Review

Knee Osteoarthritis-Current Diagnosis and Treatment Options-A Narrative Review

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ABSTRACT: Knee osteoarthritis (KOA) represents a progressive and painful disease that in time can lead to loss of function and disability. Early diagnosis and correct treatment are essential in preventing the advancement of the condition to a stage where it can affect the quality of life. The development of new imagistic methods and devices can help detect changes in the structure of the join before the onset of symptoms. At the moment there are no disease-modifying drugs approved, so the current treatment is symptomatic, focusing on pain reduction, improving function and trying to prevent progression towards disability.

KEYWORDS: *Knee osteoarthritis, diagnosis, symptomatic treatment, pain reduction.*

Introduction

Osteoarthritis (OA) has become one of the most frequent musculoskeletal chronic diseases worldwide, with its prevalence and incidence growing mainly due to the increase in life expectancy [1].

The economic burden of OA in the United States alone is estimated to be in the range of the hundreds of billions per year, with the disease affecting more than 30 million in the country and at least 300 million worldwide [2].

Beyond its socioeconomical impact, OA represents a source of pain which in time can lead to disability.

The most frequent affected joints are located in the hand, hip and knee.

The incidence is higher in women than in men, a gap that widens with age [3,4].

Even though initially it was considered a wear and tear degenerative joint disease, hence the name of osteoarthrosis, recent developments have shown OA to be a disease of the entire joint, affecting the cartilage, the subchondral bone, synovium, the surrounding muscles, the periarticular ligaments and the meniscus in case of knee joint involvement.

A certain degree of inflammation is also present thus the terms osteoarthritis and osteoarthrosis have become synonymously used in literature [5,6,7].

Taking into consideration that there are no disease-modifying medications available at the moment, treatment is mainly symptomatic and focuses on pain management and function improvement.

The following review focuses on current diagnosis and treatment options for knee osteoarthritis, as studies have shown the knee joint to be one of the most common places of OA development [4,8].

Diagnosis of knee osteoarthritis

Osteoarthritis can either be primary or secondary.

Primary OA, also called idiopathic, occurs in previously healthy joints without the action of an inciting agent.

In this form, aging plays an essential part due to the abnormal repair mechanisms that first develop at cartilage level.

Secondary OA can be caused by mechanical stress, trauma, surgery or infection of the joint, as well as endocrine and metabolic disorders, congenital defects or other diseases that involve the articular structures [9].

For a positive diagnosis, usually a thorough medical history and physical examination are sufficient.

These can be complemented by imagistic and laboratory investigations.

Typically, symptoms develop gradually, local knee pain being the most frequent cause that leads the patient to seek medical evaluation.

Pain is worsened by physical activity involving the joint and is relieved by rest.

10.12865/CHSJ.50.02.01

As the disease progresses, pain gowns in intensity and may be present even in a resting state or at night.

In time functional capacity and range of motion are affected by the sensation of pain.

If morning stiffness is present, it usually last less than 30 minutes.

The physical examination tends to reveal reduced range of motion, crepitus, bony enlargement, intra-articular accumulation of fluids, tenderness, flexion contracture or even bone malalignment (Figure 1).

If we notice inflammation signs, most of the times they are mild, if not, this could suggest another kind of arthropathy being present [9,10].

