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Case Report

Effects of aquatic therapy on the physiological knee varus deformity and osteoarthritis through radiographic findings in post menopausal obese women- A case report

Pooja Kamble^{1,*}, Yojana Navneet Mange², Binal Dave¹

¹Aqua Centric Therapy Pvt. Ltd., Andheri West, Mumbai, Maharashtra, India

²Physiotherapist, Andheri, Mumbai, Maharashtra, India



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ABSTRACT

Obesity is strongly linked to osteoarthritis (OA) at the knee. Varus malalignment intensifies the effect of excess body weight on the medial tibio femoral compartment. Aquatic therapies are beneficial in the management of patients with musculoskeletal problems, however management specific of osteoarthritis has shown to be effective in reducing Pain, Stiffness and has a high compliance of the patient to the Therapy. Aquatic exercises seems to offer the safest and most protective environment for obese individuals due to the buoyancy effects of immersion, which minimizes the risk of joint injury. Although Aquatic therapy is widely used all over the world, literature on the correcting Physiological knee Varus in Indian population is lacking. This case report is first from India (Mumbai) which shows the beneficial effects of Aquatic therapy on Obese female with OA knee, correction of the physiological Varus and its evidence on a Visual radiographic increased in joint space in knee varus deformity with reduction in Pain and improving her gait pattern & her quality of life.

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1. Introduction

Obesity and Overweight in the western pacific are defined as abnormal or excessive fat accumulation that may impair health.¹ Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m²).¹ The WHO definition is a BMI greater than or equal to 25 is overweight & a BMI greater than or equal to 30 is obesity.¹ Obesity is associated with markedly reduced life expectancy, thus becoming a leading cause of deaths in most of the countries and a challenge in both economically developed and developing

regions of the world.² Obesity is a risk factor for both the development and progression of knee osteoarthritis (OA). Obesity is supported by an increase in OA risk through 1) direct effects, and 2) the influence of local factors that mediate the mechanical impact of excess body weight at the knee.² Knee misalignment is another factor that influences how load is distributed at the knee and helps to explain the predisposition of obesity-associated knees. Varus malalignment intensifies the effect of excess body weight on the medial tibio femoral compartment.² Knee alignment is reflected by the angle made by the intersection of the femoral and tibial mechanical axes. Varus malalignment increases medial compartment load and Valgus malalignment increases lateral compartment load.² In a typical position of ambulating knee, load is irregularly imparted to the medial compartment. Varus

* Corresponding author.

E-mail address: poojakamble779@gmail.com (P. Kamble).

malalignment helps increase the total load passing medially during gait.³ Water has been believed to promote healing and has therefore been widely used in the management of medical ailments but only since the early 1990s has the use of Aquatic therapies dramatically expanded, as recognition of the efficacy and safety of Aquatic therapies became widespread among both therapists and medical practitioners. Nearly all of the biological effects of immersion in water are linked to the fundamental principles of hydrodynamics. Blood flow during exercise is likely enhanced as well and there is research that supports this supposition, finding a 20% increase in blood flow in sedentary middle-aged subjects subjected to 12 weeks of swim training, the hydrostatic effects of immersion, possibly combined with temperature effects, have been shown to significantly improve dependent edema and subjective pain symptoms in patients with venous varicosities.³ The buoyancy of water combined with the hydrostatic pressure produced during immersion and the thermal properties of water make the aquatic environment uniquely beneficial in the management of patients with osteoarthritis. Aquatic therapy has shown to be effective in reducing pain, stiffness and high rates of compliance with Aquatic exercise programs, which is highly beneficial in the restoration of fitness in obese population due to the protective effects in opposition to heavy joint loading in the aquatic environment. On dry land, the capacity to achieve an aerobic exercise level for sufficient time to produce a conditioning effect may be difficult in obese population. However, a strategy that starts in water and moves to land as strength, endurance, and tolerance build up gradually may be the most productive way of bringing about both conditioning and weight loss.⁴ In this case report, we have shared our experience of how aquatic therapy helped Post menopausal obese women with evident radiographic changes on the physiological varus deformity of the knee and also improving the OA.

