Prevention, Treatment and Exercise of Osteoarthritis in the Elderly—Knee Osteoarthritis as an Example

Yan-Hong ZHANG\textsuperscript{a}, Zhi-Yong WU\textsuperscript{b} and Zhi-Da HUANG\textsuperscript{c}
Nanchang Institute of Science & Technology, Nanchang, Jiangxi, China
\textsuperscript{a}1209956246@qq.com, \textsuperscript{b}1209956246@qq.com, \textsuperscript{c}1209956246@qq.com

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Abstract. With the increasing incidence of knee osteoarthritis in the middle-aged and the elderly in China, the joint disorders and deformities caused by knee osteoarthritis seriously lead to joint disability and affect the quality of life of patients. Therefore, this article from the knee osteoarthritis as the main clinical manifestations, to explore the mechanism of prevention and treatment of knee osteoarthritis and the treatment of knee osteoarthritis, in order to provide a reference for the establishment of the correct prevention and treatment of knee osteoarthritis.

Introduction

The number of people suffering from arthritis in the world is up to 355 million. In China, more than half of people over 50 years old suffer from osteoarthritis, 90% of women and 80% of men over 65 years-old suffer from osteoarthritis, and the vast majority of osteoarthritis occurs in the knee joint. With the aging of our country, the incidence of knee osteoarthritis is still increasing. The joint disorders and joint deformities caused by knee osteoarthritis seriously lead to joint disability and affect the quality of life of patients. In this paper, from the knee osteoarthritis as the main clinical manifestations, to explore the mechanism of prevention and treatment of knee osteoarthritis and the treatment of knee osteoarthritis, so as to provide the basis for the establishment of the correct prevention and treatment of knee osteoarthritis.

Knee Osteoarthritis and Clinical Manifestations

Osteoarthritis (OA) is a chronic disease of bone and joint, which is mainly caused by articular cartilage damage due to biological factors and biomechanical changes. Its pathological characteristics are degeneration of subchondral bone and periosteum, hyperplasia of bone, synovium and capsule, relaxation, weakness or spasm of ligament and muscle around joint, etc. More commonly, osteoarthritis is a kind of degenerative disease, which is caused by many factors such as old age, obesity, strain, trauma, congenital abnormality of joint, deformity of joint and so on. The clinical manifestations of osteoarthritis are joint pain, tenderness, stiffness, joint swelling, limited movement and joint deformity. In clinic, osteoarthritis is easy to occur in the knee joint, hip joint, ankle joint, neck and lumbar vertebrae and so on. More patients mainly wear the medial compartment of the knee joint, only a few belong to the eversion type. Therefore, the treatment of osteoarthritis mainly focuses on the knee joint and other parts. Osteoarthritis is a common and high incidence disease in the elderly, of which knee osteoarthritis has the highest incidence. In Europe and America, knee osteoarthritis ranks fourth and eighth respectively. The epidemiological study of knee osteoarthritis in six major cities in China shows that the total prevalence of knee osteoarthritis is 15.6%, and the prevalence increases with the increase of age.

Mechanism of Prevention and Treatment of Knee Osteoarthritis

At present, there are many methods for the treatment of knee osteoarthritis, including drug treatment, nondrug treatment and surgical treatment. Because of the advantages of sports therapy, such as easy to implement, small side effects and low cost, the new version of osteoarthritis
diagnosis and treatment guidelines clearly points out that sports therapy such as joint function training and muscle strength training are nondrug therapy for osteoarthritis. A large number of studies show that these sports therapy can improve the clinical symptoms and joint function of patients with knee osteoarthritis. At the same time, in recent years, the research on the mechanism of exercise therapy in the prevention and treatment of knee osteoarthritis has become a hot spot, and its possible mechanism of action mainly involves the following aspects:

The Occurrence of Knee Osteoarthritis is Closely Related to Biomechanical Factors

