

A clinical study on the efficacy of natural therapeutic factors in Băile Tuşnad for the rehabilitation of post-stroke patients

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ABSTRACT

Introduction. Stroke is one of the main causes of morbidity and mortality worldwide. Hypotonic carbonated mineral waters in Băile Tuşnad are used for their peripheral and cerebral vasodilator effects in the prophylaxis, therapy and rehabilitation of cardiovascular patients. **Objectives.** The aim of the clinical study was to assess the efficacy of natural therapeutic factors in Băile Tuşnad for continuing the rehabilitation of post-stroke patients in a spa and climatic resort for the treatment of cardiovascular diseases. **Methods.** The study included 30 patients with a history of stroke, aged between 56 and 89 years, with a mean age of 69 years, at the Facility Treatment of the Tuşnad Spa Complex SA, in the period April-December 2014. The clinical study was a prospective longitudinal analysis. Of all 30 patients, 50% had ischemic stroke, 43% transient cerebral ischemic attack, and 7% hemorrhagic stroke. Hemiparesis was the most frequent clinical sign, followed by coordination, balance and gait disorders. Patients attended rehabilitation treatment consisting of kinesiotherapy, carbonated mineral water baths for 15 minutes, aerotherapy for 30 minutes daily, massotherapy, performed daily for 16 days. Each patient was clinically assessed before and after treatment based on the TINETTI Balance Scale, the 10-m walk test, the Motor Assessment Scale, the BARTHEL Index, adverse reactions. **Results.** At the end of treatment, an improvement in the walking speed, a statistically significant improvement in the quality of gait were observed, $p < 0.05$. Statistically significant results $p < 0.05$ were also obtained for balance. On the Motor Assessment Scale, by comparing the means before and after treatment with the paired T test, a statistically significant value $p < 0.05$ was obtained. When evaluating the patients' performance for 10 activities of daily living depending on the need for external assistance, using the Barthel Index, the value of $p < 0.05$ was statistically significant. There were no side reactions to the treatment applied. **Conclusions.** Natural therapeutic factors, i.e., carbonated mineral water baths and aerotherapy, along with kinesiotherapy, indicated for rehabilitation treatment in post-stroke patients, influenced the clinical and functional picture, determining a significant improvement of the quality of gait, balance, and an increase in the autonomy of these patients. Continuing the rehabilitation treatment, in the absence of contraindications, in spa and climatic resorts, is extremely important and necessary for post-stroke patients.

Key words: stroke, carbonated mineral water, medical rehabilitation, gait

Introduction

Cerebrovascular accident (CVA) is a severe acute neurological disorder, resulting from the lack of blood flow to a brain area or through cerebral hemorrhage.

According to the World Health Organization, in 2001 there were 5.5 million deaths from cerebrovascular accidents, and annually about 15 million persons survive stroke. Stroke lethality is 11% for women and 8.4% for men. Prospective studies show that the incidence and prevalence of this disorder increase every year, and WHO experts estimate that cerebrovascular accidents will become the main cause of mortality by 2030. Stroke is the main etiological factor of long-term disability, representing the third cause of death, after cardiac disease and various types of neoplasms, in developed countries.

Also, CVA is the second cause of dementia and the most frequent cause of epilepsy in elderly, as well as a frequent cause of depression. Romania ranks among the first ten countries in the world regarding the incidence of stroke. CVA mortality is three-four times higher in our country compared to European Union countries and six-seven times higher compared to the United States [1]. Survivors of a cerebrovascular accident frequently have persistent symptoms such as: paralysis of motor function, sensory deficits, aphasia, depression, dementia or other cognitive impairments. These data suggest that stroke is a real health problem, not only because of its high mortality rate, but also due to its consequences on motor and cognitive performance in survivors. CVA sequelae may have catastrophic effects on the quality of life of patients and their families [1].

Natural therapeutic factors specific to Băile Tușnad are represented by mixed carbonated mineral waters, natural mofettes and microclimatic conditions - a tonic, stimulating, sparing bioclimate.

