https://doi.org/10.55453/rjmm.2024.127.1.10
The article was received on May 14, 2023, and accepted for publishing on July 5, 2023.

ORIGINAL ARTICLE

The Impact of Physical Therapy on Psychomotor Functions in a Patient with Systemic Lupus Erythematosus and Diabetes Mellitus – Case Illustrated Literature Review

Adina Geambaşu[1], Remus R. Glogojeanu[1], Lucian G. Eftimie[1,2]

[1] National University of Physical Education and Sports, Bucharest, Romania
[2] Carol Davila Central Emergency Military University Hospital, Bucharest, Romania

Correspondence: Remus Relu Glogojeanu, remusglogo@gmail.com

Abstract: *The scientific and medical world is making permanent efforts to study, understand, and cure the complicated pathology of Systemic Lupus Erythematosus (SLE) – the disease with 100 faces, due to the diversity and complexity of the symptoms. SLE has a devastating impact on the patient's life, causing multiple metabolic imbalances produced by both the disease itself and the necessary medication. This case report addresses the therapeutic aspects of SLE and diabetes mellitus, on a 47-year-old male with a sensitive multi-pathology and aggressive evolution, medication, and approaching psychomotor rehabilitation therapy, up to now, when SLE treatment has ended. Also, this case study report highlights the importance of flexibility in the psychomotor rehabilitation strategy, in the context of a large range of factors that influence its definition.*

Keywords: *SLE - systemic lupus erythematosus, diabetes mellitus, medication, recovery therapy, psychomotor*

INTRODUCTION

The scientific and medical staff are making permanent efforts to study, understand, and cure the complicated pathology of Systemic Lupus erythematosus (SLE) [1-3]. SLE, an inflammatory autoimmune disease, also named the disease with 100 faces due to the diversity and complexity of the symptoms, has a devastating impact on the patient's life due to the multiple metabolic imbalances produced by the disease itself and the necessary medication [4].

The etiology of SLE is unknown, as are the possible disorders (but not necessarily) – hematological, nephrological, neurological, skin, and ocular, because of cellular and tissue damage [5-7]. There is no chronological sequence of SLE manifestations, even in the same patient. It is problematic to diagnose, hard to treat (due to the various symptomatology from minimum to severe), and difficult to continuously adapt the strategy of preserving psychomotor capacity, sometimes necessary to change in an abrupt way.

Diabetes Mellitus in the case of SLE is a particular situation with the need for continuous monitoring because it can be influenced by this long-term disease and its complex medication treatment [8,9]. Administration of insulin units and/or gliclazide must be dosed by the treating physician according to the particularities of the case [9,10]. It is well known that diabetes can be controlled with careful diet and weight monitoring, and physical exercise as a supplement to medical treatment. That is why we consider the good collaboration between family, patient, doctor, and physical therapist, alongside the regular medical checkouts for blood variables of vital importance. The medical approach therapy is individualized and customized to fit each patient's need depending on the type of disease and each symptom.

Reflection of the theme in specialized literature and conceptual boundaries

Systemic lupus erythematosus (SLE) is a chronic autoimmune disease with multisystem involvement. It is triggered by deregulation of the immune system which, due to the autoantibodies produced, attacks the body's healthy cells and tissues. The clinical picture is very rich, it can affect several organs, it has an undulating evolution with periods of exacerbation and remission, and the forms of presentation are from clinical manifestations without life risk (affects the skin, and joints) to potentially severe forms (affects the patient at neurological, renal, cardiovascular level).

There are 4 types of lupus:

• Systemic lupus erythematous – is the most common form of lupus. The manifestation of the disease differs depending on the affected structures.

• Cutaneous lupus – manifests itself in the skin.

• Lupus induced by drugs – iatrogenic lupus occurs as a reaction to the administration of certain drugs.

• Neonatal lupus – is a particular form of the condition and occurs due to the transplacental transmission of anti-Ro antibodies from mother to fetus during pregnancy and can have skin, cardiac (the most serious being atrioventricular block), hematological, and neurological manifestations.

Symptoms can range from mild to very severe, and although they can be chronic, they usually come and go, with the disease having an undulating course.

The most common complaints are fatigue, altered general condition, fever, lymphadenopathy (inflammation of the lymph nodes), and joint and muscle pain. Almost any organ can be affected.

Skin-mucosal damage

It is present in approximately 70% of patients. The classic manifestation of acute lesions is the heliotrope rash, erythema in "butterfly wings" present at the level of the nasal pyramid and the cheeks (redness that extends from the nose to the cheeks, below the eye area), without affecting the nasolabial folds. Erythema can also spread to other areas exposed to UV radiation – forehead, chin, décolleté. Photosensitivity is another characteristic of lupus patients. Subacute lupus may initially present with erythematous lesions that, over time, become papulosquamous, mimicking psoriasis or lichen planus. Discoid lupus erythematosus can appear on the face, scalp, ears, arms, hands, and back, the erythema being followed by hyperkeratosis or atrophy. Discoid lupus can be a strictly dermatological lesion, without being accompanied by systemic manifestations [29].

There may also be alopecia, skin purpura, erythema, small red dots, urticarial eruptions, livedo reticularis, Raynaud's syndrome, and ulcerations of the fingers pulp. Mucous membrane lesions consist of frequently painless petechial and ulceration of the nasal, oral, and, less commonly, genital mucosa.

