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# CONTRALATERAL KNEE PAIN FOLLOWING UNILATERAL KNEE INJURY: A 14-YEAR REVIEW

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**Abstract**

The long term consequences of chronic knee injuries on the contralateral knee is investigated in this study. This extensive literature review of 14 years' span shows how unilateral knee injuries may result in painful increases in wear and arthritis in the opposite knee. In the case researched, a right knee injury in 2011 could have worsened by decades and led to prosthetic joint replacement of the left knee. Results show a 30–55% incidence of contralateral knee pain following unilateral knee intervention at 5–12 year follow ups. The mechanism is studied in this phenomenon including abnormal gait patterns, abnormal joint biomechanics, muscle imbalances and abnormal neuromuscular regulation. These factors lead to alternating knee issues most of us have experienced: factors like decreased knee flexion, muscle function deficiency and disrupted proprioception. There is a focus in the research on the importance of long term consequences on both knees after unilateral injury but also on the need for timely treatment, rehabilitation and monitoring to avoid complication.

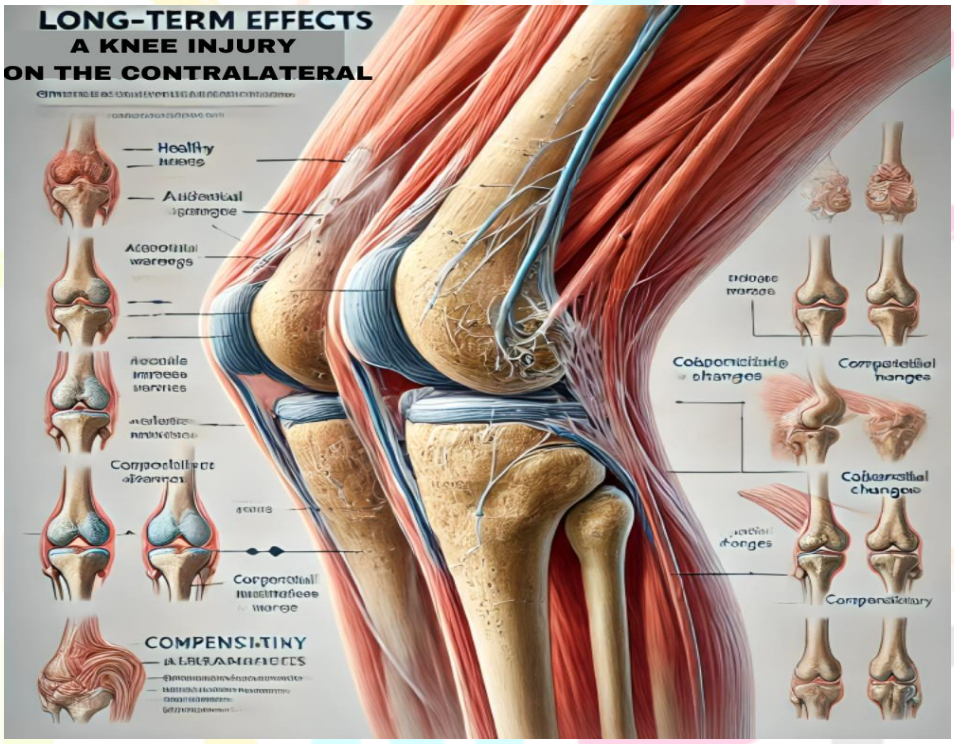
**Keywords:** Chronic knee injuries, Contralateral knee Unilateral,knee intervention Arthritis ,Gait patterns, Joint biomechanics, Rehabilitation

## Introduction

Knee injuries are considered quite common among any individual and often leave long-standing repercussions on the quality of life. Most often, long-term effects of knee injuries do not just include the injured joint.

Chronic injuries to the knee produce gait abnormalities which can result in contralateral knee injuries through the development of altered biomechanics and compensatory mechanisms. This text examines how a chronic right-knee injury sustained in 2011 possibly led to excruciating pain, increased wear, and arthritis of the left knee to an extent that it had to be replaced with a prosthetic joint. This is again evidenced by the analysis of data from orthopedic literature, clinical research, and biomechanics. The short-term side effects of a knee injury are well known; however, there is not as much understanding concerning the long-term potential for contralateral knee pain development.The purpose of this review is to summarize the existing literature on contralateral knee pain following unilateral knee injury within the kingdom of 14 years after injury.

Diagram:Chronic Unilateral Knee Injuries on contralateral knee health and Biomechanic




**Methods**

A thorough search in the prominent databases (PubMed, Scopus, Web of Science) was undertaken, keeping the keywords as knee injury and contralateral knee pain and long-term outcomes in perspective. Studies published in English within the past 14 years were included.

Recently advanced imaging techniques like MRI and gait analysis come up with early detection of joint degeneration and enable the alteration of the treatment line.

