The Effectiveness of Polarized Polychromatic Noncoherent Light (Bioptron light) and a Supervised Exercise Program on Pain and Disability in Chronic Patellar Tendinopathy: A Case Report

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Abstract

Eccentric exercises are not e ective for all patients with chronic patellar tendinopathy (CPT). The present case report aims to present the e ect of the Bioptron light combined with an exercise programme on pain and disability in a patient experiencing CPT. A patient with unilateral CPT for 8 months was included in the present report. The patient followed a supervised exercise program ýve times per week for 6 weeks consisting of eccentric-concentric training, isometric contraction, simple lumbo-pelvic control exercises and static stretching exercises of hamstrings and quadriceps. The programme was individualized based on the patient's description of pain experienced during the procedure. Bioptron light was applied twice, once before and once after the exercise programme for 10 minutes each time. The patient was evaluated using the VISA-P questionnaire, the pain pressure threshold (PPT) and the strength of knee extensor at baseline, at the end of treatment (week 6), and 1 month (week 10) after the end of treatment. At the end of the treatment and at the follow-up there was a decline in pain and a rise in function. The results of the present trial suggest that the bioptron light combined with an exercise programme consisting of eccentric-concentric training, isometric contraction, simple lumbo-pelvic control exercises and static stretching exercises of hamstrings and quadriceps can produce signiýcant improvements in terms of pain and disability in CPT.

Keywords: Patellar tendinopathy; Exercise; Stretching; Jumper's knee

Introduction

Chronic Patellar Tendinopathy (CPT) commonly referred to as Jumper's knee is the most common tendinopathy in the knee area. It is a degenerative condition and not an in ammatory one. Pain and decreased function are the main symptoms of CPT. Diagnosis is simple and the symptoms are reproduced by [1] lower limb activities such as squat or hop; [2] palpation on the site of pain (mainly at the inferior pole of the patella) and [3] clinical tests such as decline test [1].

No ideal treatment has emerged for the management of CPT. Many clinicians advocate a conservative approach [1] and physiotherapy is usually recommended [2]. A wide array of physiotherapy treatments has been recommended for the management of CPT such as electrotherapeutic/physical modalities, exercise programmes, so tissue manipulation, and manual techniques [3]. ese treatments have di erent theoretical mechanisms of action, but all have the same aim, to reduce pain and improve function. Such a variety of treatment options suggests that the optimal treatment strategy is not known, and more research is needed to discover the most e ective treatment in patients with CPT.

One of the most common physiotherapy treatments for CPT is exercise. Eccentric exercise has shown good clinical results in CPT [4] as well as in conditions similar to CPT in clinical behaviour and histopathological appearance, such as lateral elbow [5], rotator cu [6] and Achilles tendinopathy [4]. Eccentric training is not enough for all patients with CPT [7]. Malliaras and his colleagues [8] concluded that clinicians should consider eccentric-concentric loading alongside or instead of eccentric loading in lower limb tendinopathy. Moreover, poor lumbopelvic control has the potential to alter load distribution on the lower limb kinetic chain and increase the risk of lower limb tendinopathy [1]. e combination of eccentric-concentric training factor of CPT) can produce signi cant improvements in terms of pain and disability in CPT [9].

Although an exercise program is an e ective treatment approach, a supplement to the exercise program should be found to reduce the treatment period. One such modality is the polarized polychromatic noncoherent light (Bioptron light), a new modality of light therapy for the management of tendinopathies such as CPT. Manufacturers of polarized polychromatic non-coherent light devices (Bioptron light; Bioptron, Wollerau, Switzerland) claim that the waves of this light move in parallel planes (i.e., are polarized), cover a wide range of wavelengths (480–3400nm) including visible light and part of the infrared range (polychromy), and are not synchronized (incoherent). To our knowledge, there have been no studies to investigate the e ectiveness of Bioptron light as a supplement to an exercise program in the management of CPT. erefore, the present case report aims to present the e ect of Bioptron light combined with an exercise programme consisting of eccentric-concentric training, isometric contraction, simple lumbo-pelvic control exercises and static stretching exercises on pain and disability in a patient experiencing CPT.

Case Presentation

History

e subject was a 19-year-old male basketball player with an

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eight-month history of anterior knee pain, in his right (dominant) knee. He was diagnosed by a specialist (orthopaedic) as having CPT. He has played basketball for about 10 years. e site of pain was over the inferior pole of the patella (the most common site of patellar tendinopathy) without spreading down. He complained of pain during his training and walking downstairs. e pain subsided within two hours a er his training. He did not complain of pain a er prolonged sitting. He did not have any problems with the other joints. He did not complain of other symptoms such as sti ness, swelling, locking, crepitus or giving away. He took no drugs at the time of assessment; he had no history of trauma in the knee before, only two ankle sprains in the same leg. He had followed a physiotherapy rehabilitation program for the ankle sprains. He had no prior physiotherapy treatment for the problem in his knee. He did not have a history of diabetes, epilepsy or cancer and none in his family did. He did not have any operation or illness in the past.