Musculoskeletal damage

About 90% of patients diagnosed with lupus will have joint pain, arthritis, or muscle pain at some point. The joints of the hands, fists, and then the large joints (knees, ankles, shoulders, elbows) are most frequently affected. They can be painful, swollen, or red, the damage is usually symmetrical. Unlike rheumatoid arthritis, lupus arthritis rarely causes severe joint deformities and is not erosive.

Hematological impairment

Anemia, thrombocytopenia, leukopenia with neutropenia or lymphopenia may occur within the disease or secondary to pharmacological treatment.

Cardiovascular damage

Pericarditis, myocarditis, and endocarditis can occur in this disease.

Lupus endocarditis, called Libman-Sacks endocarditis, has no infectious cause. Atherosclerosis occurs more frequently and develops more rapidly than in the general population.

Lupus patients can also associate antiphospholipid syndrome (SAFL), in which antiphospholipid antibodies are present (anti-beta 2 glycoprotein 1 antibodies, anti-cardiolipin antibodies, lupus anticoagulant).

The presence of SAFL causes thrombosis), and spontaneous abortions.

Lung damage

It can take the following forms: pleurisy, inflammation of the pleura, pleurisy, pneumonitis, interstitial lung disease, pulmonary hypertension, and pulmonary thromboembolism. These can cause coughing, dyspnea (choking hazard), chest pain, and hemoptysis.

Kidney damage (lupus nephritis)

Renal damage determines the severity of the evolution of lupus patients. One-third of patients have kidney damage, suggested by proteinuria or hematuria, serum creatinine is above the upper limit of the laboratory, and creatinine clearance is low.

Neuropsychological impairment

It is the least understood manifestation of systemic lupus erythematosus and one of the most severe. Among the neurological manifestations, we mention convulsions, severe headaches, peripheral neuropathies, cranial nerve damage, cerebral vascular accidents, acute meningitis, and chorea. Psychiatric manifestations include psychoses, cognitive dysfunction, anxiety syndrome, and mood disorders.

Gastrointestinal symptoms

The most common gastrointestinal symptoms are anorexia, nausea, vomiting, and abdominal pain, and may be manifestations of mesenteric vasculitis, peritonitis, pancreatitis, or secondary to the administered medication.

Liver damage is found in up to 60% of patients – hepatomegaly, increased liver enzymes, and hepatic steatosis. Up to 8% of patients develop retinal artery inflammation with thrombosis at this level. The conjunctiva and cornea can be affected by secondary Sjogren's syndrome [30].

Specific immunological abnormalities

The presence of autoantibodies that target their own structures. Antinuclear antibodies (ANA) occur in approximately 95% of patients but have low specificity and may be associated with other conditions (rheumatoid polyarthritis, autoimmune thyroiditis, autoimmune liver diseases, infections, neoplasms, or in healthy individuals). The most frequent antibodies encountered in SLE are the antibodies: anti-double-chain DNA (SLE specific, associated with disease activity), anti-Sm (SLE specific), anti-U1 RNP, anti-Ro, anti-La, anti-ribosomal protein P (SLE specific, appear in neurological, hepatic damage), anti-histones (occur in classical and drug-induced lupus), anti-phospholipids (characteristics of SAFL), rheumatoid factor (non-specific, occurs in many other autoimmune conditions, infections). Decreased serum complement fractions (C3, C4, CH50) are associated with disease activity.

As is the case with many chronic conditions, systemic lupus erythematosus (SLE) negatively affects the quality of life, due to factors such as depression, pain, cognitive dysfunction, and sleep disorders.

Despite a little-understood etiology, fatigue is associated with SLE in approximately 80% of cases, which leads to a decrease in the level of physical activity necessary to carry out usual daily activities and thus dramatically decreases the quality of life.

Physical medicine and recovery in Systemic Lupus Erythematous may involve physical therapy, occupational therapy, speech therapy, recreational therapy, or combinations thereof. The specialist doctor should coordinate the patient's care and be attentive to subtle changes in symptoms that may indicate periods of disease activity [32].

Ultrasound is a frequently used procedure to provide heat in the depth of the affected joint, but it should not be used in the presence of inflammation; locally applied ice is the preferred method for inflamed joints. When ultrasound is used to improve joint mobility, the application of ultrasound and joint movement should be simultaneous.

Hydrokinetic therapy is recommended for the mobilization of inflamed joints, due to the buoyancy that ensures the unloading of the joint and the soothing action of the warm water.

The cardiovascular and pulmonary systems can also be affected by lupus. We try to improve aerobic capacity through physical exercises and specific breathing exercises [31]. These exercises will also contribute to maintaining a strong bone system, as well as strengthening ligaments and joints. Regular practice of sports activities is particularly recommended for patients with lupus.

Occupational therapy has the role of helping the patient regain as much of his functional independence as possible, despite the problems caused by the disease. Activities of daily living are encouraged and may require training with special equipment, techniques, and procedures. These activities include feeding, dressing, bathing, grooming, grooming, and cooking in the home.

A safety assessment at the patient's home may be indicated. Occupational therapy can provide recommendations for equipment (for example bathtub bench, elevated toilet seat, grab bar) to increase the patient's independence and safety at home.

Patients who have neuropsychiatric complications due to lupus may have cognitive dysfunctions, with deficits in attention, language, and memory. The speech therapist can be helpful when a patient with systemic lupus erythematous has slurred speech, difficulty understanding speech, or difficulty speaking properly.

Because systemic lupus erythematosus is a condition that manifests itself episodically, through bouts of activity alternating with episodes of remission, it is important that the patient does nothing without consulting the rheumatologist who deals with his disease – thus, it will reduce the risk of triggering a set of activities.

