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Research Article

## Staged treatment of knee OA

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### Abstract

**Background:** Osteoarthritis is one of the most common systemic diseases leading to physical disability reducing the quality of life. Osteoarthritis affects all the structures of the joint and the surrounding tissues. In the state of Kuwait, osteoarthritis of the knee joint is prevalent, especially among women. The purpose of this article is to view our experience in the staged treatment of knee osteoarthritis in one of the leading private hospitals in Kuwait.

**Methods:** A deferent approach of treatment is applied depending on the severity of osteoarthritis, co-morbidities, and age of the patient. Conservative and joint preserving surgical treatment used in mild to moderate cases. The main steps for the conservative treatment consist of patient education and changing of the style of life, medications, physical medicine and rehabilitation, intra and periarticular injections, weight loss, hydrotherapy, orthosis, and braces. The last step is knee arthroplasty.

**Results:** There is no evidence-based medical treatment to stop or reverse the progression of knee osteoarthritis (OA), and thus the available treatments aim is to reduce pain and improve knee function which is also beneficial for other co-morbidities. Almost all the patients eventually reached the final stage of treatment, which is a total knee replacement, regardless, the conservative active treatment and joint preserving surgical treatment.

**Conclusion:** Non-operative treatment in early stages of OA can dramatically help in the prevention of progression of the disease and improve the quality of life.

**Keywords:** Osteoarthritis, kuwait, knee replacement, treatment, co-morbidities, arthroscopy

## INTRODUCTION

Arthritis is prevalent but not well understood. The term “arthritis” is not a disease; it is an in-formal way of referring to joint pain or joint disease [1]. Osteoarthritis is the most common cause of disability in adults [2].

Osteoarthritis (OA) of the knee in adults is prevalent, known to cause progressive destruction of the articular cartilage, and all the structures around the knee, causing the patients to be completely disabled to do Activities of Daily Living (ADLs). Knee OA is divided into two categories: the more prevalent is the primary OA, which causes progressive joint cartilage destruction over time. Secondary knee OA can be caused by rheumatoid arthritis, inactivity, overweight, or trauma. Treatment of knee OA aims to relieve pain and inflammation and improve or maintain mobility, function, and Health-Related Quality of Life (HRQoL). There are a lot of treatment plans, implemented in different hospitals; it's still unclear which treatments or combinations of medications are effective. Never the less, it's already well known, that Total Knee Replacement (TRK) is sufficient, but not all patients are candidates for this surgery. Besides, TKR is not a permanent solution, as surgery may need to be repeated within two decades. Effective treatment for OA needs to be identified that can relieve pain and improve function to delay or avert surgery [1].

Today an estimated 30.8 million adults have osteoarthritis in the United States (US) [3].

Diagnosis of OA in the athlete is often delayed and difficult because of high tolerance to pain, as well as the athlete's preference for an expedited return to play [4].

Among people younger than age 45, osteoarthritis is more prevalent among men; among that age 45 and older, it is more prevalent among women [5].

The lifetime risk is of developing symptomatic knee osteoarthritis is 45% [6].

The prevalence of symptomatic knee OA in the US for patients age 45 and older has been estimated between-5.9 and 13.5 percent in men and 7.2 and 18.7 percent in women [7].

Knee osteoarthritis is frequently accompanied by comorbidities that contribute to decreased quality of life:-obesity or being overweight (90 percent). For people younger than age 65 with symptomatic knee osteoarthritis, there is substantially more time for greater disability to occur [8].

Opioids are not a cost-effective medicine in osteoarthritis patients without comorbidities because of their negative impact on pain relief after total knee arthroplasty [9].

Hip fracture due to osteoarthritis is the most common complication, which requires hospitalization and leads to permanent disability in 50 percent of individuals and fatality in another 20 percent [10].

From 1999 to 2008, the utilization rate of total knee replacement procedures in the U.S. more than doubled for the overall population and tripled for individuals age 45 to 64 [11].

Coupled with increasing knee osteoarthritis prevalence, the rising costs of healthcare may inflict a tremendous societal, economic burden in the future. Currently, there are no medical or surgical treatments that will improve this alarming trajectory [12].

By 2012, surgery for end-stage knee osteoarthritis was performed

on 658,000 Americans annually [13].

In the US, about 54 percent of knee osteoarthritis OA patients will receive total knee replacement over their lifetime, which suggests that there may be a 29 percent increase in lifetime direct medical costs attributable to this procedure among knee OA patients [14].