The changes of biomechanical factors such as weight bearing or stress, stress line, stability of cartilage, ligament, capsule and muscle of knee joint can lead to the occurrence of knee osteoarthritis or aggravate the symptoms of patients with knee osteoarthritis. At the same time, patients with knee osteoarthritis can further accelerate the changes of above biomechanical factors due to clinical symptoms. Jiang Shuyun and Chu Lixi pointed out that functional exercise of knee joint muscles and ligaments can significantly increase the stability of knee joint, improve the walking ability of patients with knee osteoarthritis, and improve the quality of life of patients. Cao Yuelong and other researchers found that muscle weakness, muscle strength decline and muscle function change play an important role in the pathological process of knee osteoarthritis, and pointed out that the effective target organ of knee osteoarthritis treatment is muscle. Chen Jian and other researchers found that knee osteoarthritis can produce joint derived muscle inhibition, long-term joint derived muscle inhibition can cause muscle atrophy, the atrophy of knee joint muscles, ligaments, capsule and other tissues will inevitably cause changes in the biological stress of the knee joint, accelerate the pathological changes of knee osteoarthritis, and sports therapy is a reasonable way to change muscle atrophy and joint instability, and prevent knee joint cartilage degeneration Effective means.

Molecular Mechanism of Exercise Therapy

Pover, S.K. showed that aerobic training can increase the activity of SOD CSHPX and cat in young rats, and running can keep higher proteoglycan P on the surface and middle area of the articular cartilage of KOA. Kiviranta found that moderate intensity increased the content of GAGs, mainly chondroitin sulfate, in the middle layer, deep layer and even depletion layer of cartilage, but the surface layer there was no significant change. Aerobic exercise can increase the expression of HSP in articular cartilage, reduce the apoptosis of chondrocytes, and achieve the therapeutic effect. Fallah, M.M. suggested that aerobic exercise can treat OA because it can inhibit the signal transduction pathway of proinflammatory mediators. Studies such as Williams PT have shown that running significantly reduces the risk of OA, probably because running reduces BMI.

In conclusion, as a means to improve the biomechanical environment of knee joint, sports therapy has been widely used in the prevention and treatment of knee osteoarthritis by scholars at home and abroad, and the therapeutic effect is satisfactory and positive. However, at present, the research on the exercise cycle, exercise intensity and objective evaluation of knee osteoarthritis by domestic and foreign scholars is still in the primary stage, especially the mechanism of exercise on knee osteoarthritis, which needs further research and better effect.

Prevention and Treatment of Knee Osteoarthritis

Appropriate Sports

There are many middle-aged and old people suffering from knee osteoarthritis, which is related to age, heredity and joint fatigue, especially some heavy manual workers, who often cause osteoarthritis due to some small problems in middle age. For this chronic disease, the elderly should pay special attention to appropriate exercise to prevent osteoarthritis. Therefore, it is not suitable for the elderly to run, including jogging, because the elderly, cartilage elasticity is poor, the impact force of the joint during running is too large, it will damage the bone structure, but lead to knee osteoarthritis. Learning Taijiquan after old age is also not appropriate, because of the high
requirements of body position, especially knee bending position is very harmful to joints. In 
addition, inappropriate sports include mountain climbing, stair climbing and so on, which will also 
cause joint wear and tear, and is not good for osteoarthritis. According to the research, swimming, 
walking and cycling are the most suitable sports for the elderly. In the process of exercise, if there is 
fatigue and pain, you should stop and rest properly. Muscle exercise will have a good effect on the 
blood circulation of joints. It is suggested that the elderly sit or lie on the bed, straighten their legs, 
slowly tighten the back of their feet towards the head, and then slowly relax, which can effectively 
exercise muscle strength and prevent osteoarthritis. Of course, the physical quality of the elderly is 
more complex, but also need to carry out specific sports, otherwise it will aggravate the knee 
osteoarthritis is not good. To prevent knee osteoarthritis, we should pay attention to the diet of the 
elderly. Nutrition balance is a very important measure. We can't blindly supplement nutrition.

