

STUDY ON THE CURRENT MEANS OF GAIT REHABILITATION IN ADULTS WITH NEUROLOGICAL PATHOLOGY

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Abstract

Introduction: Stroke causes a neurological dysfunction that leads to hemiplegia and the most serious disability is the dorsiflexion deficit that affects physiologic gait. Neurological rehabilitation represents an extremely important stage in the healing process due to the functional sequelae we encounter, sequelae of variable severity that can even cause severe handicaps. *Purpose:* Through this study we want to identify and highlight the therapeutic means currently used to re-educate gait in people who have suffered a stroke. We aim to find the weaknesses for the entire gait recovery process and bring new elements to the classic recovery program. *Materials and methods:* To carry out the study, we made an online questionnaire using the Google Forms platform and distributed it online to the target group. *Results:* Gait specific recovery programs are currently quite simply thought out. Currently, the greatest emphasis is on restoring the ankle joint in order to improve the dorsiflexion movement. *Conclusions:* We can conclude that the therapeutic strategy approached to reeducate gait at the current moment needs improvement, being largely based on the use of therapeutic physical exercises for the ankle and foot and physiotherapy and therapeutic massage procedures.

Introduction

Stroke causes neuromotor dysfunctions that produce hemiplegia, either on the right side if the injury occurred in the left hemisphere of the brain or on the left side if the injury occurred in the right hemisphere of the brain.

The most important clinical features include the onset of motor and/or functional deficits. In the acute phase, the onset of hemiplegia is flaccid, followed by spasticity when primitive movement patterns reflexly occur.

Medical statistics show that, currently, the number of people suffering a stroke is increasing and the most worrying aspect is related to the age of those affected, which is decreasing. A comprehensive study that assessed the overall risk of stroke concluded that the risk of stroke increased among young people. Reported trends in the absolute incidence of young people with stroke have been heterogeneous, but all research has shown a less favorable trend in incidence at younger ages versus older ages [1].

Compared to the European average, Romania has one of the highest mortality rates in Europe and one of the highest incidences of stroke. The best estimates show that in Romania, annually, about 7,500 people suffer a hemorrhagic stroke, 55,000 people suffer an ischemic stroke and 1500 people suffer a subarachnoid hemorrhage. However, thanks to several national health programs implemented by the Ministry of Health, significant achievements have been made in the care of people with acute stroke in the last 5 years, especially the increase in the national rate of thrombolysis from 0.8% to 5.4%. Romania's profile regarding the health of the population with stroke was evaluated both from the point of view of infrastructure and from the point of view of the public health protocols implemented. Many of the data reported in the studies were obtained by accessing the RES-Q registry [2].

In 2016, the European Stroke Organisation launched and implemented the RES-Q Registry, a platform used as a tool for assessing, monitoring and continuously improving the quality of healthcare for people with stroke [3]. In Romania, between 2017 and 2022, a total of 10,583 people with stroke were registered in the RES-Q platform, the distribution according to the type of condition is as follows: ischemic stroke (80.6%–87.4%), hemorrhagic stroke (9.4%–13.4%) and indeterminate form (0.1%–0.2%) [2].

In our country there are many shortcomings in the treatment and rehabilitation of people with stroke, and this is due to the low number of doctors and rehabilitation specialists in hospitals and clinics that treat this pathology. For example, data from the College of Physicians show that on average, about 70% of cities have less than 0.5% neurologists per 10,000 inhabitants.

In recent years, Romania has been facing a dramatic decrease in the number of physicians due to a sharp phenomenon of migration, largely determined by the poor health care system that does not provide specialists with the conditions for a truly professional performance [2]. Romania's health profile for 2019 states that health expenditure in Romania is the lowest in the European Union [4].

Another worrying reason regarding the health status of people with stroke in Romania is given by medical recovery. The transfer of people with stroke to a department or clinic specialized in motor neurorehabilitation varies, according to data from the RES-Q registry, between 5.76% and 9%.

Over the years, several stroke awareness campaigns have been implemented among the population. For example, in 2021, the first support organization for people with stroke in Romania was established, called ALIA (Association for the Fight Against Stroke) [5]. This organization aimed to provide information about the clinical signs of a stroke, about the network of clinics and hospitals that provide revascularization treatment services for acute ischemic stroke or motor neurorehabilitation services. Also, together with the Ministry of Health and the Romanian Society of Neurology, ALIA was actively involved in the implementation of the first public awareness campaign on the occurrence and identification of a stroke, a campaign that was launched on May 17, 2022 promoting the slogan "Stroke 112 – time means life" [2].

