

CORRELAÇÃO ENTRE O RISCO PARA QUEDAS E A INDEPENDÊNCIA FUNCIONAL DE PACIENTES HEMIPARÉTICOS

CORRELATION BETWEEN RISK FOR FALLS AND FUNCTIONAL INDEPENDENCE OF HEMIPARETIC PATIENTS

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RESUMO | O Acidente Vascular Cerebral (AVC) é uma das mais importantes doenças crônicas no Brasil e que pode resultar em sequelas neurológicas, sendo a principal delas, a hemiparesia. A hemiparesia é o comprometimento unilateral do corpo, caracterizado, principalmente, pela presença de assimetria postural. Em virtude da fraqueza muscular, da espasticidade e, principalmente, do déficit de equilíbrio, pacientes hemiparéticos podem sofrer prejuízo no controle postural e no equilíbrio; sendo estes, considerados os principais mecanismos envolvidos na elevada prevalência de quedas. Objetivo: Correlacionar o risco para quedas com o nível de independência funcional de pacientes hemiparéticos. Materiais e métodos: Estudo observacional, transversal, realizado com 12 pacientes hemiparéticos e 12 indivíduos saudáveis (grupo controle). O equilíbrio funcional e o risco de quedas foram mensurados através do teste *Timed Up and Go* (TUG), em ambos os grupos. O nível de independência funcional dos pacientes hemiparéticos foi avaliado com base no índice de Katz. Resultados: Na avaliação do TUG, os pacientes do grupo de hemiparéticos apresentaram um tempo de deslocamento significativamente maior ($57,75 \pm 11,8s$) que os participantes do grupo controle ($7,12 \pm 0,29s$). Através da aplicação do Coeficiente de Pearson, pode-se observar que houve uma correlação moderada e inversamente proporcional ($r = -0,61$) entre o número de funções independentes e o tempo de deslocamento no TUG ($p < 0,05$). Conclusão: Os resultados deste estudo confirmaram a relação entre risco de quedas e capacidade funcional em pacientes com hemiparesia pós-AVC.

Palavras-chaves: Acidentes por Quedas. Hemiplegia. Avaliação da Deficiência. Limitação da Mobilidade.

ABSTRACT | Stroke is one of the most important chronic diseases in Brazil and may result in neurological sequelae, the main one of which is hemiparesis. A hemiparesis is the unilateral involvement of the body, characterized, mainly, by the presence of postural asymmetry. Due to muscle weakness, spasticity and, balance deficit, hemiparetic patients may suffer impairment in posture and balance. These are the major factors involved in the fall prevalence class. Objective: to correlate the risk for falls with the functional independence of hemiparetic patients. Methods: This study was observational and cross-sectional performed with 12 hemiparetic patients and 12 healthy subjects (control group). Functional independence and risk of falls were measured using the Timed Up and Go (TUG) test in both groups. Functional independence level of hemiparetic patients was evaluated based on the Katz index. Results: In TUG evaluation, hemiparetic group was slower (57.75 ± 11.8 s) than the control group (7.12 ± 0.29 s). Pearson Coefficient showed a moderate and inversely proportional correlation ($r = -0.61$) between number of independent functions and TUG performance ($p < 0.05$). Conclusion: These results are similar to those found in the literature and confirm the relationship between risk of falls and functional capacity in post-stroke patients.

Keywords: Accidental Falls. Hemiplegia. Disability Evaluation. Mobility Limitation

INTRODUCTION

The Cerebral Vascular Accident (CVA) is one of the most important chronic diseases and one of the main culprits of hospital admittances and mortality in Brazil, which may incur in both partial or total neurological sequelae considerably incapacitating¹. Schepers et al.² adds that even though past the cerebral accident, normally a certain degree of motor and functional performance occurs, many survivors present chronic sequelae, which are complex and heterogeneous.

Within the main limitations imposed by a stroke is hemiparesis, responsible for 80% of neuromotor sequelae. Hemiparesis is the unilateral debilitation of the superior and inferior limbs, characterized by, mainly, postural asymmetry. Although the majority of patients with hemiparesis may reacquire independent gait functions, great part of the patients present limitations to engage in Activities of Daily Living (ADLs) due to muscle weakness, spasticity, and mainly, balance deficiency².

The debilitating effects on the postural control and in the balance on hemiparetic patients are considered to be the main mechanisms involved in the high prevalence rate of falls in this population. It is estimated that 40-70% of the individuals with hemiparesis will yield falling episodes within the first year after the CVA, being thus a superior statistic when compared to the population in general of the same age. In addition, it is known that these alterations can result in medical complications and an increase in comorbidities, including the elevated risk of fractures, social isolation, and a decline in quality of life³.