Unfortunately, there is still no treatment that can cure lupus, but there are treatments that can improve the symptoms while prolonging the episodes of remission of the disease. Adopting a healthy lifestyle also contributes to increasing the quality of life of the lupus patient.

Other things that the lupus patient can do to improve their condition:

• To give up smoking, but also the consumption of caffeine or alcohol.

• To adopt a healthy, balanced diet, based on as many natural foods as possible.

• To rest enough.

• Follow exactly the treatment recommended by the doctor, even during periods of remission of the disease.

• To avoid exposure to the sun because ultraviolet radiation

increases the risk of triggering a flare-up of systemic lupus erythematous.

It is recommended to reduce exposure to UV rays (using creams with a minimum sun protection factor of 50, avoiding exposure to the sun), a diet adapted to the patient undergoing corticosteroid therapy (to prevent its adverse effects – diabetes, hypertension, dyslipidemia), quitting smoking.

To prescribe a drug treatment, it is essential to identify the type of organ damage and its severity.

Non-life-threatening damage (skin-mucous, musculoskeletal, serositis) is indicated for the administration of non-steroidal anti-inflammatory drugs, low-dose systemic cortico-therapy, and synthetic antimalarials.

Potentially vital damage (cardio-pulmonary, hepatic, renal, hematological, central nervous system) requires cortico-therapy in moderate or high doses, associated depending on the affected organ, with immunosuppressants, anticoagulants, anticonvulsants, or even biological therapy.

Systemic lupus erythematosus is a chronic condition with multisystem involvement that presents severe evolutionary potential. Currently, thanks to advances in the knowledge of mechanisms, diagnosis, and treatment, the 10-year survival rate of lupus patients is almost 90% [30].

MATERIALS AND METHODS

This review started with a case study and addresses the therapeutic aspects of SLE and Diabetes Mellitus of a 47-year-old male with a delicate multi-pathology and aggressive evolution, caused by both the diagnostic and the difficult approach of the psychomotor rehabilitation therapy when SLE treatment has ended. In this case study report, we approach the importance of the management of the disease combining not only the multiple therapeutic actions but also the proper medication and nutrition and the psychomotor rehabilitation [11]. The study includes stages of life-threatening biological depreciation, and treatment, until the present when the therapy is positively affecting the patient's quality of life.

We present the short version of the patient's clinical history:

- At 27 years old, he underwent surgery for Non-Hodgkin's Lymphoma, associated with polychemotherapy and radiotherapy, with good response, in remission and without any specific medication from 2003.

- No forms of SLE manifestation until 2017.

- The aggressive form of SLE debuted in September 2017, caused by an unstable lifestyle associated with many detrimental factors accumulated in the last 15 years: unbalanced alimentation (almost exclusively processed meat products/minced meats and semi-prepared products, and carbonated beverages), smoking, stress, lack of sleep, improper self-medication for diabetes mellitus, sustained effort.

- The SLE treatment itself begins in February 2018, the patient's previous treatment included only medication for his symptoms - edema, hypertension, cytopenia, etc.

- In his delicate condition, with the complex ongoing treatment, the patient beneficiated from the support of his family, nutritionist, priest, and doctors which improved his mental state of being.

- The period 2018-2019 was an equilibrated one when the patient was under observation, good nutritional plan, and 3 weekly sessions of physical therapy.

- In February 2022 the patient gets infected with SARS-CoV-2 Covid 19 Omicron Type which lead to a 10 days hospitalization in the nephrology unit medical care.

- The clinical picture of the subject presented above starts from the aggressive debut in the autumn of 2017 until 2021. We mention that multi-pathology and all associated diagnoses are not included in this presentation.

We also mention that during this period of multiple hospitalizations, there were diagnosed multiple associated pathology such as Diabetes mellitus type 2 with established Diabetic Nephropathy, Hypertensive Nephropathy with Renal Impairment, Hyperuricemia without signs of Inflammatory Arthritis or Tophaceous Disease, Vulgar Ichthyosis, Glomerular disorders in systemic connective tissue disorders, other water and electrolyte disturbances not elsewhere classified, Anemia in other chronic diseases classified elsewhere, Non-inflammatory Pericardial infusion, Medication-induced Specific Polyneuropathies, Secondary hypertension of other kidney disorders, Ascites, Hypo-osmolality and hyponatremia, Chronic nephritis syndrome, etc.

Also, here are some additional landmarks: the dietary regimen consisted of predominant vegetarian and hypoglycemic food, water management with 500 ml more than the urinary removal, medical plant tea indication, measurement of food in carbs no more than 150 per day (50/50/50 for each meal) associated with the prescribed medication; glycemic test each day before meals with calculated insulin administration (rapid and long-acting insulin) and/or gliclazide.

The multidisciplinary team of doctors (diabetologists, nephrologists, cardiologists, and Physiotherapists) [12-17] followed the patient during all the periods.

Treatment of SLE with the administration of combined diuretic treatment: high-ceiling diuretics (furosemide), Vasopressin antagonists (tolvaptan), Diuretic thiazide and potassium-sparing (amiloride hydrochloride and hydrochlorothiazide), thiazide diuretics (hydrochlorothiazide) and immune-suppressive combination (cyclophosphamide, mycophenolate mofetil), cyclosporine and corticosteroids (prednisolone).

Evaluation methods

To carry out this research from the Physiotherapists point of view, we chose the following measurements and evaluation tests:

1. to assess the level of the peripheral inflammatory stage at the level of the lower limbs as well as that of the muscle mass of the subject, we performed the anthropometric-perimetry method for the ankle and calf.