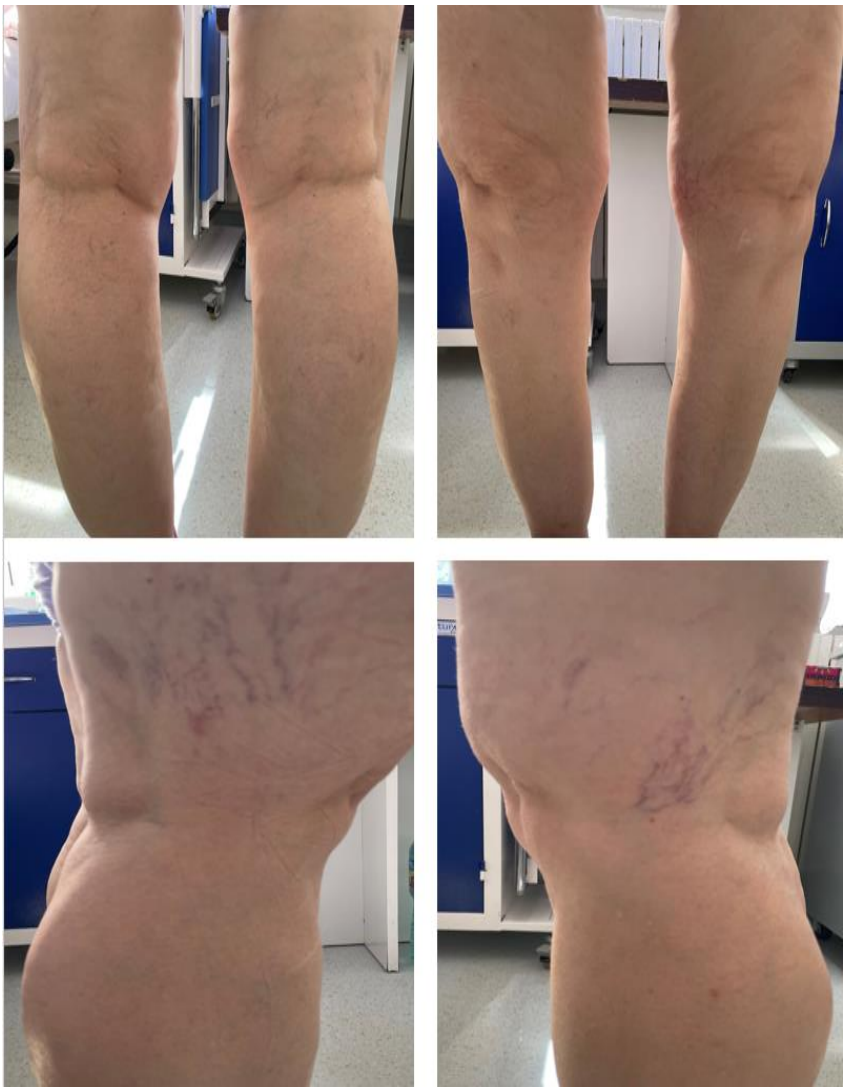

Figure 1. Enlarged and swollen knee joints with telangiectasias more pronounced on the lateral side of the thigs and varus bilateral deformation (unpublished authors' images).

Imagistic evaluation of knee osteoarthritis

There are multiple ways to evaluate the knee joint from an imagistic point of view, each having their own advantages and disadvantages, starting with the basic radiographic evaluation to the contrast enhanced MRI.

Knee radiographic assessment

Most of the times this is the first line of imagistic investigation that a patient suspected of KOA is advised to undergo.

It is a widely available and cheap method of evaluation.

Radiographic assessment should consist of at least two views (usually antero-posterior and lateral view).

Using plain radiography, we can outline the presence of osteophytes and cysts, subchondral sclerosis and joint space narrowing (Figures 2 and 3).

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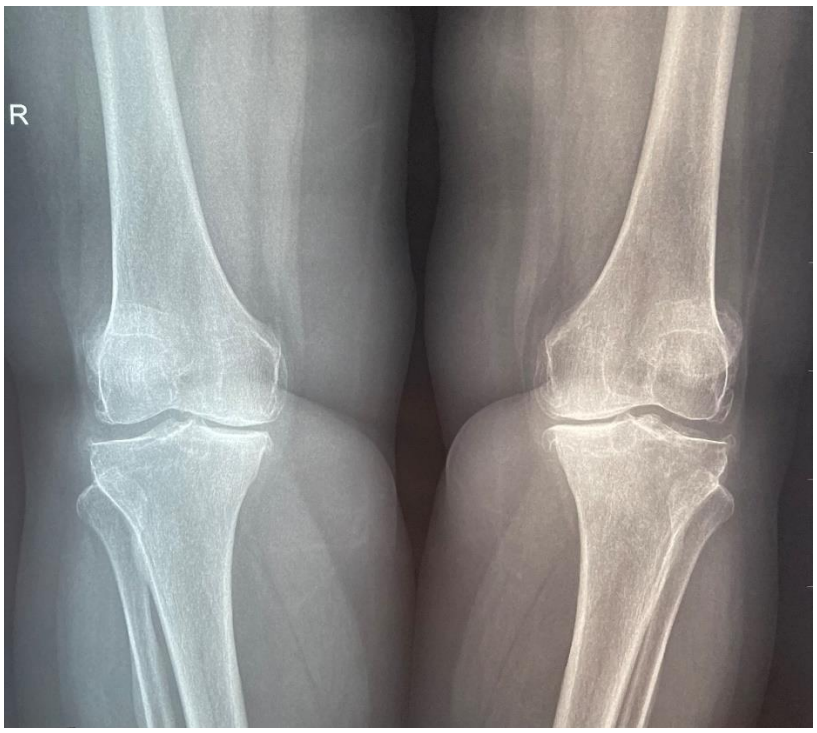

