510 FEASIBILITY OF NEUROMUSCULAR TRAINING IN PATIENTS WITH SEVERE HIP OR KNEE OSTEOARTHRITIS

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Purpose: Neuromuscular training, with the aim of improving sensorimotor control and achieving compensatory functional stability, has gained recognition over more traditionally used strength training after knee injury (anterior cruciate ligament injury) in the past 10 to 15 years. Exercise, such as aerobic exercise and strengthening exercises, is included in the treatment of knee osteoarthritis (OA). Hypothetically, the principles of neuromuscular training apply also to knee OA and to other joints in the lower extremities. The feasibility of a neuromuscular training program for patients with severe knee or hip OA, based on the same principles as that for patients with knee injury, has not yet been established.
The purpose of the study was to apply the principles of a neuromuscular training method, which have been successfully used in young and middle-aged patients with knee injury, to older patients with severe knee and hip OA. We hypothesized that the training method was feasible in these patients, determined as at most acceptable self-reported pain following training.
Methods: Totally 27 patients, 11 patients with knee OA (mean age 70, range 61−74, 8 women, mean BMI 29.4, SD 5.0) and 16 patients with hip OA (mean age 68, range 60−74, 9 women, mean BMI 27.1, SD 4.7), included in an ongoing prospective study underwent the same individualized goal-based neuromuscular training program for a mean of 10 weeks (range 3 to 15) prior to total joint replacement. Training took place in groups, under the supervision of an experienced physical therapist, 2 sessions a week of 60 minutes each. The training program, based on neuromuscular and biomechanical principles, is divided into 3 levels of function, and the level of training and progression is guided by the patient's neuromuscular function. The training sessions consists of three parts: warming up (ergometer cycling), a circuit program, and cooling down (walking, stretching, mobility). The circuit program comprises four exercise circles with the key elements core stability/postural function, functional alignment, lower extremity muscle strength, and functional exercises. Pain was self-reported immediately after each training session on a 0 to 10, no pain to pain as bad as it could be, visual analog scale (VAS), where 0−2 indicates safe, >2 to 5 acceptable and >5 high risk pain.
Results: The mean number of training sessions was 13 (range 4 to 25). Mean self-reported pain after the training sessions was 2 (SD 1.7, range 1−6) in patients with knee OA and 1 (SD 0.9, range 0−3) in those with hip OA. There was a trend that patients self-reported less pain after exercise with increasing number of training sessions ($p = 0.013$).
Conclusions: The individualized goal-based neuromuscular training program seems to be feasible in patients with severe knee or hip OA, in terms of safe self-reported pain following training.

511 PRINCIPLES OF BRAIN PLASTICITY IN IMPROVING NEUROMUSCULAR FUNCTION OF THE KNEE AND LEG: A DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL

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Purpose: Training is included in the treatment of knee injury and knee OA to improve objective and patient-reported function. Despite training, neuromuscular function is often impaired after knee injury and knee OA. Using neuromuscular mechanisms in training intervention, such as brain plasticity, may improve the outcome. Principles of brain plasticity, i.e., the ability of the brain to change in response to internal and external stimuli to improve the neuromuscular function of a joint/extremity, include treatment such as training of the contralateral extremity, mirror training, and deafferentation of adjacent body parts.
The purpose of the study was to investigate if the principles of brain plasticity that have been successfully used on the upper extremity and hand to improve sensory and motor functions, can be applied on the lower extremity and knee. We hypothesized that deafferentation of the skin area above and below the knee would improve neuromuscular function of the ipsilateral knee and leg.
Methods: In a first study, 28 physically active subjects without knee injury/disease (mean age 26 years, range 19−34, 50% women) were randomized to deafferentation using a local anaesthetic cream (EMLA®) ($n = 14$) or a placebo cream ($n = 14$). 50 grams of EMLA® or placebo were applied on the leg 10 cm above and 10 cm below the knee. The study subjects and the tester were blinded to group allocation. The mean difference between test occasions before and after EMLA/placebo (after minus before) for measures of sensory and motor function was used for comparisons within and between groups. All measurements were done on the ipsilateral leg. Measures of sensory function were: skin sensitivity assessed with monofilaments (medial femoral condyle), vibration sense assessed by biothesiometer (medial malleolous, medial femoral condyle), and knee kinesthesia determined as the threshold to detection of passive motion. Measures of motor function were: isokinetic knee flexion and extension muscle strength (60 degrees/sec) and the one-leg hop test for distance. The number of subjects needed was determined by an a priori sample size calculation.
Results: No statistically significant or clinically relevant differences were seen in skin sensitivity, vibration sense, kinesthesia, knee muscle strength or the one-leg hop test in the EMLA® group or in the placebo group before and after EMLA®/placebo (Table 1). There were no differences between the groups in effects of treatment (EMLA® vs. placebo) ($p = 0.262$ to $p = 0.853$).
Conclusions: There was no effect of deafferentation on neuromuscular function of the knee and leg in healthy subjects. The principles of brain plasticity used in this study remain to be tested in subjects with knee injury/disease.

Table 1. Mean difference (95% CI) between test occasions before and after EMLA/placebo (after minus before)

	Mean diff (95% CI)	
	EMLA group (n = 14)	Placebo group (n = 14)
Sensory function		
Skin sensitivity	−0.1 (−0.5−0.4)	−0.2 (−0.6−0.2)
Vibration (med fem condyle)	1.6 (−2.1−5.3)	1.2 (−0.8−3.2)
Kinesthesia	−0.3 (−1.0−0.4)	−0.4 (−0.7−−0.1)
Motor function		
Knee ext strength (peak torque/body weight)	−7.2 (−16.3−1.9)	−5.9 (−17.2−5.3)
One-leg hop test	7.5 (−8.2−23.2)	−0.3 (−6.1−5.6)

512 THE PROPER REHABILITATION EXERCISE IN PATIENITS WITH DEGENERATIVE ARTHRITIS OF THE TOTAL KNEE ARTHROPLASTY

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Purpose: To search proper rehabilitation exercise in patients with degenerative arthritis of the knee after total knee arthroplasty (TKA) by evaluating changes of the muscular function and functional mobility according to knee motion in close and open kinetic chain exercise.
Methods: Muscular function & functional mobility test was performed in 3 patients with degenerative arthritis of the knee 6month after post-surgery. Muscular function, at the angular speed of 60 in open kinetic chain & in closed kinetic chain, was evaluated by the Biodex Isokinetic Dynamometer. Functional mobility was evaluated using function score in knee society score.
Results: First patient was 63years old female with left TKA 6month ago, the function score was 50, peak torque/body mass ratio was 0.33 (23.5%; close kinetic chain/72.1%; open kinetic chain) at knee extension but 1.26 (65%/51.6%) at knee flexion. Second patient was 69 years old female with left TKA 11month ago, the function score 70, peak torque/body mass ratio 0.22 (15.2%/70.0%) at knee extension but 0.73 (29.1/39.9) at knee flexion. The last patient was 70years old female with left TKA 12 month ago, the function score 80, the ratio peak torque/body mass ratio 0.44 (23.9%/55.4%) at knee extension, but 1.22 (53.7%/43.9%) at knee flexion. After all, we can find that knee extension power in patients after TKA is still weak in close kinetic chain exercise (such as gait) as times goes by.
Conclusions: This study suggests that close kinetic chain exercise for knee extensor can be used for rehabilitation in patient with degenerative arthritis of the knee after TKA.