A Review of Non-Arthroplasty Treatment for Knee Osteoarthritis

Abstract
Knee osteoarthritis is one of the most important causes of disability in elderly. Increasing age is associated with increased knee osteoarthritis. The average population age is increasing. In the next 30 years, Iran will enter the club of countries with the 30% of the population aged over 65. The cost of osteoarthritis treatment accounts for a significant amount of each country's GDP. Knee osteoarthritis is caused by an imbalance between the destruction and repair of articular cartilage under the influence of several risk factors such as trauma, excessive use, and genetic predisposition. Overweight and joint disorders apply an increased load to the specific points of the knee. This overload creates a tissue response, which provides the conditions for the occurrence of osteoarthritis. No cure has been found for knee osteoarthritis so far. Although joint replacement (knee arthroplasty) at this point is the best solution, its survival and durability is not permanent. Some patients are not suitable for surgery; some are reluctant to have surgery, and finally, the cost of surgery is high. Treating knee osteoarthritis without joint replacement is another method to deal with this problem. Through extensive studies and review of medical literature, The American Academy of Orthopaedic Surgeons has prepared the Guideline for Non-Arthroplasty Treatment of Knee Osteoarthritis. This Guideline brings the promise of quality of life equal to the surgical approach. The Academy recommends its use to all orthopaedic surgeons and also calls for an assessment of the outcome studies. Nonarthroplasty treatment of knee osteoarthritis is a simple and inexpensive treatment method. The majority of patients will benefit from this treatment. We all need to set up centers to treat patients according to the academy Guideline with special interest on recording outcomes.

Keywords: Knee osteoarthritis, Nonarthroplasty Treatment, AAOS guideline

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Epidemiology

In Europe, 100 million people suffer from osteoarthritis (OA). Direct costs of OA in 2004 in USA have been 510 billion dollars. In this regard 11.3 million people have visited physician office in 2009. As the age increases, the number of patients with OA increases. At the age of 80, one of two people will have OA at least in one of their knees. The average age of population is constantly increasing. The population growth of the elderly will rise from 10% to 30% in the next 35 years. Thus, Iran will be ranked in the old 56 countries by 2050, which was among the young countries in 2015. Therefore, we will face the increased rate of OA each year. There is no accurate data on patients with OA in our country. However, busy clinics indicate a high prevalence of knee osteoarthritis. The ordinary scenario is a large number of relatively heavy-weight women with bags of similar drugs in their hands wandering from one office to another.
Prevention
There has been no cure for OA or the so-called repair of cartilage; however, its occurrence can be somewhat prevented. Joint replacement is the common treatment for knee OA, which is not a definitive cure but helps to improve the quality of life and function of joint. Non-arthroplasty treatment of knee osteoarthritis is indicated for patients with co morbidty or those who not willing to have a surgery. Prevention is better than cure. The prevention of OA has not been taken seriously so far. However, due to the gradual nature of the disease progression and recognition of some of OA pathomechanics, a window is opened through which the OA progression can be prevented at some stages of the disease. For example, weight loss and exercise has been recognized in playing their role.

Pathomechanics of Osteoarthritis
Pathomechanics of OA is divided into two initiation and progression phases. The initiation phase is associated with kinematic changes, which apply the load to unconventional areas that can not withstand it. During the progression phase, the destruction of the cartilage severely progresses with the increase in load on the knee. During menopause and old age, a combination of biological, morphological and neuromuscular is imposed on the bone system, causing idiopathic OA.

Knee OA involves medial tibiofemoral, lateral tibiofemoral, and patellofemoral compartments. The resulting changes reduce the fair transfer of the load throughout the joint and lead to disruptions in the joint performance. Knee OA dramatically reduces daily activity and significantly increases the per capita health costs.

Symptoms
The major symptoms of knee OA include joint pain, joint stiffness during rest and activity, difficulty in walking such as instability. Physical symptoms, including reduced joint motion, crepitation (crepitus), increased bone mass due to the formation of osteophytes, and deformities due to joint pseudo-instability and effusion in a number of patients. Decreasing the sense of proprioception causes knee instability. Examining the risk factors of unilateral knee osteoarthritis, the decreased proprioception has been found in both knees in patients with one of the knees with OA indicating the impaired proprioception as a risk factor for.

OA visual symptoms
Radiography is the best visual diagnostic tool. Here, we need to refer to the misuse of MRI, which is not indicated for the diagnosis of OA. Kellgren has divided the radiography of knee osteoarthritis into four stages, which are used in most clinical and research cases.

