

Comparison Between Right and Left Hemisphere Lesion of Stroke Patients for Functional Gait Assessment

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ABSTRACT

Objective: To compare the functional gait among left and right hemisphere lesion patients of stroke.

Methodology: This cross-sectional comparative study included 126 patients with right and left-sided hemispheric lesion. The study was conducted from December 2019 to March 2020. Patients were selected consecutively from different hospitals and rehabilitation centers of Lahore, Pakistan on the basis of inclusion & exclusion criteria. Functional gait assessment (FGA) scale was used to measure functional gait performance and disturbance related to balance in stroke patients. Independent sample t-test was used for comparison of functional gait between left and right hemispheric lesions. A p-value $\leq .05$ was taken statistically significant.

Results: A total of 126 patients of stroke with right and left-sided hemisphere lesion were assessed for functional gait assessment. The mean age of patients in group A and B was 54.19 ± 8.54 years and 51.46 ± 8.57 years, respectively. The mean weight of patients in group A and B was 61.95 ± 8.82 kg and 58.67 ± 5.83 kg, respectively. Functional gait assessment mean score in group A was 12.56 ± 2.60 and in group B was 15.59 ± 4.17 points with p-value of 0.001. There was a significant difference of FGA scores present between the two groups.

Conclusion: The study concluded that ambulatory functions differ with respect to site of hemisphere lesion. The site of hemisphere lesion impact on patient's functional gait has statistically significant.

Keywords: Disabilities, Functional gait assessment scale, Gait, Hemispheric lesion, Stroke, Stroke rehabilitation, Walking abilities.

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Introduction

Regaining walking ability in stroke patients is of more valuable and may be a big goal of all rehabilitation institutes. So, that some reportable data may vary but those patients which survive after stroke can regain some extent of perfection in their ambulation ability are near 50% to 80%.¹ Many studies suggested that most of the motor recovery is started at duration of first 3 months' post stroke and the recovery levels progressed from six months to one-year post stroke.²

The right hemisphere found to be dominant for spatial orientation and the left side of brain dominant with motor functions. So the left-side lesions cause more disturbance

of voluntary movements but right-side lesions cause loss of spatial attention and posture management. We may compare people with left and right side lesion regarding to start their first impairments and recovery after 3 months' post stroke.³

Gait may be a higher quality determinant for independent life. Therefore, it is not shocking that among the stroke survivors regaining walking function found to be top priority importance as compared to other impairments.⁴ Those patients which haven't done some adequate therapy represent with higher level of postural changes. As compared to right hemispheric lesion patients the left one expressed with more instable in their postural balance while sitting and standing positions.⁵

Recovery of independent walk in post stroke may be a major goal. Although there is insufficient proof that ambulant functions are hemisphere-dependent, this hypothesis can't be excluded.⁶ Function and mobility improve throughout the second month of rehabilitation ($p=0.001$), however stance unsteadiness and imbalance don't. The aspect of brain lesion appears to have an effect on recovery of independent stance with a bonus to patients with right hemiparesis. However, there's no distinction between balance management of people with left versus right hemiparesis in patients who reach independent stance by the top of the first month following their stroke.⁷

As the result of stroke, evidence showed that variations must be present within the left and right hemispheres are especially attention-grabbing. The right hemisphere was a lot of significant in spatial orientation but the left one significant with more control.⁸ The location or side of lesion and age of the patient was not affected on the recovery rate. the purposeful recovery established by the physical and occupational therapy.⁹ The population of stroke patients may be a heterogeneous group. Severity but additionally location and kind of stroke confirm the symptoms and outcome, even in gait analysis.¹⁰

We conducted this study because to show how much variation present in functional gait during different walking tasks among left and right hemisphere lesion patients during recovery stages. The objective of the study was to compare the functional gait among left and right hemisphere lesion patients of stroke.

Methodology

After approval from ethical committee of the institution, this comparative cross sectional study was carried out in Rehabilitation clinics of different hospitals of Lahore, Pakistan from December 2019 to March 2020. After informed written consent a total of 126 patients with stroke (the sample size was calculated by using WHO sample size calculator and the formula was $n = z^2 \times p(1-p)/d^2$. The following parameters was used, effect size was 0.09%, margin of error 0.05%, and confidence level 0.95%),¹⁰ aged between 45 to 65 years, both men and women either right side or left side hemisphere lesion, sitting and standing upright at least for 1 minute were taken by non-probability consecutive sampling for the purpose of this study. Patients with partial or no muscle contraction in the lower limb, who were having comorbidities like seizures in last 12 months, neurological deficits other than stroke, critical illness, postural hypotension and history of fall were excluded from the study. Data were collected by

using functional gait assessment (FGA) scale to determine the patient's performance. It helps in determining gait and balance of patients.

Functional gait assessment scale is a unique measure with its clinical usefulness, ascertain demonstrable qualities for assessing functional gait performance and disturbance related to balance in stroke patients.¹¹ FGA is suggested for its psychometric properties (the total score of FGA is from 0 to 30)¹² because it efficiently detect decrease in functional gait during walking by performing different walking tasks. It is an observational test with excellent validity, consistency and reliability with least ceiling effects.¹³⁻¹⁵

The procedure was followed as: two groups (A and B) were made by inclusion criteria of patients either right sided hemisphere lesion or left sided lesion and each group had 63 patients. FGA test performed by a consultant therapist. A trainee therapist or a nurse remained by the patient's side during the test procedure for safety in case the patient lost his or her balance.

The data were analyzed using SPSS v20. Means and Standard deviations were calculated, and independent sample t-test was used for comparison of functional gait between left and right hemispheric lesion patients. Kolmogorov–Smirnov and Shapiro–Wilk test was used for normality data between the groups. A p -value ≤ 0.05 was considered statistically significant.

