CARTILAGE INJURY: RESUMPTION OF WEIGHTBEARING IN THE POOL

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The use of water for rehabilitation spans centuries. Increasing interest in aquatic physical therapy can be attributed in part to a greater variety of exercises, including those that require sustained propulsive movements. Using the water to regain lost mobility and strengthen weakened muscles is used for the treatment of cartilage injury.

Using Buoyancy to resumption of weightbearing

Water provides a low-stress physical environment where axial and compressive forces are reduced; thus, a case can be made for early prescription of aquatic therapy. Cartilage injuries can be treated in water by taking advantage of the force of buoyancy to promote both active and passive movement without weightbearing. Varying the standing depth controls the amount of knee load. Other types of flotation equipment can be used to assist with movements of the lower extremity. When full weight-bearing activities are premature but closed kinetic chain exercises are recommended, exercising in the water at graduated depths is ideal.

Cooperative movements of lower extremities

An advantage of aquatic physical therapy is the extensive range of exercises that require alternating or symmetric movements of the limbs and associated joints. These movements encourage increased involvement of the affected limbs by inducing the injured side to match the effort and range of motion of the uninjured side. The propulsive movement patterns of formal swimming strokes require arm and leg actions that combine symmetric or alternating patterns of motion.

Cardiorespiratory fitness in water

The loss of cardiorespiratory fitness can be significant during recovery after injury. Aquatic therapy allows the injured athlete to begin exercising earlier. Deep-water running has been shown to compare favourably with land-based exercise. Maximum heart rate values for aquatic running ranged from 89 % to 95 % of values measured on land.
Aquatic running, when supported by a floatation device, offers additional benefits, most notably the maintenance of quick turnover (rapid gait cycling), and coordinated movements, between the arms and legs. These aspects facilitate the return to land-based training.

Early restoration of joint mobility

Prolonged rest or inactivity following injury is no longer recommended for patient recovery. The therapeutic advantages of early restoration of joint mobility are well documented. The inactive injured athlete is predisposed to muscle atrophy, soft tissue weakness, decreased joint mobility, and possible increases in pain. Also, functional deficits may be addressed sooner with early mobilization.

REHABILITATION

A wide variety of aquatic exercises are employed for strengthening and increasing joint range of motion.

Primary body positions used in aquatic rehabilitation

A typical aquatic exercise program combines exercises that are performed in several body positions.

Standing on the bottom of the pool

Most standing exercises are performed at depths between midchest (xyphoïd) and the top of the shoulder (coracoid process). This determines the degree to which the buoyancy will affect the percentage of weight bearing on joints and range of motion. There is a positive force when moving toward the surface of the water and an opposing or negative force when moving away from the surface.

Walking and associated stepping patterns

Walking at different depths provides an invaluable method of reintroducing the mechanics of gait while varying the axial loads on the lower extremities. The mechanics of gait can be simulated without the risks associated with gravitational forces and the loss of balance. An added benefit is the increased muscular effort needed to move through a denser medium.

It must be remembered that the degree of ground reaction force that can be maintained when submerged at different depths will establish the amount of contact between the foot and pool bottom. In turn, the amount of contact will determine the effectiveness of the propulsive phase of each stride.

Floating on the surface

Flotation devices allow the body to remain motionless, eliminating the need to apply propulsive forces to remain on the surface. This allows the gradual introduction of upper and lower extremity movements for both flexibility and strengthening.

For most individuals, a floatation vest is necessary to float vertically in deep water. Therapeutic exercises in this position range from passive vertical traction with weights attached to the ankles, to a knee, and ankle movements in the cardinal and oblique planes can be performed in the absence of all gravitational forces. Running movements of varying stride lengths and frequencies can be simulated. Alternating leg movement that resemble the "flutter kick" of the front crawl are also performed in this position. This kick pattern strengthens the quadriceps muscles and promotes strengthening of the hip and lower lumbar regions.

Cardiorespiratory fitness in water

Studies have recommended a combination of open and closed chain exercises for increasing quadriceps and hamstring strength during acute and intermediate postoperative.

In the water, functional activities, such as walking at varied depths, that affect the percentage of weightbearing, can be started earlier than on land. When open-chain exercises are prescribed, using water as an accommodating resistance medium eliminates risks associated with excessive muscle force or loading of the joint. Resistive fins provide increases in resistance.

Most of the previously described exercises can also serve as proprioceptive exercises if the exercise technique is modified. Because the effects of gravity are minimized with immersion, the proprioceptive input from the force of gravity is negated. Thus, the pool is an ideal medium to retrain this sense. Active-repositioning exercises can be performed in a variety of positions. Many of the knee- and core-stabilization exercises constitute exceptional proprioceptive exercises if the visual cues are removed.

Sport-specific activities can be duplicated using aquatic equipment. Resistance can be added via buoyant or surface. Moreover, because the athlete is free floating and not stabilized on the pool's bottom, exercises require a great deal of trunk stabilization. Stabilization exercises can be performed in both open-chain and closed-chain positions. A variety of resistive and stabilization activities can be performed in provocative positions.

The athlete is asked to perform these exercises with the eyes closed and in a variety of postures and positions.