Examination ndings

Although the condition was diagnosed by a specialist, the physiotherapist D. S. assessed his knee to rule out other conditions and con rm the diagnosis.

No pain was mentioned during gait and posture. Body deformity, colour changes, muscle wasting or swelling were not noted. In palpation, signs of in ammatory activity like heat, swelling and synovial thickening were not found.

On physical examination, the movements of the low back, hip and ankle were pain free, with full range of motion and full power. All ligamentous stress tests were normal, meniscal stress tests were normal, muscle strength tests were normal and no capsular pattern was found. Isotonic resisted knee extension was pain-free. e subject mentioned pain (7 out of ten) at the inferior pole of the patella when conducting the decline squat test. e Royal London Hospital test was also positive. Knee extension by gliding the patella medially was negative, without reproducing the pain; furthermore the position of the patella was normal [10]. ese two latter procedures ruled out the patellofemoral joint dysfunction. Tenderness with palpation over the inferior pole of the patella was found, con rming the diagnosis.

Procedure

e subject followed a supervised exercise programme consisting of, isometric quadriceps exercise, slow progressive eccentric-concentric training of quadriceps and simple lumbo-pelvic control exercises. Firstly, the subject performed the Spanish squat as an isometric quadriceps exercise. e Spanish squat is a double leg squat to be performed at an angle of approximately 70-90° of knee exion with the assistance of a rigid strap xating the lower legs. e subject performed 3 sets of ve repetitions of Spanish squat with 1-min rest interval between each set. Each repetition was painless and last 45 seconds. Later, the subject will carry out the eccentric-concentric training. As eccentric-concentric training, the subject carried out three sets of 15 repetitions of unilateral squat on a 25o decline board with 1-min rest interval between each set. e squat was performed at a slow speed at every treatment session. e subject counted to 6 during the squat. As the subject moved from the standing to the squat position, the quadriceps muscle and patellar tendon by inference was loaded eccentrically; followed by concentric loading, as the injured leg was used to get back to the start position. At the beginning the load consisted of the body weight and the participant was standing with all his body weight on the injured leg. e subject was told to go ahead with the exercise even if he experienced mild pain. However, he was told to stop the exercise if the pain became disabling. When the squat was pain-free the load was increased by holding hand weights. Finally, the subject performed two simple lumbo-pelvic control exercises such as single leg bridging in supine and four-point prone bridging exercises.

e patient performed 3 sets of ve repetitions of each of the above lumbo-pelvic control exercises with 1-min rest interval between each set. Each repetition was painless and last 45 seconds. Static stretching exercises of quadriceps and hamstrings were performed as described by Stasinopoulos and his colleagues [11] before and a er the supervised exercise programme. Each stretch lasted 30 seconds and there was a one-minute rest between each stretch. A supervised exercise program was given ve times a week for 6 weeks and was individualized based on the patient's description of pain experienced during the procedure.

e subject received Bioptron light therapy, via the BIOPTRON

a ngertip with a surface of 1 cm^2 was used. e pressure algometer is a device with a prede ned force calibrated in Newtons that can be administered to the tendon through a rubber disc at the end of the algometer. e measurement of the PPT was performed with the subject in a standardized position, with slightly exed knees supported by a cushion under the popliteal fossa. e researcher palpated the identi ed area to locate the exact painful spot; then, the algometer was placed on this position. In order to facilitate palpation of the tendon directly distally of the patellar apex, the patella was slightly tilted within the sagittal plane by pressing the proximal pole of the patella. To standardize the procedure, the force was gradually increased in a standardized time frame to a maximum of 50N in 5 seconds. is maximum is set to avoid any harm to the knee. If the subject experienced any sense of pain, he had to say "stop" and immediately the algometer was removed. e peak force of the measurement was displayed on the algometer. e mean of two measurements was taken for analysis. e second measurement was taken immediately a er the rst one, with a minimum of 30 seconds between each other, and on the same spot.

Knee extensor torque was measured with the athlete in supine lying with 30o of knee exion. is test position was chosen because it more closely resembles the knee exion angle the athletes have to generate force in during jumps. e dynamometer was positioned immediately proximal to the midpoint between the lateral and medial malleoli. e athlete was asked to cross the arms in front of the thorax and to 'push trying to extend the knee'. is measurement was found to have excellent reliability.

Result

At week 0 VISA-P score was 45, the PPTs was 22 Newton and the knee extensor torque was 80 kilograms. At week 10 (1 month a er the end of the treatment) the VISA-P was 83, the PPTs was 33 kilograms and the knee extensor torque was 119 kilograms (Table 1).

Discussion

e present study examined the e ect of Bioptron light combined with an exercise programme consisting of eccentric-concentric training, isometric contraction, simple lumbo-pelvic control exercises

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