The effect of external treatment with carbonated mineral waters is extremely complex, and relies on the mechanical and thermal action, as well as on the chemical properties of carbon dioxide, whose influence is either local or postabsorptive [2,3]. Following studies conducted in Vatra Dornei, it was found that atherosclerotic patients with arterial hypertension had an improvement of peripheral circulation and a normalization of vascular hyperreactivity, assessed by the Hines test, an improvement of collateral circulation and the claudication index, evaluated by radioisotopic and clinical methods, a reduction of blood pressure values and a tendency to bradycardia following treatment with carbonated mineral waters. An extensive study, conducted in Covasna in 1000 patients with arterial hypertension, demonstrated a hypotensive effect and capillary vasodilation assessed by capillaroscopy. In peripheral ischemic disorders, an improvement of the claudication index, of oscillometric values was reported [2,3,4].

This study aimed to monitor the efficacy of natural therapeutic factors, i.e., carbonated mineral waters and bioclimate in the form of aerotherapy, used for rehabilitation treatment at the Tușnad Spa Complex SA, along with kinesiotherapy and massotherapy, with a role in continuing neurorehabilitation treatment in post-stroke patients in a Romanian spa and climatic resort for the treatment of cardiovascular diseases, where indicated.

Spa treatment indications must be limited to those patients who have made progress in motor deficit and functional recovery in medical rehabilitation services, and who do not present decompensation or evolving disease aspects.

Material and method

The study was a prospective longitudinal analysis and was conducted at the Treatment Facility of the Tușnad Spa Complex SA in Băile Tușnad resort, in the

period April – December 2014. The study included 30 patients with a history of ischemic or hemorrhagic stroke, aged between 56 and 89 years (mean age 69 years). The group comprised both female and male patients, 14 women and 16 men. The informed consent of the patients was obtained before their inclusion in the study. The study was approved by the Ethics Committee of the University of Medicine and Pharmacy Cluj-Napoca. This was a prospective longitudinal analysis.

The inclusion criteria in the study were patients with stabilized forms of ischemic or hemorrhagic stroke, with hemiparesis sequelae, at least 6 months after stroke, with reduced motor deficit, able to walk, with balanced cardiovascular and neurological function. The exclusion criteria were patients with contraindications of spa treatment, with epilepsy, mental disorders, sphincter disorders, and patients with contraindications of carbonated mineral water baths.

Patients attended rehabilitation treatment consisting of carbonated mineral water baths for 15 minutes, aerotherapy for 30 minutes daily, massotherapy, kinesiotherapy, performed daily for 16 days. Mineral bath treatment was performed in individual bathtubs. The water temperature was adjusted by heating or cooling to 32°C. The patients were immersed in a 300 liter bath, with the avoidance of useless movements as gas dissipates through water agitation, followed by a 30 minute pause. The therapeutic effects of carbonated mineral baths rely on the action of carbon dioxide and to a smaller extent on the pharmacodynamic action of mineral salts in the composition of mineral water. The carbonated mineral water bath increases

arteriolar blood flow to the skin, its vasodilator effect being directly proportional to the carbon dioxide concentration in the mineral bath. The effect of external treatment with carbonated mineral waters is based on the mechanical and thermal action, as well as the chemical properties of carbon dioxide, whose influence is either local or postabsorptive.

As part of treatment, patients underwent muscle relaxing and decontracting massage procedures, for the improvement of musculocutaneous circulation and muscular and cutaneous relaxation. The following massage techniques were used: smoothing of spastic muscles, effleurage, vibrations applied to stimulate neuromuscular excitability. The duration of a procedure was 15-20 minutes, daily. The objectives of kinesiotherapy were: improvement of coordination, recovery of walking, recovery of balance, improvement of function. Kinesiotherapy sessions were conducted daily, for 30 minutes, during 16 days of treatment.

Each patient was clinically monitored on day 1, before treatment, and at the end of treatment, on day 16, based on the TINETTI Balance Scale, the 10-m walk test, the Motor Assessment Scale, the BARTHEL Index, adverse reactions.

Data were collected and analyzed using the Microsoft Excel 2007 application. Descriptive statistical analysis was performed in the two groups before and after treatment, with the specific module of the Data Analysis component – Descriptive Statistics. The T test for the comparison of the means of paired samples was applied for each scale. The statistical significance threshold used was $p < 0.05$.

