



The Role of Aquatic Therapy in Managing Knee Osteoarthritis

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ABSTRACT

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Knee osteoarthritis (OA) is also called as “Degenerative joint disease”.^[1] It is a prevalent condition among older adults which is a result of natural age related degeneration of the cartilage of the knee leading to difficulty moving around and may cause deformities in later stages.^[2] It mainly affects the large weight bearing joints of the body with knee joint most commonly affected. Aquatic therapy is also known as the “hydrotherapy” and has emerged as a promising intervention in the world of rehabilitation.^[3] The properties of water have various health benefits on the joints. Aquatic therapy can play a role in improving strength, endurance, reducing joint load and swelling and thus improving the joint health and function.^[4] The article explores the benefits, mechanisms, and practical applications of aquatic therapy for patients with knee OA.

KEYWORDS:

Osteoarthritis, Knee OA, aquatic therapy, joint function

INTRODUCTION

Osteoarthritis (OA) is the most common form of arthritis, characterized by the progressive degeneration of joint cartilage and the underlying bone.^[5] In simple terms it is the wear and tear of the joint due to ageing. It typically affects large weight-bearing joints such as the knees, hips, and spine, but it can also occur in smaller joints like the hands.^[6] OA develops gradually often due to aging, repetitive joint stress, obesity, or previous joint injuries. It causes the progressive wearing off of the cartilage thus leading to symptoms such as pain, stiffness, swelling, and decreased joint mobility.^[7] Over time, the loss of cartilage causes the bones to rub against each other, resulting in further damage and discomfort, and result to the formation of deformities in the later stages.^[2]

Knee osteoarthritis (OA) is a degenerative joint condition that affects the knee's cartilage, which serves as a cushion between the bones, femur and tibia that make up the joint. Over time, the cartilage wears down, leading to increased friction, pain, swelling, and stiffness in the joint. In the early stage of Knee OA there are changes observed in the collagen structure and proteoglycans along with degeneration of the meniscus noted. In the later stages of the disease it causes changes in the synovial tissue and subchondral bone causing bone sclerosis

and increasing the thickness of the synovial membrane and capsular structures thus leading to formation of osteoblasts due to increased friction of the bones.^[8] It is a highly prevalent joint disease affecting 22.9% of population over the age of 40 years.^[9] Knee OA is 16% prevalent in population below 40 years of age while increasing prevalence as the age advances.^[10] The ratios of prevalence and incidence in females and males were 1.69 and 1.39 respectively.^[10] The risk factors for developing Knee OA are direct trauma or injury to the joint, occupations that require prolonged standing, occupations that need repeated squatting, kneeling, bending, obesity that increases the load onto the joints, genetics that increases the chances for developing the disease.^[11] The non-surgical management options of Knee OA are medications (most commonly NSAIDs), intra-articular injections, and weight loss in case of obese individuals, physical therapy, and use of support braces.^[12] Along with physical therapy that focuses on exercises to improve strength, and delay further degradation of the joint other adjunct therapies can play a vital role in managing OA. The adjunct therapies include thermal therapy, laser therapy, yoga therapy, taping, manual techniques, aquatic therapy, etc.^[13]

Aquatic therapy, also known as hydrotherapy, is a form of physical therapy conducted in a water environment, typically in a pool designed for therapeutic use. This therapy utilizes the unique properties of water, such as buoyancy, resistance, and hydrostatic pressure, to assist in rehabilitation and pain relief.^[14] Aquatic therapy is suitable for a wide range of patients, including those recovering from surgery, managing chronic conditions, or seeking low-impact exercise options.

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Its supportive and low-stress environment allows individuals to perform movements and exercises that may be difficult or painful on land, promoting overall physical function and well-being. Over the past few decades aquatic therapy has been proven to be beneficial for managing Knee OA.

MECHANISMS OF ACTION

Buoyancy

It is the upward force exerted by water that opposes the weight of an object submerged in it. This force reduces the effective weight of the body, making it feel lighter in water. For individuals with knee osteoarthritis (OA), buoyancy plays a crucial role in reducing joint stress and pain during movement. ^[15] Water's buoyancy reduces the effective weight on joints, making it easier to perform exercises with reduced pain and stress on the knee.

Resistance

Water resistance is a key component of aquatic therapy that can significantly benefit individuals with knee osteoarthritis (OA). In water, every movement creates resistance due to the viscosity of the fluid, which requires the muscles to work harder to overcome it. This provides a low-impact yet effective way to strengthen the muscles around the knee joint, including the quadriceps, hamstrings, and calf muscles, which helps improve joint stability and function. ^[16] For individuals with knee OA, strengthening the muscles surrounding the knee can reduce the strain on the joint itself, alleviate pain, and improve overall mobility. Water resistance allows for controlled, gradual strengthening without the risk of overloading the joint.

