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An Aquatic to Land-based Therapy Transition Approach for Persons with Lower Extremity OA: A Case Report

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Abstract

Background: The benefits of physical therapy in the management of lower body osteoarthritis is widely discussed in the literature. However, recommendations in the usage of aquatic therapy, land-based therapy, and transitioning from aquatic therapy to land-based therapy in managing osteoarthritis is limited. **Case Description**: The patient was a 60-year-old male with primary complaints of low back pain, right hip pain, and right knee pain resulting from confirmed osteoarthritis in these regions. Interventions included utilizing the principles of aquatic therapy and adapting his plan of care to complete land-based therapy following his episode of aquatic therapy. **Outcomes:** The patient was treated for a total of 17 visits in aquatic therapy with an improvement in the patient's Physical Functional Status Primary Measure score within the Focus On Therapeutic Outcomes measure from 35 to 36 for the lumbar spine and from 24 to 28 for the knee, a decrease in pain from 10/10 to 5/10, and an improvement in 5 Times Sit to Stand time from 28 seconds to 21 seconds. **Discussion:** The purpose of this case report is to describe the initial use of aquatic therapy in a patient with lower body osteoarthritis prior to continuing his therapy on land. The meaningful, yet limited improvement in reported pain and function in 11 weeks of aquatic therapy may suggest that aquatic therapy for individuals with lower extremity osteoarthritis is beneficial in the initial plan of care, but may also suggest that a transition from aquatic therapy to land-based therapy may be indicated to further enhance function.

INTRODUCTION

Osteoarthritis (OA) is a chronic, degenerative disease affecting joints of the body and is one of the most common forms of arthritis. It is estimated that 54.4 million, or 22.7% of the adult U.S. population has physician diagnosed arthritis.[3] One epidemiological study compiled research on the prevalence of radiographic OA in knee and hip, and found between 19.2% and 27.8% of adult participants aged 45 and older and 37% of adult participants aged 60 and older had knee osteoarthritis.[19] Prevalence of hip OA ranged from 7% of women 65 and older and 27% of adult participants aged 45 and older, or 19.6% radiographic OA.[19,1] The most common clinical manifestations of OA include joint pain, stiffness, and motion restrictions.[4]

Currently, treatments can only be aimed at controlling symptoms of OA and preventing further progression of the disease. There is a considerable amount of research assessing the value of physical therapy for OA. Aquatic therapy is a well-known therapy approach for patients with OA. Particularly for overweight or obese patients and for those who cannot tolerate land therapy.[15] Aquatic therapy is known to be beneficial due to the properties and principles of the aquatic medium. These principles include hydrostatic pressure, buoyancy, and thermal shift.[11,13] Therefore, a therapist can use these principles to their advantage when treating a patient with OA. Currently, we have good evidence to show that, independent of one another, land-based therapy and aquatic therapy have positive benefits for the patient with OA; however, there is lacking evidence studying the efficacy of utilizing both therapies in conjunction with one another. Consequently, the purpose of this case report is to describe the use of aquatic physical therapy before completing land therapy for a patient with lumbar spondylosis, knee and hip OA.

CASE DESCRIPTION

History

The patient was a 60-year-old male with a referral to physical therapy from a physical medicine and rehabilitation physician with a diagnosis of spondylosis of lumbar region, primary osteoarthritis of the right knee, and a history of right hip osteoarthritis. He had long-standing back pain and recent right knee pain. His pain worsened in month prior, so he decided to seek help. The only reported trauma to identified regions was a right knee aspiration surgery when the patient was in high school.

The patient had a remarkable past medical history and social history. His past medical history included chronic pain, COPD, obesity, hyperlipidemia, hypertension, sleep apnea, and a hernia. He was a current, daily cigarette smoker as well. His symptoms primarily involved his right knee and low back with some pain in his right hip as well. Prolonged standing or walking caused him the most pain. He also had the most pain and stiffness in the morning. If he sat for too long, he would occasionally get numbness in his legs. On evaluation, he rated his current pain as 10/10, but his pain reached a 5/10 at best. To find relief, he described that his positions of comfort were not consistent from one day to the next. The patient denied any bladder or bowel incontinence, or any progressive weakness or sensation changes.

