# Medial Knee Arthrosis: A Pathology with a Progressive Evolution

## *Artrose medial do joelho: Uma patologia de evolução progressiva*

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**Abstract**

Medial arthrosis of the knee is an evolutionary pathology that occurs due to progressive muscle imbalance. The muscles of the knee region have a large imbalance caused by the difference of power and lever arm. With the progression of life, this imbalance manifests itself more importantly, especially due to the loss of muscle strength due to aging. Pathological postures begin to occur and determine areas of support and pressure harmful to the joint. Meniscal injury is typical in the evolution of this pathology, as well as cartilage injury. The recognition of this pathology enables good results with less aggressive treatments, such as correction of muscle imbalance and consequent reeducation of joint support. Economic and partial meniscectomy brings good results in the early stages of the degenerative process. Progressive evolution leads to knee degeneration and the consequent need for broader surgeries.

**Keywords**

- arthrosis
- meniscus/injuries
- osteonecrosis

**Resumo**

A artrose medial do joelho é uma patologia evolutiva que ocorre em decorrência de desequilíbrio muscular progressivo. Os músculos da região do joelho têm um grande desequilíbrio, provocado pela diferença de potência e braço de alavanca. Com a progressão da vida este desequilíbrio se manifesta de forma mais importante, especialmente em decorrência da perda de força muscular em função do envelhecimento. Posturas patológicas passam a ocorrer e determinar zonas de apoio e pressão lesivas para a articulação. A lesão meniscal é típica na evolução desta patologia, assim como a lesão da cartilagem. O reconhecimento desta patologia possibilita resultados bons com tratamentos menos agressivos, como a correção do desequilíbrio muscular e consequente reeducação do apoio da articulação. A meniscectomia econômica e parcial traz bons resultados nas fases iniciais do processo degenerativo. A evolução progressiva leva à degeneração do joelho e à consequente necessidade de cirurgias mais amplas.

**Palavras-chave**

- artrose
- menisco/lesões
- osteonecrose

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## Introduction

Arthrosis is a frequent clinical condition with which we generally deal without adequate systematization.

Three types of arthrosis are considered:

1. arthrosis of inflammatory cause – it is a result of an inflammatory degenerative process, osteoarthritis, or consequent to inflammatory or infectious arthritis, in which the lesion of the subchondral bone is the most important;
2. posttraumatic arthrosis – it is a result of traumas affecting the articular surface such as fractures, and osteochondritis, in which the cartilage is the most affected; and
3. mechanical arthrosis – it results from shaft deviations or joint instabilities in which the subchondral bone and cartilage are affected.

These are different conditions that, if mistaken, will lead to disastrous therapeutic attitudes.

In the knees, and probably in other joints, such as the shoulders, there is a type of arthrosis that results from the evolution of a muscle imbalance leading to mechanical arthrosis, with very clear characteristics. In the knee, the arthrosis is what compromises the compartment, determining a varus deformity. It is a degenerative process that evolves progressively, if not treated. We will analyze the evolution of this degenerative process of mechanical cause.

## Etiopathogenesis

The knee is subjected to poorly-balanced muscle forces, which are balanced by activity and hypertrophy.

It has a single extensor group and three flexor groups, two of which are, apart from flexors, also rotators, one medial and one lateral. The medial flexors are the hamstrings, the lateral one is the femoral biceps, and the gemellus muscles are powerful flexors.

The balance of these forces allows harmonic movements in day-to-day activities and in sports.

In the daily clinical practice, we observe cases of muscle imbalance in which the extensor group (quadriceps) overcomes the flexor (biceps, semitendinosus, gracilis and sartorius, and the gemellus muscles) group, or in which the flexors overcome the quadriceps, leading to several complaints.

Over the years we lose 30% to 40% of muscle strength, and this loss is not uniform: the larger muscles will suffer more than the smaller ones.

