

PHYSICAL EXERCISES AS A THERAPEUTIC EFFECT IN THE COMPLEX TREATMENT OF DIABETES

EXERCIȚIILE FIZICE CA EFECT TERAPEUTIC ÎN TRATAMENTUL COMPLEX AL DIABETULUI ZAHARAT

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Key words: physical therapy, rehabilitation, exercises, patients.

Cuvinte cheie: recuperare, tratament, exerciții, pacienți.

Introduction. This research starts from the hypothesis that if we provide a program of therapeutic exercises well selected we will maintain and improve clinical condition of patients with diabetes type II. Main objective is to maintain biochemical parameters specific clinics and as close as possible to normal, with a view to the completion of secondary prevention.

Purpose. It is intended to check hypothesis and determination of the efficiency of exercises therapeutic program selected and applied.

Material and method. Patients selected, the number of 12, they were admitted in the period June - September 2012, in the Diabetes Section, Nutrition and Metabolic Diseases the Emergency Hospital, Targu-Jiu. Assessment methods used have been: the history, the method of observation, experimental method and laboratory methods.

Results. As a result of the evaluation has been found to have significant differences of the values of blood sugar to T1 and T2 front, from the original values and the cholesterol and also, it is found that the values triglycerides do not differ significantly. It is considered a significant difference, with a probability of 5% error ($p=0.05$) if t calculated is higher than that of the table for degrees of freedom.

Discussion. The physical exercises, along with medicinal treatment, have an important role in recovery and mastery of the parameters endocrine-metabolic factors for persons with diabetes type II.

Conclusions. The metabolic response of the body to physical activity becomes positive in the case of persons with diabetes type II. A program of exercises well defined, associated with a medication properly, generates values favorable to improve parameters endocrine-metabolic factors in people with diabetes type II.

Introducere. Prezenta cercetare pornește de la ipoteza că dacă aplicăm un program de exerciții terapeutice bine selecționat vom menține și ameliora starea clinică a pacienților cu diabet zaharat tip II. **Scop.** Obiectivul principal este acela de a menține parametrii clinici și biochimici specifici cât mai aproape de normal, în vederea realizării prevenției secundare. Se urmărește verificarea ipotezei și stabilirea eficienței programului de exerciții terapeutice selectat și aplicat. **Material și metodă.** Bolnavii selecționați, în număr de 12, au fost internați în perioada iunie - septembrie 2012, în Secția de Diabet, Nutriție și Boli de Metabolism a Spitalului Județean de Urgență, Târgu-Jiu. Metodele de evaluare utilizate au fost: metoda anamnezei, metoda observației, metoda experimentală și metode de laborator.

Rezultate. În urma evaluării s-au constatat diferențe semnificative ale valorilor glicemiei la T_1 și T_2 față de valorile inițiale și ale colesterolemiei și, de asemenea, se constată că valorile trigliceridemieii nu diferă semnificativ. Se consideră o diferență semnificativă, cu o probabilitate de eroare de 5% ($p=0,05$) dacă t calculat este superior celui din tabel pentru gradele de libertate corespunzătoare. **Discuții.** Exercițiile fizice, alături de tratamentul medicamentos, au un rol important în recuperarea și menținerea sub control a parametrilor endocrine-metabolici pentru persoanele cu diabet zaharat tip II.

Concluzii. Răspunsul metabolic al organismului la exercițiul fizic devine pozitiv în cazul persoanelor cu diabet zaharat tip II. Un program de exerciții bine definit, asociat cu un tratament medicamentos adecvat, generează valori favorabile îmbunătățirii parametrilor endocrino-metabolici la persoanele cu diabet zaharat tip II.