2. to evaluate the degree of mobility of the lower limb necessary for functionality, we used the goniometric method for the ankle and hip joints.

3. to assess static balance, we used the simple bipedal balance test with eyes open with several penalties for imbalance for 5 minutes.

4. to assess dynamic balance we asked the patient to walk on a drawled line of 5 meters distance, eyes open, without imbalance, dizziness, or lateral support.

5. to evaluate the subject's effort capacity, we used the ergometric bike without resistance with heart rate measurement.

Description of the used methods

1. The patient is in the supine position, and the measuring tape is applied at the level of the ankle joint including the most inflamed area, measuring an average of the right/left ankles before the physical therapy program.

2. The patient lying on his back, and the goniometer is applied according to the goniometric measurement and evaluation standards of the ankle and hip joint for the flexion movement, before the physical therapy program.

3. The patient in the standing position with bare feet on the floor for better plantar kinesthesia, eyes open, is timed for how many minutes/seconds he can stand without imbalances, dizziness, or lateral support. The evaluation was carried out at the beginning of the meeting for static balance.

4. For dynamic balance, a 5m line was marked on the floor, and the patient was asked to follow the line walking, eyes open, marking any sign of imbalance, dizziness, or lateral support, evaluated in how many meters the patient succeed to go on, at the end of the session.

5. The patient on the ergometric bicycle without lumbar support, with a distance between the hip and the pedals so that the knee is slightly flexed, without load, he pedals freely at a slow pace, following the heart rate so that it does not exceed 120 beats/min, it is marked how many minutes he can pedal up to the indicated maximum cardiac effort, or any other sign of imbalance, dizziness, numbness or pain. The test was held at the end of the physical therapy session.

Evaluation Instruments

The used instruments were a tape measure, goniometer, stopwatch, liner, ergometric bicycle, and pulse tester.

Research methods used

The research methods used in the paper were:

- the theoretical documentation method.

- pedagogical observation.

- the experimental method.

- the method of tests and evaluation samples.

- the investigation method.

- the method of recording and statistical-mathematical data processing.

- the graphic method.

Applied intervention

To streamline and synthesize the process of describing exercises applied, they are presented below (Tables 1 and 2).

The tables show the means we worked with, the exercise program proposed for every period, and their dosage.

Teaching materials used to fulfill the improvement program of motor functional skills and of balance and effort capacity were the stick, a small hand weight 1 kg, a terra band, the balance board, the inflatable balance disc, the gym ball, the small spikes ball for prehension, the bicycle, marker.

The physical therapy program no. 1 consisted of this period in: specific exercises that do not involve risks factors for strokes, bruises, or bleeding; exercises that do not present risk factors for a patient with high blood pressure; exercises and techniques for lymphatic drainage; specific techniques for tone muscle and equilibrium; specifically adapted methods for connective flexibility and joints mobility; programs for developing effort capacity; outdoor adapted program; exercises that consider the electrolyte imbalance (already existing due to the disease); breathing exercises.

Table 1: The process of describing initial exercises applied – the first program

Type of method	Exercise	Series	Reps or seconds/minutes	Pause (sec)
Mobilization	From the lying position - slow passive mobilization of the ankle in all directions	3	30 reps	30 sec
	From the lying position - slow passive mobilization of the knee for flexion and extension	3	15 reps	30 sec
	From lying position - Slow passive mobilization of the hip in all ranges of motions from simple to complex	3	15 reps	60 sec
	From lying position and sitting - Active mobilization of the upper limbs with a stick in all ranges of motions	3	15 reps	60 sec
	From lying position - Free active mobilization of the upper limb in all ranges of motions	3	15 reps	30 sec
	From lying position - Free active mobilization of lower limbs in all ranges of motion (bicycle, shears, bypasses)	3	15 reps	60 sec
	Quadrupedal position, cat forward and backward	3	10	120 sec
Tone muscle	Lying position - all range motion mobility with 1-kg hand weights	3	15	60 sec
	Sitting position - all range motion mobility with 1-kg hand weights	3	15	60 sec
	Sitting position - terra band extension between arms in abduction and extension	3	10	120 sec
	Sitting position - leg extension with a terra band resistance	3	10	120 sec
	Lying position - knee flexion and extension with terra band resistance	3	10 reps	120 sec
Static balance	Sitting position - imbalance from the shoulders in all directions with the requirement to maintain the posture from the abdomen without the help of the hands	3	10 reps	60 sec
	Standing position - Keep abduction of the hands	3	10-60 seconds	120 sec
	Standing position - maintain the balance without lateral support or movements	3	10-60 seconds	120 sec
Dynamic balance	Standing position - Raise 1 leg on a support ball	3	10-60 seconds	60 sec
	Standing position - walking with a plastic cup with water in the hand	3	10 m	60 sec
	Standing position - walking on a drawled line on the floor without lateral support or lateral deviations	3	10 m	120 sec
	Standing position - with lateral or face hand support - on a balance platform or ball - back straight, crunches	3	10 reps	120 sec
	Standing position - lateral support - kick a ball	3	10 reps	60 sec
Effort capacity	Bicycle ride - level 0	1	5 min	-
	Bicycle ride - level 0	1	15 min	-
	Claiming stairs from 1 to 3 floors	1	15-30 min	5 min
Outdoor training	Walking outdoors on a parc with support (frame, cane or crutch, or human lateral support)	1	15-30 min	-
Breathing techniques	Lying position - costal and abdominal breathing techniques, slowly and following the dizziness or pain	1	5- 10 min	-
	Sitting position - gently inhale with the extension of the trunk and arms, and exhale slowly and long with the return and withdrawal of the navel towards the spine.	1	5-10 min	-
Manual techniques	Manual lymphatic drainage and pump exercises	1	15 – 30 min	-
	Manual therapy for connective tissues	1	15-30 min	-

All exercises and techniques were adapted to the daily dynamic state of functionality of the patient from very simple basic to the maximum possible in his case. The programs were carried out on an outpatient basis at the patient's home, with a frequency of 3 sessions per week (Monday, Wednesday, Friday), the duration of the session being between 30 and 120 minutes depending on the daily state of the patient and the applied methods.

