

Effects of a Renal Rehabilitation Exercise Program in Patients with CKD: Controlled Trial

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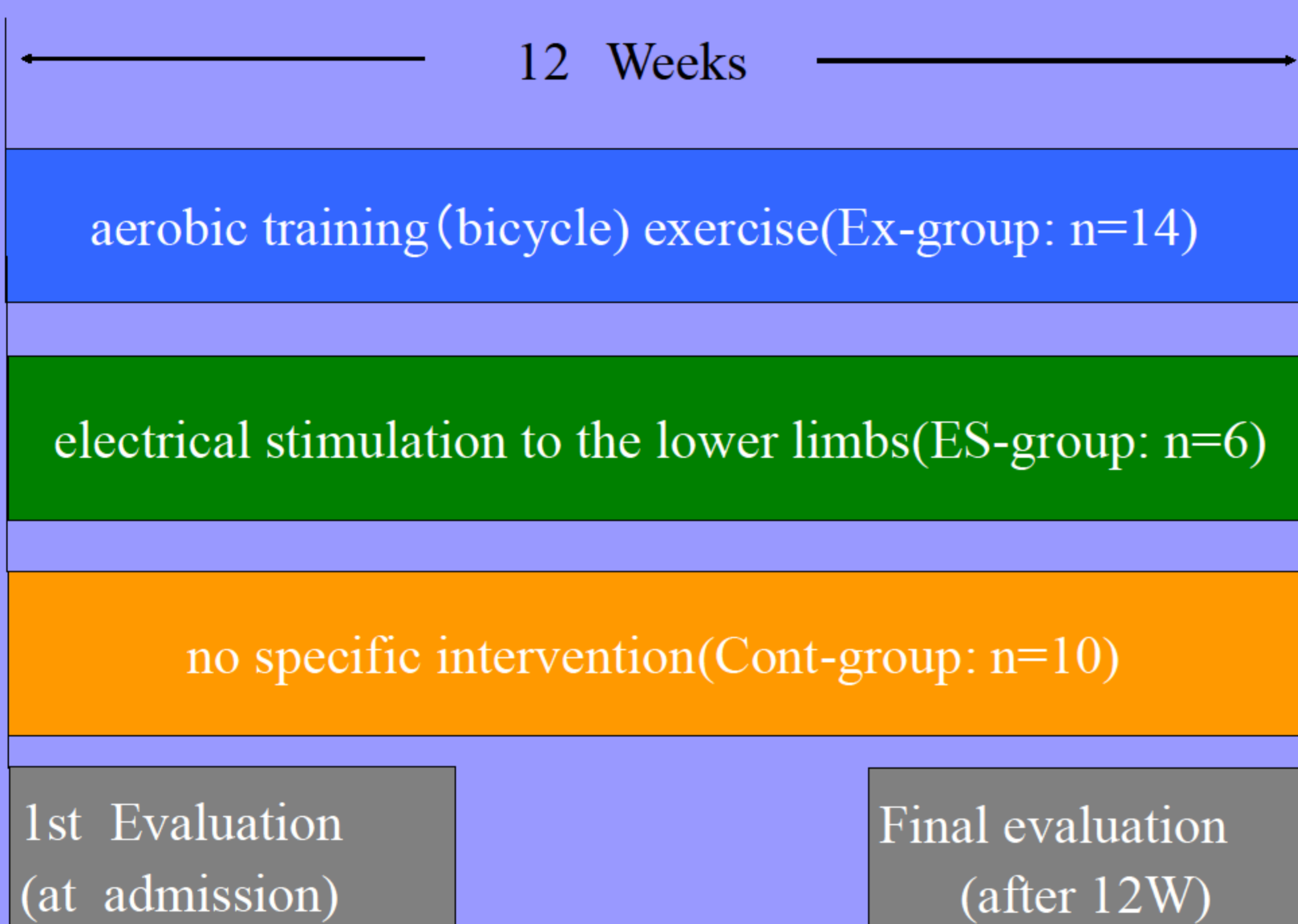
Objectives:

Hemodialysis patients show reduced physical function and greater risk of arteriosclerosis because of hypertension, metabolic disturbances, and vascular calcification. Meanwhile, exercise training in hemodialysis patients improves fitness, physical function, quality of life, and markers of cardiovascular disease such as arterial stiffness. This study aimed to determine whether aerobic training and electrical stimulation to skeletal muscles for 12 weeks could improve physical function and dialysis efficacy in patients with end-stage renal disease (ESRD).