Purpose

The aim of the research is to identify the ways in which gait recovery is now achieved in people who have suffered a stroke. The target group is people who are able to start a gait recovery program.

We considered it necessary to carry out a study based on the opinion of the people we address when we offer medical recovery services. The goal is precisely to understand the real needs when we want to bring new elements in terms of medical gait recovery for people with leg dorsiflexion deficiency. The main aim of this study was to identify the particularities of people who have benefited from gait rehabilitation services and the means by which it was carried out. We were also interested in the beneficiaries' vision of the gait medical rehabilitation services and the way they are applied, as well as the difficulties encountered in order to meet their needs by finding new therapeutic strategies that respond to their real needs.

Materials and methods

To conduct the study we developed an online questionnaire using Google Forms and distributed it online to the target group. The selection of the target group was based on an anamnesis and one of the selection criteria was the therapeutic technique used by neurologists, namely thrombolysis as an emergency treatment for stroke. The proposed questionnaire consists of 20 questions, 3 of which reflect identification data, the remaining 17 are single or multiple choice questions and reflect information on how the recovery phase was carried out and the therapeutic means used. The questionnaire also contains subjective response questions on how each beneficiary perceived the whole process of gait rehabilitation with dorsiflexion deficiency.

Results

The questionnaire was distributed online for a period of three months. During this period, the questionnaire was completed by 93 people, 32 female (34.5%) and

61 of them male (65.5%). Regarding age, we note that the average age is about 53 years, the youngest age being 43 years old and the oldest being 73 years old. The latest studies confirm that the occurrence of this condition in younger ages is no longer so rare. Stroke also occurs in young adults and this is increasing alarmingly fast and is particularly tragic because of the pathological potential to create long-term disabilities [6], [7].

Dorsiflexion deficiency is a common gait impairment derived from other neurological disorders that manifests as significant weakness of the ankle dorsiflexor muscles [8], [9]. We aimed to identify the causes of dorsiflexion deficit in patients by proposing three possible answers and the results are presented in Fig. 1. The most common cause of foot dorsiflexion deficit is, as shown by the answers of our subjects, hemiplegia following a stroke. 92.4% of the participants have this cause, the remaining 7.6% of them suffer from nerve root lesions, a cause not investigated in detail by this questionnaire.

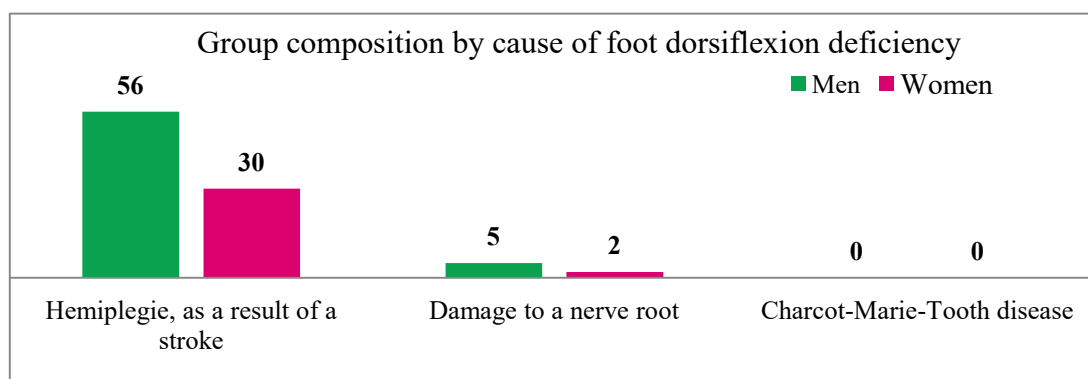


Fig.1. Group composition by cause of foot dorsiflexion deficiency

The following questions in the questionnaire focus on the difficulties encountered in the gait recovery process and on the importance of the principles of re-education used by specialists in the applied physical therapy programs. First of all, we wanted to identify the walking difficulties that these people faced after the onset of the functioning deficit that occurred as a result of the stroke.

In the case of people who have suffered a stroke, by far the most important neurological manifestation of functional deficit is the deficit of dorsiflexion of the leg (Fig. 2).