Examination & Evaluation

The patient completed Focus On Therapeutic Outcomes (FOTO) upon arrival to his physical therapy examination.[18] FOTO is a tool to measure a patient's perceived function level and provides predictive outcome information based upon the patient's entered data. The score can range from 0 to 100 where a higher number is representative of greater function. On evaluation day, the patient's lumbar region intake score for Physical Functional Status Primary Measure was 35 out of 100 while the knee measured to be 24 out of 100.

The evaluation of the patient was completed by the author's supervising therapist, where a knee, lumbar, and functional assessment was completed. In his postural assessment, the patient was identified having decreased lumbar lordosis, increased thoracic kyphosis with a left thoracic curvature. His lumbar motion was assessed to be globally limited in all directions. The patient had tenderness to

palpation in all of his lumbar region and at bilateral PSIS. When screening for sensation deficits, it was discovered that he had numbness along the plantar aspect of both feet.

The patient's knee flexion active range of motion (AROM) was measured to be 126 degrees bilateral, while knee extension measured to be 15 degrees lacking on the right and 7 degrees lacking on the left knee. His hamstring length in the 90/90 position (90 degrees of hip flexion and starting at 90 degrees of knee flexion) was measured to be 25 degrees lacking on the right and 35 degrees on the left. During manual muscle testing of lower extremities, the patient's only measured deficit was right knee extension (4+/5). All other lower extremity manual muscle test scores were 5/5 strength.

Special testing revealed a positive McMurray's knee test. Lumbar special tests showed a negative Slump test bilaterally, positive FABER (flexion, abduction, external rotation) bilaterally for low back pain, and a negative Hip Scour bilaterally. The therapist then examined the patient's function by utilizing the Five Times Sit to Stand test (5x STS) and the Timed Up and Go (TUG) test. In the 5x STS he scored 28 seconds with upper extremity support on thighs, and scored 12 seconds on the TUG. Lastly, the therapist reviewed an aquatic precautions form with the patient, which was remarkable for COPD, diabetes, and foot neuropathy. The patient's blood pressure was measured to be 141/79 mm Hg, which indicates that aquatic therapy is appropriate.

Diagnosis and Prognosis

After completing the examination, patient's subjective report, and review of patient's history, it was apparent that the degenerative changes of spine and knee measurably contributed to the patient's back and right knee pain. This was agreeable to previous imaging studies indicating degenerative changes in the right knee and lumbar spine. The pain, due to osteoarthritis of the knee and spondylosis of the spine, demonstrate his painful symptoms while weight bearing and the decrease in functional mobility (assessed in 5x STS and TUG) and decreased function reporting as seen in the FOTO measurement.

Additionally, a limitation in right knee range of motion (15 degrees to 126 degrees) and limited right knee extension strength mirror the expected capsular pattern and strength deficits in a joint diagnosed with OA. This was also apparent in his decreased lumbar spine mobility and poor core musculature activation. His bilateral foot neuropathy appears to be a result of his diabetes as no position or movement provoked or decreased his neuropathy symptoms. Therefore, the therapist proceeded with skilled therapy utilizing an aquatic medium.

INTERVENTION

The patient was expected to benefit from aquatic therapy based upon key aquatic principle such as buoyancy to unload lower extremity joints and lumbosacral spine, thermal shift to decrease pain by decreasing sympathetic nervous system activation, and hydrostatic properties to improve strength and activity tolerance.[11,13] Therefore, aquatic therapy was to be utilized 1-2 times per week for 17 treatments total in order to improve functional movement and to address patient's goal to decrease the pain and lose weight.