Figure 2. Radiograph of the knees in anterior view showing reduction of the joint space, predominantly in the medial compartment, subchondral sclerosis of the tibial plateau, and medial and lateral femoral and tibial osteophytes. R: Right (unpublished authors' images).

Figure 3. Radiograph of the left knee in lateral view showing narrowing of the tibiofemoral and patellofemoral joint spaces, subchondral sclerosis of the tibial plateau, as well as patellar osteophytes (unpublished authors' images).

In addition to these we can also view chondrocalcinosis, joint effusions, dislocations, fractures and bone static defects (varus or valgus) [9,11].

Several classification systems are available to standardize the assessment of knee osteoarthritis, but the most frequently utilized is the Kellgren-Lawrence (KL) scale (Table 1) [12].

Table 1. Kellgren and Lawrence system for classification of osteoarthritis.

Grade 0	No joint space narrowing or reactive changes
Grade 1	Doubtful joint space narrowing, possible osteophytic lipping
Grade 2	Definite osteophytes, possible joint space narrowing
Grade 3	Moderate osteophytes, definite joint space narrowing, some sclerosis, possible bone-end deformity
Grade 4	Large osteophytes, marked joint space narrowing, severe sclerosis, definite bone ends deformity

Knee musculoskeletal ultrasound (MSUS) assessment

MSUS also represents an inexpensive method of evaluation that does not expose the patient to radiation or the need for contrast material administration, even though studies using contrast enchanting materials exist.

One major limitation concerning this type of examination is the skill of the operator which can influence the quality of the obtained images.

Ultrasound can assess many structures implicated in the pathogenesis of knee osteoarthritis, including the bone surface, menisci, and synovium.

Thus, we can observe the inflammation and hypertrophy of the synovium membrane, extrusions of the menisci, osteophytes and superficial layers of the cartilage (Figures 4 and 5).

The most frequent ultrasonography findings in knee osteoarthritis are joint effusion, popliteal cysts (Baker's cyst), tendinopathy (quadriceps and/or patellar) and bursitis [13,14].

Various recommendations and guidelines are available for the use of musculoskeletal ultrasound in clinical practice [15,16].

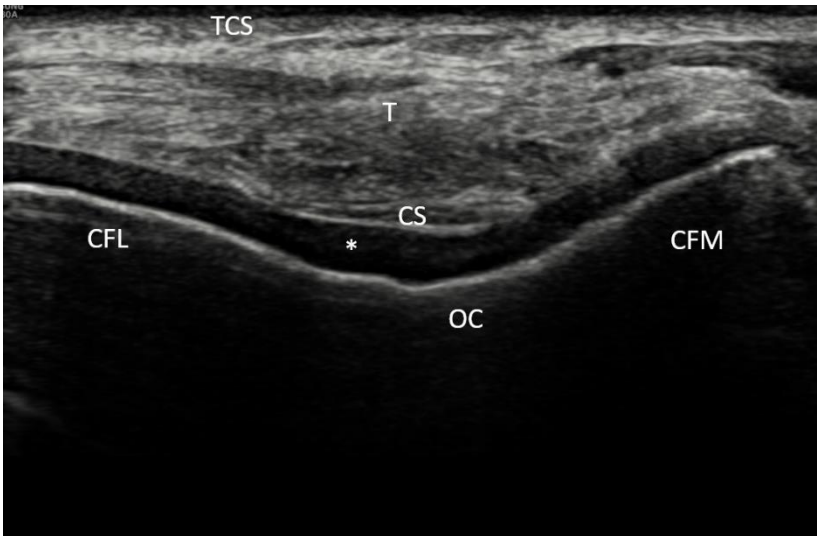

Figure 4. Femoral-patellar articular cartilage slightly reduced in thickness at the level of the medial compartment, slightly hypoechoic, inhomogeneous appearance, with irregularities of the osteochondral and chondro-synovial margins. CFL-cortical bone of lateral femoral condyle, CFM-medial femoral condyle, *-femoral-patellar articular cartilage, T-quadriceps tendon, OC-osteochondral margin, CS-chondro-synovial margin of the articular cartilage (unpublished authors' images).