**Exercise Therapy for Knee Osteoarthritis**

In the early stage of knee osteoarthritis, the articular cartilage was not damaged obviously, and 
the symptoms of joint pain and stiffness were not obvious. At the same time, after the doctor's 
evaluation, it is not necessary to carry out the operation, and it is recommended to carry out the 
exercise therapy. In clinic, nondrug therapy is the first choice for knee osteoarthritis. In nondrug 
therapy, exercise therapy has been advocated in foreign countries for a long time. "Clinically, the 
sports therapy of knee osteoarthritis can be divided into equal length training, equal tension training 
and endurance training, which can be treated by oneself and mainly used to train muscle strength. 
The other type is training that needs help from others."

**Equal Length Training.** The purpose of isometric training is to keep the muscle length constant 
and change the tension. Isometric training is a metaphor for holding something, stretching the 
muscle to keep it still. Such as knee joint holding, hip joint holding exercise, can prevent muscle 
atrophy, increase muscle strength; it is recommended to twice a day, 20 times a time.

**Isotonic Training.** That is to keep the tension constant and the length changes. This training is 
generally used for rehabilitation training; 10 times of maximum exercise, which is the best way to 
exercise muscles. It is suggested to increase some weight in quadriceps femora’s training. At the 
same time, due to the pain symptoms of patients with knee osteoarthritis, the amount of exercise can 
be reduced to three quarters. You can first test your maximum amount of exercise, and then reduce 
it to three quarters.

**Endurance Training, Mainly for Maintaining Cardiopulmonary Function.** For example, 
swimming (better flexibility of joints); cycling (no weight bearing of knee joint during exercise, 
keep flexibility of joints, and keep cardiopulmonary function).

**Need Assistance to Complete the Training.** (a) Joint loosening technique. Joint pain and 
excessive activity may cause adhesion, stiffness and other phenomena, and then lead to decreased 
joint activity. May as well try joint loosening technology, mainly divided into four levels. The first 
level is a small range of movement; the second level is a wide range of movement away from the 
starting end; the third level is a large range of manipulation, which can touch the end; the fourth 
level is a minimum range of end effect. Generally, it is suggested that patients with arthritis pain 
should use Level 1 and Level 2 manipulations; after pain relief, in order to restore the activity of the 
joint, try Level 3 and Level 4 manipulations. The loosening technique can also be combined with 
other methods. Firstly, joint pain and swelling may occur after joint loosening. It is recommended to 
apply hot compress before loosening and cold compress after loosening to prevent capillary 
bleeding and increase pain or pain after stimulation. Secondly, with electrotherapy, use ultrasound 
or ultrashort wave to promote blood circulation and avoid adhesion. Thirdly, in combination with 
traditional Chinese medicine wax therapy, the elasticity of muscle fiber will increase after heat 
treatment. It is suggested to use traditional Chinese medicine fumigation or wax therapy before 
loosening. Of course, other physical factor therapies, such as acupuncture and carbon magnetic 
thrapy, can also be used. (b) Proprioception training. When the activity of the elderly or 
osteoaarthritis patients is reduced, the proprioception may be decreased. Proprioception, the popular 
exploration is that when walking, you know your speed, which belongs to the sense of movement;
when the legs are not raised high, the joint activity is not large, which belongs to the sense of vibration; how the sitting posture belongs to the sense of position. These three sensations belong to both sides of the joint. If the proprioception of patients with arthritis drops, proprioception treatment can be carried out to restore their proprioception. Such as local pressure and elastic bandages (elastic socks, elastic pants) wrapped tightly, can make it recover 30%; squeeze on both sides of the joint, traction and other technologies, known as proprioceptive neuromuscular facilitation technology. (c) Energy saving technical training. Try to exercise slowly, keep good posture at the same time, sit with sitting, and stand with standing; pay attention to proper rest. If lying on your back, use appropriate auxiliary means, such as walking stick and crutch.

