

" EFFECTIVENESS OF PHYSICAL REHABILITATION AND KINESITHERAPY IN PATIENTS WITH ANKYLOSIS SPONDILITIS" (MORBUS BECHTEREV)

Lence Nikolovska¹, Petar Zlatkov¹, Tamara Stratorska¹

1. Faculty of Medical Sciences, Goce Delcev University, Stip,

DOI: <https://www.doi.org/10.59710/oaijoaru2422082n>

Abstract

At the end of the 19th century, the Russian neurologist, neurophysiologist and psychiatrist Vladimir Bekhterev gave a clinical description of the disease. The first separates the disease as an independent nosological unit. The disease is also known as Bekhterev's disease. The main characteristic of the pathological process in Bekhterev's disease is the tendency towards the rapid onset of calcification of the connective apparatus in the spine, and more precisely the formation of the so-called "bone bridges" between the vertebrae. In the periphery of the bodies of the vertebrae, bone bridges are formed between their bodies, which look like a "bamboo stick" on an X-ray. The same process affects the posterior column of the spine.

The aim of the research is: to study the effectiveness of treatment with physical rehabilitation and kinesitherapy in patients with ankylosing spondylitis.

Research methods: The research was conducted in the Recreational Center at the University "Goce Delchev" in Shtip and Thermal Bath Kezovica at "Clinical Hospital" - Shtip. 17 patients diagnosed with ankylosing spondylitis are included in the research, of which 11 patients are male, and 6 of them are female.

Result: In the patients of the Second Group, in which hydro-kinesitherapy is applied, much better results were achieved compared to the patients of the First Group.

Discussions: In most cases, the diagnosis is delayed by several years, due to insufficient knowledge of the characteristics and symptoms of the disease. Incomplete clinical examination, lack of symptoms in the initial stages and the slow evolution of the disease. Particular attention is paid to preserving range of motion in affected patients.

Conclusions: Physical therapy is an essential element of the complex treatment of ankylosing spondyloarthritis. With the methods of physical rehabilitation and kinesitherapy, control and reduction of pain symptoms, maintenance and preservation of the mobility of the affected joints are achieved.

Key words: Bekhterev's disease, syndesmophyte, sacroiliitis, physiotherapy, kinesitherapy.

1. INTRODUCTION

The main characteristic of the pathological process in Bekhterev's disease is the tendency towards the rapid onset of calcification of the connective apparatus in the spine, and more precisely the formation of the so-called "bone bridges" between the vertebrae. In the periphery of the bodies of the vertebrae, bone bridges are formed between their bodies, which look like a "bamboo stick" on an X-ray. The same process affects the posterior column of the spine. Syndesmophytes is a calcification or hypertrophic ossification in the spine, especially at the sacroiliac joint. This makes the spine extremely rigid and semi-mobile. Very often the sacroiliac joints, which are the connection between the spine and the pelvis, are completely immobile and completely dysfunctional. Naturally, achieving hardening is a gradual process and depends on the individual. [1]

1.1. Forms of Morbus Bekhterev

There are five forms of Morbus Bekhterev:

1. Dorsal form with ascendant character;
2. Rhizomialitic form in which, apart from the back, the hips and shoulder joints are involved in the process;
3. Dorsal peripheral form with involvement of peripheral joints;
4. Scandinavian form - the distal joints of the hands and feet are affected;
5. Visceral form, with involvement of the eyes, heart, lungs and kidneys.

The motor activity of a person is drawn gradually and with the progression of the disease, the spine of a person loses its mobility and elasticity. The body is quite rigid and almost all movements in the joints are limited. Especially affected are the cervical, dorsal and lumbar parts of the spine. Movements in the shoulder and hip joints can be significantly limited.

The aim of the research is: to study the effectiveness of treatment with physical rehabilitation, kinesitherapy and hydrokinesitherapy in patients with ankylosing spondylitis.