Table 2: The process of describing initial exercises applied – the second program

Type of method	Exercise	Series	Reps or seconds/minutes	Pause (sec)
Mobilization	From the lying position - slow active mobilization of the ankle in all directions	3	30 reps	30 sec
	From the lying position - slow active mobilization of the knee for flexion and extension	3	15 reps	30 sec
	From lying position - Slow active mobilization of the hip in all ranges of motions from simple to complex	3	15 reps	60 sec
	From lying position and sitting - Active mobilization of the upper limbs with a stick in all ranges of motions	3	15 reps	60 sec
	From lying position - Free active mobilization of the upper limb in all range of motions with 1 kg hand weights	3	15 reps	30 sec
	From lying position - Free active mobilization of lower limbs in all ranges of motion with 1 kg leg weights (bicycle, shears, bypasses)	3	15 reps	60 sec
	Quadrupedal position, cat forward and backward	3	10	120 sec
Tone muscle	Face lying position - all range motion mobility with terra band	3	15	60 sec
	Sitting position - all range motion mobility with 1 kg hand weights	3	15	60 sec
	Sitting position - terra band extension between arms in abduction and extension	3	10	120 sec
	Sitting position - leg extension with a terra band resistance or 1 kg leg weights	3	10	120 sec
	Lying position - knee flexion and extension with terra band resistance or 1 kg leg weights	3	10 reps	120 sec
Static balance	Sitting position - imbalance from the shoulders in all directions with the requirement to maintain the posture from the abdomen without the help of the hands or with a ball or a weight of 1 kg in the hands	3	10 reps	60 sec
	Standing position - Keep abduction from 90^{O} - 180^{O} of the hands	3	10-60 seconds	120 sec
	Standing position - maintain the balance without lateral support or movements and keep a 1 kg weight on the hands	3	10-60 seconds	120 sec
Dynamic balance	Standing position - Raise 1 leg on a support ball with 1 kg leg weight	3	10-60 seconds	60 sec
	Standing position - walking with a 1 kg weight on the hand	3	10 m	60 sec
	Standing position - walking on a drawled line on the floor without lateral support or lateral deviations with a cup of plastic water in the hand or on the head	3	10 m	120 sec
	Standing position - with lateral or face hand support- on a balance platform or ball - back straight, squats or lunges	3	10 reps	120 sec
	Standing position - lateral support - kick a ball or roll a 1 kg leg weight	3	10 reps	60 sec
Effort capacity	Bicycle ride - level 1	1	5 min	-
	Bicycle ride - level 1	1	15 min	-
	Claiming stairs from 1 to 6 floors	1	15-30 min	5 min
Outdoor training	Walking outdoors on a parc with or without support (frame, cane or crutch or human lateral support)	1	15-30 min	-
Breathing techniques	Standing position - costal and abdominal breathing techniques, slowly and following the dizziness or pain	1	5- 10 min	-
	Standing or quadrupedal position - gently inhale with the extension of the trunk, leg, and arm, and exhale slowly and long with the return and withdrawal of the navel towards the spine	1	5-10 min	-
Manual techniques	Manual lymphatic drainage and pump exercises	1	15 – 30 min	-
	Manual therapy for connective tissues	1	15-30 min	-

The program contains breathing exercises from decubitus and sitting, easy mobilization exercises for upper limbs with the stick and weights no more than 1 kg, slow exercises for lower limbs at the bedside level, lymphatic drainage, progressive passive mobilizations, progressive active spine mobilizations, static and dynamic equilibrium methods, core and leg muscle

tone exercises, home bicycle program from 0 weight, outdoor walking sessions. Monday and Wednesday were addressed to the indoor program and Friday evening (due to the ocular and skin problems in SLE) if the weather was proper and the state of the patient was a good one, was addressed to the outdoor program.

Objectives

The 1 physical therapy program followed the objectives of each period of the evolution of the patient's state.

The initial objectives of the treatment were those of:
- preserving life
- following developments in functionality and evasion of complications.

The main objectives were:
- Improve the quality of life
- Decrease in inflammation and lymph retention
- Preserve and gain flexibility
- Develop tone muscle
- Develop a functional effort capacity
- Obtain a good static and dynamic stability
- Maintain a good psychological state of mind and optimism with the patient and family.

The functional state of the patient translates into functional disability to service and personal care, unable to have an orthostatic position, seated posture, and displacement.

The physical therapy program no. 2 consisted of the same exercises as in the first period but improved and adapted to the new daily possibilities of the patient. Such as upper and lower limb mobilization in a full range motion and with resistance, static and dynamic balance improved techniques for outdoor walking without the support and on uneven terrain, effort capacity development on the bicycle with resistance, maneuverability, and coordination exercises.

The program contains breathing exercises from sitting and standing positions, mobilization, and tonus exercises for upper limbs with the stick and 1 kg weight, exercises for lower limbs at the bedside level and from standing position with terra band, abdominal and diaphragmatic exercises, equilibrium exercises with or without lateral support, progressive active mobilizations, prehension exercises, lymphatic drainage, and manual therapy, bicycle training, outdoor walking sessions.

