

The Risk Factor and Exercise Therapy for Knee Osteoarthritis

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Abstract. Knee osteoarthritis (KOA) is one of the most common osteoarthritis. It is a chronic degenerative joint disease, within a year, incident KOA patients frequently move abruptly to advanced-stage radiographic disease. The main treatment program of KOA consist of physical therapy, pharmacotherapy and reconstruction surgery. Currently, there are more and more evident show that exercise therapy can be used a better treatment to help improve the symptom of KOA, release the pain. To evaluate the optimal exercise trial for patients with different degrees, this review mainly summarized the risk factors of KOA, as well as the characteristics of aerobic exercise and resistance training and therapeutic efficacy in different type of exercise for patients with different symptom and degree.

Keywords: Knee osteoarthritis; exercise therapy; resistance training; aerobic training; risk factor.

1. Introduction

Osteoarthritis (OA) is among the most prevalent degenerative joint conditions, knee OA is described as side effects of constant torment and confined joint movement. The occurrence of KOA has risen sharply in late a long time because of the supported expansion in future and the percentages of obesity around the world [1, 2]. OA has a distinctive feature of damage to articular ligament and the development of new bone at the edges of the bone due to biochemical, metabolic, physiological and pathological varies in the articular cartilage and subchondral bone, also known as osteophytes. Symptoms that may result include joint pain, inhibited joint movement, creaking, deformity, asymmetric joint swelling, signs of inflammation, and gait changes. The prevalence of knee osteoarthritis (KOA) ranges from 5%-15% in men more than 60 years old and 10%-25% in women more than 60 years old [3, 4]. The risk factors of KOA consist of aging, obesity, gender, ligament injury (commonly anterior cruciate ligament injury).

Currently, there are many options of non-surgical management for knee osteoarthritis, including physical therapy, rehabilitation therapy, pharmacotherapy, lose weight, exercise therapy [5]. In many cases, exercise therapy has been shown as an effective nonpharmaceutical way for knee osteoarthritis, it is suitable for patents with early-stage KOA [6-11]. In one of review research, it summarizes and analyze the different approaches of activity treatment for KOA with respect to release the symptoms of KOA, including aquatic exercise (AE), stationary cycling (CY), resistance training (RT), traditional exercise (TC), and yoga (YG) [11]. All listed five approaches can effectively improve the KOA [5]. Furthermore, exercise therapy can not only release the pain of patients with KOA, but also effectively delay the surgical treatment.

Although many types of exercise have been showed to improve the symptoms of KOA, there are still have limitation in exercise protocols for different patients. However, there is no clear comparison between strength training and aerobic training for different levels of symptoms. Strength training and aerobic training are different in terms of training modalities, and therefore need to be more clearly oriented as interventions to achieve symptomatic relief. So, this study summarizes the relevant studies on strength training and aerobic training to compare and analyze the differences in the application of the two, and to provide reference guidelines for the subsequent exercise interventions.

2. Risk Factors for KOA

Knee OA has significantly impacted the daily life of patient. The risk factors mainly consist of overweight and obesity, inflammation and injury as well as age.

2.1. Overweight and Obesity

More than 33% of the total populace is classified as overweight or obesity, and that is what research proposes assuming latest things proceed, in excess of 55% of the total populace will be arranged as overweight or fat by 2030 [2]. Nowadays, overweight and obesity has become one of the principal risk elements of KOA [2,12]. In obese and overweight patients, appropriate weight loss (10% or more) has a positive clinical effect and has also been shown to be effective in improving osteoarthritis symptoms [13]. In one of research, to evaluate the longitudinal association between the KOA and body composition involved fat and muscle, selecting 1,650 subjects without radiographic KOA in baseline. The result found that the obese women show a higher risk of KOA, which was significantly increase. Among the body creation, including corpulent nonsarcopenic (fat), sarcopenic fat, sarcopenic nonobese (sarcopenic), or nonsarcopenic nonobese (the referent classification), heftiness in light of body structure and sarcopenic stoutness are connected with the KOA, while there is no clear show that sarcopenia can cause the increment chance of KOA [12].

2.2. Inflammation and Injury

According to the research, trauma history in knee is another risk factor for KOA. Systematic reviews show that anterior cruciate ligament injury significantly increase the risk for development of knee osteoarthritis [13-15]. In some cases, knee injury may contribute to post-trauma osteoarthritis (PTOA). In some common knee joint injury, such as ACL and meniscal injury, will lead to POTA in 20%~25% of patients [16].

Knee osteoarthritis also can be caused by inflammation, inflammatory molecules and cytokines may stimulate and damage the microenvironment within the joint. It may lead to some joint disease, including subchondral bone, cartilage, meniscus and infrapatellar fat pad (IFP) [11]. IFP is a nearby fat tissue situated beneath the patella, it assumes a vital part in KOA pathogenesis, in any case, the worry whether other comparable fat tissues intra-articular have a similar capability with IFP or even co-work with IFP, need to concentrate on unequivocally later [17].