Some studies have documented the correlation between the risk of falls and the performance of daily chores. Cho et al.⁴ verifies that such a risk may lead to a decline of autonomy in routine activities, such as getting dressed, taking a shower, using the restroom, and freely moving about. Weerdesteyn et al.³ adds reporting that patients with an elevated risk of falling, demonstrated by the use of specific tools, showed a greater level of functional dependence as opposed to patients having a low risk of falling.

Taking into consideration the clinical and socioeconomic significance of falling incidents in

patients post-stroke, the systematic follow-up of the functional independence and walking and mobility alterations are of extreme importance when it comes to adopting preventive strategies and optimization of rehabilitation programs. On this basis, the general objective of this study was to correlate the risk of falling with the level of functional independence in hemiparetic patients.

METHOD

This transversal and observational study was carried out in a physiotherapy clinic-school of a university in Rio Grande do Sul, comprised of 12 hemiparetic patients (n=12), average age of 50,25 (\pm 13,30) years old, of both genders, (hemiparetic group). The inclusion criteria for selecting the participants of this group were: (1) hemiparesis symptoms due to cerebral accidents; (2) non-existent complaints of algia or dyspnea; (3) ability to rise from a chair on their own; and (4) having autonomous mobility, with or without the use of a helpful device.

Patients with cognitive deficiencies and those who did not agree with the Informed Consent Form (ICF) were ruled out. As for the group comprised of healthy individuals (control group), 12 participants were included (n=12), average age of 51,50 (\pm 11,05) years old, of both genders, selected by convenience and had their walking and balance abilities intact. Those with a clinical condition which would interfere in the motor function and balance performance were excluded from this group, such as vertigo syndromes (linked to the use of medication or not), claudication of different etiologies, a neurological condition, and disturbances that cause a decline in cognitive activities. The research was approved by the Ethics and Research Committee at Feevale University according to the resolution number 466 of December 12, 2012 (CAEE 4.08.03.10.1777).

Functional balance and the risk of falling by means of the test Timed Up and Go (TUG) were measured in the hemiparetic and the control groups alike. For this test, the the participant was asked to rise from a chair (height of chair 45 cm), walk for 3 meters as fast and safely as possible, return to the chair and sit

back down supporting their backs against it. Using a stopwatch, a trained evaluator kept track of the time and also gave the instructions and explanations coherently. Based on previous studies^{5,6}, a “ten-seconds run” was considered normal without the risk of falls; a time varying between 11-20 seconds was expected for individuals with deficiencies and the risk of falling was minimal; and a time beyond 20 seconds was considered an important mobility deficiency having a high risk of falling. For safety reasons, all of the participants utilized rubber-soled shoes resembling tennis shoes.

After performing the TUG, the level of autonomy of hemiparetic patients was evaluated through 6 daily life activities, having the Katz⁷ index as a basis. For this variable, the participants were asked about their dependency level on the following activities: taking a shower, getting dressed, using the restroom, move about, bladder control and eating. The score 0 (zero) was given for total dependence; and score one (1) was given for activities performed with total independence. In addition to the tests that were carried out, secondary data was collected, including age, gender and the time elapsed in the hemiparetic stroke group.

To characterize the clinical data, a descriptive analysis was used. To verify the possible relation between TUG and the variables, age, time elapsed since the lesion, and the number of independent daily life activities, the Pearson linear correlation coefficient was calculated. The non-paired test t was utilized to compare the average time in TUG between the control group and the hemiparetic group. In all the statistical tests utilized, a level of significance of 5% ($p < 0,05$) was considered. The software Graph Prism 7 was used for the analysis and elaboration of graphics.

RESULTS

The study comprised 12 hemiparetic patients predominantly women (75%), average age being (50,25) ($\pm 13,30$) years old. The majority of the participants (87%) presented as an etiological factor for the hemiparetic sequelae the Cerebral

Vascular Accident (CVA) originating from an ischemic stroke, having an average post-lesion time of 5,81 ($\pm 2,49$) years.

According to the evaluation using TUG, (Figure 1) the group of hemiparetic patients yielded a movement time significantly greater ($57,75 \pm 11,8s$) than the participants of the control group ($7,12 \pm 0,29s$). On Figure 2, it can be noted that most of the hemiparetic participants presented a high risk of falling, in other words, 75% of the individuals evaluated presented a movement time superior to that of 20 seconds.