1.2. Research tasks

- 1.To develop a specialized program for kinesitherapy, based on modern principles of neurorehabilitation on functional disorders in patients with ankylosing spondylitis and adapted for home use.
2. To study the early effect of the application of physical therapy and a specialized program for kinesitherapy in functional disorders of the spinal column.

2.RESEARCH METHODS:

Male and female patients of different age categories are included in the research.

Each patient was asked to consent to participate in the trial with guaranteed discretion included. At the beginning, a detailed anamnesis was taken for each patient and a detailed examination was done with various functional tests, such as Manual Muscle Testing (MMT) and Goniometry, to determine the mobility and functionality of the spine and other joints, before and after the implementation of the program for rehabilitation. After conducting the functional testing, the most appropriate treatment technique is determined in accordance with the obtained results of the functional testing.

Before the start of the treatment, each patient must fill out a Visual Analogue Pain Scale (VAS)".

The research was was conducted in the Recreational Center at the University "Goce Delchev" in Shtip and Banja Kezovica at "Clinical Hospital" - Shtip. 17 patients diagnosed with ankylosing spondylitis are included in the research, of which 11 patients are male, and 6 of them are female.

Table 1. Classification of patients according to gender structure

Gender structure	Number of patients	Percentages
Male	11	64,7%
Female	6	35,3%
In total	17	100%

Table 2. Classification of patients according to the selected treatment

Selected treatment	Number of patients	Male	Female	Percentages
Control group	8	4	2	47%
Experimental group	9	6	4	53%
In total	17	11	6	100%

The research participants are divided into two groups, Control and Experimental.

Treatment of patients from the Control group

Drug therapy, physical therapy procedures and kinesitherapy methods are applied to the participants from the Control group.

Treatment of patients from the experimental group

In the patients of the experimental group, in addition to drug treatment, physical therapy and kinesitherapy procedures, hydrokinesitherapy is applied. Hydrokinesitherapy is the performance of medical gymnastics in water, where the temperature of the water, which is usually 32-34 degrees, is of great importance for the achieved effect. Swimming is one of the main sports recommended for patients with ankylosing spondylitis.

2.1. Diagnostic methods

Both laboratory and imaging tests, as well as some functional tests - such as Faber's test, Patrick, are important for making the diagnosis. A sacral distraction test is performed - unlocking pain after applying pressure on the anterior superior iliac spine.

If an inflammatory condition is suspected - it is important to order a complete blood count, erythrocyte sedimentation rate, C-reactive protein, antinuclear antibody, rheumatoid factor.[2]

Nuclear magnetic resonance is suitable for detecting the presence of subchondral swelling, which is the earliest sign of sacroiliitis.

2.2. Clinical picture and symptoms:

Initial symptoms are characterized by chronic pain in the lower back or gluteal area combined with stiffness in the lumbar region. Often during the functional examination of patients with Bekhterev's disease, the following structural and functional changes in relation to the musculoskeletal system are revealed:

- The patient has increased spinal kyphosis in the area of the thoracic spine, that is, the patient is hunched over.

Presence of stiffness throughout the patient's trunk. The patient can hardly straighten the back actively due to the formed bone bridges between the vertebrae (in more advanced cases). Because of this forced posture, the flexor muscles of the body are most active, while the extensors are extremely inactive and presumably weak. And they are one of the basic muscles supporting the upright posture of a person.

- The patient has severely limited ability to turn his head sideways in both directions. This limited mobility leads to muscle stiffness in the neck area, the appearance of active trigger points in the muscles, reduced sliding ability of individual muscle layers. Decreased mobility, respectively, of the muscle fascia, and hence stiffness.

- The patient has severely limited mobility of the hip joint, both during rotations and during leg abduction and flexion. In general, the same changes occur in the muscle

tissue and in the fascia as in the neck. Due to the bent and hunched posture of the body, the patient cannot properly use the extensor muscles in the hip joint, which greatly affects the ability to have good support while walking.

- The gait is impaired due to the described problems in the hip joint and the body. During the support phase of walking, the patient hardly uses the so-called extensor mechanism of the body, which is responsible for the upright posture, for the effective performance of various activities such as putting and sitting, etc.