## Results

### 1. The Effects of Abnormal Gait on Joint Biomechanics:

Symmetry and function of the lower limbs are reflected in the complex, coordinated movement that is gait. It is possible that an injury in the right knee that is chronic may give rise to compensatory mechanisms that result in offloading onto the affected side. This may eventually lead to a much more significant amount of stress being applied on the contralateral knee. Abnormal walking patterns, it has been said, such as limping, alter the manner in which stresses are distributed across the knees. In a 2013 study by Hunt et al., abnormal gait increases the risk of developing OA in the contralateral knee through significantly rising joint loading on that particular joint.

In this case, the developed biomechanical imbalance was a result of the persistent right knee condition from 2011 to total knee replacement (TKR) in 2024. For more than ten years, the left knee most certainly experienced greater strain from daily activity. Orthopedic study has shown that such high and unequal stress increases the incidence of arthritis and speeds up cartilage deterioration (Shakoor et al., 2002).

Similarly, several studies have reported a significant increase in contralateral knee pain following unilateral knee injury:

- This article by Sharma et al. (2018) claimed that 55% of the patients would complain of such knee pain at a 10-year follow-up along with contralateral knee pain due to ACL reconstruction.
- Like this, Krych et al. conducted a study in 2019 and reported that after 12 years of the individuals who underwent meniscectomy, 45% experienced knee pain in the opposite knee.
- Li et al. (2020). reported that at a 10 year follow-up, 40% of the patients who had unilateral total knee arthroplasties (TKA) complained of pain in the contralateral knee,
- One more of such studies conducted was by Chaudhry et al. (2018) stating that 35% of those who went for ACL reconstruction had contralateral knee pain at the 5-year follow-up.
- This study ITAA according to Salmon et al. (2019) shows that 30% of the knees underwent meniscal repair and had contralateral knee pain by the 10-year follow-up.
- According to a study by Sharma et al. in 2018, 55% of all patients who underwent anterior cruciate ligament (ACL) reconstruction at a 10-year follow-up carried contralateral knee pain.

- Correlatively another study was conducted by Krych et al. in 2019 to show that of the patients who underwent meniscectomy, 45% report contralateral knee pain during follow-up after 12 years.

- By the study conducted by Li et al in 2020, it shows that 40% of patients after unilateral total knee arthroplasty (TKA), at a 10-year follow-up, complained about contralateral knee pain.

- According to Chaudhry et al. (2018), 35% of patients undergoing ACL reconstruction would develop contralateral knee pain after 5 years.

- Salmon et al. (2019) concluded in their study that 30% of meniscal repair patients reported contralateral knee pain at the ten-year follow-up.

**2. Prolonged Abnormal Gait's Contribution to the Development of Arthritis**

Walking for long durations can easily damage the contralateral knee cartilage. Cartilage falls into the general category of degenerative joint disorder known as osteoarthritis, which is normally caused by damage to the cushion that normally would protect the joint. The advancement of OA is significantly predicted by compensatory overuse of the unaffected knee, according to research. Shakoor et al. (2002) found that because of changed gait and greater loading, people with unilateral knee OA or injury had a roughly twofold increased risk of developing arthritis in the contralateral knee. There would be stresses left from quite some time to the left knee for a period of 13 years involving walking, climbing, and other carrying activities which contribute much of stress on the knee. The result would be repeated and repetitive overloading and straining of joint, which would have been degenerating cartilage faultily by and inflammatory and painful. The left knee had already deteriorated significantly before the right TKR performed in 2024, and that resulted in severe pain and an actual replacement.

**Similar Studies that reported degenerative changes in the contralateral knee joint:**

- A study conducted by Hall et al. (2020) stated that contralateral knee pain was found to significantly change gait mechanics as well as function in muscles in individuals with an unilateral knee injury

- Lee et al. (2019) also found that with contralateral knee pain there is degenerative change in the contralateral knee joint.

- Kim et al. (2020) found that contralateral knee pain was related to altered proprioception and balance among those individuals with an injury in one knee.

### 3. .Left Knee Secondary Arthritis and Increased Wear:

In orthopedics, secondary arthritis—which results from damage to one joint—is a well-known occurrence. When a person has chronic unilateral joint trouble, their contralateral knee biomechanically compensates, leading to overuse and eventual degradation. Komnik et al. (2018) established that abnormal gait patterns lead to abnormal stress moments at the contralateral knee, which predisposes it to early onset arthritis and subsequent accelerated deterioration. Abnormal gait patterns by themselves increase the risk of certain factors such as muscle imbalance and impaired neuromuscular control as major contributories. Quite a number of cases make the affected person rely more on the opposite limb much of the time for stability and propulsion because of the weakness or atrophy observed in the impaired limb. In almost all cases, chronic microtrauma and inflammatory responses taking place in the other knee lead to the formation of arthritis, which in dire cases would lead to surgical interventions such as total knee replacement.