Treatment Session 1 and 2

Due to patient having a high amount of pain following his initial evaluation, therapy during his first treatment was to introduce a foundational repertoire of aquatic exercises and decrease his pain. Treatments included water walking, dynamic gait exercises, LE open and closed kinetic chain exercises, core exercises, and deep water. Therapist was able to control the dose

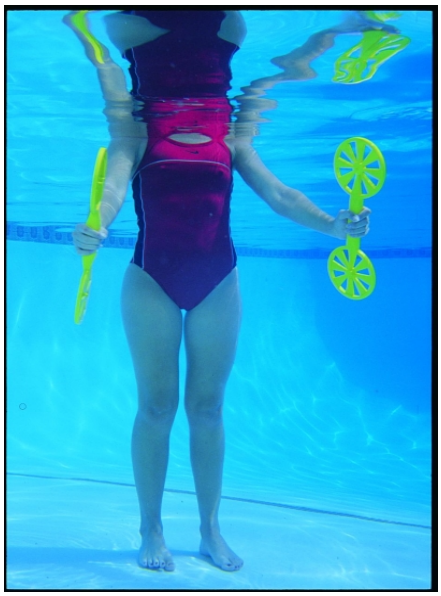

Figure 1. Demonstrates paddles frequently used to provide resistance in the water. www.theraquatics.com

by utilizing different shapes and sizes of pool gear. Pool gear included fins, cuffs, steps, paddles, kickboards, and other floatation devices (Figure 1). The first visit allowed positive groundwork in improving the patient's pain as he felt some relief in the pool.

By his second treatment session, the patient continued to have relief during therapy and the therapist was able to begin focusing on abdominal and hip strengthening in order to facilitate further stabilization of his lumbar spine. To accomplish this, the therapist initiated transverse abdominis activation by having the patient move paddles through the water while the patient was instructed to keep abdominal muscles engaged and maintain spine position. Additionally, both open and closed kinetic chain exercises such as hip abduction with cuffs at his ankles and squats in the pool were introduced to begin strengthening hip muscles (Figure 2). To end each session, the patient completed exercises on the parallel bars placed within the pool. The patient rested on his elbows while he completed bicycle kicks, scissor kicks (hip abduction and adduction), and ended with him resting his lower extremities in order to provide decompression to his spine and lower extremities. A home exercise program was prescribed during session 2.

Figure 2. Shows step used during CKC activity. www.athleticstuff.com

Treatment Session 3 and 4

The patient continued to have 9/10 pain when he arrived to therapy. Most of his discomfort is reported to be muscle soreness from the new exercises at therapy. The therapist continued to progress core exercises by initiating a modified prone position in the water where the patient completed lower extremity movements while maintaining correct spine stability. A low back stretch in the water was initiated as well. In order to obtain this stretch, the patient kept his hips against the wall while he flexed forward with his hands placed forward on a flotation device until a stretch in the low back was felt. Step ups onto 6-inch step in the water were also initiated during session 3 in order to improve lower extremity strength, especially hip extension and knee extension strength.

By session 4, the patient arrived with more back and right knee pain. He had less muscle soreness, but increased joint pain, especially during weight bearing. The focus of therapy was to continue addressing proper core activation and lumbar stabilization with his aquatic exercises. A progression of prior stabilization exercises was introduced. The patient assumed single leg stance position with contralateral foot on a step while the patient provided self-perturbations by moving his arms in different positions within the water. Continued verbal and tactile cuing was required in order for the patient to maintain upright stance and to properly engage abdominal and gluteal muscles. Increased attention was given to providing relief of his joint pain by unloading via buoyancy of the water. The patient utilized floatation devices to provide buoyancy so that the patient was not weight bearing. Five minutes of completing a decompression hang on the floatation device provided great relief for the patient as he reported to feel "much better." With this, it is evident that buoyancy is advantageous for his joint pain (Figure 3).

