

# The Knee Meniscus Tear – An Overview

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**Abstract:** Knee meniscus tears are a prevalent orthopedic injury that can significantly impact an individual's quality of life. This abstract provides an overview of knee meniscus tears, including their causes, symptoms, diagnosis, and treatment options. Symptoms of knee meniscus tears often include localized pain, swelling, limited range of motion, and a sensation of "locking" or "catching" in the knee during movement. Clinically, physical examinations, imaging (such as MRI), and arthroscopy are used to diagnose meniscus tears. Establishing the best management strategy requires a thorough study regarding the meniscal structure, including vascularity, zones, function, and impacted movements along related symptoms. Optimal therapy additionally involves a thorough evaluation of the patient's features, comorbidities, post-repair rehabilitation, and general function and satisfaction. Treatment options for knee meniscus tears encompass conservative measures such as rest, ice, physical therapy, and knee bracing. Additionally, corticosteroid injections may be utilized to alleviate pain and inflammation. In cases of severe tears or failed conservative treatments, surgical interventions like arthroscopic procedures for repair or partial meniscectomy may be necessary. Early diagnosis and appropriate treatment, guided by the tear's characteristics and the patient's specific circumstances, are crucial for achieving successful outcomes and improving the patient's overall quality of life.

**Keywords:** Meniscus tear, Repair, Arthroscopy, meniscectomy.

## INTRODUCTION

The knee meniscus is a crucial component of the knee joint, serving as a cushion and stabilizer between the thigh bone (femur) and the shinbone (tibia) [1]. A meniscus tear is the rupture of one or more of the knee's menisci, which are strips of fibrocartilage. One of the most frequent sports-related injuries is a meniscus tear, which frequently necessitates surgery owing to knee pain and dysfunction [2]. Menisci were

first thought to be useless vestiges that were frequently removed. The meniscus is a C-shaped cartilaginous structure located within the knee joint, serving as a vital cushion and stabilizer between the thigh bone (femur) and the shinbone (tibia). Meniscus tears typically occur due to traumatic events, degeneration associated with aging, overuse, or excessive strain on the knee joint, such as during sports activities [3-4]. Meniscal repair, meniscectomy, and nonoperative management are the available treatments for meniscal tears. Meniscus extrusion involves the movement of the meniscus across the boundaries of the tibial plateau, either laterally or medially [5]. This paper aims to review the current literature about the meniscus anatomy, pathology, incidence, and management options of meniscal tears.

## ANATOMY OF THE MENISCUS

The meniscus is a crucial structure in the human knee joint, comprising two wedge-shaped cartilage pieces located between the thigh bone (femur) and the shinbone (tibia). These C-shaped structures are integral for the joint's stability, load distribution, and shock absorption. [6]

- ❖ **STRUCTURE:** In every knee joint, there are two menisci - the inner one called the medial meniscus, and the outer one known as the lateral meniscus. These menisci are made up of fibrocartilage, which is a robust and pliable type of cartilage.
- ❖ **SHAPE:** The menisci exhibit a clear C-shaped or crescent-like configuration, enabling them to adapt to the curved contours of the femur and tibia within the knee joint. This distinctive shape plays a pivotal role in even weight distribution, minimizing friction, and ensuring stability.
- ❖ **FUNCTION:** The main roles of the meniscus include the equitable distribution of forces within

the joint, bolstering joint stability, offering lubrication, and cushioning against impacts during activities such as walking, running, and jumping. Additionally, they play a part in preserving the integrity of the articular cartilage, which encases the ends of the femur and tibia.<sup>[6,7]</sup>

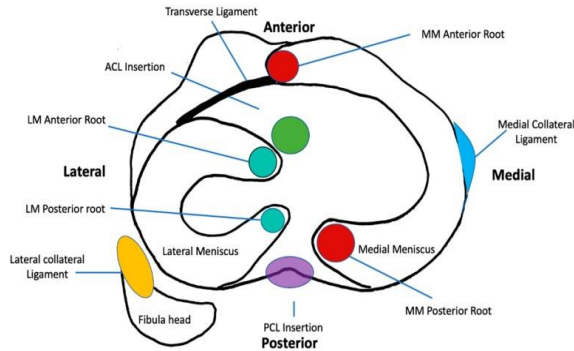


Fig 1: Schematic diagram of anatomy of meniscus  
Source: Jacob G, Shimomura K, Krych AJ, Nakamura N. The Meniscus Tear: A Review of Stem Cell Therapies. Cells. 2019 Dec 30;9(1):92.

