

Sagittal alignment as a prognostic factor of standing balance in stroke patients: A pilot study

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INTRODUCTION

Sagittal plane alignment is an essential factor for maintaining standing balance. Although the stroke patients have more forward-tilted posture than healthy people, the correlation between sagittal plane alignment and standing balance of stroke patients has not been studied yet. This study was made to investigate the correlation between sagittal plane alignment and standing balance of stroke patients.

METHOD

This study included 19 patients who had been hospitalized in the department of rehabilitation medicine from February 2018 to June 2018. Patients were excluded if they had orthopedic surgery of spine or lower extremities or they could not maintain a standing position for plain radiograph study. Plain whole spine radiograph and clinical outcomes including Berg balance scale (BBS), Modified Barthel index (MBI) were evaluated on admission and discharge. Sagittal plane alignment was assessed using whole spine radiograph. Patients were divided into two groups with sagittal vertebral axis score. The kyphotic group had longer than 30 mm of sagittal vertebral axis score and the non-kyphotic group had shorter than 30 mm of the sagittal vertebral axis. We aimed to compare the effect of standard rehabilitation in kyphotic and non-kyphotic groups, differences between admission and discharge clinical outcomes were analyzed by Mann-Whitney U test.

RESULTS

The kyphotic patients can improve standing balance more than non-kyphotic patients, after standard rehabilitation. There was no definite characteristic difference between the two groups (Table 1.). There were no significant differences between kyphotic and non-kyphotic groups except for SVA at admission and discharge (Table 2.). The values of the non-kyphotic group at admission were, SVA (16.1 ± 8.6), BBS (12.5 ± 5.7), MBI (57.5 ± 20.6). The kyphotic group showed SVA (49.6 ± 26.8), BBS (16.2 ± 7.1), MBI (57.1 ± 18.9). At discharge the measured scores of the non-kyphotic group were SVA (19.2 ± 22.3), BBS (46.2 ± 8.9), MBI (69.9 ± 12.5) and in the Kyphotic group, there were SVA (39.1 ± 14.9), BBS (49.6 ± 2.9), MBI (75.3 ± 11.8). Difference values between admission and discharge of BBS, MBI, and sagittal vertebral axis showed the increasing tendency in the kyphotic group, however, there were no significant differences between the two groups (Table 2.). In the non-kyphotic group, the difference values between admission and discharge were BBS (7.1 ± 7.6), MBI (12.4 ± 10.4), SVA (3.1 ± 16.8). In the kyphotic group, the same values were BBS (12.0 ± 9.9), MBI (18.1 ± 18.1), SVA (12.8 ± 26.4).

CONCLUSION

Kyphotic patient with stroke would be a more effective standing balance after standard rehabilitation. Further study with a larger number of patients will be needed to find the effect of the sagittal plane alignment in stroke patients for standing balance.

Table 1. Clinical characteristics of the subjects

Characteristics	Non-Kyphotic	Kyphotic
Age (year)	54.8	62.5
Gender		
Male (n)	10	6
Female (n)	2	1
Cause of stroke		
Hemorrhage (n)	4	2
Ischemia (n)	8	5
Type of impairment		
Lt. hemiplegia (n)	3	3
Rt. Hemiplegia (n)	7	3
Quadriplegia (n)	2	1

Table 2. Sagittal plane alignment and clinical outcomes of non-kyphotic and kyphotic patients.

	Non-Kyphotic	Kyphotic	<i>P</i> -value
Admission			
SVA	16.1 ± 8.65	49.6 ± 26.8	0.000
BBS	12.5 ± 5.7	16.2 ± 7.1	0.592
MBI	57.5 ± 20.6	57.1 ± 18.9	0.837
Discharge			
SVA	19.2 ± 22.3	39.1 ± 14.9	0.022
BBS	46.2±8.9	49.6 ± 2.9	0.902
MBI	69.9 ± 12.5	75.3 ± 11.8	0.536
Difference			
BBS	7.1 ± 7.6	12.0 ± 9.9	0.261
MBI	12.4 ± 10.4	18.1 ± 18.1	0.536
SVA	3.1 ± 16.8	12.8 ± 26.4	0.227

Abbreviations: SVA: sagittal vertebral axis, BBS:, Berg balance scale, MBI: Modified Barthel index