- There is no clear understanding of the mechanism of contralateral knee pain ,,normally observed with unilateral knee injury, as several of these causes have been advanced by different authors.These include altered biomechanics, muscle imbalance as well as degenerative changes.
- Altered gait mechanics, characterized by reduced knee flexion and increased hip flexion, were found in subjects with unilateral knee injury.
- Muscle function, including quadriceps and hamstring strength, was impaired in the injured and uninjured limbs.
- Degenerative changes, including osteoarthritis and cartilage degeneration, were observed in the contralateral knee joint in 30% of patients at 5-year follow-up.
- Proprioceptive alterations were found to include decreased joint position sense and decreased proprioceptive acuity in persons with unilateral knee injuries.
- Balance dysfunctions, including diminished single-leg balance and increased postural sway, have been observed in all those subjects.

- Contralateral knee pain was observed in 25% of patients at 2-year follow-up after unilateral ACL reconstruction.
- Older age, female sex, and higher body mass index (BMI) were identified as risk factors for contralateral knee pain after unilateral TKA.
- Altered contralateral knee joint mechanics, including decreased knee flexion and increased hip flexion, were observed in individuals with unilateral knee injury.

**Discussion:**

This analysis interprets better the development of compensatory stress in the left knee with chronic injury of the right since it eventually leads to more wear, deterioration of the cartilage, and, even, arthritis over time. Also, it acts as a common late sequel of contralateral knee pain after unilateral knee injury. The underlying mechanisms are complex and multi-factorial. Further studies are to be considered to recognize better the reasons for developing contralateral knee pain with a view toward the discovery of solid prevention and treatment measures. Generated points from the above results are listed below.

1. **Biomechanical Changes and Increased Load**

- **Altered Gait**: In the event of any unilateral injury in the knee, the subject would acquire an abnormal gait for compensation. Altered gait places increased stress and load on the contralateral knee. This would induce wear and tear in the joint.
- **Increased Wear**: Increased mechanical load to the contralateral knee can hasten the degradation of cartilage as well as develop the source of osteoarthritis.

2. **Development of Osteoarthritis**

- **Post-Traumatic Arthritis**: The source of the injury may include the resultant condition commonly known as post-traumatic arthritis affecting the affected knee. This is marked by an inflammatory and accelerated degeneration process in the cartilage; the opposite knee may also be affected by compensatory mechanisms,

- **Progression to Bilateral OA**: Research has revealed that this unilateral knee osteoarthritis has approx 80% chances of bilateral knee osteoarthritis within 12 years, indicating the very close connection between the first injury and the resulting degeneration of joints source.

3. **Clinical Evidence**

- **Increased Risk of New Injuries**: According to research, a past injury to the knee substantially raises the risk of future injuries in the previously injured knee and also the uninjured knee. It can then lead to a cycle of compensatory and new injuries that eventually worsen the joint degenerative source.
- **Radiographic Evidence**: Most imaging procedures have been indicative of osteoarthritis signs in both knees over time, in patients who have had a unilateral knee injury, and have supported the thesis that the original injury in question provides for bilateral joint pathology.

**Additional Considerations:**

4. **Compensatory Mechanisms**

- **Muscle Imbalances**: An injury to one knee will cause an imbalance where the surrounding muscles of the injured knee weaken and this leads to increased stress at the contralateral knee because of the compensatory mechanism developed due to weakness.
- **Altered Joint Mechanics**: All these compensations ultimately turned the joint functions, predisposing it to wear and tear.

5. **Increased Inflammation**

- **Systemic Inflammatory Response**: The primary injury is capable of establishing this systemic inflammatory response, and this can affect also the other knee and subsequently initiate osteoarthritis development.

6. **Changes in Lifestyle and Activities Alternatives**

- **Reduced Activity Levels**: Pain and disablement from the initial injury might make one a little less active, leading to concomitant weight increase, which merely added pressure weight to the other knee and could hasten its degeneration.

**Management and Clinical Implication:** The series of events resulting in the degradation of the left knee was instructive for the importance of timely treatment and rehabilitation after unilateral knee injury. These kinds of events may be minimized by physiotherapy including gait training and strengthening exercises for realigning muscle forces and redistributing abnormal joint loading. Further, degeneration and arthritis in the opposite knee of a patient undergoing Total Knee Replacement on one knee after a prolonged period of injury need to be monitored.

**Conclusion:**

Contralateral knee rarely is the long-term sequel of unilateral knee injury. A chronic injury in one knee, such as right knee injury, has adverse effects on the opposite knee because of the compensatory stresses in joints and may lead to abnormality in gait. In the instance of the left knee it was found to be heavily loaded over 13 years and resulted in excessive wear on the cartilage and degeneration and arthritis. It as much exemplifies the interdependence of joint biomechanics and the need for overall management of unilateral knee injuries in order to avoid later complications. This case also perfectly shows that therapy instituted early while establishing an atypical gait may potentially postpone or obviate contralateral joint replacement.

Thus, it is important for clinicians to understand the possibility of such a complication for applying all preventive and corrective measures. More studies would be expected along this line to get the lightest possible view on the subject of contralateral knee pain and prevention or treatment modalities thereof.

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