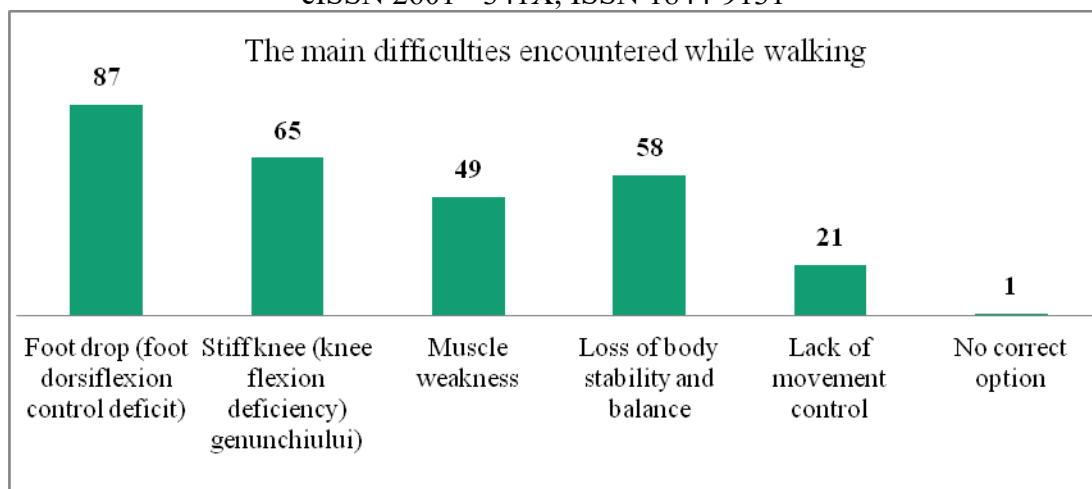


Fig. 2. The main difficulties encountered while walking

93.5% of the surveyed subjects mentioned this answer and the following answers that exceed the percentage of 50% define stiffness of the knee (69.8%), loss of stability and balance of the body (62.3%) and the onset of muscle weakness (52.6%). These manifestations can define the principles that should guide a gait recovery program, being functional manifestations that influence each other. In the case of hemiplegia, muscle weakness occurs and dorsiflexion deficiency creates abnormal gait patterns that block knee flexion movement, which influences the stability and balance of the body in static and dynamic.

In relation to the recovery process, we asked the subjects about the physiotherapeutic means used in their case for gait recovery. According to the results (Fig. 3), current gait rehabilitation programs are poorly designed and mostly use therapeutic physical exercises, physiotherapy, massage and drug treatment in that order.

In 87% of cases, recovery programs are created with an emphasis on the foot joint, which is indeed the manifestation segment of this dorsiflexion deficit, in 10.7% of cases therapeutic exercises created for the knee joint are also used and in 3% of cases hip joint exercises are also used (the results shown in fig. 4).

However, in neuromotor recovery we are not only interested in the place where the effect of functional deficit propagates, but the entire kinetic chain.