2. Case Report

A sixty one year old, Post menopausal female walked in the Aquatic therapy Clinic with chief complaints of knee pain (LT>RT) specifically in bilateral medial compartment of the knees, progressive in nature since 2 year, aggravated in the past 6 month. She had difficulty in walking and doing her daily chores. Her Surgical history includes Cholecystectomy and Hysterectomy and was also diagnosed with incisional hernia. She is a Multiparous mother delivered with Caesarean section. She manages to have an active lifestyle & is a NGO social worker.

She has a typical abdominal obesity (apple shaped features) and a waddling gait because of the abdominal fat and her stature. On palpating both the knees, mild warmth, moderate Tenderness was present which suggests an Acute inflammation of the Knee due to the Osteoarthritis. She

rates her pain on the Visual analog pain scale as 9/10 on left knee and 7/10 on right knee. She scored 28/88 on the Foot and Ankle disability index (FADI) functional scale, Pain FADI scoring was 10/16 and The Western Ontario and McMaster Universities Arthritis Index (WOMAC) (pain, stiffness, physical disability) scoring was 11/20, 5/8, 45/68 respectively. Tanita Body composition analyzer recorded her weight of 83.7 Kgs, BMI 35.3 kg/m², Fat % 42.5, Fat free Mass 48.1kg. Radiographic findings on an X-Ray showed visual compressions on both sides of medial compartments of the knee (Figure 1).

3. Intervention

The Subject was 100 sessions of Aquatic therapy. The treatment was divided in 4 parts (25 sessions each) and 8 review sessions after completing each part to see the progress. First 25 sessions were exclusively dedicated to her underwater stretching and different walking exercises with releasing techniques in standing and floating as well. Next 25 sessions were a combination of underwater Strength training and Functional training again in standing and floating. The 3rd set of 25 sessions included a combination of Strength training, functional and modified cardio training. The last 25 session's had a combination of functional, strength, modified cardio training & also included underwater treadmill & cycling. All the treatment protocols were based on the FITT principle. Therapy was supervised and administered by the therapist 3 times a week with a customized home exercises program was given on the other 3 days of the week.

Each Aquatic therapy session lasted for 45 minutes, including warm up and cool down. Her Vitals such as Blood pressure, Heart rate and Respiratory rate were recorded throughout her therapy sessions, first before entering the pool, during the treatment session after approximately 25 minutes & post workout immediately.

4. Results

Remarkable changes were seen after completion of 100 Aquatic therapy sessions. Radiographic X ray findings showed increased space (decompression) on both sides of medial compartments of the knee (Figure 2). The Comparison of the outcomes- Pre therapy and Post therapy (Table 1)

5. Discussion

The incorporation of Aquatic therapy into the rehabilitation program profoundly affects the overall care of the patient. The hydrostatic pressure of water is the main force that assists in decreasing swelling when an individual is in water. The increased pressure on the thorax and chest cavity results in a shift in blood volume cranially from the lower extremities and abdomen. This superior shift results

Table 1: Comparison of outcomes- Pre therapy and post therapy

Pre therapy	Post therapy
Tenderness: mild B/L medial compartment of knee	Tenderness: Negative
Warmth: Present on the left > right knee	Warmth: Absent
VAS score for Left Knee was 9/10, Right Knee was 7/10	VAS score left knee: 1/10, and right knee: 1/10
Patellar Tap Test : Positive	Patellar Tap Test : Negative
FADI Functional score 28/88, Pain 10/16	FADI Functional score 80/88, Pain 1/16
WOMAC- Pain score 11/20, Stiffness was 5/8, Physical difficulties 45/68	WOMAC- Pain score 1/20, Stiffness 1/8, Physical difficulties 2/68
Weight 83.7 kg, BMI 35.3 kg/m ²	Weight 80 kg, BMI 33.3 kg/m ²
Fat % 42.5, Fat free mass 48.1	Fat % 39.1, Fat free mass 48