Figure 3. Example of decompression hang used in the pool to provide back relief for patient. www.askdoctorjo.com

Treatment Session 5 through 7

By the fifth visit, the patient began to notice less soreness arriving to therapy and less soreness throughout each day. During therapy, the patient was able to tolerate treatment with less pain, less cuing, and with increased muscle endurance. The therapist continued to progress patient with single leg exercises, squats, step ups, and also introduced static stance on an uneven surface placed under the patient's feet.

Treatment Session 8

During treatment session 8, a progress report was completed. The patient's pain arriving to therapy for this session returned to 10/10 pain in his right knee and low back. Although he had increased pain, the patient's 5x STS improved from 28 seconds (9/1/17) to 23 seconds (10/5/17) in approximately one month demonstrating improvement in patient's functional strength and power. Additionally, his right knee extensor strength measured to be 5/5 strength. Continued progression of previously completed exercises was achieved during therapy.

Treatment Session 9 through 14

The patient arrived to therapy during session 9 still feeling sore and believes his pain has gotten worse. However, following light exercises (like water walking, core activation, stretching, and deep water) during session 9, the patient began to experience a shift in self-reported pain as he stated that he had a "great improvement in pain." He had continued pain and stiffness in knee and back at session 10 where light exercises we completed again. His pain improved greatly by the end of treatment. He also received verbal education on the importance of strengthening around his joints for improved pain and function. Starting with session 11 and through treatment session 14, he began to have improved pain response where experienced 6/10 pain even after waking up in the morning. We then re-initiated squats, OKC exercises, and modified prone exercises for each following treatment session. The patient commented that he "feels as though higher intensity in pool is helping."

Treatment Session 15

Began session with a retest of 5 Times Sit to Stand, and he scored 23 seconds on the test again. Although he presented to therapy this session with 10/10 knee and back pain, he reported that therapy is helping and that if he continued to be active and lose weight will help as well. The first discussion about continuing with therapy on land when his aquatic therapy ended occurred during session 15. He was motivated and agreeable to begin land therapy when he was finished in the pool. After sending this progress note to his physician, he received a land-based therapy prescription.

Treatment Session 16 and 17

In his last two sessions, the patient completed an independent exercise program for the pool to complete on his own time following therapy. By the last session, he stated he had "better than normal" pain and reiterated that he is motivated to lose weight, get stronger with land therapy and get better on his own time. His 5 Times Sit to Stand was re-measured to be 21 seconds.

OUTCOMES

The patient was treated in aquatic therapy for a total of 17 visits over an 11-week span with a decrease in pain from 10/10 to 5/10. Additionally, he improved upon his 5 Times Sit to Stand time from 28 seconds to 21 seconds. However, his slight improvement in the Functional Status Primary Measure score within the FOTO measure from 35 to 36 for the lumbar spine and from 24 to 28 for the knee does not meet the Minimal Clinically Important Improvement (MCII) for lumbar spine (9 point change) or the knee (13 point change).[18] The FOTO scores place him at stage 2, or extreme difficulty performing usual work, and improving from stage 2 to stage 3, or moderate difficulty performing usual work for lumbar spine and knee, respectively.

DISCUSSION

The purpose of this case report was to describe the initial use of aquatic therapy in a 60-year-old patient with lumbar spondylosis, hip and knee OA prior to continuing his therapy on land. Interventions in the pool focused on improving pain symptoms, functional mobility, functional lower extremity strength and stability, activity tolerance, as well as providing guidance and support for him to progress towards his goal to lose weight. The general guidelines, in the management of OA, are in parallel with the stated focus of interventions.[2,6]

In order to properly manage this patient's arthritis, the author concurs that utilizing an aquatic medium for therapy was appropriate. Tilden et al discusses numerous reasons to start management of OA with aquatic therapy as land-based therapy may not be tolerable.[15] Hydrostatic pressure may help decrease joint edema as well as inhibit sensory and joint pain. Additionally, thermal neutral water promotes increased blood flow, modify pain perception, and allow for enhanced joint motion.[8,11,15] Buoyancy of the water can allow unloading of the affected joints while promoting advantageous body movement, especially for our patient who was overweight. If the client has low self-efficacy, it may be beneficial to begin with aquatic exercise to build confidence before transitioning to land-based therapy.