All exercises and techniques were adapted to the daily dynamic state of functionality of the patient following the rule of "primum non nocere" [26].

Objectives

The 2 physical therapy programs followed the objectives of each period of the evolution of the patient's state.

The initial objectives of the treatment were those of:
- preserving the quality of life and existent functionality
- following developments in functionality and evasion of complications.

The main objectives were:
- Improve the quality of life
- Preserve and gain flexibility and connective tissue elasticity
- Develop tone muscle and regain muscle mass
- Gain a functional effort capacity for outdoor functionality
- Obtain good static and dynamic stability together with coordination skills
- Maintain an optimistic continuous psychological state of mind and optimism with the patient and family.

Figure 1: Representative images of the foot edema and neuropathy skin lesions

The recovery protocol consisted of tracking the functionality of each step according to the patient's evolution, following the food and drug indications and the degree of muscle and joint recovery, and also considering the equilibrium function that has been greatly affected.

During these months of complex treatment, the patient had positive or stagnant recovery moments, being affected by atmospheric pressure temperature, and climate change.

The purpose was to perform standing posture and walking with a moderate balance and state of equilibrium.

The functional state of the patient in March 2021 was that of functional and personal care integrity, the ability to perform standing posture, and walking with a moderate balance and state of equilibrium (Figure 3).

The patient continued the prescribed programs on his own at home during the pandemic period and the functional state of the patient in June 2022 was that of functional and personal care integrity, the ability to perform standing posture and walking with a moderate balance, and a state of equilibrium. (Figure 4).

RESULTS

The results concerning our patient were very promising (Table 3).

The perimetric measurements showed a constant decrease between the initial, intermediate, and final evaluations of the dimensions by 6 centimeters for the ankle joint and by 8 centimeters for the calf, relevant to a good drainage process both through the function of the kidney and through the lymphatic system, due to both effective medication and the sustained kinetic program.

Figure 2: Representative images of the foot edema and neuropathy skin lesions

Figure 3: Representative images of the foot from March 2021.

Figure 4: Representative images of the foot from June 2022.

The goniometric measurements for ankle and hip flexion had values of increased joint mobility, thus the ankle gained 10 degrees and the hip 55 degrees in a range of motion, which allowed the patient better mobility and dynamic functionality.

Table 3: Results of evaluation tests

Measurements	Initial testing Feb 2017	Intermediary testing Feb 2018	Final testing March 2019	Observations
Ankle perimeter	30 cm	27 cm	24 cm	Decreased by 6 cm
Calf perimeter	45 cm	43 cm	37 cm	Decreased by 8 cm
Ankle flexion mobility	5^{o}	10^{o}	15^{o}	Improved with 10^{o}
Hip flexion mobility	35^{o}	85^{o}	90^{o}	Improved with 55^{o}
Static stability	0	5 min	10 min	Improved 10 min
Dynamic stability	0	10 meters	30 meters	Improved 30 meters
Effort capacity	0	10 min	15 min	Improved 15 min

The evaluation of static stability recorded beneficial increases for the patient's life from the value of 0 minutes to 10 minutes without imbalance. The dynamic stability tests increased from 0 meters to 30 meters of walking without imbalance and support. Thus, the static stability gained 10 minutes without imbalances, and the dynamic one from value 0 reached a displacement of 30m without imbalances and support, which allowed the patient to go outside the house.

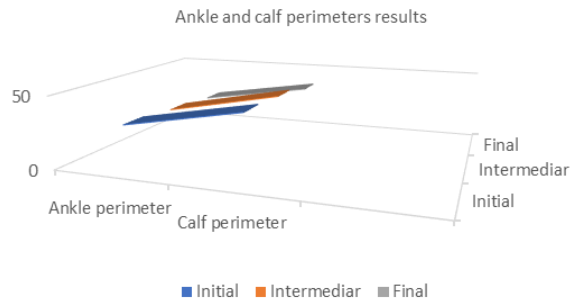

Figure 5: Ankle and calf perimeters measurements results

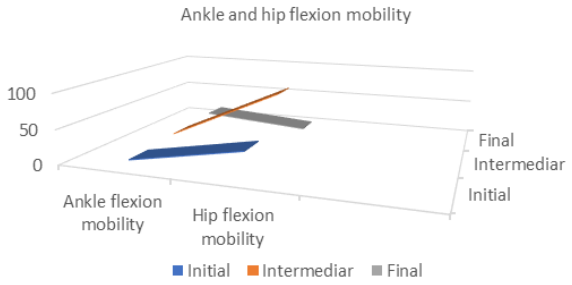

Figure 6: Ankle and hip flexion mobility results

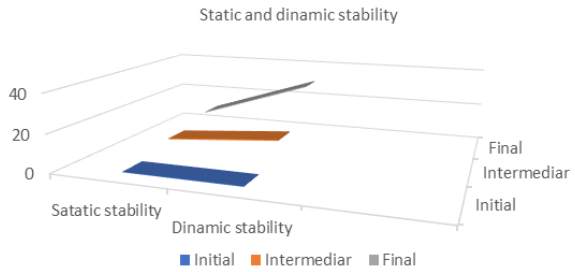

Figure 7: Static and dynamic stability evaluation results

The evaluation of the effort capacity from 0 initial value has reached 10 minutes without effort disorders so that later on the final evaluation on the best day of the patient will be 15 minutes without effort disorders. We mention that every day the patient's dynamics undergo changes from one hour to the next and the time of day matters a lot.