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Introduction

Diabetes incidence is increasing. Disease is spread all over the world, regardless of geographical area, sex, age, breed, covering 10% of the general population [1,2.]. Diabetes mellitus is a metabolic disorder with chronic evolution, characterized by disturbance of carbohydrate metabolism, accompanied or followed by disrupting lipid metabolism, protidic and mineral. It is a complex syndrome and genetic disorder induced heterogen or gained to the secretion of insulin and/or peripheral cell resistance to the action of insulin. [3;4; 5]

The etiology of diabetes is complex, sometimes the disease is the result of the interaction of several factors of which we list the most important: heredity, this (regardless of the nature of the food), sedentary or professions that require a permanent mental overload, damage to the exocrine Pancreas (chronic pancreatitis, cystic fibrosis, hemochromatosis), stress hyperglycemia (after severe burns, acute myocardial infarction), atherosclerosis of the pancreas (the elderly), endocrine diseases (Cushing's syndrome, pheochromocytoma, glucagonom, hyperthyroidism), drugs (corticosteroids, thiazides, nicotinic acid) and pregnancy (gestational diabetes).[6;7;8.]

Most authors consider that diabetes has an evolving moment in which the clinical form manifests is the last stage of four evolutionary stages:

- diabetes potentially or before diabetes (stage I)-common tests and applied for the detection of the disease are negative; [9;10.]
- latent diabetes (stage II)-disturbance of carbohydrate metabolism evidenced by sample Fajans-Conn; [11]
- chemical or asymptomatic diabetes (stage III)-modification of hyperglycemia, curve fasting blood sugar is normal; [12;13.]
- clinically manifest diabetes mellitus (stage IV)-fasting hyperglycemia, polyuria, and sugar, and polydipsia, and polyphagia sometimes. [14]

Hypothesis

In conducting this research, we started from the following hypothesis: if we apply well-selected exercise program, with specific diabetes treatment, the clinical condition of patients with diabetes can improve and maintain the appropriate parameters.

Purpose

Following verification of the hypothesis and determining the effectiveness of selected therapeutic exercise program, strategy recommendation classic exercise we take into account the regularity with which they performed physical activity, duration or intensity of exercise, the exercise protocol was prescribed individually.

The purpose of this approach deliberately and consciously experimental nature applicative aims to demonstrate metabolic benefits plan, a program of physical and mental exercise, carefully controlled diabetic patients. By using specific chiropractic process are envisaged positive results which they could be applied immediately or in the future.

Tasks

There has to be a precise delimitation between the setting and the observation of the following tasks, such as:

- documentation and consultation with a comprehensive bibliography of literature and international;
- 1. composition of the study;
- 1. establishment of clinical and para clinical parameters evaluated during the study;
- 2. choosing specific exercise program this condition;
- 3. compiling individual evaluation sheets;
- 4. recording and processing results; [15;16.]
- 5. conclusions and proposals;

Subjects

Patients selected for this study were admitted between June-September 2012 at the Division of Diabetes, Nutrition and Metabolic Diseases Emergency Hospital in Târgu Jiu. 12 patients, ages between 45-56, were carefully assessed in terms of metabolic control, presence or not of micro - and macro vascular complications or any associated pathology was drafted alone sheets of observation.

Also underwent a rigorous examination of the cardiovascular, respiratory and locomotor not to include in this study patients with major chronic complications or those at high risk. The risks and benefits of exercise in these patients were assessed by a team of specialists.

In order to support participation in physical-kinetic program lasting four months, patients were exposed to the necessity and benefits of making individualized physical activity programs in order to improve blood glucose levels and other metabolic parameters.

Making exercise therapy started during hospitalization, the hall of the Department of Physical Therapy, Physiotherapy and rehabilitation of the hospital said, equipped with: dining treatment, trellises, mattresses, mirrors, slopes, banks, gym, treadmill, platform balance bike.

Patients have noted individual file types of exercises performed, regularity, intensity, and duration. At discharge, patients were recommended, in addition to diet and appropriate medical treatment, continuing the exercise performed during hospitalization, with specific reference to each patient.

Mentioned, is that all patients live in Târgu-Jiu as residences and are hospitalized in the hospital's clinic specialized service, which is an important criterion that led to the preparation of the experiment. In addition to bio- constitutional features of patients have noted spontaneity permission, cooperative attitude and a high degree of patient understanding of the purpose of this analyze and answer yes to participate in therapeutic exercise program.

In order not to include in this paper high risk patients, evaluation of patients was performed by a team of specialists and consisted of:

6. complete physical examination with emphasis on the cardiovascular system, peripheral nervous system and skin changes;
7. examination of the fundus;
8. radioscopia cardio – pulmonary;
9. abdominal ultrasound;
10. laboratory tests for patients in research.