### EPIDEMIOLOGY

Meniscus tear is the most common knee injury, with an incidence of 61 cases per 100,000 persons and a prevalence of 12% to 14%. Meniscus tear is more common in males than females, with a ratio of 2.5:1 to 4:1. Meniscus tear is more frequent in sports that involve rough contact or pivoting, such as soccer, ski, handball, and tennis. Meniscus tear can be classified into traumatic or degenerative, depending on the cause and age of the patient. Traumatic tears are more common in younger and more active patients, while degenerative tears are more common in older patients. Medial meniscus tears are more common than lateral meniscus tears, with a ratio of 3:1. This is because the medial meniscus is more constrained and experiences more force during weight-bearing movements.<sup>[8,9]</sup>

### CLASSIFICATION OF MENISCAL TEAR

Meniscal tears are common knee injuries that can be classified into several types based on their location and appearance. The six main types of meniscal tears are:

- ❖ **Radial tear:** Radial tears are the most common type of meniscus tear. They occur within the avascular zone of the meniscus, the part that does not have a blood supply. Radial tears can

significantly impact the function of the meniscus.<sup>[10]</sup>

- ❖ **Horizontal tear:** Horizontal tears take place alongside the surface of the meniscus. These tears can be divided into complete or incomplete categories, depending on whether they extend completely through the meniscus or not.
- ❖ **Longitudinal tear:** Longitudinal tears are linear in nature, following the lengthwise axis of the meniscus. These tears can vary in their length and may be situated either on the inner or outer part of the meniscus.
- ❖ **Bucket handle tear:** A bucket handle tear is a distinctive form of longitudinal tear in which a segment of the meniscus tears and flips over, resembling the handle of a bucket. This tear pattern can lead to the displacement of the meniscus and typically necessitates surgical intervention.
- ❖ **Flap tear:** A flap tear of the meniscus represents an atypical tear pattern. In this type of tear, a portion of the cartilage is peeled back and has the potential to become trapped in the joint, leading to a sensation of "catching" or locking up in the affected area.
- ❖ **Complex tear:** Complex tears result from the combination of various tear patterns, such as the presence of both radial and horizontal tears within the meniscus.<sup>[10,11]</sup>

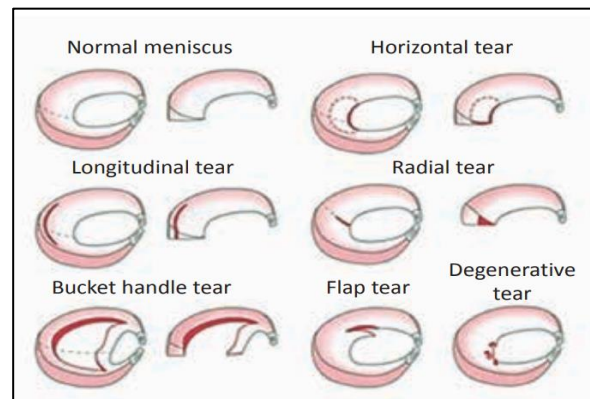
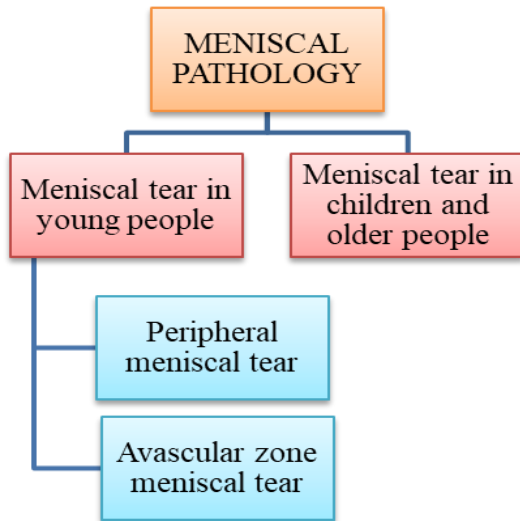