Hydrostatic Pressure

Hydrostatic pressure helps promote circulation and fluid movement, aiding in the reduction of swelling around the knee joint. By improving blood flow and lymphatic drainage, it helps remove excess fluid from the affected area, which can decrease inflammation and puffiness. The compression from hydrostatic pressure can have a mild analgesic effect, reducing pain and discomfort by relieving pressure on the joint and surrounding tissues. It also helps ease muscle tension, which can further reduce pain in the knee. ^[15] With reduced swelling and pain, individuals with knee OA can move more freely and perform exercises with less discomfort. This contributes to better range of motion (ROM) and overall functional improvement.

Thermal effects

The ideal water temperature for aquatic therapy typically ranges between 83°F to 88°F (28°C to 31°C). This temperature range offers several benefits for individuals undergoing rehabilitation. Warmth of the water helps to reduce the joint stiffness by relaxing the muscles, improves blood circulation thus leading to improved ROM and flexibility.

Therapeutic benefits of Aquatic Therapy

Reduces Joint load:

Aquatic therapy reduces joint load primarily through the “buoyancy” provided by water. When the body is submerged in water, there is an upward force that counteracts gravity, effectively reducing the body's weight and the pressure placed on joints. ^[17] This significant decrease in weight-bearing load allows individuals to perform movements and exercises with minimal stress on the joints, particularly in weight-bearing areas like the knees, hips, and spine. This unloading effect makes aquatic therapy ideal for people with arthritis as it enables them to engage in physical activity without exacerbating pain or causing further joint damage. The reduced load also allows for improved joint range of motion, reduced friction of the bones of the joint and makes water a good medium to exercise as compared to on the land.

Pain Relief:

The buoyancy of water reduces joint loading, minimizing the stress and strain on the knee joints during movement. The warmth of therapeutic pools promotes relaxation of muscles, reduces stiffness, and enhances blood circulation to the affected area, which helps decrease pain and inflammation. ^[18] Warm water can reduce muscle tension and improve blood flow, alleviating joint pain and stiffness. Hydrostatic pressure of water can reduce swelling around the knee joint by promoting fluid movement and improving lymphatic drainage. The resistance of water provides gentle yet effective strengthening of the surrounding muscles, improving joint stability and reducing pain caused by muscle imbalances or weakness.

Improved Muscle Strength and Endurance:

The viscosity of water is denser than air, so movements in water require more effort, thereby enhancing muscle activation and promoting strength development, even with gentle movements. Buoyancy of water supports the body, reducing the risk of injury, allowing individuals to perform exercises for longer durations and with more repetitions than they might be able to tolerate on land. This prolonged engagement enhances muscular endurance. Over time, these repetitive, resistance-based exercises build both strength and endurance, improving the function and stability of muscles around the joints, which is particularly beneficial for conditions like knee osteoarthritis.

Improved Range of Motion:

Buoyancy reduces the stress on the joints making it easier for the individual to perform the movements easily with better ROM. ^[17] Warmth of the water helps the muscles to relax and become more flexible attributing to the improved ROM. Thus reduced load onto the joints with better flexibility of the muscles lead to improved ROM in the joints.

Psychosocial Advantages:

Aquatic therapy offers several psychological benefits in addition to its physical advantages. The soothing nature of

water, combined with the warm temperature of therapeutic pools, can promote relaxation and reduce stress levels. The calming effects of being submerged in water can trigger the body's parasympathetic nervous system, lowering heart rate and reducing anxiety.^[19] This helps individuals feel more at ease during exercise, especially those who may feel apprehensive or anxious about physical activity due to pain, injury, or chronic conditions like arthritis. Group aquatic therapy sessions can foster social interaction and reduce feelings of isolation or depression, common among patients with chronic pain conditions.

CONCLUSION

Aquatic therapy offers a highly effective, low-impact treatment option for individuals with knee osteoarthritis (OA). By utilizing the unique properties of water—such as buoyancy, resistance, and hydrostatic pressure—this therapeutic approach reduces joint load, alleviates pain, and promotes muscle strength and flexibility. The supportive water environment allows individuals with knee OA to engage in exercises that improve range of motion, reduce swelling, and enhance overall joint function, all while minimizing the risk of exacerbating symptoms. Additionally, the warmth of the water aids in muscle relaxation and pain relief, creating a comfortable setting for rehabilitation. The combination of physical benefits, such as improved strength, endurance, and mobility, with psychological benefits like reduced stress and anxiety, makes aquatic therapy an essential tool in managing knee OA and enhancing the quality of life for those affected by the condition.

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