



Multicenter trial of aerobic exercise in maintenance hemodialysis patients : Clinical and biochemical effects.

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Abstract

Hemodialysis patients show reduced physical function. Therefore, this study aimed to determine whether aerobic training and electrical stimulation could improve physical function in patients with end-stage renal disease (ESRD). In this study, the safety and efficacy of training and electrical stimulation during hemodialysis were confirmed without side effects. Therefore, training during hemodialysis session for 12 weeks might improve physical function with specific whole-body effects as well as local effects in ESRD patients.

Background

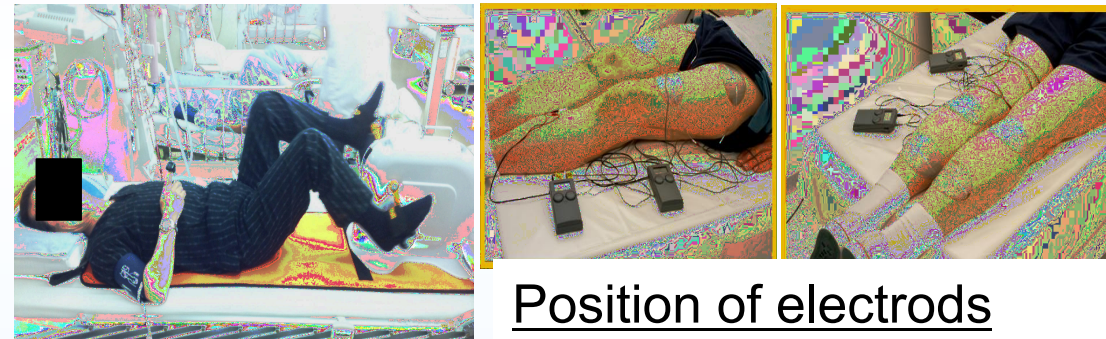
Hemodialysis patients show reduced physical function and greater risk of arteriosclerosis because of hypertension, metabolic disturbances, and vascular calcification. Some previous studies, the effect of the training during the hemodialysis session for ESRD patients were reported, but there have been few reports of multi center trial.

Subjects

	Age	BMI (kg/m ²)	Time on dialysis (month)
Ex group (n=19)	68.3±11.4	22.8±3.6	112.0 ± 102.9
Ctrl group (n=10)	69.9 ± 8.6	21.6±2.1	64.8 ± 37.9
ES group (n=6)	73.2 ± 9.5	20.3±3.7	120.3 ± 94.1

Methods

This was a multicenter trial. A total of 35 ESRD patients on three occasions (20 males, 15 females; age: 68.3±11.4 years) were randomized to receive 12 weeks of aerobic training exercise during hemodialysis session (Ex-group: n=19), electrical stimulation to the lower limbs (ES-group: n=6), or no specific intervention (Cont-group: n=10). The Borg scale was used to control the intensity of training. At baseline and study completion, the primary outcome measures were grip strength, quad muscle torque, activities, dialysis efficacy, LDL-cholesterol, C-reactive protein (CRP), Interleukin-6 (IL-6) and blood pressure on the morning of the dialysis day.



Position of electrodes (lower limb extensors)

