심폐재활

게시일시 및 장소 : 10 월 18 일(금) 08:30-12:20 Room G(3F)

질의응답 일시 및 장소 : 10 월 18 일(금) 10:00-10:45 Room G(3F)

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The Effects of Recumbent Ergometer Exercise on Cerebral Blood Flow and Ankle Brachial Index

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Objectives

To investigate the effects of recumbent bicycle ergometer exercise on cerebral blood flow velocity (CBFV), arterial stiffness index and rate pressure product (RPP).

Methods

Seventeen young male volunteers (20.2±1.5 yrs) were enrolled in this study from January, 2018 to June, 2018. They were asked to perform the incremental bicycle ergometer exercise (SRH100H®,NanoBioLife Inc, Seoul, Korea) (Monark Ergometer 881®, Varberg, Sweden_ three times in the upright, 65° recumbent (R), and 30°postures with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes to 150W. CBFV in middle cerebral artery (MCA) (SONARA Transcranial Doppler ultrasound®, VIASYS Co. Ltd., USA) and arterial stiffness including cardio ankle vascular index (CAVI) , ankle brachial index (ABI) and augmentation index (AIx) (VaSera VS-2000 instrument®, Fukuda Denshi Co. Ltd., Tokyo, Japan) were measured at rest, 5 minutes, 10 minutes during exercise and 10 minutes recovery.

Results

CBFV in 65°R and 30°R was significantly higher than in upright posture at 5 minutes (75±14, 76±8 vs. 63±12 cm/s, p<.05) and 10 minutes during exercise (87±20, 88±18 vs. 69±19 cm/s, p<.05). ABI in 65°R was significant higher than in upright posture at immediately after exercise (1.03±0.08 vs. 0.94±0.11, p<.05). AIX in 65°R was significant lower than in upright posture at 10 minutes after exercise (0.68±0.10 vs. 0.84±0.15, p<.05). Rate pressure product (RPP) in 65°R and 30°R was significantly lower than in upright posture at immediately after exercise (18446.5±2407.5, 17639.5±2474.6 vs. 24186.7±4322.5 mmHg×beat/min, p<.05)

Conclusion

The bicycle ergometer exercise in recumbent posture has more beneficial effects on cerebral blood flow, arterial stiffness and myocardial O2 consumption than in upright position. Therefore, it might be suggested for severely deconditioned patients.

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Table 1 . Changes Mean, Peak, Maximum End-diastolic Velocity in Cerebral Blood Flow Velocity of Middle Cerebral Artery

Variables		Middle cerebral artery velocity				F
		Rest	5min	10min	Post 10min	
Mean (cm/s)	CON	57.22±9.09	63.33±12.11[a]	69.67±19.83[a]	56.01±7.69	T:33.304*** T×G:1.843 G:3.903*
	65° R	56.78±9.53	75.69±14.09[ab]	87.59±20.61[ab]	60.16±9.66	
	30° R	59.16±9.80	76.17±8.52[ab]	88.30±18.06[ab]	61.17±8.35	
Peak (cm/s)	CON	97.16±9.84	115.96±28.51[a]	131.62±41.89[a]	98.74±15.54	T:30.647*** T×G:0.635 G:0.375
	65° R	94.22±16.18	126.46±25.38[a]	142.74±29.07[a]	102.46±17.31	
	30° R	95.26±13.77	129.06±14.12[a]	138.95±22.20[a]	101.10±9.70	
EDV (cm/s)	CON	41.76±7.66	43.40±8.04[a]	48.51±12.39[a]	41.77±5.39	T:17.814*** T×G:1.803 G:1.37777
	65° R	38.80±7.30	50.68±9.32[a]	61.39±14.25[a]	43.36±7.65	
	30° R	41.94±7.55	49.83±6.77[a]	57.12±10.23[a]	41.94±7.36	

*p<.05, ***p<.001
aSignificantly different from rest(p<.05)
bSignificantly different from control group(p<.05).

Table 2. Changes of Cardio Ankle Vascular Index(CAVI), Ankle Brachial Index (ABI) and Augmentation Index (Aix)

Variables		Arterial stiffness			F
		Rest	Post	Post 10min	
CAVI	CON	5.65±0.50	5.09±0.97[a]	4.95±0.51[a]	T:14.939*** T×G:0.670 G:1.691
	65° R	6.25±1.57	5.30±0.59[a]	5.38±0.52[a]	
	30° R	5.94±1.16	5.02±0.65[a]	5.25±0.59[a]	
ABI	CON	1.14±0.05	0.94±0.11[a]	1.09±0.09	T:61.801*** T×G:3.919** G:1.140
	65° R	1.13±0.09	1.03±0.08[ab]	1.13±0.10	
	30° R	1.09±0.07	1.01±0.10[a]	1.12±0.09	
Aix	CON	0.73±0.09	0.83±0.10[a]	0.84±0.15	T:4.107* T×G:3.544 G:1.452
	65° R	0.76±0.06	0.78±0.14[a]	0.68±0.10[b]	
	30° R	0.76±0.07	0.80±0.16[a]	0.74±0.19	

*p<.05, **p<.01, ***p<.001
aSignificantly different from rest(p<.05)
bSignificantly different from control group(p<.05)

Table 3 . Changes Of Rate Pressure Product

Variables		Rest	Post	F
RPP (mmHg×bpm)	CON	12019.41 ±2033.33	24186.76 ±4322.52[a]	T:74.792*** T×G:26.268* G:14.298*
	65° R	10988.00 ±1406.84	18446.53 ±2407.45[ab]	
	30° R	10769.71 ±1830.53	17639.53 ±2474.61[ab]	

RPP: rate pressure product
*p<.05, ***p<.001
aSignificantly different from rest(p<.05)
bSignificantly different from control group(p<.05)