Results

Socio-demographic characteristics of the study population and the distribution of their data are summarized in Table-I. Out of 63 patients in group A, 45 (71.4%) were males and 18 (28.6%) were females, whereas in group B, 41 (65%) were males and 22 (35%) were females. Mean age of patients in group A was 54.19 ± 8.54 and in group B was 51.46 ± 8.57 years. And mean weight of patients in group A was 61.95 ± 8.82 and group B was 58.67 ± 5.83 kg, respectively.

The demographic characteristics showed that the patients in both groups were equal without any statistically significant difference ($p > 0.05$) except for body weight where group A was at disadvantage ($p = 0.015$).

Comparison of mean score of difference in functional gait assessment between groups showed in Table-III. Mean difference of functional gait assessment scores in group A was 12.56 ± 2.60 and in group B was 15.59 ± 4.17 points with p -value of 0.001. P -value shows that the difference is significant.

Table I: The socio-demographic profile data of both groups (n = 126)

		Group A Left hemisphere lesion (n = 63)	Group B Right hemisphere lesion (n = 63)	P- value
Age (years)		54.19±8.54	51.46±8.57	0.076
Weight (Kg)		61.95±8.82	58.67±5.83	0.015
Gender	Male	45 (71.4%)	41 (65%)	0.444
	Female	18 (28.6%)	22 (35%)	
Use of device	Yes	23 (36.5%)	15 (23.8%)	0.120
	No	40 (63.5%)	48 (76.2%)	
Hand dominance	Left	7 (11.1%)	11 (17.5%)	0.309
	Right	56 (88.9%)	52 (82.5%)	

Table II: Test for Normality (n = 126)

	Group A		Group B	
	Kolmogoro v Smirnov	Shapiro -Wilk	Kolmogoro v Smirnov	Shapiro -Wilk
Functional gait assessment scale	.174*	.163*	.200*	.461*

*: Kolmogorov Smirnov and Shapiro-Wilk were applied as tests for normality and there found all the data normative ($p > 0.05$) throughout the assessment.

Table III: Comparison mean difference of scoring FGA scale between groups (n = 126)

Functional gait assessment scale	Group A Mean±SD	Group B Mean±SD	P- value
Mean score	12.56±2.60	15.59±4.17	0.001

Discussion

The present study is perhaps the fresh and first hand knowledge regarding the site of hemispheric lesion differentiation with functional gait assessment of stroke patients conducted in Lahore. In Pakistan where stroke is a prevalent condition and causing a major morbidities or disabilities among individuals which effect their functional status of life to a great extent.

In this study, the mean age of patients in group A and B was 54.19±8.54 and 51.46±8.57 years, respectively. While in a study by Lopes PG, et al.,² the mean age of patients in left and right hemispheres lesion groups was 54.2±2.8 and 56.4±7.4 years, respectively. In our study, the total number of males 86 (68.25%) and females were 40 (31.75%), the male to female ratio was 2.15:1. The mean body weight in both groups (A and B) 61.95±8.82 and 58.67±5.83 kg, respectively was measured. In study by Lopes PG, et al.,² the total number of males 15 (71.43%) and females were 6 (28.57%) and male to female ratio was 2.5:1. The mean body weight was measured in Lopes PG, et al.,² study. In

left and right hemisphere groups, the mean body weight was 75.3±11.7 and 71.4±11.6 kg, respectively.

In our study, the mean functional gait assessment score in both groups (A and B) was 12.56±2.60 and 15.59±4.17 points ($p=0.001$), respectively. In a study by Kim K, et al¹⁶ they found the functional gait assessment score in experimental group and control group of 21.9±1.3 versus 19.8±1.6 points ($p < 0.05$) respectively at the end of treatment.

The current study results confirmed the hypothesis that there is a significant difference in functional gait of patients with right and left hemisphere lesion. Differences between the functional consequences of stroke in the left and right hemispheres is particularly interesting.

Our study revealed that stroke patients with left side hemispheric lesion represent with greater functional impairments which means they show poor balance and gait during performing different walking tasks on FGA scale as compared to right sided patients. These findings suggest that individuals with left side injury we may need different treatment protocol and rehabilitation procedure or training for stroke patients should under consideration.

This differentiation may be the fact of dominance of left hemisphere for the motor function as compared to right hemisphere which dominant for spatial orientation. This was supported by results from many other studies. A previous study showed that individuals with left sided injury show greater impairment of gait and daily activities as compared to same right sided injury but recovery rate of gait is less in left ones by Voos MC & Ribeiro do Valle LE.³ Another study reported by Perna R, & Temple J¹⁷ that functional outcomes depends upon the age, initial severity of stroke and lesion side which represented by patients. The study illustrated and conducted by Lopes PG, et al² that individuals with left hemiparesis (right sided lesion) represent with good center of pressure and gait determinants with improved balance and gait during rehabilitation training.

These are the findings which relate with our results but some studies also against in this regard.¹⁸ Our study differ from other similar studies because of the use of observation tool and age group. The existing significant findings difference in functional gait has clinical importance which help us to set or change patient's protocol with respect to lesion and improved quality of life with better recovery of stroke.

Conclusion

This study concluded that a significant difference is present between the two groups. The findings of this study gave us understanding that ambulatory functions differ with respect to site of hemisphere lesion. The site of hemisphere lesion impact on patient's functional gait has statistically significant. The patients had their stroke on left side hemisphere more prone to balance and gait impairment as compared to right hemisphere lesion patients expressed from the study population. So, these differences in deficits caused by left & right CVAs must be taken into account in various physical therapy approaches.

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