Research methods

To validate the hypothesis by monitoring and compliance tasks and its purpose we used the observation method, anamnesis, evaluation method, experimental method and standard laboratory methods for the determination of biochemical parameters in order to collect data on nutritional status and representation of fat (for classifying a patient in the category of normal - under-or overweight) and data osteoarticular and muscular system, which are the most required during the exercise.

In terms of the application of the experimental method was performed following selection of patients achieving a homogeneous group in terms of diagnosis and treatment. We used configuration experiment in which the assumption explicit and applied to all the subjects I chose the same samples following the same parameters.

Parameters evaluated at baseline (T_0) were:

11. blood pressure;
12. pulse;
13. glucose;
14. cholesterol;
15. triglycerides.

Anamnesis method

Anamnesis method it's a particular form of communication. It is a method which seeks to establish a detailed history on the history of the personal (physiological and pathological) and the collateral-potentially critically important diabetogen (parents, siblings).

Through history we made contact with the subjects in question.

I found out the age, profession, place of residence, family status, time of start of the condition, the symptoms you have, if you have had difficulty adapting to the new situation resulting from the diagnosis of diabetes, if you have other associated diseases (cardiovascular, liver or kidney disease), as well as dietary and medicinal treatment that follows.

Laboratory methods

Measurement of biochemical parameters (glucose, cholesterol, triglycerides) were performed in the hospital clinical laboratory, biochemical Reflotron Plus analyzer, manufactured by Roche Diagnostics, using reactive strip.

All data specific parameters are encoded in the magnetic strip on the opposite side of the impregnated with reagent and sample volume needed for each determination is 32 μ l and can be applied with very high accuracy using the pipette Reflotron. Operating on the principle of luminous reflectance and photometry in its composition a plasma separator system, the device allows you to use both whole blood and plasma or serum depending on the biochemical parameter.

Glucose, cholesterol and triglycerides were determined in serum samples by enzymatic methods. The normal values for blood sugar levels are between 76-110 mg/dl (4.22-6.11 mmol/l). Normal values has Cholesterol < 200 mg/dl (< 5.2 mmol/l) and triglycerides are normal values of less than 200 mg/dl (< 2.3 mmol/l).

Therapeutic physical exercises

To support the participation in this program, though-kinetic lasting four months, patients were exposed to the need and benefits of physical activity programs in accordance with improved blood glucose values and other metabolic parameters.

It begins with a program of activity with moderate intensity, which will be increased gradually.

High intensity and strenuous exercises should be avoided. It will choose programs and exercises that aim to reduce postprandial hyperglycemia and will be discouraged from physical activity during the peak action of insulin or administration of sulfonylureas.

Particular attention should be paid to prevention of hypoglycaemia during post exercise (10-20g carbohydrates ingest mainly in the form of juice).

Physical activity should be supported, performed regularly, although often there is a tendency of postponing or avoiding the excuse of lack of time. The patient may choose activities that fit her the most and which are recommended by specialist exercise given the regularity with which it is performed physical activity (ex 3 sessions per week), the time (on average 45 minutes to moderate exercise) and exercise intensity (moderate).

Routine physical activity is recommended, not the sporty type. Time spent sedentary (computer or watching TV) should be limited to the maximum, in a planned manner. The recommended type of exercise and also the reach diabetic patients is walking.

In all patients included in this study, we applied physical exercises program is presented below.

Exercises for head and neck

Initial position standing or sitting with head facing away gaze forward (those with cervical spondylosis sitting position is recommended not to occur rapidly Syndrome):

1. Left – right bendings:

Time 1; 4 series of 12 repetitions. - left lateral bending, tempering;

Time 2 - right lateral bending, tempering.

2. Left – right twistings:

Time 1; 4 series of 10 repetitions. - twisting left, return;

Time 2 - twisting clockwise, comeback.

3. Bending and extensions:

Time 1; 4 series of 10 repetitions - leaning forward, back;

Time 2 - extension head return.

Perform them slowly and with eyes open. Dizziness can occur very easily even at a healthy man.

