EFFECTS OF AQUATIC RESISTANCE TRAINING ON ASYMMETRICAL MUSCLE DEFICIT AFTER TOTAL KNEE REPLACEMENT

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INTRODUCTION

Knee replacement reduces pain but also may cause knee extensor and flexor muscle weakness in the operated leg. Lower limb asymmetrical muscle deficit, that is, side-to-side differences in muscle force, power and mass of the operated leg compared to the non-operated one may result in mobility limitation. Aquatic training is beneficial to persons with joint diseases but the effects of aquatic training on physical performance after total knee arthroplasty have been poorly studied. Therefore the aim of this randomised controlled clinical trial was to study the effects of progressive 12-week aquatic resistance training on knee extensor and flexor muscle power, torque and muscle cross-sectional area after total knee replacement.

METHODS

51 volunteers (31 women and 20 men, 55-75 years old) with unilateral knee replacement 9.5±4.4 months post-surgery were recruited from the hospital records. Subjects were randomly assigned into an aquatic exercise group (N=26) which conducted a 12-weeks intensive aquatic training and a control group (N=25). Maximal knee extensor and flexor power and torque of the operated and non-operated legs were measured by isokinetic device (Biodex) at constant angular velocities of 60 and 180 degs-1. In addition, knee extensor and flexor muscle cross-sectional area (CSA) was assessed by computed tomography.

RESULTS

After 12 weeks of aquatic training, the training effects in knee extension and flexion power of the operated leg were 33% (95%CI 19 to 48%, p<.001) and 51% (11 to 100%, p<.001), respectively, in favour of the aquatic exercise group. The training effects for 60 degs-1 maximal torque of the knee extensors and flexors were 12% (5 to 18%, p=.011) and 29% (7 to 52%, p<.001), respectively. In addition, the training effect in knee extensor LCSA was 3.8% (-1.1 to 8.1%, p=.023) and in knee flexor LCSA 3.0% (0.4 to 5.4%, p=.007) in favour of the training group.

CONCLUSIONS

The results showed that 12 weeks of progressive aquatic resistance training resulted in significant improvement in muscle power and torque of the knee extensors and flexors accompanied with increased size of the trained muscles. Progressive aquatic resistance training can be recommended after major knee surgery such as total knee replacement.

Keywords: Power, Hypertrophy, Muscle Force