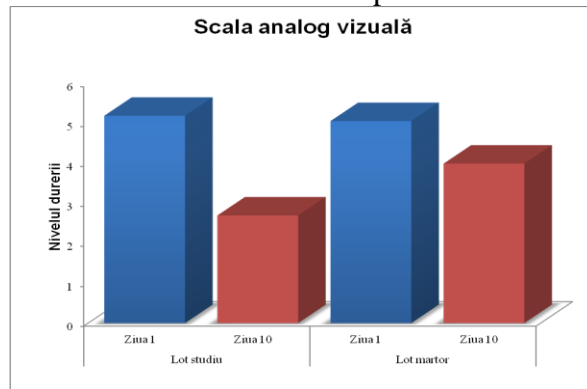


Diagram 1 – Evaluation of pain on the Visual Analogue Scale

The graphical representation above indicates the evolution of pain; on day 1 of treatment, the subjects of the study group, with a hydro-kinesiotherapy program, exceeded by little the score of 5 units, while the subjects of the control group had a 5 unit score. At the end of treatment, the results show that the patients of the study group had a decrease, with a score of about 3, while those of the control group had a 4 unit score.

2. Influence of treatment on lumbar spine mobility

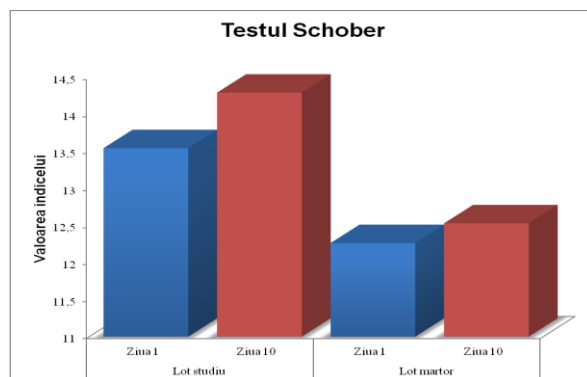


Diagram 2 – Lumbar spine mobility using Schober's test

This diagram shows the evolution of treatment regarding lumbar spine mobility. Thus, on the first day of treatment, the subjects of the study group had a score of approximately 13.5 cm, and those of the control group had a score slightly exceeding 12 cm. At the end of the 10 days of treatment, the subjects of the study group had a score of about 14.5 cm, while those of the control group obtained a score of 12.5 cm.

3. Influence of treatment on the patient's disability

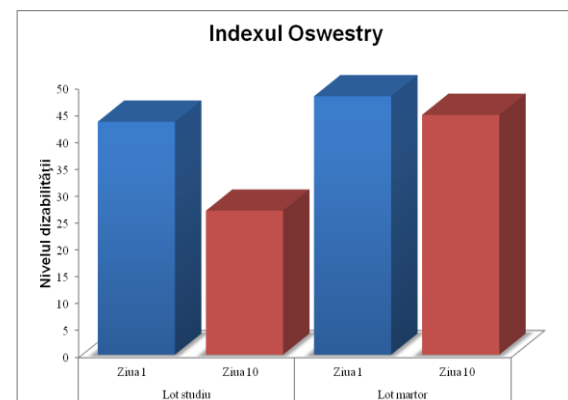


Diagram 3 – The level of disability, assessed using the Oswestry index, in the patients of both groups

This diagram indicates the level of disability on the first day of treatment, which was scored 45 units in the study group and 50 units in the control group. At the end of the 10 days of treatment, the control group had a score of 45 units, while the study group had a score of about 25 units.

Using the t-Test: Paired Two Sample for Means for the Visual Analogue Scale, a $p < 0.01$ with a 99% confidence interval was obtained for the study group; and a $p < 0.05$ with a 95% confidence interval was obtained for the control group. The same statistical test was

applied for Schober's test; a $p < 0.001$ with a 99% confidence interval was obtained for the study group, and a $p < 0.05$ with a 95% confidence interval was obtained for the control group. Regarding the Oswestry index, $p < 0.001$ with a 99% confidence interval in the study group and $p < 0.05$ with a 95% confidence interval in the control group.

Conclusions

The results of the study demonstrated the therapeutic efficacy of medical rehabilitation programs which comprised hydro-kinesiotherapy programs.

The patients of both groups had improvements through a decrease of lumbar pain, an increase of lumbar spine mobility, as well as of the patients' ability to organize themselves in the activities of daily living.

However, the patients of the study group, with a hydro-kinesiotherapy program performed for two weeks, had better scores in lumbar pain (score 3 on the Visual Analogue Scale), disability (from 45 to 25 points on the Oswestry scale) and joint mobility (from 13.5 to 14.5 cm using Schober's test).

There is strong scientific evidence of the beneficial potential of hydro-kinesiotherapy in chronic lumbar pain.

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