Fig 2: Types of meniscal tear

Source: Cojocararu DG, Hogeaga GB, Florescu S, Patrascu Jr JM, Halmagy D, Stoica R, Anglitoiu B, Patrascu JM. Meniscus transplant: is still a step forward for good results in cartilage lesion progression and knee pain?. Romanian medical JouRnal. 2021 Jan 1;68(1)

PATHOPHYSIOLOGY OF MENISCAL TEAR:



1. MENISCAL TEAR IN YOUNG PEOPLE:

**Mechanical Stress and Trauma:** Meniscal tears in young people often begin with mechanical stress or trauma to the knee joint. This can occur due to activities like sports, falls, or accidents. The fundamental cause of these injuries typically includes cutting or twisting motions, overextension, or the application of significant force.

- ❖ *Peripheral meniscal tear:* A peripheral meniscal tear is a specific type of meniscal injury that takes place near the outer edge of the meniscus, particularly within areas called the red-red or red-white zones, where a blood supply is present. These tears have a higher likelihood of natural healing when compared to tears occurring in the inner, avascular white-white zone, which doesn't receive a direct blood supply. The severity of peripheral meniscal tears can differ, and the appropriate treatment strategy, whether conservative methods or surgical procedures, depends on the tear's specific features and the individual's overall condition.
- ❖ *Avascular zone meniscal tear:* An avascular zone meniscal tear is when a tear develops in the white-white region of the meniscus, which lacks a direct blood supply. These tears generally have a reduced ability to heal on their own when contrasted with tears in the outer red-red or red-white areas of the meniscus, where a blood supply exists. Treating avascular zone meniscal tears often involves surgical intervention due to their limited inherent healing capabilities.

2. MENISCAL TEAR IN OLDER PEOPLE AND CHILDREN:

- ❖ Meniscal tears are a common knee injury that can occur in both children and older adults. The pathophysiology of meniscal tears differs between these two age groups. In younger people, meniscal tears are usually caused by twisting the knee, which often happens while playing sports such as football or basketball. In contrast, older adults are more likely to experience degenerative tearing of the meniscus due to years of normal wear and tear that weakens the meniscus. The meniscus is a rubbery, wedge-shaped piece of cartilage that absorbs shock in each knee joint. It is located between the thigh bone (femur) and shin bone (tibia) where they meet in the knee joint, behind the knee cap (patella).
- ❖ The most common types of meniscal tears seen in middle-aged to elderly populations are degenerative tears. These tears occur when cartilage wears thin and weakens over time, making it more prone to tearing in less-than-traumatic circumstances, such as when rising awkwardly from a chair or twisting the leg on a step. Patients may experience knee pain without recalling a specific event or injury that could have created the problem. In adolescents and adults, about 4/5 of a meniscus has no blood supply, so tears in this inner 4/5 of meniscus will usually not heal. In younger children, more of the meniscus has a blood supply, so tears have a greater potential to heal. <sup>[12,13]</sup>

CONCLUSION

In summary, a meniscal tear is a frequent injury that can profoundly affect an individual's well-being. Although it is a widespread injury, it should not be underestimated due to its potential for extensive consequences. Preventative measures continue to be a vital component in the management of meniscal tears, particularly for those participating in sports and activities that exert pressure on the knee joint. Tactics such as effective warm-up routines, strength training, and the use of suitable protective equipment can significantly diminish the likelihood of injury. In general, by receiving appropriate care, undergoing rehabilitation, and making necessary lifestyle

modifications, numerous individuals can restore their mobility and maintain an active lifestyle following a meniscal tear.

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