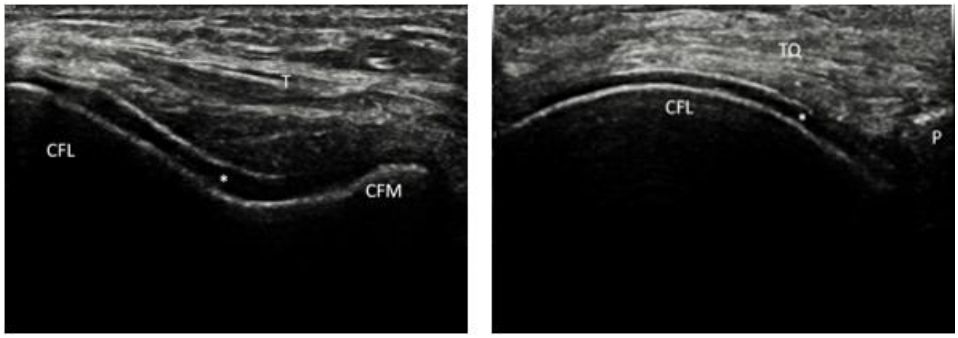

Figure 5. Femoral-patellar articular cartilage slightly reduced in thickness in the medial compartment, with fine irregularities of the osteochondral and chondro-synovial margins. CFL-cortical bone of lateral femoral condyle, CFM-medial femoral condyle, *-femoral-patellar articular cartilage, T, TQ-quadriceps tendon (unpublished authors' images).

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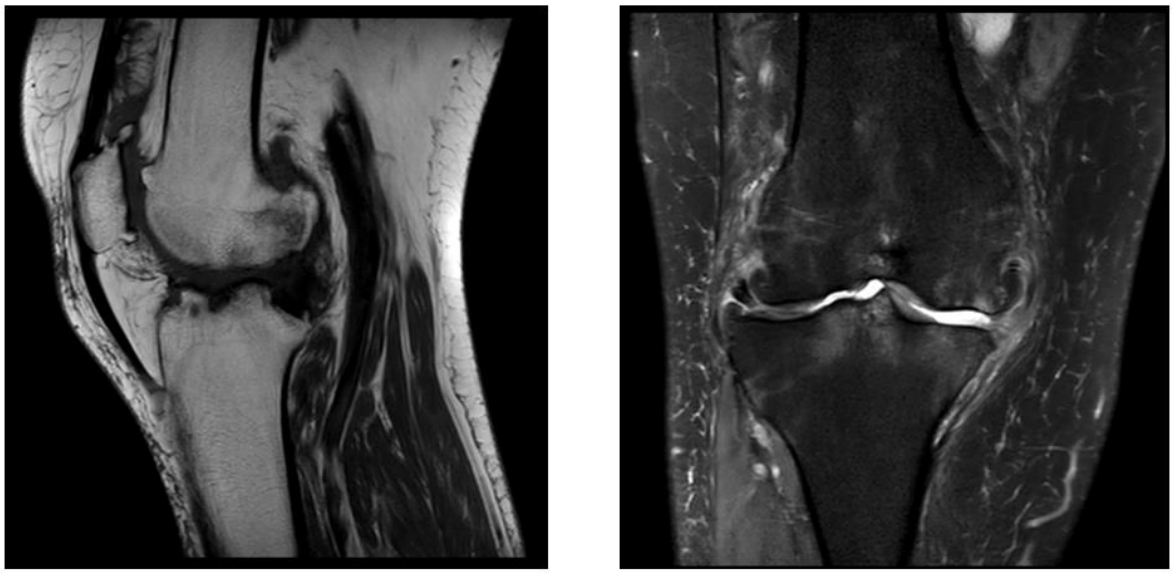
Knee magnetic resonance imaging (MRI) assessment

Like ultrasonography, magnetic resonance imaging can better evaluate the soft tissues in comparison with the classic radiography. MRI is at the moment considered the highest standard in musculoskeletal imaging.

