19-3 Long-term effects of repeated hot spring aquatic exercise combined with physical therapy on muscle strength and endurance of patients

Yusuke SAKAGUCHI1), Yu IMAIZUMI1), Chie EBIHARA1), Satoko ISHIHARA1),
Go HORIKAWA1), Toshiaki KABASAWA1), Mihoko MATUMURA2),
Kunihiko SAKURA3), Masaaki MASUBUCHI4), Toshio MORIYAMA3)

1) Rehabilitation Center, Tochigi Medical Association Shiobara Hot Spring Hospital, Tochigi, Japan
2) Department of Endocrinology and Metabolism, Tochigi Medical Association
Shiobara Hot Spring Hospital, Tochigi, Japan
3) Department of Neurology, Tochigi Medical Association Shiobara Hot Spring Hospital, Tochigi, Japan
4) Department of Orthopedics, Tochigi Medical Association Shiobara Hot Spring Hospital, Tochigi, Japan

Objective: While electromyographic data on healthy individuals during aquatic exercise have been reported, few studies have examined long-term changes in patients’ muscle strength after 30-day intervention. This study aims to study the long-term effects of repeated hot spring aquatic exercise combined with physical therapy on patients’ muscle strength and endurance.

Methods: A total of 12 patients (mean age: 71.9±13.1; FIM score: 117±7.5; the number of patients with cerebrovascular disease: 5; and the number of patients with orthopedic disease: 7) who suffer decreased muscle strength and endurance in addition to sensory and balance dysfunction due to paralysis or fracture, were studied. Each hot spring aquatic exercise session consisted of walking forward and backward, hip abduction, flexion, and extension, lunge, and squat, which lasted approximately 15 minutes. The loading level was set at a pulse of 77 ± 11.2 → 84 ± 13.5/minute, with a perceived exertion rate (modified Borg Scale) of 0.7 ± 1.0 → 2.4 ± 2.3. During the intervention period, conventional physical therapy was also performed on the patients in parallel. Measurement was performed 4 times, immediately, 10, 20, and 30 days after the initiation of intervention. Measurement items were the 6-minute walking distance (6MD) for an index of endurance, CS-30 score for an index of muscle strength, and hip flexor, extensor, and abductor, knee flexor and extensor, and ankle plantar and dorsiflexor strength using a hand-held dynamometer (HHD).

Results: The 6MD and CS-30 scores improved 20 days after, and the hip flexor and extensor, knee flexor, and ankle plantar and dorsiflexor strength improved 30 days after the initiation of intervention. Those patients with higher ADL levels showed improvements markedly in 6MD score. Measurements conducted on some patients 60 days after the initiation showed improvements in the 6MD and CS-30 scores.

Discussion: While it has been reported by other studies that the muscle activity level in the aquatic exercise is lower compared to that in the ordinary physical therapy, the results of CS-30, 6MD and HHD scores after the 30-day intervention in this study show the improvements at the muscle strength and endurance of each joint. This may be because the buoyancy and
viscosity of water have contributed to the adjustment of the suitable exercise intensity level, which depends on each patient’s disability, the endurance and strength of the muscles involved in standing up and walking are improved. Based on these results, it is said that the intervention combining hot spring aquatic exercise and physical therapy should be continued for more than 20 days to improve the CS-30 score and 6MD, and more than 30 days to promote the muscle strength of each joint.

Keywords: Rehabilitation therapy, Aquatic exercise, Muscle strength, Orthopedic disease, Cerebrovascular disease