**Resistance exercise training improves strength and quality of life in patients undergoing haemodialysis**

**Synopsis**


**Question:** Does 12 weeks of progressive, resistance exercise administered during haemodialysis improve skeletal muscle quantity and quality, muscle strength, exercise capacity, and quality of life compared with standard care? **Design:** Randomised, controlled trial with concealed allocation and blinded assessment of primary outcomes. **Setting:** Outpatient haemodialysis unit of an Australian hospital. **Participants:** Adults who had received haemodialysis for more than three months, were independently ambulant > 50 m, and were able to perform resistance exercises. Randomisation of 49 subjects allotted 24 to the intervention group and 25 to standard care. **Interventions:** Both groups received standard medical care. In addition the intervention group undertook two sets of eight repetitions of 10 different exercises for the major muscle groups of the upper and lower limbs in supine or sitting during each dialysis session, three times per week for 12 weeks. This was performed to a rating of perceived exertion of hard to very hard. The arm used for vascular access was exercised immediately before each haemodialysis session. **Outcome measures:** The primary outcomes were the change from baseline to 12 weeks of thigh muscle cross sectional area (muscle quantity) and the intramuscular lipid infiltration using computed tomography scan (a measure of muscle quality where a reduction in Hounsfield units represents improvement). Secondary outcome measures were strength of the knee extensors, hip abductors, and triceps measured using a digital dynamometer and summed to give a total score; exercise capacity measured using a six-minute walk test; C reactive protein assayed from blood samples; anthropometric measures; and quality of life using the SF-36. **Results:** 44 subjects (90%) were followed up. Change in muscle quantity did not differ significantly between groups but the change in muscle quality, −0.4 Hounsfield units (95% CI −0.8 to 0.0), significantly favoured the intervention group. Changes in the intervention group were also significantly better for total muscle strength by 18 kg (95% CI 9 to 26); C reactive protein by log −0.32 (95% CI −0.53 to −0.11); and two domains of quality of life: physical function by 9 (95% CI 1 to 18), and vitality by 10 (95%CI 1 to 19). Changes in body weight, BMI and mid arm and mid thigh circumference were also significantly better in the intervention group. **Conclusions:** Twelve weeks of progressive resistance training during routine haemodialysis showed clinically meaningful benefits.

**Commentary**

Muscle atrophy is extremely common amongst patients with end-stage renal disease (Kouidi 1998). It may occur as a consequence of acidosis, corticosteroid use, oxidative stress, and disturbances due to haemodialysis. Disuse is another major contributory factor, with reductions in daily activity and formal exercise participation due to both musculoskeletal sequelae of renal disease (cramps, myoclonus, fatigue) and the prolonged periods devoted to haemodialysis. This further reduces function and quality of life.

Evidence of the beneficial effects of exercise training in this population has been accumulating since the 1980s (Nakao 1982, Goldberg 1983, Shalom 1984, Castellino 1987). One previous trial has investigated resistance training during routine haemodialysis treatment (Johansen 2006). That factorial trial demonstrated improvement in quadriceps muscle cross-sectional area in response to exercise training – an effect that was still evident even when the anabolic steroid nandrolone decanoate was used as a co-intervention. Unfortunately, an improvement in lean body mass was not identified, since this correlates with long-term survival in haemodialysis patients (Desmeules 2004).

The current study extends knowledge in this area by examining a more comprehensive (full body) and higher intensity exercise intervention. Previously identified improvements in muscle strength were confirmed, however the effect on muscle cross-sectional area was not statistically significant. The increases in total strength, body weight, body mass index, and limb circumference were both statistically significant and clinically worthwhile. It is unfortunate that lean body mass was not measured directly since it is an excellent prognostic indicator (Desmeules 2004).

The current study is of excellent quality, scoring 8/10 on the PEDro scale (Maher 2003) and with patient compliance over 80%. Hopefully this will increase physiotherapy involvement in the haemodialysis unit and provision of this worthwhile intervention, which has not received the active promotion it deserves in many haemodialysis units worldwide.

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**References**