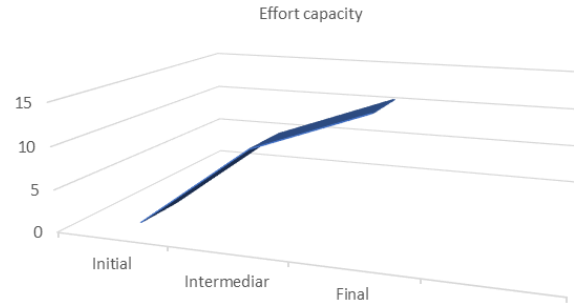

Figure 8: Effort capacity results.

DISCUSSION

The recommended strategy for addressing such a complex SLE case, for recovery of motor function, requires monitoring of at least three lines of observation:

1 Always be aware of disease progression (more in the context of risk of relapse of disease) and medication applied:

• Consulting physician recommendations, the results of medical tests, imaging investigations, etc.

• Check the treatment schedule, especially in the case of a disease involving a long-term treatment scheme with the adjustment of the substances and doses used (side effects of drugs can often have an impact on the patient's condition).

2 Use in an efficient manner the pluses of a positive psychic state (a calm, orderly mind with clear targets) and cultivate the will of the patient.

3 Permanent assessment of patient evolution, in points where difficulties were found: posture, coordination, and motricity.

Following the lines of this strategy, the physical therapist will be able:

• To work together with the patient, in a flexible system, the recovery exercises - maximum 10-30 minutes.

• To recommend to the patient a set of exercises to perform at home (immunosuppressive regimens do not recommend the presence of the SLE patient in the community over long periods of time, even more in the presence of other patients with transmissible diseases).

• And additionally, where appropriate, to apply therapeutic manual therapy and drainage sessions, as well as breathing techniques.

The recommended strategy for addressing the rehabilitation of motor function in such a complex case requires monitoring of at least these five levels of observation:

- Always be aware of the disease progression (even more in the context of risk of relapse) and medication administration, constantly consult physician recommendations, the results of medical tests, imagistic investigations, and so on. In this case, multiple impairments of the organ systems have led to chronic or acute manifestations of imbalances in the body [21-25,33, 34]. Permanently check the treatment schedule, especially in the case of a long-term treatment plan disease with the adjustment of the substances and doses used (side effects of drugs can often have an impact on the patient's condition).

- Permanent assessment of the patient’s evolution, in points where difficulties were found posture, coordination, and motricity, cause many of the associated diseases, both in the kidneys and other organs, make it difficult to choose the correct and balanced diet and medication.

- An important path leading to complete rehabilitation in this case, as in many others, was the combination of sustained social - psychological - spiritual support through faith and management with attention focused on the patient. The psychological support received from the medical staff and family, largely based on the patient’s trust in them, was even more necessary as the treatment with corticosteroids can cause changes in behavior (periods of extreme energy and activity, combined with periods of insomnia and irritability). We identified at least three main engines of the patient’s desire to recover – confidence in the attending physician and successful completion of the treatment, the desire to return to a normal life and sacred therapy.

The multi-pathology, as well as the delicate situation of the patient, have greatly raised the stakes of the entire medical staff in choosing the most suitable treatment management, which is still in progress daily.

References:

1. Ciccacci C (2017) A polymorphism upstream MIR1279 gene is associated with pericarditis development in Systemic Lupus Erythematous and contributes to definition of a genetic risk profile for this complication. Lupus 26(8): 841-848.

2. Ivan C, Popescu L (2019) Adapted training sessions - a plus for beginner athletes- Discobolul - Physical Education, Sport and

Kinetotherapy Journal Year 57(3): 31-35.

3. Petri MA, Van Vollenhoven RF, Buyon J (2013) Baseline predictors of systemic lupus erythematosus flares: data from the combined placebo groups in the phase III belimumab trials. Arthritis Rheum 65: 2143-53.

4. Yeganeh MZ, Sadeghi S (2013) Risk factors of glucocorticoid-induced diabetes mellitus in systemic lupus erythematosus. Galen Medical Journal 2: 39-43.

5. Houssiau FA, Vasconcelos C, D'cruz D (2010) The 10-year follow-up data of the Euro-Lupus nephritis trial comparing low-dose and high-dose intravenous cyclophosphamide. Ann Rheum Dis 69: 61-64.

6. Koutsonikoli A, Trachana M, Heidich AB (2015) Dissecting the damage in northern Greek patients with childhood-onset systemic lupus erythematosus: a retrospective cohort study. Rheumatol Int 35: 1225-1232.

7. Schroeder M, Russo S, Costa C, Hori J, Tiscornia I, et al. (2017) Pro-inflammatory Ca++-activated K+ channels are inhibited by hydroxychloroquine. Sci Rep 7(1): 1892.

8. Cortes S, Chambers S, Jerónimo A, Isenberg D (2008) Diabetes mellitus complicating systemic lupus erythematosus-analysis of the UCL lupus cohort and review of the literature. Lupus 17: 977-980.

9. Wahono CS, Rusmini H, Soelistyoningsih D, Hakim R, Handono K, et al. (2014) Effects of 1,25(OH)2D3 in immune response regulation of systemic lupus erithematosus (SLE) patient with hypovitamin DInt J Clin Exp Med 7(1): 22-31.

10. Stoicescu I (1999) Practice Dermato-Venerology Guide, Sitech Publishing House, Craiova, pp. 147-150.

11. Ulivieri C, Baldari CT (2014) Statins: from cholesterol-lowering drugs to novel immunomodulators for the treatment of Th17-mediated autoimmune diseases- Pharmacol Res 88: 41-52.