The main thing that patients with Bekhterev's should realize is that movement is extremely important for them. Without exercise and movement, they are highly exposed to the risk of stiffness and the subsequent negative consequences.

The disease can affect other areas of the body, other symptoms also may develop and include: loss of appetite, weight loss, fatigue, skin rashes, vision changes and eye pain, etc. [3]

2.3. Physical therapy methods for treatment of Ankylosis Spondilitis

Treatment: Until now, no therapy has been discovered that would prevent the progression of the disease. The treatment is symptomatic, and non-steroidal anti-inflammatory rheumatics are most often recommended. Physical therapy and kinesitherapy have a special role in the treatment, as their methods can reduce pain and stiffness and improve the general condition of the patient.

Treatment consists first of all in conservative therapy with medicines, electrotherapy with medium-frequency interference current, urrent, ultrasound along the length of the spinal column, (paravertebral), transcutaneous neuromuscular stimulation (TENS), laser therapy of painful points, thermotherapy (heat treatment), physical therapy methods to strengthen the back muscles, Among the medicines, non-steroidal anti-inflammatory drugs are indicated, and in more severe cases - tricyclic antidepressants.

Electrophoresis of drugs is applied, i.e., an electrotherapeutic method of introducing drugs with the help of galvanic current, locally in the affected area. A subcutaneous depot is created which can last up to 15 days. The drug is resorbed through the blood and lymph. In this way, damage to the mucous membrane of the gastrointestinal system is prevented.

Iontophoresis with novocaine or local Phonophoresis is applied in order to introduce non-steroidal anti-inflammatory drugs with ultrasound. In this way, the penetration of the active substance into the affected structures is facilitated. [4]

2.3.1 Manual treatment of painful trigger points

Rules for manual treatment of painful trigger points:

- The treatment always starts from the most painful point and continues to the less painful points.

- Symmetrical points on both sides of the body are pressed, and 5-6 points are covered in one session.
- The massage should not exceed the limit of pain, and the pressure and speed should increase gradually.
- The effect of the treatment is greater if the painful points are treated during the period of the strongest pain symptoms.
- If during the procedure sweating, nausea, cold skin or shivering occur, then the procedure should be stopped.

2.3.2. Number of procedures

The number of procedures depends on the disease. In the first 10 days, daily procedures are done, and then they are done over one or two days. The total number of procedures is from 15 to 20 procedures.

Physical therapy will help to patients to reduce pain, morning stiffness, maintain mobility of the spine and affected joints, as well as prevention of deformities and contractures. Physical therapist also may teach you: posture training to improve your posture, strengthening exercises, stretching exercises, flexibility exercises, deep-breathing exercises, pain management techniques, etc. [5]

2.4. Kinesitherapy methods for treatment of Ankylosis Spondilitis

First of all, the kinesitherapist is obliged to make a correct functional diagnosis, which will direct him to the affected muscle groups, critical zones in terms of the correct composition of the body, etc.

Kinesitherapy treatment includes: analytical and respiratory gymnastics, active exercises to maintain the range of motion of the spine and engage the peripheral joints, Proprioceptive neuromuscular facilitation (PNMF), relaxants for shortened muscles, relaxing massage, Post isometric relaxation (PIR), active and passive exercises for the muscles of the upper limbs, exercises to strengthen weakened muscles, isotonic and active exercises for the paravertebral muscles.

Kinesitherapy offers many means to deal with the problem. Both with passive methods such as massage, dry needling, soft tissue mobilizations, myofascial techniques, influencing trigger points in the muscles, and with active means. Active methods mean that the patient is the one who works, not the therapist. Among the active agents, there are many well-known methods, concepts and approaches for the treatment of neuromuscular dysfunctions of various origins, such as:

- Proprioceptive neuromuscular facilitation (PNF);
- The Bobath concept (Bobath);
- Dynamic neuromuscular stabilization (DNS).