For the first 10 treatment sessions, all of the interventions focus areas were utilized by incorporating the principles of aquatic therapy. Although his self-reported pain remained unchanged, he did have measured improvement in his right quadriceps muscle strength as well as in functional strength and power. Numerous studies demonstrate that strength gains are measured in persons with OA receiving aquatic therapy.[8,10,17] Some gains in strength are small, as found in Foley et al where only left quadriceps muscle strength improved significantly following resistance training in the water.[8] However, when aquatic therapy strength gains are compared to land-based therapy, the improvement in strength is not as apparent.[9] This suggests that strength gains in the pool may still be important as the arthritic patient experiences less joint stress than completing exercises on land.

Although significant improvements in strength and function had already been made, therapy continued to focus on improving functional strength and mobility, as well as pain control during the second half of his care. It was noted initially in the patient's care that the patient's pain was better immediately after treatment. By the end of his plan of care (POC), pain reduction was maintained to the next day. This correlates with studies on pain reduction immediately after treatment and at follow-up.[5,7,14,16] Other important short-term benefits noted after receiving aquatic therapy were improvement in quality of life (QoL) and reduction in disability as found in the Cochrane review where they state that, "there is moderate quality evidence that aquatic exercise may have small, short-term, and clinically relevant effects on patient-reported pain, disability, and QoL in people with knee and hip OA."[2] This may indicate that, in the management of OA, persons with lower extremity OA may benefit from initially receiving aquatic therapy.

After seeing the small, yet important gains the patient made, our therapy approach shifted to consider the benefits of land-based therapy. In essence, could our patient have benefitted from only land-based therapy as much or more than aquatic therapy, or could he benefit from further therapy completed on land? In regard to managing lower extremity OA, exercise therapy on land can provide improved pain immediately after treatment as well as sustained improvements for up to six months.[5,7,14,16] Improvements in physical function have also been reported post-treatment and three to six months post land therapy treatment.[5,7,12,14] In their review on hip OA and exercise, Fransen et al conclude from high-quality evidence that, "land-based therapeutic exercise programmes can reduce pain and improve physical function among people with symptomatic hip OA."[6] Since the benefits of aquatic therapy may be small, short-lived, and difficult to translate to daily life on land, a patient with LE OA may also benefit from land-based therapy in regard to pain and physical function. Therefore, we suggested an aquatic to land-based therapy transition for this patient as an approach that could be extended to the majority of patients with lower extremity OA.

Because aquatic therapy provides short-term benefits and land-based therapy affords more utility to daily life on land, a transition approach may be useful in order to reap the benefits of both. As Tilden et al suggests, "for long-term OA management, it is important to link the aquatic-based activities

to the land-based functional requirements of the participant."[15] The findings of this case report support that an aquatic to land-based therapy transition approach may be advantageous for the patient with LE OA. However, further research will be needed in order to match a patient to the transition approach and to determine the proper dose of aquatic and land-based therapy. Lastly, it may be suitable that a formal guideline or decision tree be formulated in order to guide clinicians in correctly allocating patients with lower extremity OA to the most appropriate POC, including the transition approach.

CONCLUSION

This case report described the initial use of aquatic therapy in a patient with lumbar spondylosis, knee and hip OA prior to continuing his therapy on land. The outcomes show improvement in pain, strength, and small improvements in function according to FOTO. Research indicates that aquatic therapy provides small, short-term benefits in pain and strength while land therapy can provide immediate and sustained improvements in pain and functional strength. This suggests that an aquatic to land-based therapy transition approach may be advantageous for the patient with lower extremity OA. Further research is needed in order to match and dose a transition approach. An evidence-based formal guideline for clinicians may be useful to accurately prescribe an aquatic therapy to land-based therapy transition approach for individuals with lower extremity osteoarthritis.

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