Results

1. Incidence of stroke pathology by sex groups (Fig. 1)

Incidence of stroke pathology by sex groups

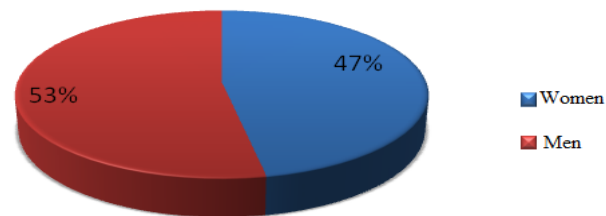


Fig. 1 Incidence of stroke pathology by sex groups

The study group included 30 patients, of which 16 men and 14 women. It can be said that stroke was represented with a higher frequency in male patients compared to female patients. The above

diagram shows shows a higher incidence in male patients, 53%, compared to female patients, 47%

2. Incidence of stroke pathology

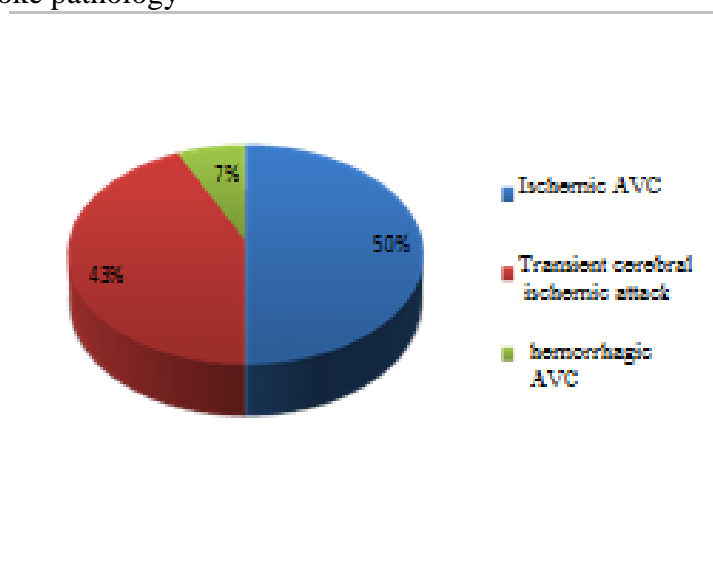


Fig. 2 Incidence of stroke pathology

The study performed on 30 patients evidenced a prevalence of ischemic stroke of 50%, followed by transient cerebral ischemic attacks, 43%, and hemorrhagic stroke, 7% of all 3 predominance in the male sex. By analyzing the group in terms of age, the frequency of stroke cases was observed

investigated patients, with a slight predominance in the male sex. By analyzing the group in terms of age, the frequency of stroke cases was observed in the 56-89 age range (the mean age being 69 years) (Fig. 2).

3. The Tinetti Balance Assessment Scale

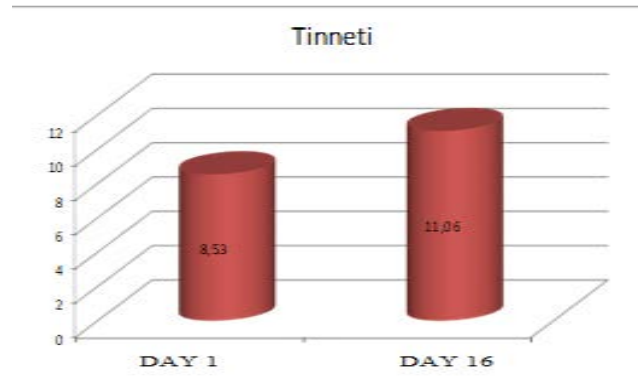


Fig. 3 Graphic representation of the means before and after treatment for the Tinetti Balance Scale

The above figure shows the results obtained after applying the Tinetti Balance Scale for grading static balance, by comparing the means before and after treatment with the paired T test (8.533 vs. 11.06). The p value obtained is less than

0.05 ($p=0.0000000000000061$), so the mean after treatment (day 16) is statistically significantly higher compared to day 1 (Fig. 3).