## SOME FACTS ABOUT KUWAIT AND THE PREVALENCE OF KNEE OA

Kuwait is a small country in the Arabic Gulf region with a population of about 4 million, two-thirds of them are not- Kuwaitis. In Kuwait, females are more affected by symptomatic knee OA than male. This fact is documented in the operation statistics, as nowadays, six out of seven operated patients in this country are female [15].

There are certain specific risk factors for the early onset of OA in Kuwait. Many individuals are obese which increase the load on the joint during walking. [16].

Also, the cultural habits of sitting and kneeling in Kuwait are risk factors for knee OA [17]. Hormonal and metabolic factors are probably involved, and there may also be hereditary traits, which are not fully known in the Arab population but are reported for other communities [18,19].

Another factor, which considered to be very important in my opinion and should be studied in the future, are 1-the style of life in Kuwait is inactive (sedentary lifestyle) and dependant on servants in almost all activities of daily living and using the car for short distances. It's very common in an Arab country and especially the gulf area to sit in the floor with cress-crossing the legs for a long time, and this is alone cause much pressure in the knee joints. 2-The Weather in Kuwait is scorching; it can reach up to 65 degrees in the summer. 3-All the buildings in Kuwait are air-conditioned, most of the people complain of joint pain due to air condition. 4-Obesity and morbid obesity, hypertension and diabetes mellitus are the most common morbidities among people of Kuwait and almost found in every house.

## DIAGNOSIS

X-ray is used to diagnose the osteoarthritis and assess the progression of it. Clinically the patient presents to the doctor with a complaint of knee pain that is exacerbated by the use of the joint and relieved by rest, and that tends to worsen over the rest of the day. The patient's advanced stages complain of pain, stiffness, and weakness all the day and reduced knee range of motion.

### **Radiographic picture of OA may correlate with symptomatic OA but may not correlate with symptom severity [1].**

Radiologically, OA severity can be estimated and expressed using the Kellgren and Lawrence criteria. Also, at less severe grades, correlation with symptoms is weak, whereas, at more severe degrees, agreement tends to be higher [20]. When suspecting patellofemoral OA, Skyline views should be done. However, it was not noted, that knee pain can start a years after radiographic changes [21].

Another criterion for evaluation of the severity of OA is Outerbridge scale, which classifies the articular degeneration of the knee by compartment in 4 grades, which can be detected during arthroscopic intervention or by MRI scan (Table 1).

## METHODS

All our patients with knee osteoarthritis are treated at first non-

**Table 1.** Osteoarthritis classification

Scale Criteria-stage	Kellgren and Lawrence	Outerbridge
0	No abnormality	
I	incipient osteoarthritis, beginning of osteophyte formation on eminences	softening or blistering of the articular cartilage
II	moderate joint space narrowing and subchondral sclerosis	fragmentation or fissuring in an area less than 1 cm
III	>50% joint space narrowing, rounded femoral condyle, extensive subchondral sclerosis, extensive osteophyte formation	fragmentation or fissuring in an area greater than 1 cm
IV	joint destruction, obliterated joint space, subchondral cysts in the tibial head and femoral condyle, subluxed position	Cartilage erosion down to the bone

operatively, regardless of the grade of OA. This is related to the mentality of the people here and the culture. To till the patient, that arthroplasty is the treatment, this is a big “NO,” and the patient will not come back to you.

The non-operative treatment consists of a staged scheme, which is applied individually depending on the grade of OA, the severity of the symptoms and accompanied co-morbidities.

Almost all our patients, diagnosed with symptomatic OA, after proper examination and assessment are put to a treatment plan. Usually, we start with some educational materials about OA, life modifications and home or gym exercises, braces and orthosis and medications such as analgesics, non-steroidal anti-inflammatory drugs (NSAIDs) and supplements.

If this step failed, then we recommend intra and periarticular injections of steroids, viscosupplementation, Platelet-Rich Plasma (PRP) and rarely stem cells and cartilage tissue. Most of the patients don't prefer to take injections, and many of them refuse this procedure. Besides, it's costly, and most insurance companies are not covering these procedures. These patients usually continue the first step of treatment or use traditional medicine.

Next step consists of minimally invasive surgeries such as arthroscopic surgery, abrasion arthroplasty, subchondral penetration (microfracture) procedures, and laser/thermal chondroplasty.

The last step in the treatment options is a total joint replacement.

**FIRST STEP**

**Self-management programs**

Patient education, information and self-management support are critical for patient cooperation during treatment. Besides Osteoarthritis Research Society International (OARSI) recommendations [22], several evidence-based studies on self-management programs have shown that it is auspicious to engage patients to better manage their chronic diseases [14,23-27].