The Movement of Knee Osteoarthritis Patients should Pay Attention to. In the study, we found that most of the patients with knee osteoarthritis do a lot of exercise to relieve pain, but it is not the case. When they are in the acute stage of knee osteoarthritis and the symptoms are obvious, it is not recommended to carry out exercise treatment; some patients are worried that too much exercise will cause joint wear, so once diagnosed as knee osteoarthritis, they dare not exercise easily. In fact, inactivity may cause muscle atrophy and decrease joint activity, which is not conducive to improving the recovery of osteoarthritis. In addition, exercise therapy should avoid the wrong way of exercise. For example, building climbing exercise and mountain climbing exercise, the survey found that the stress intensity between the cartilage surface can be up to 3 times of their own weight when they go down the mountain and down the stairs, and the weight of the knee during running is about 4 times of their own weight; playing ball is about 6 times of their own weight; squattting and kneeling are about 8 times of their own weight; square dancing, mostly requires fast frequency of knee joint activities, so it is suggested to change it to slow and low frequency of knee joint collision. For Taijiquan, it is suggested to carry out the modified version of Taijiquan and try to exercise the upper body. When the patient is in the acute stage of osteoarthritis, such as severe pain, stiffness and other symptoms, it is not suitable for exercise therapy. Patients with osteoarthritis should make personalized treatment plan according to their own situation. For example, for walking, those in poor physical condition should be controlled at 6000 steps, and those in good physical condition can try 10000 steps; choose a suitable way to stay in the office for a long time. If you want to exercise, it is recommended to put some small pillows between the legs and the chair, with the back close to the back of the chair and the two legs moving forward and backward; or raise the two legs by yourself to exercise the hip and prevent the quadriceps from turning out.

Exercise Therapy Prevention of knee Osteoarthritis

The exercise therapy of knee osteoarthritis is very important, but the prevention of exercise medicine is more important. The first level prevention refers to the prevention of arthritis through exercise; the second level prevention is to delay the aggravation of arthritis symptoms through exercise when the patient has arthritis; the third level prevention, if the patient has been ill and the symptoms are severe, can reduce the symptoms and improve the function through exercise. To prevent knee osteoarthritis, we can start from four aspects. First, we should change the way of diet, for example, obese people need to lose weight and eat reasonably during the period; second, we should change the weight-bearing, for example, some arthritis patients usually carry heavy load, pull heavy work, etc., to reduce the weight-bearing; third, we should avoid intense accelerated exercise and reduce violent exercise; fourth, we should change the way of behavior, such as some Women like to wear high-heeled shoes and men like to wear high-rise shoes. In daily life, if the insole is too high, it can be adjusted properly; if it is arthritis patients, it is recommended to use some protective supports.

Conclusion

Through the research on the functional benefits of different intensity exercise on knee osteoarthritis, we try to determine the best exercise intensity to improve exercise therapy, reduce the blind obedience of exercise intensity selection in clinical rehabilitation treatment, and hope to explore the prevention and treatment of middle-aged and old patients with knee osteoarthritis,
reduce the recurrence rate of knee osteoarthritis patients, and reduce the pain of knee osteoarthritis patients. We should enrich the connotation of "exercise and prevention" and further improve the rehabilitation and prevention strategies of the elderly with knee osteoarthritis.

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References

[1] Li Peiyu, Chen Haipeng and Qiu Honglong. Research progress in the treatment of primary knee osteoarthritis with traditional Chinese Medicine [J]. TCM research, 2014 (11).

[2] Chen Lirong, Wu Ran, Zheng Jiejiao, Pan Yujian, and Bingchen. The effect of knee osteoarthritis on the balance ability of the elderly [J]. Nursing research, 2016 (11).

[3] Chen Qi, Meng Xiaoyun, Deng Huaping, Zhan Hongsheng and Guo Chaoqing. Observation on the effect of guiding therapy on knee osteoarthritis [J]. Modern clinical nursing, 2014 (10).

[4] Yi Yi, Jin Rongjiang, Yang Yang and Kou Yangyang. To analyze knee osteoarthritis from the biomechanics of lower limbs [J]. Chinese Rehabilitation Theory and practice, 2013 (06).

[5] Wang Jianjun. Analysis of 28 cases of knee osteoarthritis treated by Decoction of knee osteoarthritis combined with Huoxue Xiaozhong formula [J]. Journal of Guiyang College of traditional Chinese medicine, 2013 (02). Chen Lirong, Wu ran, Zheng jiejiao, pan Yujian, an Bingchen.