4. The Gait assessment Scale

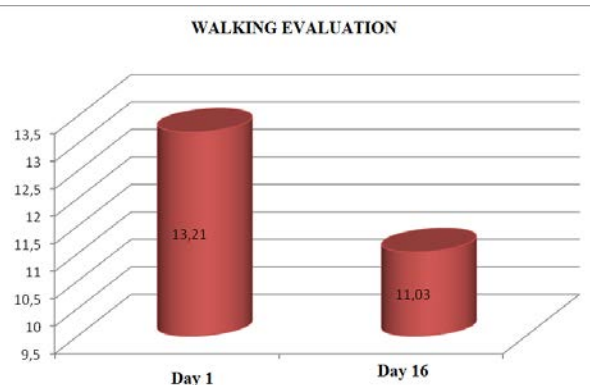


Fig. 4 Graphic representation of the means before and after treatment for the Gait Assessment Scale

Fig. 4 shows an increase of the patients' walking speed, assessed by the 10-m walk test. A comparison of the means before and after treatment using the paired T test shows a p value lower than 0.05 ($p=0.00000000000000072$).

5. Barthel Index assessment

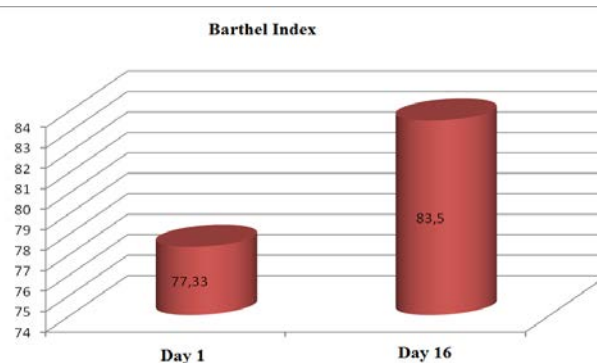


Fig. 5 Graphic representation of the means before and after treatment for the Barthel Index

For the Barthel Index, used to assess motor deficit, the statistical estimate obtained is a p value lower than 0.05 ($p=0.0000000000000037$), which indicates a statistically significant difference when comparing the means before and after treatment with the paired T test (77.33 vs 83.5).

Discussions

Carbonated mineral water baths are a treatment method used for the prevention and treatment of cardiovascular diseases, in some Romanian spa resorts [2].

Carbonated mineral water baths increase arteriolar blood flow to the skin, which is demonstrated by the flowmeter, the vasodilator effect being directly proportional to the carbon dioxide concentration in the mineral bath. Carbon dioxide is absorbed in the skin even if it does not produce gas bubbles [2]. There is vasodilation of arterioles and arteriovenous anastomoses. The temperature of the carbonated water bath is between 28-31°C [5].

Recent studies performed in Buziaş resort confirm the favorable effects of external treatment with carbonated mineral water in arterial hypertension stage II [2].

Conclusions

1. The clinical study carried out in Băile Tuşnad and the statistical processing of the results obtained evidence the fact that the use of natural therapeutic factors, i.e., carbonated mineral water and bioclimate through aerotherapy, in a spa and climatic resort, along with kinesiotherapy and massotherapy, significantly improved the walking speed and the quality of gait in patients included in the study, with a statistically significant difference between the first and last day of treatment ($p<0.05$).
2. At the end of treatment, there was also a statistically significant improvement in the Motor Assessment Scale ($p < 0.05$), which

evaluates motor functions based on activities of daily living.

3. Statistically significant results ($p<0.05$) were also obtained when assessing balance; a difference of about 3 points was observed by comparing the first and last day of treatment.

4. A slight improvement in the patients' function was noted.

5. Although following this study we obtained positive, statistically significant results regarding the efficacy of natural therapeutic factors in Băile Tuşnad resort, to which a physical-kinetic program was added, in post-stroke patients, a longer term study including a larger group of patients would be extremely important for the continuation of research.

6. These results demonstrate the possibility and the importance of continuing medical rehabilitation treatment in a spa resort for the treatment of cardiovascular diseases.

References

1. Dahnovici Rodica Minodora. Teză de doctorat. Accidente vasculare cerebrale hemoragice, studiu clinic, histologic si imunohistologic, UMF Craiova, 2011.
2. Munteanu Constantin. Ape minerale terapeutice. Editura Balneară Bucuresti, 2013.
3. Constantin Munteanu, Delia Cinteza. Cercetarea științifică a factorilor naturali terapeutici. București: Editura Balneară; 2011.
4. Dogaru Gabriela, Radulescu Alexandru. Therapeutic effects of carbonated mineral waters in cardiovascular rehabilitation. Balneo Research Journal 2015, vol. 6 (1):36-49.
5. Zdrenghea D., Branea I. Recuperarea bolnavilor cardiovasculari, Editura Clusium, Cluj-Napoca, 1995.