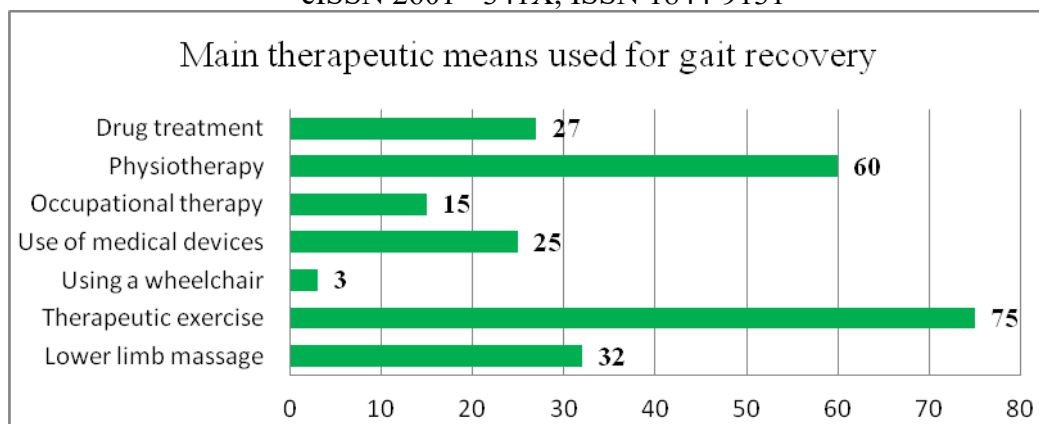


Fig. 3. Main therapeutic means used for gait recovery

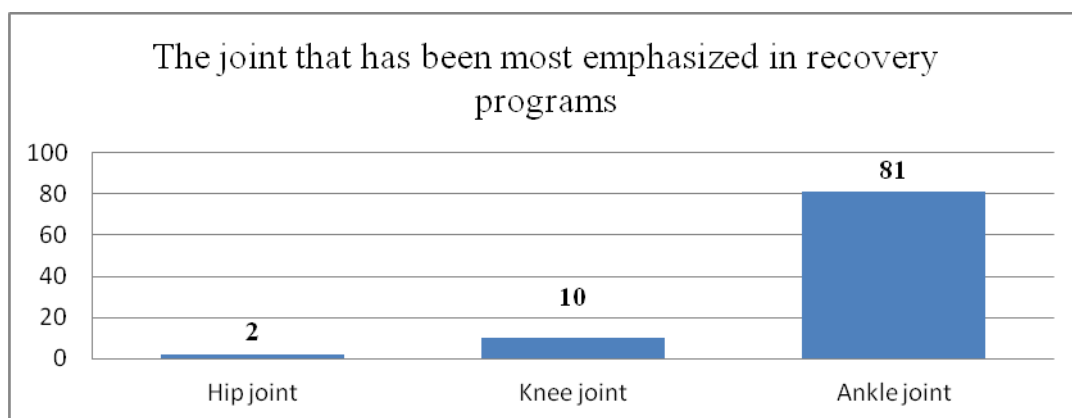


Fig. 4. The joint that has been most emphasized in recovery programs

Discussion and recommendations

Appropriate gait rehabilitation after stroke is crucial for functional independence. There are many approaches to gait rehabilitation based on different models of motor physiology and yet about a quarter of survivors, even after receiving rehabilitation services, still have residual gait impairments that require assistance with activities of daily living [10].

From this point of view, we believe that the currently applied therapeutic strategy needs improvement, being currently largely based on the application of therapeutic exercise and physiotherapy procedures. Also, in addition to the fact that the recovery programs are quite simply thought out, through this study we realized that in gait recovery with dorsiflexion deficit the greatest emphasis in the recovery is placed on ankle joint restoration with the aim of improving dorsiflexion movement.

We consider it necessary to propose a new gait recovery strategy that shortens the period of functional and social incapacity of the affected people. In order to respond to the current needs of patients in the gait re-education stage, we believe that a gait recovery program must pursue the following principles:

- To comply with the classic principles of neurological recovery but with the use of modern therapeutic means that train the entire lower limb;
- To include kinesiotape procedures and the use of various medical devices according to the functional stage;
- Include therapeutic means that can also be applied at home in order to have permanent access to therapy and to shorten the recovery period;
- Be easily accessed by all beneficiaries regardless of background or financial possibilities;

Starting from these principles, our proposals regarding the design of a walking re-education program require compliance with the following objectives:

- Use of therapeutic exercises to restore and practice hip extension on the affected side;
- Restoring knee stability during the support phase of walking;
- Training and stabilizing the pelvis in the lateral movement;
- Restoring the knee flexion movement in the swing phase of walking;
- Restoring the knee extension movement in the heel contact phase with the ground;
- Restoring the dorsiflexion movement of the foot during the contact phase of the heel with the ground;
- Training the gait on different surfaces, at different paces and speed;

Conclusions

We can conclude that the current therapeutic strategy for gait retraining needs to be improved, based largely on the use of therapeutic ankle and foot exercises and physiotherapy and therapeutic massage procedures. Also, in addition to the fact that current rehabilitation programs are quite simply thought out, through this study we realized that for dorsiflexion deficient gait retraining the greatest emphasis is placed on ankle joint rehabilitation aimed at improving dorsiflexion motion and less on rehabilitation of the entire kinetic chain of the lower limb. In the case of hemiplegia, due to the lack of dorsiflexion, knee flexion stiffness and compensatory movements of the hip joint appear, this being the explanation why we consider it extremely important that recovery programs are focused at the same time and with the same effort on the entire kinetic chain of the lower limb.

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