The quadriceps loses part of its strength, and the flexors, even losing some strength themselves, prevail; as the medial flexors are in greater numbers, a deformity in flexion and internal rotation occurs progressively, which leads to the varus.

In a study with patients with degenerative varus versus normal volunteers, Molina et al[1] observed that there were up to 9 degrees of internal rotation of the tibia in the pathological varus of medial arthrosis.[1]

Anterior cruciate ligament (ACL) failure is progressive and has been clearly described by Ahlbäck[2] in the evolution of medial arthrosis of the knee. In his classic work, the author limits the indication of valgization osteotomy of the tibia to "stable" knees, that is, those still containing the ACL; and to this end, the author defines the limitations of competence of the ACL.

Varus deformity occurs progressively and determines an increase in tension in the lateral ligament complex, which opposes varus deformity. This postural imbalance overloads the ACL, which is positioned to avoid the valgus, which progressively fails, allowing the anteriorization of the tibia in relation to the femur.

This change in support and pressure zones caused by tibial "migration" determines meniscal and cartilage lesions of various degrees, causing a characteristic arthrosis in the medial compartment.

Intra-articularly, the meniscus is the first structure to suffer, because it receives an increase in posteromedial weight in the transition between the body and the posterior horn.

An anterior migration of the tibia occurs in relation to the femur (►**Figure 1**).

The meniscal lesion of this medial arthrosis is typical in the transition already described, and we chose to call it a meniscal injury due to fatigue because of its progressive aspect. The cartilage and subchondral bone may present lesions for the same reason.

We will consider the characteristics of each of these lesions in isolation, but they occur concomitantly, and there may be meniscal lesions with varying degrees of lesions of

**Fig. 1** Profile radiograph of the knee demonstrating anteriorization of the tibia in relation to the femur. The posterior osteophyte in the tibia is noted, which is characteristic of this migration.

the subchondral bone and cartilage, or any other association of lesions.

## Meniscal Fatigue Injury

Impairment of the meniscus structure can occur for a variety of reasons. Situations ranging from trauma to degenerative processes can alter its integrity. The clinical picture is very similar regardless of the etiology, but the therapeutic approach is completely different.

In 2006,Camanho et al[3] studied a group of patients with isolated meniscal injury diagnosed by MRI, who were divided into three groups according to the etiology:

1. one group with clearly traumatic injuries;
2. one group with degenerative meniscal lesion clearly resulting from the degenerative process of the joint; and
3. one group that was called "meniscal injury due to fatigue", in which the meniscal lesion had specific characteristics that differed from those of the other two groups.

The authors were aware of the similarity regarding the profile of the patients in the group with degenerative injury and in the one with the lesion called fatigue injury. They were patients in the same age group and with the same distribution according to gender, but different clinical and radiological picture and different therapeutic approach.

In patients with degenerative meniscal injury, involvement of the meniscus is part of the degenerative process of the joint, making the meniscal lesion a part of the problem, which is not always responsible for the main symptoms.

In patients with meniscal injury due to fatigue, the clinical characteristics are quite clear, and the meniscal lesion has its own characteristics. They are:

1. spontaneous onset of pain or pain after a minor trauma (disproportionate to the symptom)[4];
2. night pain requiring a change in knee position;
3. normal radiographic examination, without signs of arthrosis; and
4. magnetic resonance imaging (MRI) demonstrating radial lesion in the transition between the body and the posterior horn of the medial meniscus, with extrusion of the meniscal body, without signs of arthrosis (►**Figure 2**).

The big difference is cartilage involvement, which occurs in the evolution of medial arthrosis.

## Osteochondral Injury

By medial and posterior support, instability due to ACL insufficiency and varus deformity to the articular surface suffers, and progressively larger osteochondral lesions occur.

The extent of these lesions and of the varus deformity define a divider in the severity of medial arthrosis.

Initially, they are focal lesions in the posteromedial region that progress as the instability generated by the ACL failure and the varismare accentuated.