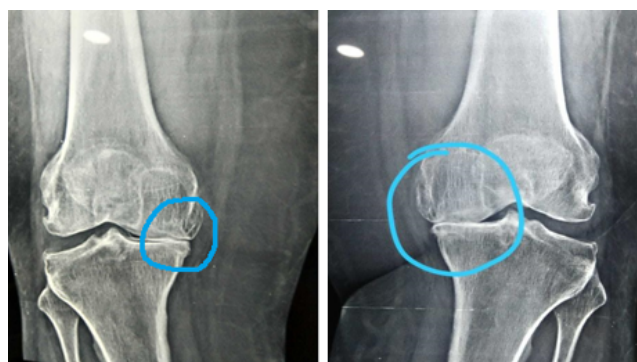


Fig. 1: X-Ray finding pre therapy- Right and left knee respectively

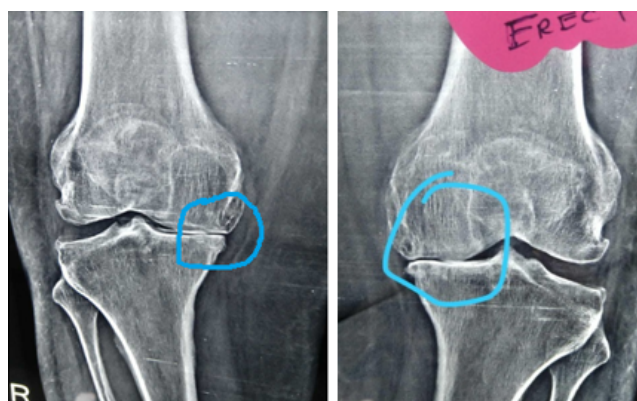


Fig. 2: Post therapy: X Ray findings of right and left knee respectively

in central hypervolemia and viscosity, which promote venous return and decreased swelling.⁴ Sensory overflow is experienced while in water. Decreased perception of pain can lead to pain modulation and eventually to increased pain thresholds. Warm water allows for increased blood flow and delivery of oxygen to muscles, allowing for improved ability to exercise in aquatic environments. Oxygen availability can increase as much as 22.5% compared to exercising on land.⁴ Regardless of the development of advanced Imaging techniques, the Radiograph remains the most convenient tool in the analysis of the OA joint. The knee joint is usually assessed using the extended-knee radiograph, which is a bilateral anteroposterior image obtained while the patient is weight-bearing, on both knees in full extension. Radiographs are used to evaluate osteophyte formation and joint space narrowing (JSN).⁵

Many research studies have been carried out involving Aquatic therapy in osteoarthritis patients of various age groups showing positive results, however Aquatic therapy in India (Mumbai) showing changes in Radiographic findings had not been carried out. In this case report, Exclusive aquatic therapy was advised considering the patients age & obesity factor and in 100 sessions we have seen a evident Positive Radiographic change in both her knees. There was a customized treatment planning for the subject which has given a positive outcome. The other factors like Pain, Warmth, Tenderness and Body composition measurements have also shown a remarkable improvement. Outcome measures used like Foot & Ankle disability index (FADI) and The Western Ontario and McMaster Universities Arthritis index (WOMAC) for this case have also shown exponential good ratings post the therapy sessions. The current Case report can help the Aquatic therapist to conduct further structured randomized studies involving larger sample size.

6. Conclusion

The case reports support that Aquatic therapy has a Positive response on the correction of the Physiological Varus Knee deformity, on Knee Osteoarthritis and evident changes on the X Ray.

7. Source of Funding

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8. Conflict of Interest

None.

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Author biography

Pooja Kamble, Senior Women's Health care Therapist

Yojana Navneet Mange, Senior Women's Health Care Physiotherapist

Binal Dave, Lead Orthopedic & Women's Health Physiotherapist

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