ECCENTRIC EXERCISE EFFECT (EET) ON PATELLAR TENDINOPATHY (PT): LITERATURE REVIEW

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Abstract

Introduction: Patellar Tendinopathy (PT), also known as jumpers knee, is a soft tissue injury that commonly affects athletes who participate in sports that involve running and jumping. The treatments that can be done can be conservative and operative. In this case, operative means a way of surgery while conservative is by doing exercises. Some experts say that eccentric exercise (EET) is the best exercise for patellar tendinopathy.
Objective: To find out and conduct observations about the effectiveness of eccentric exercise training, particularly in cases of patellar tendinopathy, using existing scientific evidence.
Method: This literature review was based on journals with similar characteristics, such as Randomized Control Trials (RCT), controlled meta-analysis, and Randomized Studies. PubMed, ScienceDirect, ResearchGate, Elsavier, and J SportMed databases were searched for data sources. Patellar Tendinopathy, Eccentric Exercise, Eccentric Therapy, Jumpers Knee, Patellar Tendon, Chronic Patellar Tendinitis were some of the keywords used to find data sources. The following were the inclusion criteria: Data sources ranged from 2008 to 2020, respondents were male and female, the data source was related to PT, and the data source was in English. The exclusion criteria for this article were that the respondent's age wass less than 18 years or greater than 65 years, that the number of respondents was less than 30 participants, and that the article had no relationship with EET or PT.
Conclusion: EET increases the patellar tendon's resistance to tension and causes collagen fibers in the tendon to lengthen. EET promotes the formation of tendon collagen fibers, increases remodeling, and requires less oxygen consumption.
Keywords: *Patellar Tendinopathy, Eccentric Exercise, Jumper's Knee*

INTRODUCTION

Patellar Tendinopathy (PT), also known as jumper's knee, is a soft tissue injury that commonly occurs in athletes who participate in sports that involve running and jumping. These sports include volleyball, basketball, and running (Helland et al., 2013; Nuhmani & Muaidi, 2018; Tendinopathy et al., nd). PT is an inflammation of the tendon that connects the patella to the tibia, causing pain and loss of function of the patellar tendon and can affect the quadriceps muscle. The patellar tendon is one of the strongest tendons in the human body, measuring 4 to 5 cm in length, ± 3 cm in width, and 1 cm in thickness. The patellar tendon is designed for standing against gravity, running, walking, and jumping (Gómez Daz, 2016). PT can affect both recreational and professional athletes. It can also affect people of all ages, but it primarily affects young athletes (11.8 percent - 14 percent) (Kulig et al., 2015; Nuhmani & Muaidi, 2018; Tendinopathy et al., nd). Volleyball athletes have a 45% incidence of PT, while basketball athletes have a 32% incidence (Nuhmani & Muaidi, 2018; Trojan et al., 2019). The primary cause of Patellar Tendinopathy (PT) is unknown with certainty; however, it can be determined that there is overuse, causing the tendon to be unable to adapt to the given load. This causes repeated microscopic damage to the tendon fibers (Biernat et al., n.d.; Malliaras et al., 2015).

The risk factors that can cause patellar tendinopathy are classified as intrinsic or extrinsic. Intrinsic factors are those found within the body, such as height, weight, age, obesity, the length and strength of the hamstring muscles, quadriceps, and other thigh muscles, joint range of motion, and lower limb length, and quadricep and hamstring muscle weakness. Extrinsic factors such as training errors, overtraining, insufficient equipment, poor technique, and training in difficult environments all increase the risk of PT (Murtaugh & Ihm, 2013; Nuhmani & Muaidi, 2018).

Symptoms of patellar tendinopathy include stiffness around the knee tendon in the morning that disappears after walking for a while, the patellar tendon is soft when touched, varying pain including pain at the base of the patellar tendon (65-70%), quadricep tendon (20%), and the end of the base of the tendon that attaches to the tibial

tuberosity (10%), the latter is painful during certain activities such as jumping, squat (Helland et al., 2013; Nuhmani & Muaidi, 2018). PT-related symptoms will be a problem, interfering with daily activities and sports activities. As a result, the most appropriate treatment must be used to resolve these issues.

Conservative and operative treatment options are available, with operative treatment involving surgery and conservative treatment involving exercise. Eccentric exercise (EET), according to some sources, is the best exercise for patellar tendinopathy. Stanish and Curwin first introduced EET in 1986, and the first study was conducted on 200 athletes with Achilles tendinitis. The exercise was performed for 6 weeks, and 44% of the patients experienced improved recovery (Gómez Daz, 2016). Then, in 1988, Alfredson did EET exercises for 12 weeks with six series of 15 repetitions, with the exercise progressing with increasing load, resulting in a gradual increase (Gómez Daz, 2016). According to some research, EET, in addition to other treatments, is the best way to treat PT. The EET is mentioned in the National Institute for Health Case Excellence (NICE) London guidelines (Breda et al., 2021).

OBJECTIVES

Because some literature suggests that eccentric exercise training is the best treatment for PT, the main objective of this article is to find out and conduct observations about the effectiveness of eccentric exercise training, particularly in cases of patellar tendinopathy, using existing scientific evidence.

METHODE

This literature review was based on journals that had the same characteristics, such as using a Randomized Control Trial (RCT), controlled meta-analysis, and Randomized Studies. The following databases were searched for data sources: PubMed, ScienceDirect, ResearchGate, Elsavier, and J SportMed. Patellar Tendinopathy, Eccentric Exercise, Eccentric Therapy, Jumper's Knee, Patellar Tendon, Chronic Patellar Tendinitis were some of the keywords used to find data sources.