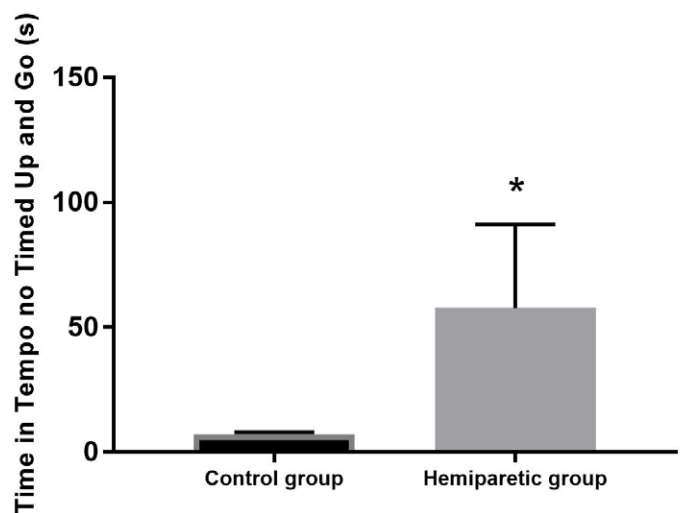


Figure 1. Average time of movement in the Time Up and Go (TUG) test of both the hemiparetic and control groups. * $p < 0,01$.

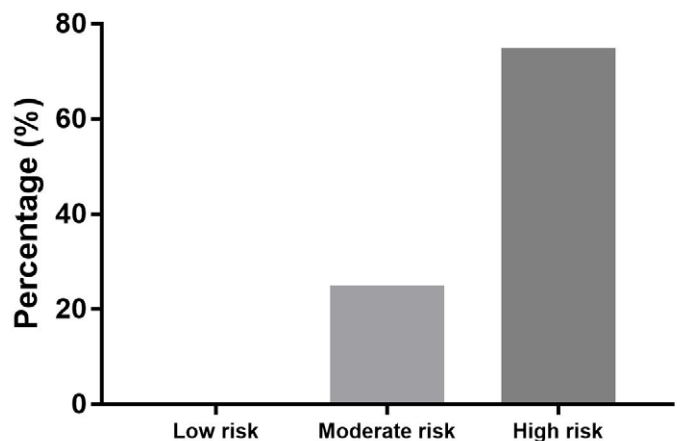


Figure 2. Percentage of fall risk, taking into account the performance of the patients in TUG.

In the Pearson Linear Correlation Coefficient analysis (Figure 3) a moderate correlation can be seen ($r = 0,51$) between the age and the movement time of hemiparetic patients during TUG, however with no statistical relevance ($p = 0,08$). Additionally (Figure

4), shows a strong correlation inversely proportional ($r = -0,70$, $p < 0,05$) between the post-lesion time and the performance in TUG of the hemiparetic group.

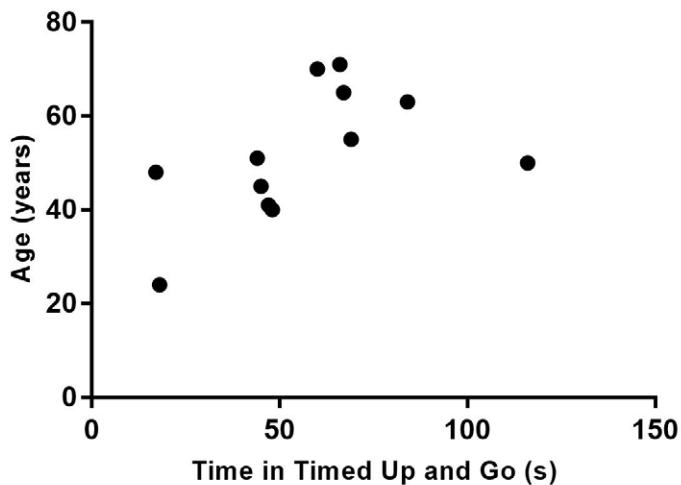


Figure 3. Linear correlation between the age and movement time of hemiparetic patients in TUG. $r = 0,51$; $p = 0,08$.

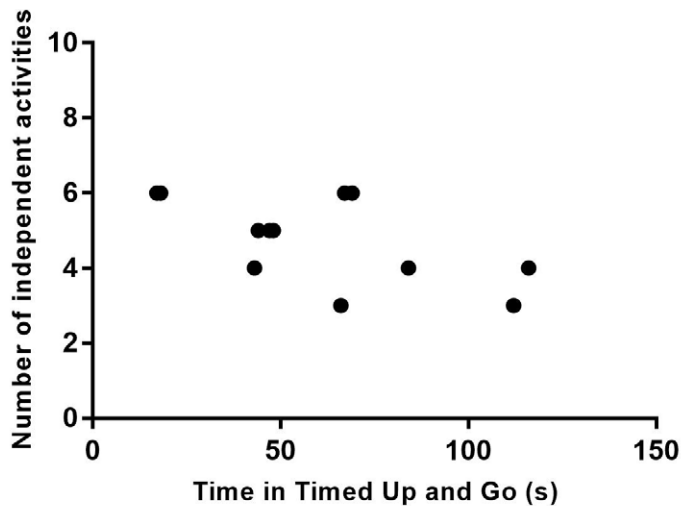


Figure 5. Linear correlation between the number of independent activities and movement time of hemiparetic patients in TUG. $r = -0,61$; $p < 0,05$.