Education and information for the patient can affect him psychologically. It gives the patient an idea of his condition, relieves the anxiety and improves self-confidence, but it does not have an effect on pain reduction or to improve knee function. That's why the treatment of OA should be involved and staged.

Home exercises or gym workout is directed on increasing the strength and tension of the core muscles or midsection of the body. Physical activities ought to be done under the supervision of trained staff or individual trainer.

Fransen et al. [28], Found that therapeutic exercise had at least short-term benefit in decreasing knee pain and improving physical capacity for individuals with knee OA. The effect was small but comparable to reports for non-steroidal anti-inflammatory drugs. There was no difference between individual treatment, exercise classes or home-based programs.

In a meta-analytic review by Devos-Comby et al., [29] 16 studies on exercise and self-management interventions were analyzed. In comparison to control conditions, exercise regimes improved physical health and the overall impact of knee OA. Self-management programs significantly improved psychological outcomes. Both patient education and exercise regimes had a modest influence on the patient's well-being.

Under self-education, we recommend the patient to lose weight, as this is a significant problem in Kuwait, and one of the leading causes of OA. Christensen et al., have shown, that weight loss reduces the load applied on the knees, improves function and reduces OA symptoms. This positive effect has been described following a weight loss of more than 5% over a five-month period [30].

Diet is essential, but we always recommend accompanying muscle training with a diet to lose weight, as this can preserve the muscle mass and lose the fat [31].

**Hydrotherapy or aqua exercises**

Clinical experience indicated that aqua exercise might have advantages for OA patients. Bartels et al., [32], found that aqua exercise appeared to have some beneficial short-term effects on patients with knee OA. The controlled and randomized studies done so far still not enough to give further recommendations on how to apply the therapy, for which patients and for how long can be used in the treatment of OA. In a randomized controlled trial, João Marcos Dias et al., found that hydrotherapy for older women with knee osteoarthritis is likely to have benefited from a course of hydrotherapy exercises [33].

**Orthopedic braces and orthoses**

Knee orthoses are also intended to relieve pain and improve joint function [34]. Five controlled trials (evidence level Ib) were evaluated in a Cochrane Review [35], using orthosis were found to have significantly reduced the pain and improves function than patients in the control groups. On the other hand, Duivenvoorden et al. have reported, that the benefits of braces and orthoses for treating knee OA have not been shown [36].

Shoe inserts or custom made insoles for shoes are used in mild to moderate cases of OA. In a randomized trial done by Richard K Jones et al., revealed that a good improvement after using mobility shoe. Different modalities of the insoles showed comparable reductions in medial knee loading without affecting it [37].

**MEDICATIONS**

**Topical herbal and chemical NSAIDs**

The vast majority of our patients prefer to have local medications, such as gels and creams and also using of herbal medicines instead of chemical. Regarding topical treatment, prepared from plants, Cameron et al. [38] have reported that Amica gel and Comfrey gel seemed to improve pain.

Topical NSAIDs have an almost similar effect on pain comparing to oral non-steroidal anti-inflammatory drugs NSAIDs, with less risk.

As a result, topical NSAIDs may be the preferred treatment

option, especially in OA patients aged  $\geq 75$  years, and those with co-morbidities or at an increased risk of cardiovascular, gastrointestinal, or renal side effects.

Furthermore, using topical NSAIDs in inflammatory rheumatic diseases leads to a 40% reduction in the need for concomitant oral NSAIDs [39].

The National Institute for Clinical Excellence (NICE) recommended local gels and creams as first-line treatment in its guideline for osteoarthritis.

In 2014 in England, almost 6 million prescriptions for topical NSAIDs were issued. Besides, they are sold without a doctor's prescription [40].

Concerning oral herbal therapy, Cameron M et al., concluded, that Piascidine ad extracts of *Boswellia serrata* had a short-term effect on OA symptoms [41].

### Oral analgesics and NSAIDs

According to published guidelines paracetamol and Tylenol (also called acetaminophen) and (NSAIDs) as first-line pharmacologic therapy of OA.

In 2016 a network meta-analysis by Bruno R da Costa et al., consisted, that paracetamol should not be prescribed for the treatment of osteoarthritis, regardless of the dose. Conversely, a high diclofenac daily dose of 150 mg/day is most useful for the treatment of symptomatic osteoarthritis and superior to frequently used NSAIDs in maximum doses, including ibuprofen, naproxen, and celecoxib. Etoricoxib at the maximum dose of 60 mg/day is as effective as diclo-fenac 150 mg/day for treatment of pain, but its effect estimates on physical disability are imprecise [42]. The side effects of NSAIDs should be taken into consideration for a patient with cardiac or GI problems. If pain still persistent, tramadol is added.