Class I: The probability of osteophytes presence and the possibility of narrowing the articular space
Class II: The probability of osteophytes presence but the narrowness of intra-articular space
Class III: Small and multiple osteophytes, narrowing of the joint space, sclerosis, possible bone deformity
Class IV: Coarse osteophytes, the narrowness of the joint space, severe sclerosis, bone deformity

Obesity
Obesity is another major risk factor for knee osteoarthritis. The chance of developing knee osteoarthritis in obese people are three times that of normal people. Any amount of weight gain causes an increase in the load of three to seven times the added weight to the joint. Malalignment of the joint adds to this stress. Weight loss has been shown to reduce the risk of osteoarthritis in women. The effects of weight change have an interesting story: The people who have gained more than 5 pounds have been four times more likely to develop osteoarthritis compared to those who have gained or lost less than 5 pounds. It has also been found that women who have lost 5 kilograms over the past 10 years have little chance of developing osteoarthritis. On the other hand, weight loss in obese people with osteoarthritis, especially if accompanied by
physical activity, leads to a better quality of life and better physical functioning.

**The weakness of the quadriceps muscle in osteoarthritis**
Many people with knee osteoarthritis have weakness in their quadriceps muscle. It was thought at first the muscle weakness is due to pain, and thus, its inactivity. As muscle weakness is also seen in asymptomatic arthritis, it can, therefore, be considered as a risk factor for osteoarthritis.

**The importance of prevention in the treatment of osteoarthritis**
Given the importance of prevention, the prevention and treatment of knee osteoarthritis require further consideration and attention. The prevention and even up-to-date treatments for knee osteoarthritis have not been welcomed by physicians. The most striking thing to be mentioned is the benefits of doing exercise and physiotherapy. Health organizations have abundantly provided centers encouraging everyone to do sports and exercise few hours a week from the age of adolescence to eldership. Light and moderate physical activity and exercise, at least 150 minutes per week, not only will not increase the risk of osteoarthritis but also will improve physical performance and quality of life; although heavy exercises are associated with osteoarthritis.

Patients with knee osteoarthritis do not benefit from well-considered and successful treatment and prevention strategies like exercising and fighting obesity for several reasons: People are not aware of the importance of exercise in maintaining health. When it comes to health care, the situation is even worse, since the cutting-edge treatment methods are not used and the follow-up and outcomes of patients are forgotten. The affiliated departments like physiotherapy have abandoned exercise as the main pillar of their work so indifferently that do not accept the exercise prescriptions of patients unless the addition of other modalities such as Ultrasound, Infrared, or TENS, etc to the prescription.

**Recommendations by the American Academy of Orthopaedics**
After systematic surveys and clinical and scientific research, American Academy of Orthopaedics has recommended the non-arthroplasty treatment for knee osteoarthritis Guideline as follows. This Guideline contains 15 recommendations, and each recommendation is associated with four extensions as follows: Strong, Moderate, Consensus, and Inconclusive or Incomplete. Inferring these recommendations is thoroughly described in the guideline.

- A strong recommendation means that the quality of evidence is high.
- A moderate recommendation means that its benefit overcomes its harm.
- A consensus recommendation means that the expert opinion confirms the Guideline.
- An inconclusive or incomplete recommendation means that there is a lack of necessary evidence, which has led to a non-transparent balance between losses and benefits.

**Recommendation 1**
We recommend that patients with knee osteoarthritis participate in self-management program, including body reinforcement, simple aerobic exercises, neuromuscular training, and physical activities, including national guidelines. The recommendation’s power is strong.

**Recommendation 2**
The treatment of knee osteoarthritis without obesity treatment of the patient is like beating the air. The first condition for the treatment success is to understand this fact both by the patient and physician. The Academy recommends weight loss. The recommendation’s power is moderate.

**Recommendation 3.1**
The use of acupuncture is not recommended in patients with knee osteoarthritis. The recommendation’s power is strong.

**Recommendation 3.2**
The use of physical modalities is not recommended for patients with knee osteoarthritis. The recommendation’s power is inconclusive.

**Recommendation 3.3**

We cannot recommend manual therapy for patients with knee osteoarthritis. The recommendation’s power is inconclusive.

**Recommendation 4**

Hinged or unloader braces are one of the knee osteoarthritis treatment methods. According to the Academy, we cannot recommend for or against using them. The recommendation’s power is inconclusive.

**Recommendation 5**

The use of lateral wedge is not recommended for patients with knee osteoarthritis. The recommendation’s power is moderate.

**Recommendation 6**

The use of glucosamine and chondroitin is not recommended for patients with knee osteoarthritis. The recommendation’s power is strong.

**Recommendation 7.1**

The use of non-steroidal anti-inflammatory drugs and tramadol is recommended for patients with knee osteoarthritis. The recommendation’s power is strong.

**Recommendation 7.2**

We cannot recommend the use of or not using acetaminophen. The recommendation’s power is inconclusive.

**Recommendation 8**

We cannot recommend using or not using intra-articular corticosteroids for patients with knee osteoarthritis. The recommendation’s power is inconclusive.

**Recommendation 9**

The use of hyaluronic acid is not recommended for patients with knee osteoarthritis. The recommendation’s power is strong.