The goal of kinesitherapy is:

- Strengthening of the back extensors
- Stretching of trunk flexors
- Stretching of the iliopsoas muscle
- Strengthening of the lumbar muscles.
- Maintaining chest mobility with respiratory gymnastics
- Maintaining the mobility of the cervical segment

2.5. Functional examination of patients with ankylosing spondylitis

- Measuring the mobility of the cervical spine
- Measurement of the mobility of the thoracic spine
- Measuring the mobility of the lumbar spine
- Measurement of chest mobility
- Measurement of toe-floor scattering
- Measurement of lumbar spine lateral flexion

Sometimes there is pain in the chest during breathing, which is caused by the disruption of the costovertebral joints, which leads to a decrease in respiratory function.

2.5.1 The following functional test are applied:

- Measurement of chest mobility during inhalation (Inspirium) and exhalation (Expirium)
 - At the level of the axilla;
 - Measurement at chest level, for men and behind the lower corner of the shoulder blades (scapulae), and for women it is measured below the chest.
 - Costodiaphragmatic sinus level measurement.
 - In the three measurements, the volume during inhalation and exhalation is determined, so that we subtract the maximum exhalation from the maximum inhalation and obtain the excursion (expansion) of the chest.
 - Respiratory excursion of the chest is measured in centimeters.
 - For women, the normal value is 5-6 cm, while for men, the normal value is 7-9 cm.
- [6]

2.6. Diet in patients with Ankylosing Spondylitis

Because of the gluten content, starchy foods such as potatoes, vegetables containing starch, rice, pasta and wheat should be excluded from the diet. In autoimmune diseases, we exclude gluten or at least try to reduce it to a minimum, because gluten can provoke an incorrect response of the immune system, which begins to attack the body's own cells instead of external pathogenic microorganisms.

With Bekhterev's disease, regular consumption of garlic and oregano tea, as well as onion-based preparations, is recommended. They have an antimicrobial effect against *Klebsiella pneumoniae* - the disease-causing microorganism in the intestines, which is associated with the development of the autoimmune process.

The main goal of physiotherapy and kinesitherapy treatment is: to stop the development of movement restrictions in each joint, and hence maintain normal motor activity. Particular attention is paid to preserving range of motion in affected patients.

The application of the methods of physical therapy, kinesitherapy and hydrotherapy affects the function of the spine and the functional ability of the patients, by increasing the sagittal mobility index of the cervical, thoracic and lumbar parts, the breathing index, improving the lateroflexion in the left and right , reduction of the toe-floor distance, reduction of difficulties in performing activities of daily living, as well as reduction of disease activity.

3.RESULT

The obtained results for the mobility of the spinal column and the functional ability of the patients with ankylosing spondylitis, before and after the treatment, are shown in a table.

Table 1. Range of motion before the start of rehabilitation

Mobility of different body segments	Normal range of motion	Patient range of motion (ROM)
NECK		
flexion	50	23
extension	60	28
Lateral flexion to the left	45	23
Lateral flexion to the right	45	24
Rotation to the left	80	38
Rotation to the right	80	39

CORPSE		
flexion	90	40
extension	25	9
Lateral flexion to the left	45	18
Lateral flexion to the right	45	19
Rotation to the left	45	13
Rotation to the right	45	14
CHEST		
Inspirium	5-6 cm.	3 cm.
Expirium	4-5 cm.	2.5cm.
SHOULDER		
Flexion	90/180	90/148
extension	45-60	30
Abduction	95/150	90/110
Adduction	20	14
Internal rotation	90	41
External rotation	90	50
Horizontal abduction	30	20
Horizontal adduction	110	90
HIP		
Flexion	100/125	90/105
Extension	20-30	15
Abduction	40-50	25
Adduction	20-30	15
Internal rotation	30-40	10
External rotation	40-60	29

Table 2. Range of motion of the affected joints before the beginning and after the end of the rehabilitation