Methods:

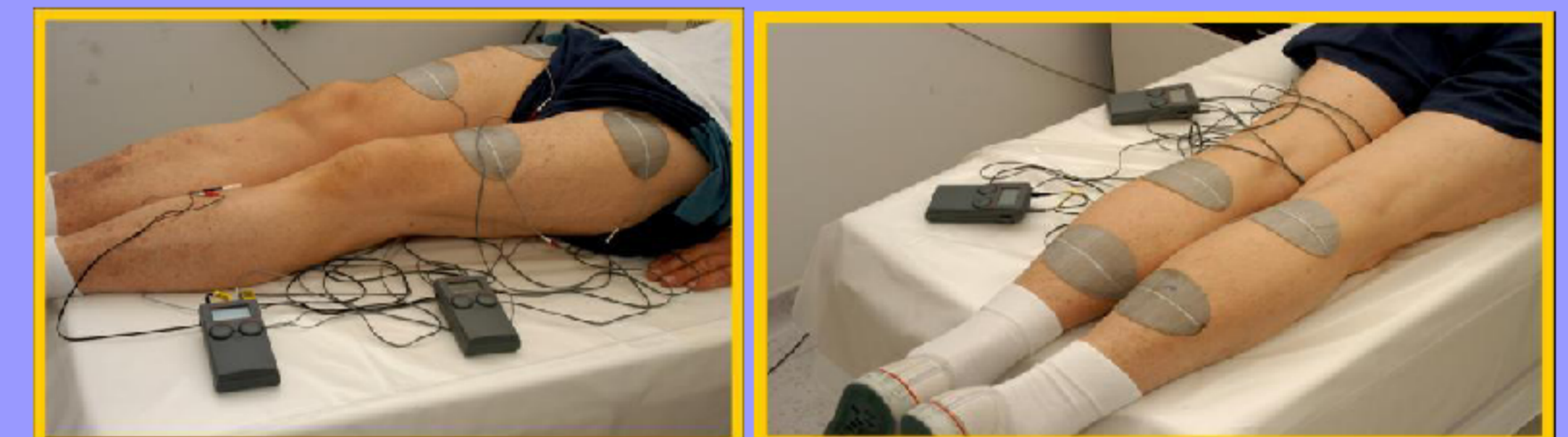
This was a controlled clinical trial. A total of 30 ESRD patients (18 males, 12 females; age: 72.9 ± 7.7 years) (table) were randomized to receive 12 weeks of aerobic training exercise during hemodialysis session (Ex-group: n=14), electrical stimulation to the lower limbs (ES-group: n=6), or no specific 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, workout time, activities, dialysis efficacy, HDL-cholesterol, LDL-cholesterol, C-reactive protein (CRP), Interleukin-6 (IL-6) and blood pressure on the morning of the dialysis day.



aerobic training exercise
(Terasu Erugo, Showa-denki inc, Osaka, Japan)

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



Position of electrodes (lower limb extensors)
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)

Table. Demographic and clinical parameters of the subjects.

	Age	Height(cm)	Weight (kg)	Time on dialysis (month)
Ex group (n=14)	73.5±9.2	160.5±5.2	57.4±7.1	105.0±52.0
Ctrl group (n=10)	69.9±8.6	162.7±5.9	58.2±7.6	64.8±37.9
ES group (n=6)	73.2±9.5	155.3±5.5	48.7±7.6	120.3±94.1

Values are presented as the mean ± S.D.