aerobic training exercise

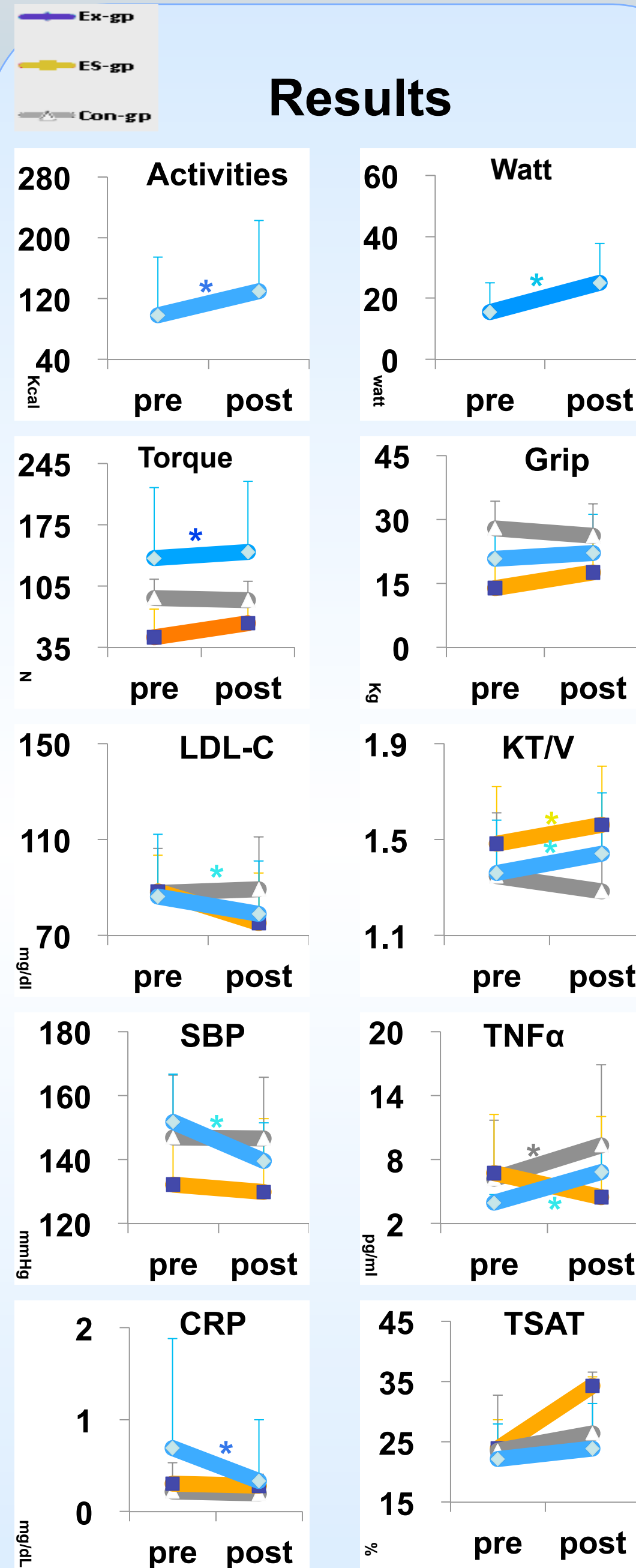
(TE2-70, SHOWA DENKI CO.LTD, Osaka, Japan)

- During hemodialysis session
- Borg scale : 11~13 RPE
- twice a week
- Work out time : 15~60 min
- Load : 0~43 watt

Portable battery-powered stimulator(REHAB X-2 Cefar, Malmo, Sweden)

- During hemodialysis session
- Intensity : just below pain threshold
- EMS was performed 60 min twice a week
- Pulse width : 0.2msec
- Frequency : 10Hz
- Cyclic stimulation: (20sec ON, 20sec OFF)

Results



No significant differences between the three groups were noted for the characteristics at the baseline. Data analysis revealed statistically significant improvements of patients in the Ex-group(averaged difference after 12 weeks of exercise as related to initial value: Δactivities: +46.2%, Δwork capacity: +64.1%, Δquad torque: +6.8%, ΔDialysis efficacy: +6.4%, ΔHDL-cholesterol:-7.6%, ΔLDL-cholesterol:-6.6%, ΔCRP: -34.4%, Δsystolic blood pressure on the morning of the dialysis day: -7.6%). These effects were not observed in the Cont-group. Meanwhile, in the ES-group(averaged difference after 12 weeks of exercise as related to initial value: Δquad torque: +33.4%, ΔDialysis efficacy: +6.7%), while the other parameters did not change. Significant difference among three groups were found Quad torque and hand grip.

Conclusion

In this study, the safety and efficacy of training and electrical stimulation during hemodialysis were confirmed without sudden drop of blood pressure or any other side effects. Therefore, training during hemodialysis session for 12 weeks might improve physical function with specific whole-body effects as well as local effects in ESRD patients.

References

1. Heiwe S, Jacobson SH. Exercise training in adults with CKD: a systematic review and meta-analysis. Am J Kidney Dis 2014;64(3):383-93.

*P<0.05 vs. pre Ex-gp, * P<0.05 vs. pre ES-gp
* P<0.05 vs. pre Con-gp