12. Bucur G, Opris DA (2002) Dermatoveneric Encyclopedia Diseases. (National Medical edn), Bucharest, Romania, pp. 468-471

13. Calabrese L, Resztak K (1998) Thalidomide revisited: pharmacology and clinical applications. Exp Opin Invest Drugs 7: 2043-2060.

14. Hanjani NM, Nousari CH (2002) Mycophenolate Mofetil for the Treatment of Cutaneous Lupus Erythematosus With Smoldering Systemic Involvement Arch Dermatol 138: 1616-1618.

15. Housman TS, Jorizzo JL Colab SI (2003) Low-Dose Thalidomide Therapy for Refractory Cutaneous Lesions of Lupus Erythematosus Arch Dermatol 139: 50-54.

16. Tien KJ (2013) Epidemiology and Mortality of New-Onset Diabetes after Dialysis. Diabetes care 36: 3027-3032.

17. Van Vollenhoven RF, Mosca M , Bertsias G (2014) Treat-to-target in systemic lupus erythematosus: recommendations from an international Task Force. Ann Rheum Dis 73: 958- 967.

18. Van Vollenhoven RF, Mosca M , Bertsias G (2014) Treat-to-target in systemic lupus erythematosus: recommendations from an international Task Force. Ann Rheum Dis 73: 958- 967.

19. Popescu V (2005) Clinica de Pediatrie și Neurologie pediatrică, Spitalul Clinic de copii „Dr. Victor Gomoiu", București - Criteriile revizuite pentru diagnosticul SLE (după Tass și colab, 1982); Jurnalul Medicinei Românesti 3(4): 59.

20. Ugarte-GIL MF, Wojdyla D, Pons-Estel GJ (2017) Remission and low disease activity status (LDAS) protect lupus patients from damage occurrence: data from a multiethnic, multinational Latin American lupus cohort (GLADEL). Ann Rheum Dis 76: 2071-2074.

21. Knop J, Bonsmann, G, Happle R si colab (1983) Thalidomide in the treatment of sixty cases of chronic discoid lupus erythematosus. Br J Dermatol 108: 461-466.

22. Tseng S, Pak G (1996) Rediscovering thalidomide: a review of its mechanism of action, side effects, and potential uses. J Am Acad Dermatol 35: 969-979.

23. Powell RJ (1999) Thalidomide: current uses. Bio Drugs 11(6): 409-416.

24. Werth V (2001) Current Treatment of Cutaneous Lupus Erythematosus. Dermatology Online Journal 7(1): 2.

25. http://www.csid.ro/health/sanatate/lupusul-o-boala-cu- o-mie-de-fete-10262986.

26. Geambasu, A., Therapeutic approach to Systemic Lupus Erythematosus – a case study, Discobolul – Physical Education, Sport and Kinetotherapy Journal Vol. XIV, no. 4(54), 2018, p 57

27. https://www.medlife.ro/glosar-medical/afectiuni-medicale/lupusul-eritematos-sistemic-les-cauze-simptome-tratament

28. https://www.doc.ro/lupus-cauze-simptome-tratament/medicina-fizica-si-recuperarea-in-lupusul-eritematos-sistemic

29. Ewa Kuca-Warnawin, Magdalena Plebańczyk, Marzena Ciechomska, Marzena Olesińska, Piotr Szczęsny, Ewa Kontny. Impact of Adipose-Derived Mesenchymal Stem Cells (ASCs) of Rheumatic Disease Patients on T Helper Cell Differentiation, Int. J. Mol. Sci. 2022, 23(10), 5317; https://doi.org/10.3390/ijms23105317 - 10 May 2022

30. Ahmad Haidar Ahmad, Dyhia Melbouci, Patrice Decker LiP Polymorphonuclear Neutrophils in Rheumatoid Arthritis and Systemic Lupus Erythematosus: More Complicated Than Anticipated, Immuno 2022, 2(1), 85-103; https://doi.org/10.3390/immuno2010007, 7 January 2022 (This article belongs to the Special Issue Advances in Autoimmune and Rheumatic Diseases: A Theme Issue in Honor of Prof. Dr. Yehuda Shoenfeld)

31. Teodora Wesselly Camelia Branet, Carmen Grigoroiu, Mihaela Netolitzchi, The Effect of Plyometric Training on Lower Body Strength in Preadolescent Athletes, BRAIN. Broad Research in Artificial Intelligence and Neuroscience, Vol 11, No. 4, Sup1 (2020), https://lumenpublishing.com/journals/index.php/brain/article/view/3733/2716

32. Corina Predescu, Anca Dana Popescu, Ioana Oprişescu Controlul biomedical al refacerii,. Bucureşti: Discobolul 2011

33. Periferakis A, Periferakis K, Badarau IA, Petran EM, Popa DC, Caruntu A, Costache RS, Scheau C, Caruntu C, Costache DO. Kaempferol: Antimicrobial Properties, Sources, Clinical, and Traditional Applications. International Journal of Molecular Sciences. 2022; 23(23):15054. https://doi.org/10.3390/ijms232315054

34. Caruntu A, Moraru L, Surcel M, Munteanu A, Costache DO, Tanase C, Constantin C, Scheau C, Neagu M, Caruntu C. Persistent Changes of Peripheral Blood Lymphocyte Subsets in Patients with Oral Squamous Cell Carcinoma. Healthcare. 2022; 10(2):342. https://doi.org/10.3390/healthcare10020342