Data retrieval - data sources have criteria - criteria that have been set by the author. The criteria set consists of inclusion and exclusion criteria. The following criteria were used to select literature for this review: Data sources ranged from 2008 to 2020, respondents were male or female, data sources were related to PT, and data sources were in English. Exclusion criteria for this article included respondents who were under the age of 18 or over the age of 65, a sample size of approximately 30 people, and articles that had no relationship with EET or PT.

RESULTS

Following a search of the aforementioned database, a total of 100 articles were discovered. The title was then considered as part of the selection process (64 selected articles). The abstract was then read to determine the validity of the data source as the basis for a systematic review; if reading the abstract was not enough to decide which data source to use, the entire article was read (20 articles). The overall process of finding articles was as follows: from the 100 articles found, 64 were chosen based on title, then narrowed down to 20 articles that met the inclusion criteria, and six articles were discarded because they did not produce the desired results. As a result, 14 of the articles were exactly as expected. This article's main review focused on the theoretical underpinnings of EET's effectiveness in PT cases, though some articles included additional treatments.

Cook et al. (2008) divided respondents into two groups to do EET exercises using the Alfredson protocol, with one group doing EET exercises with the sore foot in the neutral position and the other group doing EET exercises with the sore foot in the plantar position, with the results showing no significant difference between the two treatment groups.

The study's weakness was that it did not determine whether the injury was in the same location. Another study, by Mark Young et al. (2010), compared EET training on a 25° incline to another group on a flat surface; the results of this study were better on the Visa scale, with no difference in improvement demonstrated. Another study compared

and combined EET exercise with other treatments (concentric, TENS, Ultrasound, Low Laser Treatment, etc.).

Eccentric Exercise* VS *Concentric Exercise

Jonsson et al. (2012) conducted a study that compared concentric and eccentric exercise in tendinosis. The scale of pain and movement of the knee was measured before, during, and after the 12-week exercise program. In the fourth week of administering the exercise program, EET exercise resulted in a significant reduction in pain scale. According to the findings, EET was effective in both promoting and facilitating the formation of tendon collagen fibers.

***Eccentric Exercise* (EET)VS *Progressive Tendon Loading Exercise* (PTLE)**

Breda et al (2020) compared EET to PTLE in patellar tendinopathy patients. The exercise program lasted 24 weeks, and the participants were divided into two treatment groups. The first group received EET, which included isometric, isotonic, and reinforcement exercises. The exercises were done in a specific order and within the confines of normal pain tolerance. The other group was given a PTLE exercise that was divided into four stages. Stage 1 consists of one leg isometric exercise with 60° knee flexion and knee extension for 5 repetitions, while Stage 2 consists of stage 1 isometric exercise on each first day and fixed isotonic exercise with 1 leg on the second day, beginning with 4 sets of 15 repetitions at an angle of 45 degrees. Knee flexion between 10° and 60° was followed by 4 sets of 6 repetitions with increased load and knee angle between nearly full extension and 90° flexion. Stage 3 consists of plyometric and running exercises that begin with three sets of ten repetitions. The final stage consists of an exercise-specific sport with specific sporting characteristics. According to the findings of this study, PLTE is superior in EET exercise for the case of PT.

Eccentric Exercise* VS *Non Thermal Ultrasound* VS *Friction Massages

Stasinopoulos et al. conducted an 8-week study in which they compared three groups of modalities used to treat PT. At the end of the treatment, there was a significant increase in pain reduction.

***Eccentric Exercise* and *Low Level Laser Therapy* (LLLT)**

Xiao Guang Liu (2014) conducted a study that combined LLLT and EET in the case of PT. The study lasted four weeks, and the results showed that the combination of LLLT and EET produced significantly better results than either treatment alone.

DISCUSSION

EET is the best treatment option for PT with various pathologies. EET is excellent for strengthening the quadriceps and back muscles (Dufour et al., 2013; Manfredini Baroni et al., 2015). According to the theory, EET reduces pain faster than stretching (Dimitrios et al., 2012). EET strengthens the tendon unit, which means it aligns the collagen network in the tendon, produces stronger tendon fibers, stimulates fibroblast activity, and monitors the healing process between the tendon and the surrounding tissue (Dimitrios et al., 2012; Lamnisos et al., 2018; Murtaugh & Ihm, 2013). Regardless of the mechanism underlying EET's pain-relieving effects, studies have shown an increase in pain reduction as well as an increase in function and activity in PT patients. 2015).

EET exercises involving the use of weights on the affected extremity will necessitate a great deal of effort, and increasing loads will necessitate even more effort. There is some evidence that exercise should be performed in the presence of pain, so patients with varying degrees of pain are present. The presence of a physiotherapist who accompanies the patient during the training process is an important aspect of a successful PT treatment. A physiotherapist's job is to monitor and assess any increase in the burden of PT patients (Breda et al., 2021; Goldman & Lentz, 2010).

Although the effectiveness of eccentric exercise for PT rehabilitation has been demonstrated in this review, EET is not the only effective modality for treating PT injuries. To achieve satisfactory results, a physiotherapist must be able to combine various modalities (Gómez Daz, 2016; Rudavsky & Cook, 2014).

CONCLUSION

This review demonstrates that EET is an effective treatment for PT rehabilitation because it increases the resistance of the patellar tendon to tension and results in tendon collagen fiber elongation. EET exercise has been shown to have several physiological effects on the patellar tendon because it promotes the formation of tendon collagen fibers, increases remodeling, and requires less oxygen consumption. There is no specific PT exercise protocol.

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