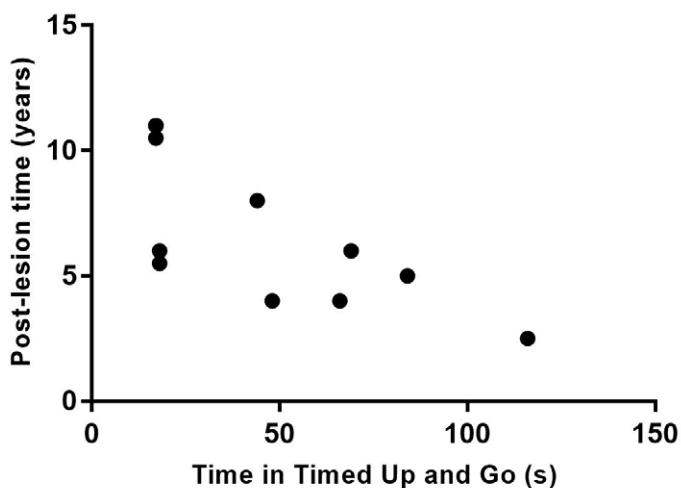


Figure 4. Linear correlation between post-lesion time and movement time of hemiparetic patients in TUG. $r = -0,70$; $p < 0,05$.

The correlation between the level of functional independence in hemiparetic patients and movement time in TUG was also evaluated (Figure 5) considering 6 daily activities from the Katz Index. Applying the Pearson coefficient we could see a moderate correlation and inversely proportional ($r = -0,61$) between the number of independent functions and movement time in TUG ($p < 0,05$).

DISCUSSION

The goal of this study was to relate the level of independence in everyday activities and the risk of falls determined by the Timed Up and Go test. The participants in this study were mainly composed of female patients averaging 50 years of age which suffered a CVA of an ischemic origin as a main hemiparetic etiological factor. Polese et al.⁸ reports that CVAs strike specially individuals above 50 years of age, being that men are 19% more susceptible than women. The predominant reason for there being more women than men in this study may be attributed to the site where the study took place (a physiotherapy clinic-school), confirming previous studies which indicate that the presence of men in volunteering for health services is still less than that of women, despite the elevated prevalence of chronic non-communicable diseases of this population⁹.

The falls and the consequential limitations to perform activities on a daily basis are among the main complications and complaints of hemiparetic individuals. In this context, several studies have investigated the use of sensitive tools to detect patients with an elevated risk of falls^{3, 4, 10}. Because

TUG is an easy, simple and quick method, it has been widely used in clinical practice to evaluate mobility, including that of hemiparetic patients¹¹. In this study, it was noted that the movement time of hemiparetic patients was superior to that of the control group. These results are similar to those found in archived literature which show that individuals having sequelae from a CVA present a significant movement reduction in TUG^{12,13}. Hsu et al.¹⁴ confirms that walking movements of hemiplegic patients are characterized by slowness and temporal and spatial asymmetry.

It is estimated that the average velocity of gait in individuals suffering from hemiparesis varies between 0,18 and 1,03 m/s, whereas healthy individuals of the same age group present an average of 1,4 m/s. Despite the resemblance of the results, the present research showed that hemiparetic patients yielded an excessively slow performance when walking 3 meters, taking into account previous studies. These findings can be justified by the type of test, which was characterized by patients with an elevated degree of elastic hypertonia (spasticity) on the lower limbs. In patients with a chronic condition, the spasticity associated with plantar flexor muscle weakness can hinder strength when gait, hence lessening movement time in TUG. Beside this, the weakness of hip flexors and knee extensors are determining factors for the altered walking performance in post-CVA patients¹⁴.

Due to compromised muscles and significant problems of postural and balance control, hemiparetic patients are highly susceptible to falls and, consequently, that poses an elevated risk of medical complications and a decline in the quality of life. Based on the final interpretation of the data in TUG6, most participants in the study yielded movement results above 20s, considered to be a high risk of falls and considerable mobility problems. Holland et al.¹⁵ showed that patients with sequelae from a CVA prone to falls spent more time in TUG as opposed to patients without a tendency to fall. This confirms the practicality of this tool for predicting falls in hemiparetic patients. Complementary to the above mentioned, Persson et al.¹⁶ observed that individuals with neuromotor sequelae in TUG above 15s present an elevated risk of falls within the first year after the ischemic event.