Shoulder Exercises

1. Initial position standing or sitting departed head facing forward:

Time 1; 4 series of 12 repetitions - shrugging your shoulders;

Time 2 – shoulder descent;

Inspire when lifting, exhale on the descent.

2. Baton heads started:

Time 1; 4 series of 12 repetitions - raising cane elbows extended to the zenith of inspiration

Time 2 - lowering stick close behind shoulders and shoulder blades to exhale.

Exercises for upper limbs

Runs with or without weights depending on the degree of training and age.

1. Initial position with both legs apart:

Time 1; 4 series of 10 repetitions - raising arms sideways to inhale;

Time 2 - return arms at your sides with expiration.

2. Initial position with both legs apart:

Time 1 ; 4 series of 10 repetitions- alternate lifting arms above the front before, with inspiration;

Time 2 - Return arms to your sides expired.

3. From the initial position runs alternately:

Time 1; 4 series of 12 repetitions - forearm arm flexion with a weight of 0.5 kg;

Time 2 - comeback.

4. From the initial position runs alternately: with a dumbbell in hand describing large circles in the sagittal and frontal plane.

5. From the original position facing the fixed scale running alternative:

Time 1; 4 series of 10 repetitions - palm against the edges of the upper trellis runs as carrying up towards the zenith, with the extent of hemithorax with inspiration;

Time 2 - comeback.

6. Initial position standing with hands on hips:

Time 1; 4 series of 12 repetitions - left lateral bending of the trunk;

Time 2 – comeback;

Time 3- bending torso to the right side;

Time 4 - comeback.

7. Initial position standing with hands on hips:

Time 1 ; 4 series of 10 repetitions - twisting of the trunk to the left;

Time 2 - comeback.

Time 3- twisting of the trunk to the right;

Time 4 - back.

Exercises for limbs

1. Initial position with both legs apart: linkage peaks.

2. Initial position with both legs apart: legwork.

3. Initial position with both legs apart:

Time 1; 4 series of 12 repetitions - lifting the right knee flexed to 90⁰ and his grip with both hands - for balance;

- Time 2 - return;
Time 3 - lifting left knee flexed to 90° and his grip with both hands;
Time 4 - comeback.
4. Initial position with both legs apart, trellis side, left hand grabs sticks at the shoulder, run:
Time 1; 4 series of 12 repetitions - abduction right leg sideways to 45° ;
Time 2 - comeback.
5. Initial position with both legs apart, trellis side, right hand grabs sticks at the shoulder, run:
Time 1 ; 4 series of 12 repetitions - lower limb abduction of the left- side to 45° ;
Time 2 - comeback.
6. Initial position facing away from the fixed scale, hands grab sticks in the pool:
Time 1 ; 4 series of 10 repetitions - triple flexion to 90° - like settlement on the seat;
Time 2 - comeback.
7. Initial position sitting facing away from the fixed scale, hands grabbed sticks to shoulder:
Time 1; 3 series of 10 repetitions - the first slat climbing the trellis with the right foot;
Time 2 - return;
Time 3 - the first slat climbing the trellis with the left foot;
Time 4 - comeback.
8. Initial supine position, knees bent, hands by their sides:
Time 1; 3 series of 10 repetitions. - carrying right knee toward your chest;
Time 2 - return;
Time 3 - carrying right knee toward your chest;
Time 4 - comeback.
9. Initial supine position, knees extended, hands by their sides:
Time 1 ; 4 series of 12 repetitions - extended right leg rises to the zenith, hip flexion;
Time 2 - return;
Time 3 - extended left leg rises to the zenith;
Time 4 - comeback.
10. Initial supine position with hands behind your head:
Time 1; 3 series of 10 repetitions - slight lift off the ground - simple crunches;
Time 2 – comeback.
11. Initial position quadruped:
Time 1; 4 series of 12 repetitions - heels settlement;
Time 2 - return column remains arched.

Exercising equipment

Devices that have been performed exercises with electronic display for measurements were: treadmill and stationary bike. Intervals were used for 10-15 minutes, individual effort alternating with pauses according to the needs of each patient.

They are provided with a special notation on the time the pulse returns to baseline after exercise. Scoring is from 1 to 6, the latter being the lowest grade.