### Glucosamine and chondroitin

Regardless of the extensive studies, that have been published so far, there has been no persuading proof regarding advantage to date [43,44]. Both the American Academy of Orthopedic Surgeons (AAOS) and American College of Rheumatology (ACR) guidelines do not support their routine use in the treatment of knee OA [45,46].

Never the less, these supplements are still widely used by all physicians.

### Physiotherapy, Acupuncture, Transcutaneous Electrical nerve stimulation, Electromagnetic fields, and Cryotherapy

All these procedures are with minimal effect on patients with symptomatic OA. The AAOS guidelines can't recommend for cryotherapy but can be considered, regarding manual therapy- unable to recommend for or against.

Transcutaneous Electrical Nerve Stimulation (TENS) can be used to reduce pain in knee OA patients [47].

Randomized controlled trials published in 2015 studied the effect of acupuncture on chronic knee pain. These investigations concluded, that acupuncture improves short- and long-term function, but provides only short-term pain relief [48].

Electromagnetic fields therapy may provide moderate benefit for osteoarthritis patients for pain relief [49].

## SECOND STEP

### Intra and periarticular injections

Corticosteroid injections are used widely to reduce local inflammation to improve pain and function. A study suggests that intra-articular corticosteroid injections may cause a relief pain for six weeks [50].

The ACR guidelines support the conditional use of corticosteroids, but the AAOS workgroup was unable to recommend for or against the use it [45,46].

In the case of pes anserinus, injection of corticosteroid usually gives a good result and for long-term reduction of pain and inflammation.

### Viscosupplementation

Naturally Hyaluronic acid is produced by joint cartilage matrix and synovial fluid. Its function is lubrication of joint and acts as a shock absorber. There are still controversies regarding viscosupplementation and their effectiveness. The AAOS is unable to recommend the use of hyaluronic acid injections in knee OA treatment, while the ACR workgroup makes no recommendations. [45,46].

### Platelet-rich plasma (prp) and mesenchymal stem cells injections (sct)

Treatments with stem cells, which can grow into different types of cells are booming in the world. This is a new technology of regenerative medicine therapies.

### Here are the results of some studies on prp and sct, which took place recently in different countries

Doctors at Tehran University reported in the International Journal of rheumatic diseases, published by Oxford in the United Kingdom (UK), that stem cell injections provided long-term (5+ years) repair in knee osteoarthritis patients [51].

Researchers found that stem cells introduced into osteoarthritic joints could signal the start of remodeling and healing. The stem cells interact with the surrounding tissue to help themselves navigate to the site of the damaged tissue and differentiate themselves into the material to build bone [52].

A study in the Journal of sports medicine and physical fitness suggests that one shot of PRP injection reduced joint pain more and for longer-term, alleviated the symptoms and enhanced the activity of daily living and quality of life in short-term duration in comparison with cortisone" [53].

In one of the most cited research studies, a study done by doctors in Iran found, that six months after stem cell injection, patients showed an increase in cartilage thickness, an extension of the repair tissue over the subchondral bone and a considerable decrease in the size of the edematous damage [54].

In the medical journal Arthroscopy, doctors indicated that in 12 months follow up PRP injection resulted in significant clinical improvements in osteoarthritic knees [55].

Both PRP and SCT are not approved by FDA until today. The AAOS: unable to recommend for or against growth factor injections and platelet-rich plasma (inconclusive).

Doctors in Spain suggest that PRP injections reduced pain three months after the final treatment and is more effective in mild to moderate osteoarthritis grades than Hyaluronic Acid [56].



### Arthroscopic debridement, meniscectomy, and lavage

Despite the fact, that arthroscopic management in the degenerative knee is not recommended according to many trials; it is still the most common orthopedic procedure in countries with available data [57,58].

According to AAOS and ACR, “no well-controlled trials of arthroscopic debridement with or without arthroplasty have been conducted, and the utility of this intervention for the treatment of knee osteoarthritis is unproven.”

Reed AC Siemieniuk et al., published an article in BMJ, made a strong recommendation against the use of arthroscopy in almost all individuals with degenerative knee disease, based on linked systematic reviews. This suggestion applies to individuals with or without imaging proof of osteoarthritis, sudden symptom onset or mechanical problems. Never the less, many patients experience significant improvements after arthroscopy, which may be erroneously attributed to the effects of the procedure itself instead of the natural course of the disease, co-interventions, or placebo effects [59].