In addition to the alterations in the walking pattern,

other factors may affect the performance in TUG. This study showed a moderate correlation between the age and total walking time of the 3 meters.

However, also observed was a strong and inversely proportional correlation between post-lesion time and the performance in TUG of the hemiparetic patients. The risk of falls is related to a number of intrinsic factors, related to the condition of the individual; linked to external environment¹⁷. Expanding on the term intrinsic factors, the age is a key contributor in the risk of falling. Studies show that the risk of falls increases with age, especially in patients with neuromotor sequelae.

While these factors are real, it has been suggested that specific exercise programs based on balance training may reduce the number of falls, even on patients in chronic stages post-CVA.³ It is important to consider that, in this study, all the participants practiced physiotherapy with the use of global active exercises, walking and balance practice, which may explain the encountered results.

In relation to the epidemiology of falls, statistical data indicate that the population of hemiparetic individuals presents and incidence of, approximately, 9 falls per year.³ It is estimated that patients with neurological alterations due to the cerebral attack may be imposed twice as much chance of falling than the control group. Additionally, studies show that these patients have a record of falls superior to the geriatric population. These falls may bring physical, social, functional and psychological consequences, which leads them to limit their performance in daily life activities. Of the hemiparetic patients with a history of falls, 88% develop a fear of falling, thus restricting them in their day-to-day activities, loss of autonomy and social isolation¹⁸. Besides the comorbidities, the mortality rate due to complications of post-fractures of the hip, for example, is significantly bigger in post-CVA patients than of the general population.

TUG is highly trusted on the levels of both intra and inter-evaluation, and is considered a sensitive tool to detect small shifts in basic mobility following an ischemic event. However, TUG was not originally created with the objective of evaluating balance while walking and the findings are still inconclusive

about the efficiency of this tool when predicting falls. On account of that, several authors recommend the use of TUG associated with outcomes which evaluate different everyday activities, since there is a weighty correlation between the time of movement and other functional variables¹⁰. Posiadlo and Richardson 19 affirms that patients who perform TUG with a movement score above 30 seconds, generally need significant assistance in their day-to-day life.

Although observed that most patients with unilateral ischemic lesions present a good prognosis of independent walking, these individuals do not possess the ability to move around with sufficient speed and conditioning to execute basic daily chores²⁰.

The ability to walk freely is one of the main components of the International Classification of Functioning, Disability and Health, since walking is directly linked to the functional independence of an individual. Based on the Katz Index, our results showed that an inverse correlation occurred between the time in TUG and independent functions, similarly to other investigations^{21,22}. Ishizuka et al.²³ demonstrated that the group of elderly with moderate functionality reported more falls than individuals with a good level of functional independence, attesting to the relation between a history of falls and functionality. The mobility and capacity of walking free of impediment of an individual, is an extremely important physical component; constituting an essential element for executing Daily Life Activities (DLA) and the up-keeping of independence.²⁴ The movement components in TUG, such as, standing and sitting, changing direction and having a steady walk, are strongly connected to everyday life activities²⁵.

This study presents some limitations. Due to the small research sampling number the results found cannot be generalized for all hemiparetic patients. In addition, several other factors involved in the risk of falling were not investigated, such as, the use of medication, the cognitive level of patients, caretakers and the presence of extrinsic agents. Moreover, the authors had difficulty to collect information related to the number of falls. In future analysis, it is suggested that these and other aspects be included to yield more consistent data.

CONCLUSION

The results of this study confirmed the relation between the risk of falls and functional capacity in hemiparetic post-CVA patients. On the basis of these findings, it is proposed that an inclusion of strategies in rehabilitation programs be done for preventing falls, which in turn may be an essential factor for better performance in everyday activities of hemiparetic patients. Furthermore, in virtue of the applicability of the tests utilized, the monitoring of these two variables (risk of falls and functionality) via validated and trustworthy tools can be easily and routinely carried out in physical therapy outpatient settings and other rehabilitation centers.

CONTRIBUTIONS OF THE AUTHORS

De Paula S participated in conception and design of the research, statistical analysis and interpretation of the data, and writing of the manuscript. Kuhn B, Laux K C and Sartori G C participated in acquisition and interpretation of data. Griebler K C participated in the statistical analysis of the data and writing of the manuscript.

CONFLICTS OF INTEREST

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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