



## PREVENTION OF KNEE JOINT WEAR, IN PATELLOFEMORAL PAIN SYNDROME, WHEN USING STAIRS – A CASE REPORT

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### Abstract

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This case report shows how the changes in the way individuals go up and downstairs acts as a tool in preventing the appearance and worsening of the patellofemoral pain syndrome through a clinical case of chronic pain. The main objective of this case study was to apply a change of habit in the act of going up and downstairs, changing the movement dynamics, to decrease the risk of injury and worsening of the patient's patellofemoral pain syndrome. The methodology applied was represented through the standard CARE methodology. This study stresses the importance of identifying disease risk factors and understanding the work environment, in the context of the individual's health, through a change in moving up and downstairs. Conclusion: It was possible to achieve a rapid decrease in the patient's pain and case resolution.

**Keywords:** Patellofemoral Pain Syndrome, Knee pain, Chondromalacia, knee injury.

### 1. INTRODUÇÃO

The case report describes a risk assessment of the patellofemoral pain worsening in the act of going up and downstairs, using the *Case Reports (CARE)* guidelines methodology (Gagnier et al., 2013), in which it was possible to apply an improvement in the mechanics of the movement, in order to decrease pain during movement.

According to Patel A. (2007), the differential diagnoses for anterior face knee pain complaints are numerous. However, after careful patient evaluation, it was possible to make the correct pain diagnosis, patellofemoral pain syndrome, making it possible to recognize the causal connection between going up and down stairs and the patient's pain, and applying changes in the habits, leading to the therapeutic success. (Patel, 2007).

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Knee pain, especially pain related to patellofemoral pain syndrome, is highly prevalent in society, affecting females in the proportion of 2 women to 1 man. It has a prevalence of 22.7% in the general population (Smith et al., 2018), and 36% of professional cyclists (Clarsen et al., 2010), 13,5% in the military (Coppack et al., 2011) and 29,3% in professional ballet dancers (Winslow & Yoder, 1995), 34.9% in workers at a large Iranian automobile manufacturing company (Sharifian et al., 2020), 30% in selective garbage collection workers from a sample in Portugal (Pereira et al., 2022). The importance of a correct diagnosis is a significant factor for the situation's success (Gao et al., 2018; Porto & Porto, 2013; Rolf, 2007).

According to Cossley et al. (2019) and Wyndow et al. (2019), many individualized factors are essential in the mechanics of moving up and downstairs. However, considering the translation movement of the knee through the anterior tibial line to the toes, described by Fry et al. (2003), based on existing guidelines (McLaughlin et al., 1978), was found to be one of the triggering factors of pain in the patient

This case report's main objective was to apply a change of habit in the act of going up and down stairs, changing the movement dynamics, decreasing the risk of injury and worsening the patient's patellofemoral pain syndrome.

## 2. CASE REPORT

Subject: Masculine, 32 years old, caucasian, 185 cm tall and 90 kg, student, a former amateur basketball player for 12 years, currently works seated most of the time. The subject presented as the main complaint stitches-like pain in the anterior part of the knee that caused lameness in the first minute after the initial pain, occurring with greater intensity when going up and downstairs. The current disease history began in adolescence when the individual presented a similar condition diagnosed as patellar chondromalacia that was resolved with age. After starting to work in 2015 on Oil Gas Platform, he needed to climb an average of 4 to 5 floors of stairs per day; he started presenting retro and peripatellar pain in the knees, worsening when moving up down stairs.

The subject started weight training to decrease pain. However, the pain returned during the periods the individual did not train, affecting him to the point that he had to use other strategies to move up and downstairs to cause less pain.

Contact with the company's occupational physician was made, who suggested taking the stairs two at a time and, when descending, moving laterally, with a lower limb projection that would make the movement lateral and posterior.



In the anamnesis, the subject did not show any alteration concerning his health history, denying common childhood illnesses, or any other disease, describing that he consistently showed growth compatible with the age and always practiced physical activities. His mother and maternal grandmother presented degenerative joint pain that was not pathognomonic to any disease regarding his family history.

## 2.1. Clinical Findings

A static physical examination of the patient was performed. He was observed in ectoscopy: varus knees, manoeuvres and palpation were performed to assess menisci, collateral ligaments, anterior and posterior cruciate ligaments and patellar tendon, all without pain complaints during the examination. The Clarke Sign was executed, showing a positive result, with pain and contraction of the quadriceps. There was no pain on the patellar movement in the patellar stress test, despite the wide degree of motion.

After the patient's physical examination, the dynamic evaluation of the movement's kinetics was performed, in which the patient was asked to go up and down stairs (Figure 1-2). The images were analysed on the computer, showing the frontal translation of the knee from the anterior tibial line to the line formed by the ipsilateral feet' fingers. This was achieved using a video camera and removing the moment of the previous translation from the image.



**Figure 1:** Representation of the climbing stages and limit line marking from the toes to the knee. A and B: going up the stairs, step by step. C and D: climbing stairs two at a time. The



yellow lines mark the knees beyond the anterior limit of the feet. The green line represents the boundary between the imaginary line between the anterior to the knee and the toes.



**Figure 2:** Knee joint damaging angles representation, present in the act of stairs descending. The yellow line represents the distance between the fingertips and the anterior part of the knee. It shows that the knee is in front of the anterior line of the ipsilateral foot



**Figure 3:** The figure represents how to descend the stairs, performing the base knee's minimum flexion preventing it from going beyond the anterior line of the toes. A: The green line represents the distance between the anterior portion of the knee and the ipsilateral fingers' tip. The red triangle represents the lower limb's projection to the posterior distance from the corporeal central axis. B: The yellow line represents the projection of the anterior portion of the knee to the ipsilateral toe.