**Recommendation 10**

We cannot recommend using or not using growth factors and PRP. The recommendation’s power is inconclusive.

**Recommendation 11**

We cannot suggest that specialists use lavage needles to treat patients with knee osteoarthritis. The recommendation’s power is moderate.

**Recommendation 12**

We cannot recommend arthroscopy with lavage or debridement for patients with knee osteoarthritis. The recommendation’s power is strong.

**Recommendation 13**

We cannot recommend the use of or not using partial arthroscopic meniscectomy. The recommendation’s power is inconclusive.

**Recommendation 14**

Doctors may perform valgus osteotomy in symptomatic patients with knee osteoarthritis. The recommendation’s power is limited.

**Recommendation 15**

We cannot recommend using or not using physical therapy modalities, including electrotherapy. The recommendation’s power is inconclusive.

In the process of treatment, intra-articular injections have made a major difference. The use of hyaluronic acid has not stabilized its position and has lost its attraction. The American Orthopaedic Academy does not recommend using it.

Hydrocortisone is an alternative for oral medications in patients with comorbidity of major organs such as kidney, heart, and the liver or those who have bleeding or digestive discomfort and can help reduce the acute symptoms.

**PRP**

Biological materials repair the tissues by preventing their inflammation. PRP is one of these substances used to treat knee cartilage injuries. Due to the complexity of its formulation, it is currently not possible to compare the outcome of a study with another study since the composition of multiple growth factors and the volume of leukocytes associated with PRP, which are effective, but not measurable. Many studies should be done
to understand the long-term clinical effects of PRP on osteoarthritis. What we know for now is that the effects of PRP on knee osteoarthritis are better than hyaluronic acid and cortisone. Some studies have also reported the cartilage repair. At osteoarthritis clinic, the PRP is currently used in a research project. In this project, patients with decreased cartilage thickness due to osteoarthritis are enrolled in study. The knee cartilage thickness is measured before treatment with sonography. One year after the treatment, the thickness of the cartilage is measured again. An increase in the cartilage thickness will indicate indirectly that something has happened to cartilage, hopefully repair of cartilage. This should be proved by further future research.

**Mobile Application**

This application is designed to provide physicians with easy and instant access to information and helps them choose the evidence-based treatment methods. The mobile application contains a disease profile and therapeutic recommendations. When the disease profile is filled by the physician, a series of therapeutic recommendations appear. Table 1. Green circle marks represent the best treatment; the yellow circle sign means that it may be appropriate, and the red circle suggests that it may rarely be appropriate.

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<th>Table 1: Mobile &quot;Application&quot; for Non-Arthroplasty Treatment for Knee Osteoarthritis</th>
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**Figure 2**

Screen shot of the Appropriate Use Criteria mobile app for Non-Arthroplasty Treatment of Osteoarthritis of the Knee.
This mobile-mounted application is designed for ease of use. The application can be downloaded through the following URL: Application address: https://www.aaos.org/MobileApps

What was described is the original text proposed by the American Academy of Orthopaedics surgeons. The method that we chose for treatment is slightly different. Dealing with obesity and its treatment is the first line of treatment. As can be seen, the power of recommendation on the use of PRP for treatment is inconclusive. There are several documents that recommend PPP since 2013. These documents promote the inconclusive or incomplete recommendation of the Academy regarding the use of PPR to higher levels. Therefore, in cases dealing with intra-articular injections prescription, PRP can be used instead of corticosteroids PRP and corticoreoid both are subject for further research in knee osteoarthritis.

Our experience with the use of tramadol and opioid drugs is unpleasant; thus, we do not use them.

Summary
Knee osteoarthritis is a serious threat to health and a cost burden on the country’s budget due to its high prevalence in older age. As no coherent remedy is applied to patients with knee osteoarthritis, these patients do not get the right treatment. The American Academy of Orthopaedic Surgeons has spent a lot of time, effort, and resources since 2008 and provided the knee osteoarthritis treatment guideline to the orthopaedic community to be used in osteoarthritis clinics. The Academy has reviewed the appropriateness of the osteoarthritis treatment Guideline among surgeons. Although the guideline has clearly demonstrated its ability to formulate the “Do's and Don'ts” but has not been used satisfactorily. For example, hyaluronic acid is still used although not recommended by the Academy. We seek to distribute and disseminate this Guideline among colleagues to be used inclusively. The Academy has provided physicians with the Mobile Application for ease of use as well as for conducting research. In addition to treating patients, it can be used to introduce and perform many studies. One of the goals of the new issue of Iranian Journal of orthopaedic surgery. The Journal is to present review articles from the everyday and routine conditions of orthopaedic to provide the latest and most up-to-date knowledge and topics available to colleagues. This article is the first of its kind. We hope to publish a few more articles in each issue with the help of the members of the Association.

References