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Effects of whole body vibration training in hospitalized older adults with sarcopenia

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Background and aims
Sarcopenia is defined as the loss of skeletal muscle mass and strength with increased age. Increased activity following whole body vibration (WBV) has been reported in patients with chronic illness, but few studies reported the effect of WBV on the physical function of patients with acute illness. This study aimed to investigate the effects of WBV training using vibration platform with tilt table on muscle mass and physical performance in hospitalized older adults with sarcopenia.

Methods
Inclusion criteria were as follow : 1) age more than 70 years old 2) unable to independently ambulate due to long term hospitalized care 3) patient who was diagnosed as sarcopenia. Patient who underwent surgical implantation because of trauma during recent 2 months, or patient who had medically unstable course was excluded. Participant were randomly allocated into WBV group using side-alternating vibration platform with tilt table vs. conventional physical therapy composed of passive range of motion exercise, balance and ambulation training. It took 40 minutes a day, 5 sessions per week for both groups to receive the intervention. In WBV group, subjects lied down on tilt table at 60 degree with bare foot. Then, subjects stood on the platform board which could vibrate. All subjects were in a squat position, with flexed knee at 30 degree. During whole body vibration, frequency was 12 Hz and amplitude was 4 mm. Initial evaluation included muscle power, muscle mass, hand grip force, balance test using Leonardo mechanography, Berg balance scale (BBS), timed get up & go (TUG) test, gait speed and activities of daily living (ADL). Muscle power was evaluated using manual muscle test (MMT). In balance test using mechanography, as a center of path parameters, standard ellipse area (SEA), path length (PL) were evaluated. After 2 weeks, when both groups finished 10 sessions, 2nd evaluation was conducted.

Results
A total of 17 patients admitted at one university hospital were identified. During the screening, one patient was excluded because of exacervation of medical disease. Among the rest of 16 patients, one patient was dropped out because of isolation caused by infection. There were no significant differences between two groups in demographic characteristics (Table 1). Subjects were hospitalized due to infection, aggrevation of known disease, frailty, or injury. At initial assessment, there were no significant differences in both groups except for SEA (Table 2, Table 3). After intervention, WBV

group showed improvements in muscle mass, SEA, BBS, TUG, gait speed, ADL. However, there were no statistically significant differences in all outcomes at 2nd evaluation.

Conclusion
WBV training may improve muscle mass, ability of ambulation and ADL in hospitalized older adults with sarcopenia. Further study with large sample size is needed.

Table 1. Demographic characteristics of both groups. Values are presented as mean±standard deviation; WBV, Whole body vibation

Variables	Control	WBV
Sex		
Male : Female (n)	4 : 3	3 : 5
Age (years)	83.5±6.9	79.7±3.9
Height (cm)	160.7±9.4	157.5±8.1
Weight (kg)	59.9±9.9	52.7±9.1
Cause of hospitalization (n)		
Infection	3	4
Aggrevation of known disease	1	2
Frailty	2	1
Other cause	1	1

Table 2. Muscle power and muscle mass of both groups. Values are presented as mean±standard deviation; WBV, Whole body vibration

Variables		Control	WBV
Hip flexion			
	Pre (Right : Left)	3.42 : 3.42	3.62 : 3.50
	Post (Right : Left)	3.57 : 3.57	3.62 : 3.62
Hip extension			
	Pre (Right : Left)	3.14 : 3.28	3.62 : 3.50
	Post (Right : Left)	3.71 : 3.71	3.62 : 3.62
Knee flexion			
	Pre (Right : Left)	4.00 : 3.85	3.50 : 3.50
	Post (Right : Left)	4.00 : 3.85	3.62 : 3.62
Knee extension			
	Pre (Right : Left)	3.85 : 3.71	3.57 : 3.50
	Post (Right : Left)	4.0 : 4.0	3.62 : 3.62
Lean muscle mass			
	Pre	37.11±7.22	35.75±7.78
	Post	35.78±8.74	38.93±7.84
Grip strength			
Right			
	Pre	14.08±5.08	8.02±5.14
	Post	14.27±6.23	10.51±5.08
Left			
	Pre	13.87±6.51	9.01±5.15
	Post	14.41±7.06	10.33±5.51

Table 3. Physical performance in both groups. Values are presented as mean±standard deviation; WBV, Whole body vibration; SEA, Standard ellipse area; PL, Path length; BBS, Berg balance scale; TUG, Time to up and go; ADL, Activities of daily living

Variables			Control	WBV
Balance test				
	SEA			
		Pre	5.62±5.59	2.23±2.22
		Post	6.57±7.03	1.61±1.79
	PL			
		Pre	0.66±0.43	0.35±0.31
		Post	0.33±0.10	0.37±0.38
BBS				
		Pre	15.71±14.48	21.37±18.02
		Post	23.71±19.13	29.62±15.65
TUG				
		Pre	31.82±11.87	38.45±11.29
		Post	27.28±15.45	29.97±14.49
Gait speed (m/s)				
		Pre	0.31±0.04	0.32±0.07
		Post	0.33±0.19	0.36±0.15
ADL				
		Pre	45.85±23.08	41.0±19.60
		Post	61.0±23.51	56.62±52.31