## 2.2. Diagnostic assessment

After the anamnesis and the physical examination, the central diagnostic hypothesis was patellofemoral pain syndrome, classified as MSD-2 (Pereira et al., 2021).

Diseases in the menisci, anterior and posterior cruciate ligament injuries, diseases of the collateral ligaments of the knee and conditions of the knee cartilage, and tendinitis of the patellar tendon were ruled out through physical examinations.

During the movement of climbing stairs, it was identified that the patient, when climbing stairs step by step, made the projection movement of the knee anterior to the line of the



ipsilateral toes. The same occurred when descending the stairs step by step, so it was proposed a change in the gait while moving up (Figure 1 C-D) and down the stairs (Figure 3A).

The patient was instructed to climb the stairs two at a time (Figure 1C-D) and, when descending, perform the movement laterally, with a posterior projection of the leg and one step at a time (Figure-3A).

After two months, a new occupational medical assessment was carried out. When questioned about changing habits, if there was pain improvement, the subject answered that the only way not to feel the pain was doing the movement as proposed by the occupational physician.

The patient undertook a change in habits according to the indications, with no adverse effects reported.

### 2.3. Follow-up

The service was performed two months after the proposed intervention with improvement reported by the patient.

A new evaluation was carried out after 12 months during the Periodic Medical Examination. The employee reported that he had adopted the recommendations of the occupational physician and that he no longer felt pain when climbing stairs.

Table 1: Summary of the medical examinations schedule with information on pain during the evaluations.

Medical Examination		
First Day 0 (Zero)	After two months	After twelve months
<ul style="list-style-type: none"> <li>• Diagnostic</li> <li>• Recommendation</li> <li>• With pain</li> </ul>	<ul style="list-style-type: none"> <li>• Reevaluation</li> <li>• without pain</li> </ul>	<ul style="list-style-type: none"> <li>• Reevaluation</li> <li>• without pain</li> </ul>

### 3. DISCUSSION AND CONCLUSION

Based on In the kinetic studies of the squat exercise (Fry et al. 2003) and on the existing guidelines (McLaughlin et al., 1978), it was demonstrated that in the squat movement without prior restriction, the tension force is greater in the knee joint when it is the front of the toes (corresponding to the increase in the anterior tibial translation angle) than when it is performed with restriction, preventing the anterior portion of the knee from exceeding the toe line. This fact predisposes to the syndrome of femoral patellar pain and knee joint wear (Contreras et al., 2015; Escamilla et al., 2008; Fry et al., 2003; Hehne, 1990; McLaughlin et al., 1978).



Therefore, through the biokinetics movement analysis, it was possible to identify that going up and downstairs reveals itself as a risk factor for the worsening of PFPS frames (Brechtler & Powers, 2002; Crossley et al., 2004). Additionally, it was observable that the angles formed by climbing stairs, step by step, correspond to angulations that increase the risk of wear (Brechtler & Powers, 2002; Fry et al., 2003; Papadopoulos et al., 2015; Powers et al., 2017; Willy et al., 2019), and SDPF contributed to the worsening of the knee's cartilage wear is observed that (Figure: 1A; 1B).

During the intervention, it was clear that the act of climbing stairs two at a time (Figure: 1C; 1D) would decrease this angle, thus attenuating the tension force and the risk of developing SDPF, in addition to joint wear, as well as the projection of the knee when descending stairs is equally harmful (Figure 2 A).

Descending the stairs laterally one step at a time allows a reduction in the damaging angles of the knee joint. In this movement, it is necessary to make a posterior and lateral displacement of the lower limb in relation to the main axis of the body and the supporting member. (Figure: 3A). Consequently, the movement with harmful angles does not occur (Fry et al., 2003; Hehne, 1990; McLaughlin et al., 1978). When the two lower limbs are close to the main axis of the body, that is, when there is not enough posterior projection of the limb in the movement of descending the step, the knee of the supporting member is after the line of the toes, increasing the tension. Under these conditions, the execution of the movement is harmful to the knee joint (Figure: 3B).

In both cases, squatting movements and climbing and descending stairs, it is recognised that the strength of the anterior and posterior thigh muscles is of great importance to perform the correct movements and, thus, not overload the tendons and the joint itself. However, in patients in the postoperative period of knee surgery, in addition to the angulation of the knees during movement, muscle strength and restrictions indicated before any intervention should be carefully evaluated.

As a limitation, it was recognised the non-possibility of applying photos on the workplace ladder due to the company's restrictions on the use of cameras in the workplace. Therefore, a random stairway from a park was used, which had steps of 45 cm in width and 15 cm in height that follow the criteria of civil construction (Baud, 1976).

In conclusion, the anamnesis and the physical examination were fundamental to close the diagnosis. The simple change in the habit of going up and downstairs to an unusual but individualised way was possible to end the patient's pain.



### 3.1. From the patient's perspective

The patient reported after being asked, "How do you see the results in the first two months and currently?"

"It was the best way to prevent pain, without having to take medication; with the implemented change in movement, it was possible to reduce the risk of worsening my pathology on my job."

## 4. INFORMED CONSENT

The informed consent term was applied to the patient based on annexe A of ISO 12894: 2001 and the Declaration of Helsinki (Organization for Standardization (ISO), 2001).

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