Mobility of different body segments	Range of motion before the start of rehabilitation	Range of motion after completion of rehabilitation
NECK		
Flexion	23	30
Extension	28	35
Lateral flexion to the left	23	30
Lateral flexion to the right	24	30
Rotation to the left	38	45
Rotation to the right	39	45
CORPSE		
Flexion	23	30
Extension	28	35
Lateral flexion to the left	23	30
Lateral flexion to the right	24	30
Rotation to the left	38	45
Rotation to the right	39	45
CHEST		
Inspirium	3cm.	4cm.
Expirium	2.5 cm.	5cm.
SHOULDER		
Flexion	90/148	90/180
extension	30	40
Abduction	90/110	90/140
Adduction	14	20
Internal rotation	41	80

External rotation	50	80
Horizontal abduction	20	30
Horizontal adduction	90	110
HIP		
Flexion	90/105	100/120
Extension	15	20
Abduction	25	40
Adduction	15	20
Internal rotation	10	30
External rotation	29	40

VISUAL ANALOGUE PAIN SCALE

After the end of the treatment, the effects of the treatment in both groups of subjects were summarized, the research results were processed and the changes achieved were compared.

In order to determine the effectiveness of the treatment and to see the differences obtained before and after the treatment, the Visual Analog Scale for Pain Assessment VAS was used.

Each patient before the beginning and at the end of rehabilitation fills out the pain scale table, rounding the degrees of pain in a different position or movement - from 1 to 8.

For each of the 6 parameters in the pain scale questionnaire, the mean value is calculated. Then the sum of the mean values of all 6 parameters is determined, and the resulting final value is calculated according to the following formula and expressed in percentages:

$$(\text{Sum of all values} / 50) \times 100 = _ \%$$

The obtained results are shown in Table 1 and Table 2.

Table 1. Pain scale in patients from the control group before the beginning and after the end of the treatment

Parameters tested (Pain intensity from 1 to 8)	Before the start of the rehabilitation	After completing the rehabilitation
Severity of pain when getting out of bed (in the morning)	7	5
Severity of pain when standing	7	5
Severity of pain when walking	7	5
Severity of pain during lumbar flexion	7	5
Pain intensity during lateral flexion of spinal column	8	6
Pain intensity during thoracic extension	8	7

Total points (44 / 50) x 100 = 88 % before the start of rehabilitation

Total points (33 / 50) x 100 = 66 % after completion of rehabilitation

Table 2. Pain scale in the patients of the experimental group before the beginning and after the end of the treatment

Parameters tested (Pain intensity from 1 to 8)	Before the start of the rehabilitation	After completing the rehabilitation
Severity of pain when getting out of bed (in the morning)	8	5
Severity of pain when standing	6	4
Severity of pain when walking	7	5
Severity of pain during lumbar flexion	7	5
Pain intensity during lateral flexion of spinal column	8	6
Pain intensity during thoracic extension	8	7

Total points (44 / 50) x 100 = 88 % before the start of rehabilitation

Total points (32 / 50) x 100 = 64% after completion of rehabilitation

4. DISCUSSIONS

Among the patients from the Experimental group, in which hydrokinesitherapy was applied as an addition, much better results were achieved compared to the subjects from the Control group.

The results obtained from water exercises are significantly faster and better than other exercises, because warm water reduces pain and improves joint mobility. The heat of the water reduces pain, reduces muscle tone, loosens contractures and improves nutrition. The resistance of the water created by body movement makes it difficult to move quickly and acts as a resistance exercise. The aquatic environment significantly reduces body weight, facilitates movement and recovery of range of motion.

5.CONCLUSION

According to our practical experience, although ankylosing spondylitis is a progressive disease, the systemic application of physical therapy, practicing kinesitherapy exercises, Postisometric relaxation (PIR) and Proprioceptive neuromuscular facilitation (PNMF), contribute to increasing the range of motion in the joints, especially in the segments of the spinal column, improvement of the general condition of the patients and independence in performing activities of daily life. Physical therapy is an essential element of the complex treatment of ankylosing spondyloarthritis. With the methods of physical rehabilitation and kinesitherapy, control and reduction of pain symptoms, maintenance and preservation of the mobility of the affected joints are achieved.

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