It can visualize the joint in entirety and all of its components from the articular cartilage to the synovium, menisci, ligaments, bones, muscles, and tendons (Figure 6).

Disadvantages are represented by the long duration of the scan, limited availability, elevated costs, and certain contraindications such as metal implants that are not compatible with this type of investigation or that may be affected by it [13].



(A) (B)

Figure 6. MRI examination. Image (A) illustrates the T1w sequence in sagittal plane and reveals marked degenerative changes with osteophytes. Image (B) illustrates the same patient (PD FS sequence) which reveals edematous changes, marked chondromalacia in the medial compartment of the knee, and absent meniscus (unpublished authors' images).

Knee computed tomography (CT) assessment

Currently knee joint CT is regarded as a secondary imagistic method in cases where more details of the bone are needed.

It is also a valuable tool for identifying and measuring the amount of mineralization in surrounding tissues [13,14].

Knee assessment using nuclear medicine

At the moment there is insufficient evidence to support the use of positron emission tomography-magnetic resonance imaging (PET-MRI), single photon emission computed tomography-computed tomography (SPECT-CT) or positron emission tomography-computed tomography (PET-CT) in the diagnosis of osteoarthritis.

However, there is data indicating that nuclear medicine may detect early changes in the cartilage metabolism and could provide supplementary information during the diagnostic procedure [13,14,17].

Treatment of knee osteoarthritis

KOA treatment is divided into surgical and non-surgical, the latter composing of non-pharmacological and pharmacological methods.

Non-surgical treatment of KOA

Usually, the first line of treatment is considered the non-pharmacological approach which consists of patient education, exercises, weight loss and physical therapy modalities.

Laser therapy, therapeutic ultrasound, electrical stimulation and thermal modalities have shown contrasting results, presenting a positive impact on pain and function in some studies while showing no improvement in others.

For patients who experience walking or joint stability problems and for those suffering from severe pain some guidelines recommend the use of knee braces, canes, walkers, orthopedic footwear and other types of devices and

technologies that might alleviate the symptoms. [18].

Regarding the pharmacological treatment, acetaminophen is usually recommended as the first line of medication mainly because of its efficacy, safety and costs.

The second line of pharmacological treatment consists of topical and oral non-steroidal anti-inflammatory drugs (NSAIDS).

If paracetamol and NSAIDS have no effect, are contraindicated or are not being properly tolerated then an alternative could be the use of opioids.

With this kind of treatment, we should keep in mind the risks of addiction and of severe side effects.

There are some guidelines that recommend the use of food supplements like glucosamine, even though the international ones are against it due to its effects being similar to placebo in randomized controlled trials.

As a final form of oral pharmacological therapy, duloxetine has shown promising results in reducing pain and improving function in multiple studies.

Another form of pharmacological treatment in KOA is represented by intra-articular injections consisting of corticosteroids, hyaluronic acid or plated-rich plasma [19-21].

New pain medication is currently studied [21].

The American College of Rheumatology (ACR), Osteoarthritis Research Society International (OARSI), European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO), American Academy of Orthopaedic Surgeons (AAOS) are only some of the guidelines and recommendations on knee osteoarthritis management currently available [22-25].

Surgical treatment of KOA

Surgery is usually considered a last resort method and it is recommended only if all other forms of treatment and conservative management fail.

Surgical options include knee arthroscopy, cartilage repair, knee osteotomy, knee joint distraction, partial and total knee replacement [8,19,21].

Conclusion

As life expectancy continues to rise, so will the prevalence of age-related diseases.

Such is the case of knee osteoarthritis and many others.

Taking into consideration the fact that no disease-modifying osteoarthritis drugs exist at the moment, the burden on the patients' quality of life and on the economy, early diagnosis and correct management should be of the utmost importance.

With the advancement in imagistic evaluation and proper state of the art devices, we should be able to observe changes in the structure of the joint before symptom onset.

A key part of knee osteoarthritis management falls upon patient education, life-style changes representing the first line of therapy.

Conflict of interest

None to declare.

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