Note the difference between the initial and final pulse, on the device software, 1 minute after completion of exercise, the patient sitting at rest on the device. The subjects were taught in advance to go on treadmill. Riding a conveyor belt was not hampered by tilting it. Treadmill has been very appreciated by patients, whereas in these circumstances requires relatively low muscle strength, reinforces the sense of balance and gives a feeling of lightness in movements as encouraging. Has the advantage that calls for a more natural gait reproduction than does circular movement and it provides simple measurement of maximum oxygen consumption. You might say that walking on treadmill requires the same energy consumption as well as walking on the floor.

Pulse, distance travelled, speed and time interval were monitored. In these patients the running speed must be between 2.5-4 km/h, distance up to 1-1.5 km, so that the pulse does not exceed 120 b/minutes.

Stationary bike. In patients undergoing trial have registered the pulse, distance traveled per unit time and speed of movement. Initially they managed to walk with difficulty a little distance between 30-100 m, in a time frame of between 2-4 minutes and travel at a speed of between 8-10 km/h. During this period of time was the rapid increase in heart rate in all patients, from the range of 76-90 beats/minutes up to the range of 130-155b/minutes. After a number of meetings repeatedly observed an improvement in exercise capacity of each patient with increasing distance traveled per unit time, travel speed and increase the time for this unit.

Also, noted a slower increase in heart rate which indicates cardiac adaptation to exercise. The program ended with relaxation exercises, breathing and recovery.

Results

Following are the results of the test parameters investigated initially, at 2 and 4 months of starting physical exercises as well as the graphical representation of the average values obtained at specified time intervals (graphs 1; 2; 3).

Table no.1 Glycemia – semnification of student test raport; „t”-Student $p < 0,05$

Variables	Number of cases	Difference of results	Degrees of freedom	t
$T_0 - T_1$	12	35,9	11	2,42
$T_0 - T_2$	12	51,6	11	3,53

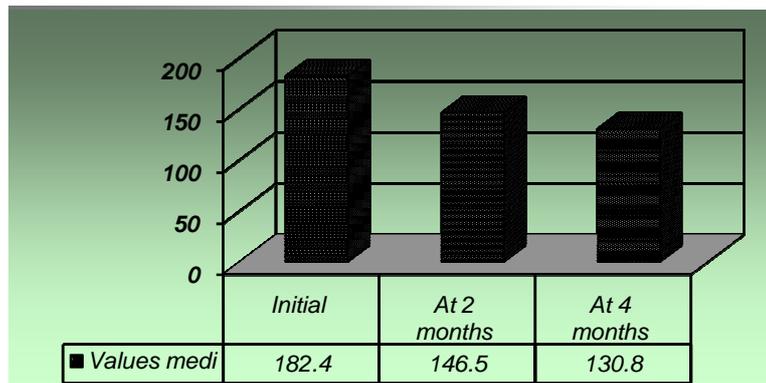


Chart no. 1 Average blood glycemia values (mg/dl)

From the data presented in the chart, 1 it is observed average values/batch of T1 and T2 to glucose compared to initial values considered witness, being more accentuated at 4 months from the start of exercise.

The values of cholesterol are presented in the following table (table no.1).

Table no. 2 Cholesterol - semnification of student test raport; „t”-Student $p < 0,05$

Variables	Number of cases	Difference of results	Degrees of freedom	t
$T_0 - T_1$	12	15,8	11	1,10
$T_0 - T_2$	12	44,6	11	3,46

