

# Approach to Painful Total knee Arthroplasty, under Recognized Diagnosis of Pseudomeniscus Formation

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## ABSTRACT

The purpose of the Total Knee Arthroplasty (TKA) is to improve function and reduce pain in patients with end-stage knee osteoarthritis. However, these treatment goals may not always be realized for some reasons and patients complain of persistent pain and functional disturbances. Pseudomeniscus is an under-recognized diagnosis of soft tissue impingement which may present with painful stiffness of the knee and causes symptomatic TKA. One of the less well-known reasons of severe TKA is pseudomeniscus development. Consider it as a potential source of discomfort if the joint line is sensitive. Arthroscopic approach should be considered for diagnostic and therapeutic purposes after laboratory and radiological evaluations are carried out.

**Keywords:** Knee arthroplasty; Pseudomeniscus; Periprosthetic; Menisectomized; Pain

## INTRODUCTION

Knee arthroplasty is a well-known surgical modality for the treatment of end-stage knee osteoarthritis, the rate of which is increasing [1]. Improving the function of the knee and reducing the pain of patients is certainly of fundamental endpoints of performing this surgery. Notwithstanding, this goal will not always be possible and a substantial number of patients suffer from variety degree of pain and dissatisfaction following Total Knee Arthroplasty (TKA).

The causes of persistent pain after knee arthroplasty include a wide range of etiologies, which are classified into intra-articular and extra-articular [2]. Extra-articular causes are essentially of concomitant comorbidities including degenerative disorder or osteoarthritis of hip and spine, neurological disorder and vascular disease. Intra-articular etiologies are defined in the form of mechanical and biological subcategories [3]. Laxity, aseptic loosening, component failure, periprosthetic osteolysis and malrotation are of more common causes of mechanical intra-articular etiologies of painful TKA. Nevertheless, some other causes including intra-articular adhesions, tendon dysfunction, and impingement such as pseudomeniscus are among the intra-articular causes of persistent knee pain after TKA, which are less noticed [2-4].

Impingement theoretically refers to a condition in which a misplaced tissue, such as fat pad, synovial membrane, regenerated or scar tissue, bone or prosthetic component cause overloading surrounded structures. Pathological impingement leads to patient dissatisfaction and decrease in survival rate through increased susceptibility to early loosening, wear and osteolysis as well as the higher risk of fractures [5]. Recurrent hemarthrosis can also be mentioned as a rare complication of impingement, especially of soft tissue entrapped between surrounded structures [6]. Meniscus-like tissue entrapped between femoral and tibial components causing painful soft tissue impingement following Menisectomized TKA should rather be called "Pseudomeniscus". Pseudomeniscus is one of the soft tissue impingements that has been less studied in the literature and is not commonly recognized.

## LITERATURE REVIEW

### Etiology of pseudomeniscus formation in painful TKA

Various types of soft tissue impingements are described in the literature including patellar clunk syndrome, Tethered patellar syndrome and synovial entrapment syndrome [7-9]. The cause of all of them is hyperplasia of fibrous tissue in the context of constant stress and pressure [10]. This stress can be the result of various conditions such as alignment and structure of femoral

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components, inflammatory response to excess remaining tissue, extensor mechanism alteration, excessive surgical manipulation and the underlying inflammatory disease such as rheumatoid arthritis [11-13]. Nevertheless, the exact etiology of the fibrosis is still not fully elucidated. Hypertrophic synovitis impingement may occur within any compartment throughout the knee. Etiologically, if this type of hypertrophic response occurs between femoral and tibial compartments should rather be called "Pseudomeniscus" [14]. Pseudomeniscus extends along the joint capsule on the medial side and to the interval between the tibial and femoral compartments [15]. Whether the mechanism of pseudomeniscus formation is due to inadequate debridement of the former meniscus during TKA or secondary hypertrophy of the synovium has not been determined yet. Similarly, soft tissue impingement may occur at posterior cruciate ligament stump due to incomplete debridement of the ligament during posterior-stabilized TKA [14]. There is also an assumption regarding the development of fibrocartilaginous tissue based on the cellular response of mesenchymal derived cells, which includes the hypertrophy of fibrotic tissue under the influence of stress and mechanical stress similar to reaction of mesenchymal derived cells against compressive force applied on tendons which subsequently causes fibrocartilaginous tissue formation [16]. Therefore, it can be expected that the formation of pseudomeniscus is justified both through the retained meniscus tissue, due to incomplete tissue debridement during initial TKA, and through regeneration of fibrous tissue. According to reliable histological traits of meniscus tissue, it has been determined that one-third of the cases of meniscal scar originate from the former tissue, and the remaining two-thirds represent scar tissue from different origin which migrated from another place to regenerate meniscal scar tissue [17]. Histological studies consider fibrocytes of synovium origin to be responsible for this metaplasia, which migrate into the joint and differentiate into chondrocytes [18, 19]. Meniscus tissue comprises a complicated structure that consists of its own unique features in different areas. In its outer layer, this tissue include the area rich in blood vessels, where most of the cells are of fibroblast-like, whereas there is dominantly avascular area in its inner layer which consists of chondrocyte-like cells [20]. This fact is important from the point of view that it can be a clarification for the difference in the origin of the regenerated meniscal tissue following its surgical removal, which may eventually result in forming scar tissue with different origin and characteristics. Retained meniscus tissue, especially posterior root of medial side, is highly proliferative with great survival rate when exposed to mechanical stress, which preserves its proliferation potential to regenerate meniscal tissue [20].