Fig.1 Change of LDL-C

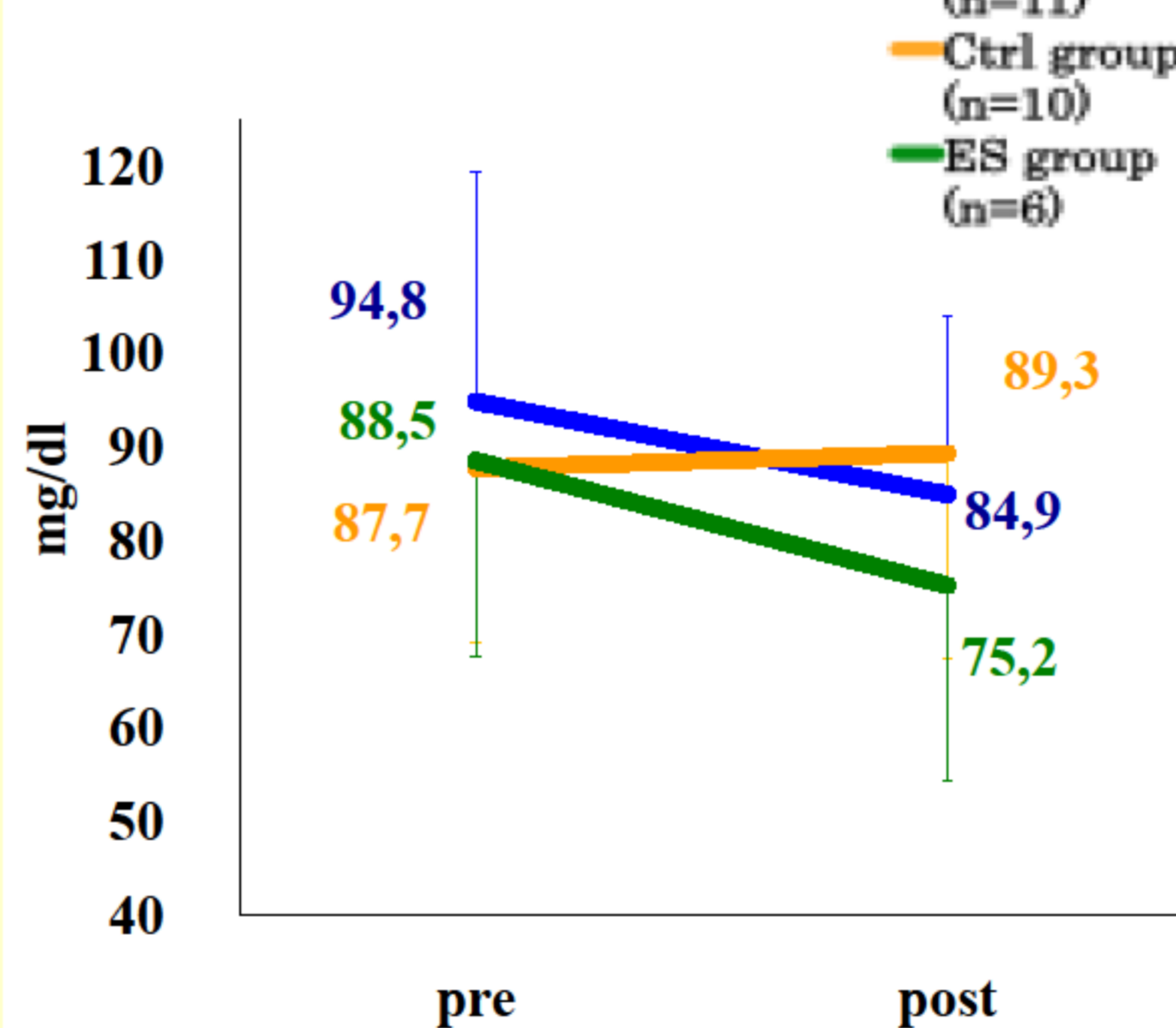
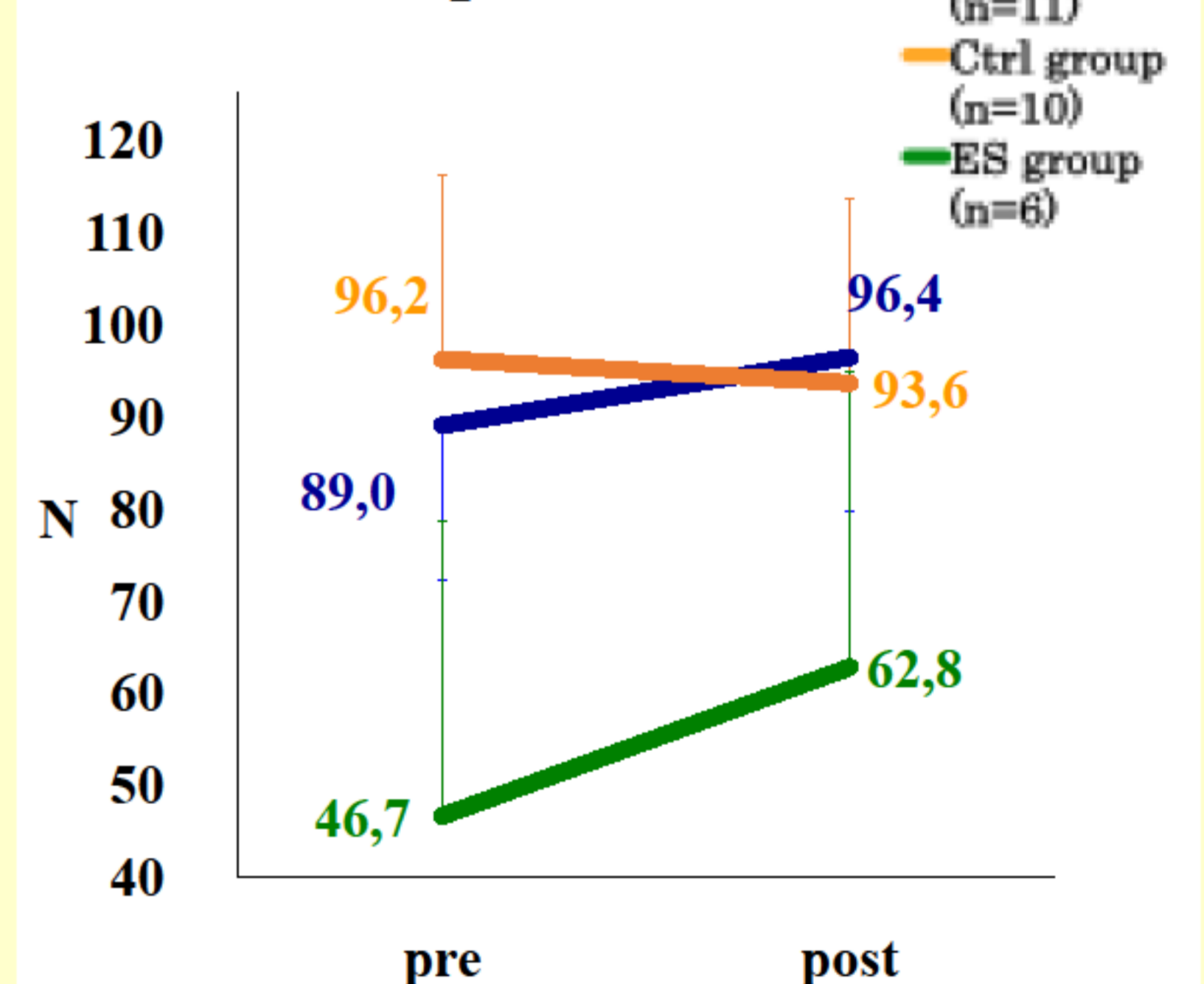


Fig.2 Change of Quad torque



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: Δ hand grip: +8.6%, Δ quad torque: +8.3%, Δ work out time: +190%, Δ activities: +59.9%, Δ dialysis efficacy: +7.7%, Δ HDL-cholesterol: -9.2%, Δ LDL-cholesterol: -10.4%, Δ CRP: -57.1%, Δ blood pressure on the morning of the dialysis day: -8.9%). 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: Δ quad torque: +33.4%, Δ dialysis efficacy: +6.7%), while the other parameters did not change. Significant difference among three groups were found Quad torque and hand grip.

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.
3. Howden EJ, Coombes JS, Strand H, Douglas B, Campbell KL, Isbel NM. Exercise Training in CKD: Efficacy, Adherence, and Safety. *Am J Kidney Dis* 2015;65(4):583-91.

Conclusions:

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.

COI Disclosure :This presentation is not related to any company with a conflict of interest that should be disclosed.