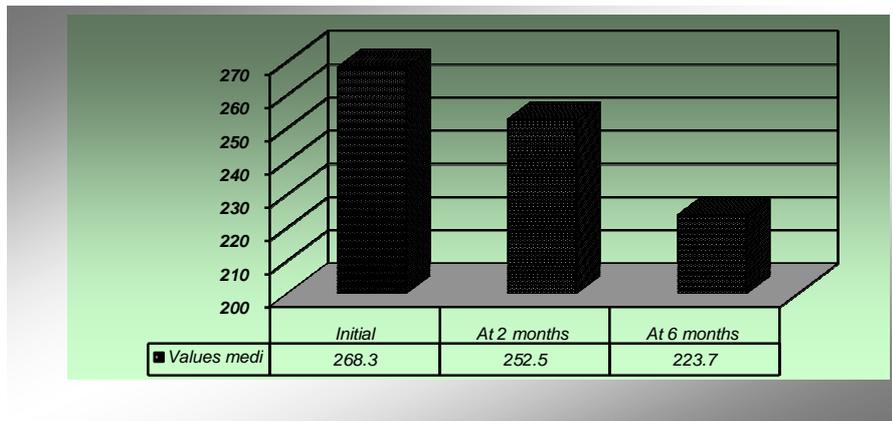


Chart nr. 2 Mean values of cholesterol (mg/dl)

Graphical representation of the average values of the batch/cholesterol indicates a moderate decrease of average values T1 and T2 at the further toward the baseline, his own witness.

In table 3, the individual values at 2 and 4 months of triglycerides.

Table no.3 Triglycerides- semnification of student test raport; „t”-Student $p < 0,05$

Variables	Number of cases	Difference of results	Degrees of freedom	t
T ₀ – T ₁	12	16,9	11	0,37
T ₀ – T ₂	12	44,1	11	1,10

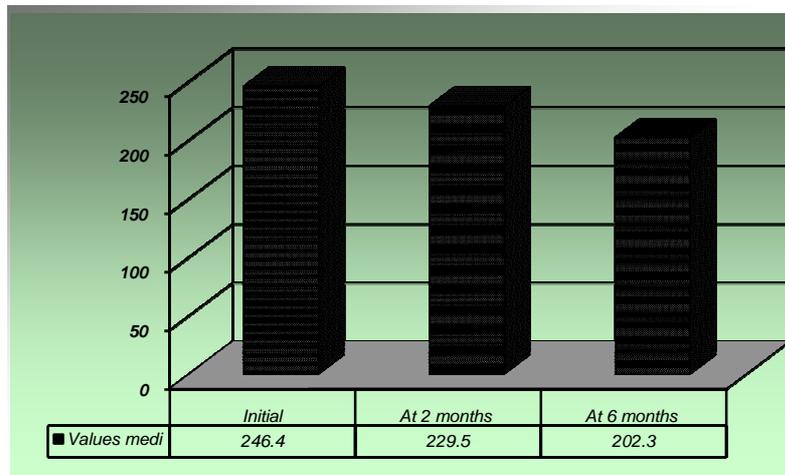


Chart nr. 3 Mean values of triglycerides (mg/dl)

Data presented in the chart 3 emphasize the slight decrease of the average values of triglycerides/lot at 2 and 4 months, compared with the initial values.

Discussions

The patients hospitalized were evaluated clinically and laboratory to include in this study patients with chronic major complications or those at high risk. The value association physical exercises with barbiturate treatment, for patients with diabetes type II, is also supported in the publications "Kinesiologie activă. Exerciții terapeutice", by Plas F., Hagron and "Tratamentul diabetului zaharat. Ghid practic", Perciun Rodica (2005). [7,11,14]

Morning gymnastics, which can be repeated in the course of the day, it is very useful, claims and causes normal maintenance of the values for patients with diabetes type II, as is clear from Medical gym, (Ionescu A.,1994). [6]

Clinical and other clinical types examinations carried out at the initial hospitalization accounted for each individual patient's own witness. Endocrine-metabolic diseases treatment is complex and involves a close interdisciplinary collaboration between physician, physical therapist, psychologist, social worker.

Conclusion

- ✓ Parameters for evaluating the effectiveness of exercise programs performed (blood pressure, pulse, blood sugar, cholesterol, triglycerides), by interpreting the effects of exercise performed at 2 months and 4 months after the start of the program, generated positive results, contributing to continuous adaptation to new situations arising kinetic treatment.
- ✓ Positive results, after 2-4 months of exercising well structure, generate significant beneficial effects of medical, biomedical, physical for diabetic patients when follow a specific sequence and order in execution.
- ✓ Unless contraindications, exercise should not miss the therapeutic armamentarium of patients with type II diabetes, beneficial effects of physical exercises are, from the point of view, both on metabolic and physical.

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