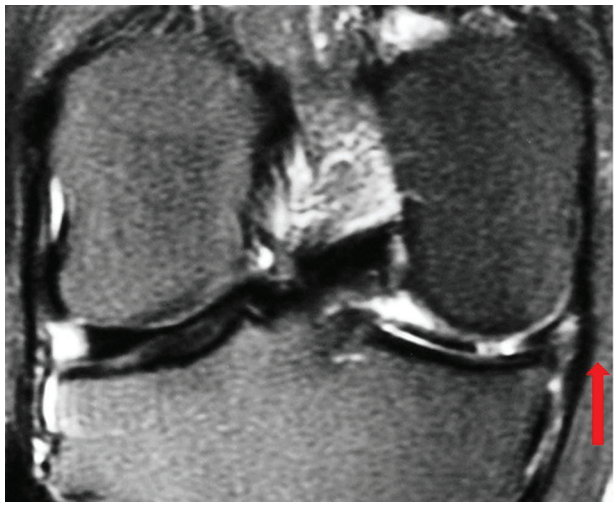

**Fig. 2** Magnetic resonance imaging (MRI)scan of the knee demonstrating a posteromedial meniscal injury.

The progression of the deformity and anteriorization lead to an increase in the area of the chondral lesion, aggravating the condition.

The accentuated varism and the anteriorization of the tibia define the severity of the picture.

Overload of the subchondral bone can lead to a fatigue fracture, which has already been confused with primary osteonecrosis.[5] The so-called primary osteonecrosis is an injury that occurs as a result of a fracture due to insufficiency, as demonstrated by Yamamoto and Bullough.[6]

The clinical presentation is very similar to that of the meniscal lesion of these patients: sudden pain after an effort or a minor trauma. The image of the bone edema on the MRI is characteristic (►**Figure 3**).

**Fig. 3** Magnetic resonance imaging (MRI)scan showing bone edema in the tibia, demonstrating a fatigue injury.

## Clinical Presentation

The clinical presentation is progressive and depends on intrinsic lesions. In general, it begins with an acute and important pain, without cause proportional to the symptom,[4] in the medial region of the knee. The physical examination demonstrates the position in flexion and internal rotation. The patient points to medial pains in the insertion region of the medial flexor muscles, the so-called goosefoot, and in the medial interline.

These pains, which are caused by increased weight concentrated in the medial region due to the varus and internal rotation, are called "goosefoot bursitis." Palpation demonstrates an increase in sensitivity in this medial region. There is difficulty to extend, which in some cases causes pain. Flexion with monopodalic support causes pain. The complaint of pain at rest is characteristic of the condition, especially at night. The report of joint effusion is rare.

## Imaging Exams

Radiographs demonstrate the progression of the varus and the degree of anteriorization of the tibia in relation to the femur.

In the early stages, the radiological changes are very little accentuated; but radiology is the best way to evaluate varus deviation. Magnetic resonance imaging demonstrates the appearance of subchondral bone edema and the typical meniscal lesion in the transition between the body and the posterior horn of the medial meniscus (►**Figure 3**).In some rare cases, the meniscal injury occurs in the insertion of the meniscus into the root of the tibial plateau. The evaluation of cartilage involvement is best performed by MRI, although it is not characteristic.

## Treatment

The treatment depends greatly on the evolution phase of the medial arthrosis. In the initial phases, without meniscal injury, muscle rebalancing with stretching exercises and quadriceps recovery brings good results. In cases of acute pain and image of bone edema, it is interesting to partially remove the load with a pair of crutches. When the MRI detects meniscal injury, without detectable osteochondral injury, isolated meniscectomy, followed by a muscle-rebalancing program, brings good results in 90% of the cases.