2.3. Age

The pervasiveness of osteoarthritis (OA) of the knee in grown-ups matured 60 years or more seasoned is around 10% in men and 13% in ladies, making knee OA one of the main sources of handicap in the more established populace [17]. Age could be also associated with the cause of KOA. It be regarded as a main driving force of joint to repair itself and maintain normal health, it also has been observed that changes in cellular composition and signaling mechanisms in the joints of the elderly may contribute to the development of degenerative joint diseases. Senescent cells found in aging joints and OA joints release senescence-related mediators that destroy joint tissue. These changes, as well as the chronic pro-inflammatory environment associated with aging, may impede the ability of joints to repair, ultimately leading to OA [18].

3. Exercise Therapy for KOA

KOA is a heterogeneous sickness related with significant consequences for personal satisfaction, and its clinical administration is troublesome [19]. Currently, there are various approach to treat knee osteoarthritis, including regeneration and non-surgical management. Exercise therapy is a method of non-surgical management, it also has different type of training, divided into resistance training and aerobic training. These two means of exercise therapy both can greatly manage the symptom of knee osteoarthritis and have different mechanism during the training [5, 19].

3.1. Resistance Training

Resistance training is one of exercise therapy, it has been proofed that appropriate training scheme can benefit for improving knee joint pain, and it can reinforce the muscle strength of lower-limb [6-8,20].

Eccentric resistance training and concentric resistance training can both have an effectively improvement for WOMAC (pain, stiffness, physical function), because it is related with the increased flexion strength. Meanwhile, eccentric RT can reduce the cardiovascular stress, so it is more appropriate for patient with cardiovascular disease compared to the concentric RT [8,21]. Resistance training conducted for 8 to 12 weeks, 3 to 5 session each week appears to safely and effectively improve the pain of KOA and enhance muscle strength [22]. Furthermore, to compare the effectiveness between focused energy obstruction preparing and low-force opposition preparing, one examination tried KOA patient through 12 weeks of RT at focused energy RT (70-80% of 1-reiteration greatest (1-RM)) or low-force RT (40-half of 1-RM), the result shows that there were no greater improvements in high-intensity RT compare with low-intensity RT, but it was well tolerated. Thus, both two training exercises could be used for patients with knee osteoarthritis [23].

3.2. Aerobic Training

Aerobic training has been seen as one of the most effective ways to relieve the symptom of knee osteoarthritis. It is a common and convenient approach to manage knee pain, it provides many benefits for patients with KOA, including expanding cardiorespiratory movement, lessening oxidative pressure, and advancing fat tissue digestion [11]. Aerobic training consists of walking, jogging, yoga, ball game, swimming, cycling, rhythmic exercise [11]. A 6-week reverse walking program reduces pain and dysfunction and improves quadriceps strength and performance to a greater extent in patients with knee OA than either the forward walking group or the control group [24]. Regular swimming exercise can greatly help middle-age and older people with KOA improve joint pain, stiffness, muscle weakness, and the benefits of swimming exercise are similar with other land-exercises, including cycling and jogging [25]. Meanwhile, if adopt an appropriate exercise prescription, it can have a better impact on long-term benefit for patients. Supervised, partially supervised and non-supervised can greatly improve the osteoarthritis, but patient preference for the level of supervision and exercise modality may have strongly connection with the degree of improvement [9, 26]. There is also evidence suggest that Baduanjin exercise have positive impact on KOA by three aspects of MOMAC score (pain, stiffness, physical function) [11]. In one rat model of obesity induced by the HFS (high fat/high score) diet, it shows that aerobic training prevented knee OA better than resistance training [27]. Low-power vigorous preparation joined with blood stream limitation (LI + BFR) might be the potential activity procedure for cyclist with knee OA [5].

4. Conclusion and Recommendation

In this review, various exercise can be considered as a viable way to alleviate the symptom of KOA, reducing the risk of disease, reinforced the cardiovascular function and muscle strength. However, there are still have slight distinguish between aerobic exercise and resistance exercise, in order to adopt an optimal treatment for different patient group with KOA, diagnose the contributing factors and provide a individual treatment is needed.

Aerobic exercise can be divided into high-intensity and low-intensity, former is more appropriate for patients suffered from gentle KOA. While when people are suffering from more severe symptom of KOA, the low-intensity aerobic is the better choice. Meanwhile, the different type of resistance trainings also has different effects for patents with different stage of osteoarthritis. Hence, to analyse the efficacy of exercise therapy, it is critical to design customized and personalized exercise programs based on the specific characteristics and severity of symptoms of the target groups.

However, though exercise therapy can pose a positive impact on KOA, there are still have limitation of clinical studies to provide more reliable evidence with the design of exercise therapy

programs, including period of exercise and training intensity. In addition, exercise therapy should not be regarded as the unique manner, if cooperate with other therapies, such as pharmacotherapy, it can bring a further recommendation for different stage of patients, to provide a more precise and comprehensive treatment.

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