### Arthroscopic joint surface restoration

In 2010 clinical practice guideline on the diagnosis and treatment of Osteochondritis Dissecans (OCD), the American Academy of Orthopaedic Surgeons (AAOS) was unable to recommend for or against a specific cartilage repair technique in symptomatic skeletally immature or mature patients with an unsalvageable osteochondritis dissecans lesion.

In 2016 guideline by the working group “Clinical Tissue Regeneration” of the German Society of Orthopaedics and Trauma entitled “Autologous Chondrocyte Implantation (ACI) for cartilage defects of the Knee” [21].

Indications for ACI depends on Defect stage 3 and 4, and osteochondritis dissecans stages III and IV, defect size: 2.5 to 3 cm<sup>2</sup> up to no limit with no limitation to defect localization.

Another factor of indication is patient’s age: preferably up to 55 years of age; although higher age is not a contraindication with significant defect morphology and primarily intact joint conditions. Children and adolescents are also not contraindications [60].

## THIRD STEP

### Total knee replacement

The primary indication for knee replacement is pain that significantly reduces walking tolerance, impairs the ability to perform daily living activities, and interferes with sleep. Some factors can affect the success of this operation like obesity, comorbidities, and unrealistic expectations for total pain relief and joint function.

### When to do TKR

- Severe knee pain or stiffness that limits simple daily activities and worsens quality of life
- Resting knee pain
- Chronic knee inflammation that does not improve with rest or medications
- Knee deformity-valgus or varus knees
- Failure of non-operative management or other surgeries

Absolute contraindications for TKA include the following:

- Knee sepsis
- Ongoing infection
- Extensor mechanism dysfunction
- Severe vascular disease
- Recurvatum deformity is secondary to muscular weakness
- Presence of a well-functioning knee arthrodesis

Al-Taiar et al., have illustrated factors that can cause the delay of surgery are:

- a) Fear of having an operation
- b) The patient seeking encouragement and advise of his family, relatives, and friends on whether to go on for surgery and if so, abroad or locally
- c) Frequent consultations to orthopedic surgeons, receiving similar medications in every time
- d) Lack and miss of information about the procedure and the outcome [61-66]

## DISCUSSION

The prevalence of OA is increasing all over the world. Many treatments of knee OA are invented till today. None of these treatments considered most effective or a cure for OA. We are treating symptoms of OA. Nothing can reverse the progression course.

Prevention of OA is important, but early detecting and treating is the key solution to lower the progression. Education and proper counseling of the patients in the very early stage of OA is mandatory. Primary care doctor can start implementing and follow up the self-management. The family members should take part in this, support and encourage the patient. An active lifestyle is essential. Control of body weight and maintain a good quality of life in all aspects.

Treatment of each patient should be individual, depending on overall condition and the stage of OA and after a full assessment of the co-morbidities and risk factors. Besides, a consideration should be given to the fact, that each population has different mentality and traditions to the treatment of now a day’s used. Physiotherapy, exercises, and hydrotherapy are essential in all stages of OA and have to be accompanied with medical treatment and controlled routinely by the treating doctor.

Arthroscopic debridement and lavage are advisable in a mild to moderate cases of OA if there is a traumatic meniscal tear and (or) loose bodies. Reed AC Siemieniuk et al., don’t recommend the use of arthroscopy in nearly all patients with degenerative knee disease [54], although, we had not bad midterm results for elderly patients, who underwent arthroscopic debridement, which was very satisfying for such patients!

High tibial osteotomy has excellent result in the treatment of unicompartmental knee OA in a young healthy active patient, with normal BMI. Corrective osteotomy needs a good pre op planning and proper indications to avoid over or under-correction. In my experience we had a few patients, who underwent HTO with a good long term results.

ACI has also limited indications and is not advisable for large chondral defects and progressed OA. In autologous Osteochondral Transplantation (OCT), also called mosaicplasty, the reported

results are, in general, very promising, although AAOS can't recommend for or against these techniques.

TKR is the final solution for the treatment of severe OA. For this surgery, it's imperative to choose the right patient. A young patient with a high level of active life has a risk for implant loosening. Old patient with the sedentary lifestyle for a long time has muscle atrophy and unable to ambulate independently due to very weak muscular motor power. Usually, these don't benefit from TKR.

## CONCLUSION

Treatment of OA in our days still controversial. Most important is detecting the case in very early stage. All the non-operative treatment options are in somehow useful in the treatment of OA in the early stages, but in moderate to severe OA it doesn't work. Joint-preserving surgeries have their precise indications, and in severe cases of OA are ineffective. Education of the patients and informing them about the effectiveness of TKR should start right away after detecting OA. Although the patient starts non-operative management, he should get full information about the TKR, benefits, and risks from the beginning.

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