It is very important to differentiate fatigue injury from degenerative injury; this differentiation is made by radiographic study. If there are signs of arthrosis, it is a degenerative injury. In this case, meniscectomy is not a good indication, as it leads to good results in approximately 50% of the cases.[3]

We studied 87 patients with meniscal fatigue injury, without detectable cartilage injury.[7,8]

All patients in the present study had MRI and radiographs that were efficient for the diagnosis of absence of cartilage lesions, because only in one case we found signs of chondral injury in the arthroscopy that had not been diagnosed in the evaluation by image.

Our patients had radial meniscal lesion in the transition between the body and the posterior horn of the medial meniscus diagnosed by MRI, which was confirmed in all cases by arthroscopy.

We performed partial meniscectomy in all cases, seeking to rectify the meniscal curve, excluding the radial lesion. Although there is some controversy as to the evolution of partial versus total meniscectomy, for us it is clear that partial meniscectomy brings better results. Some authors[9] suggest that regardless of the type of meniscal lesion, the conservative treatment may bring results in more than 50% of the cases. We believe that this interpretation may occur in short evaluation periods, as the symptoms of meniscal injury are disabling in the long term.

Our results were considered good in 85% of the cases with an average of 87 in theLysholmscale, and the poor results manifested themselves in the first 6 months of evolution. Twelve patients evolved with pain and rapidly to a picture of radiological arthrosis or insufficiency fracture.

Some patients persisted with symptoms for approximately two months postoperatively, but then remained well until the end of the evaluation period. The main complaint of these patients was pain putting weight on the leg and difficulty in going up and down stairs. We believe that bone injury due to fatigue, although without radiological translation, combined with quadriceps fragility were responsible for these symptoms, as they improved with the evolution and improvement of quadriceps strength.

Regarding the high percentage of good results (85%), we believe that the absence of cartilage injury is responsible.

Higuchi et al[10] demonstrated that it is not age and gender that are responsible for the poor results of the meniscectomy, but rather the presence of chondral injury. Schimmer et al[11] observed good results in 90% of the patients submitted to meniscectomy with age and sex like those of our group, but without chondral injury in 12 years of follow-up.

In nine patients, we had a result considered bad due to the appearance of pain and joint degeneration. This early degeneration can be attributed to the type of meniscal lesion that, once corrected, leaves the tibial plateau unprotected.

Only in one case we found previous cartilage injury in the arthroscopic evaluation, which may be related to the evolution to arthrosis, so in the remaining eight cases there was joint degeneration after the meniscectomy.

We had, in our poor results, three cases of bone injury due to insufficiency, which is also called primary osteonecrosis.[5]

Once the deep chondral lesion or varus axis deviation is verified, compared with the other side, meniscectomy will no longer bring satisfactory results.[12]

As long as we are dealing with a stable arthrosis, according to the criteria of Ahlbäck[2] valgization osteotomy of the tibia is a good approach in patients in good health.

We prefer the Puddu technique, because it presents predictable corrections.

In patients with compromised health or in those who are high-functioning elderly, the unicompartmental prosthesis is the best indication in patients with medial arthrosis with

**Table 1** We suggest the following algorithm for the treatment

| Medial Arthrosis | |
|---|---|
| 1 - Meniscal Injury Without Radiological Arthrosis Without Pathological Varism (Ahlback) | Meniscectomy + Muscle Rehabilitation |
| 2 - Chondral Injury Non-unstable varism (Ahlback) | Unicompartmental Prosthesis |
| 3 - Severe varism or signs of instability (Ahlback) | Total Knee Arthroplasty |

stable knees, according to the stability criteria established by Ahlbäckand cited in the study by Camanho et al.[13]

In patients with medial arthrosis in knees with ACL failure, that is, unstable varus, the therapeutic indication is total knee arthroplasty (►**Table 1**).

## Final Considerations

We believe that medial arthrosis of the knee is an evolutionary process resulting from a muscle imbalance, which can be treated at any time. When the therapeutic indication is adequate and early, good results may be expected.

Conflict of Interests
The author have no conflict of interests to declare.

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