### Approach to painful TKA and diagnosis of pseudomeniscus injury

When dealing with a patient who suffers from painful TKA, it is important to take an appropriate history along with the physical examination to rule out all possible intra-articular and extra-articular diagnosis. At the top of the probable complications, one should be considered is related to the patella components including loosening, mal tracking or instability. Radiographic survey should carry out to rule out component loosening and malposition. Laboratory studies should also be considered for

any source of infection and inflammation beside synovial fluid analysis both chemical and microscopic as well as cellular culture. On physical examination, one should pay attention to the range of motion and factors which ameliorate or deteriorate the pain [14]. Painful TKA with joint line tenderness along with the associated pain-causing reduced range of motion could be the most important sign and symptom of Pseudomeniscus formation that usually starts 3-6 months after TKA procedure. The Diagnostic arthroscopy would be considered as an important diagnostic tool after ruling out the infection, and radiologic evaluation for component related issue in painful TKA with intra-articular pathology. Discovering a clue of the cause of complications prior to therapeutic arthroscopy guarantees much better results. Nonetheless, even otherwise, diagnostic arthroscopy is a reasonable approach that could be considered with great care and precision. Arthroscopic intervention is indicated as follows:

- Soft tissue impingement
- Loose bodies
- Confirming the diagnosis of component wear or fracture in contradictory cases
- Lateral subluxation of patella
- Adhesion band lysis in arthrofibrosis after 3 months of initial arthroplasty
- Unknown pain

Arthroscopic evaluation of intra-articular pathologies would be more feasible in comparison with open arthrotomy, through which the lesion is clearly visible and there is no concern about displacement or resection of the entrapped tissue and consequence false negative results that may occur following open arthrotomy [21]. Early diagnostic approach with arthroscopy for suspected wear, fracture or loosening of the polyethylene patella component is recommended to avoid complete revision and to provide temporary symptom relief beside comprehensive revision planning [22]. Arthroscopic approach for diagnosing and treating symptomatic TKA is associated with low morbidity and risk of infection as well as fast functional recovery [10]. Apart from the merits of arthroscopy for therapeutic and diagnostic purposes, this intervention is technically demanding and requires an extreme precaution and accuracy. Implanted prostheses are very vulnerable to scratches which must be carefully protected while inserting and working with arthroscopic instruments.

### Pseudomeniscus treatment and outcome

Arthroscopic debridement and removal of the pseudomeniscus pathology was reported in several studies [2,23-25]. In a recently published article regarding the functional outcome of arthroscopic approach to symptomatic pseudomeniscus causing persistent knee pain following TKA, satisfactory results have been reported in 7 patients out of nine. Remarkable improvement was also reported in functional scores including Oxford Knee Score, Western Ontario and McMaster Universities Osteoarthritis Index as well as pain scores [24]. Multiple factors are proposed to have influence on surgical outcome after arthroscopy. Underlying etiology would be a decisive factor in the success rate of treatment modality. With pseudomeniscus as a soft tissue impingement, arthroscopic removal

and debridement of entrapped tissue is a reasonable technique of choice due to the ease of access to the lesion and the provision of sufficient vision for dynamic assessment [21]. Successful arthroscopic treatment has also been reported for pseudomeniscus in the setting of arthrofibrosis [26].

The precise patient selection is important part of the planning for therapeutic intervention. Patient related criteria including demographic parameters such as weight, BMI, and patients age along with time interval between initial TKA and arthroscopic intervention are proposed to influence on final outcomes [27,28]. Furthermore, pre-operative diagnosis would be effective for improving the results, so that patients who received therapeutic intervention with no distinct etiology are usually not associated with successful results [29]. This issue pronounces the importance of pre-operative diagnostic work up even more.

Arthroscopy demonstrated reasonable therapeutic prosperities in the treatment of problematic TKA in the setting of arthrofibrosis, articular impingement, and patellar malt racking and loose bodies [15,30]. This technique is also a feasible modality option in evaluating and treating painful TKA with suspicious diagnosis of infection by providing the possibility of taking synovial biopsy and cultures [25]. Arthroscopic intervention is not a frequent procedure following TKA and this surgical approach may be rarely needed only in 0.01% to 1.73% of cases. There is no common report of complication following this surgical modality. Nevertheless, the overall complication rate has been reported as scant as 0.5% following diagnostic and/or therapeutic arthroscopy after symptomatic TKA including a case of arthroscopic instrumentation break and two cases of periprosthetic infections out of entire 609 cases [28].

## DISCUSSION

This method is effective for diagnostic and therapeutic purposes, and hence, its application in patients with problematic TKA has recently become more popular [25]. Arthroscopy makes it possible to treat underlying causes of painful TKA with less morbidity and risk of complications, which otherwise required arthrotomy. Therefore, the rehabilitation course will be also quicker and easier for the patients [15]. Post-operative care include overnight admission to receive prophylactic antibiotic, starting continuous passive motion machine if the arthrofibrosis is relevant followed by physical therapy to strength quadriceps and hamstring besides range of motion exercise, and doing repetitive motion exercise like stationary bicycle if the soft tissue impingement has been considered [14].

## CONCLUSION

The purpose of performing total knee arthroplasty is to ameliorate patient's knee pain and subsequent improve in function and quality of life. Any factor that hinders the achievement of these prosperities causes the TKA to be considered a failure. Pseudomeniscus formation is one of the less known causes of painful TKA. Joint line tenderness and painful stiffness warrant us to consider it as the potential source of the pain. Arthroscopic evaluation and treatment of painful TKA could be performed after regular laboratory and radiologic

evaluation of the painful TKA and ruling out the infection, component related issue and extra-articular causes. The promising outcome of arthroscopic evaluation and treatment for some intra-articular causes of TKA including psudomeniscus and low complication rate make the arthroscopic evaluation of the painful TKA as a safe and effective diagnostic tool and treatment in painful TKA.

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