

## A TRIATHLETE WITH MEDIAL MENISCUS TEAR AND SUBCHONDRAL INSUFFICIENCY FRACTURE

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### Abstract

Subchondral insufficiency fracture of the knee (SIFK) is an important differential diagnosis for knee pain. If diagnosed early, SIFK can be treated conservatively with non-weight bearing ambulation. If left untreated, this disease may lead to catastrophic complications such as subchondral fragment detachment and fragmentation or subchondral collapse which will warrant the need for surgical intervention. The author reports a 44-year-old triathlete that presented with complaint of a trivial left anteromedial knee pain for one-year duration. This disease presented at an unusual site of the medial tibial condyle. Moreover, the patient is a healthy triathlete that does not have any predisposing factors for SIFK. Magnetic resonance imaging showed subchondral insufficiency fracture of the medial tibial condyle with a complex multi-directional medial meniscus tear in the same knee. Could the undiagnosed medial meniscus injury be the causation leading to the development of SIFK? Here, the author will summarize the literature on various clinical features, work-up and management of SIFK.

*Keywords:* Subchondral insufficiency fracture, meniscus tear, triathlete

### Case Report

A 44-year-old man with no known medical illness presented with left anteromedial knee pain for one year duration. He is a triathlete that has been competing at least twice a year over the past five years. He trains six times per week, which includes running, swimming, cycling, and muscle strengthening exercises using free weights. While he was able to complete all triathlons, the pain had become more significant, forcing him to restrict himself to slow jogs up to mere three kilometers. He could not pin-point a single traumatic event that might have led to this knee pain, but he was able to note that the pain was dull and aching in nature (pain score 2-3). It is exacerbated by running and relieved by rest. However, there was no swelling, instability or locking. There was no reported use of corticosteroids or traditional medications.

He is a medium built gentleman with an antalgic gait. Clinical examination of the left knee revealed muscle atrophy over the vastus medialis and vastus lateralis. Tenderness was noted over the medial tibial condyle and medial joint line. Active range of motion (ROM) was 0 -130° and passive ROM was 0-140°. The special tests for the ACL, PCL, MCL and LCL were normal. McMurray test was normal. However, Thessaly's test was positive. Examination of the right leg was unremarkable.

Plain radiograph of the knee was normal.

Magnetic resonance imaging (MRI) revealed insufficiency fracture of medial tibial condyle. The MRI also reported a complex tear of anterior and posterior horn of medial meniscus which extends into the body, with medial meniscus extrusion. Thickening of the medial collateral ligament and tendinosis of the semimembranosus were also present.



Figure 2- coronal view of patient's subchondral insufficiency fracture, T2-weighted scan.



Figure 1 - coronal view of patient's subchondral insufficiency fracture, T1-weighted scan.

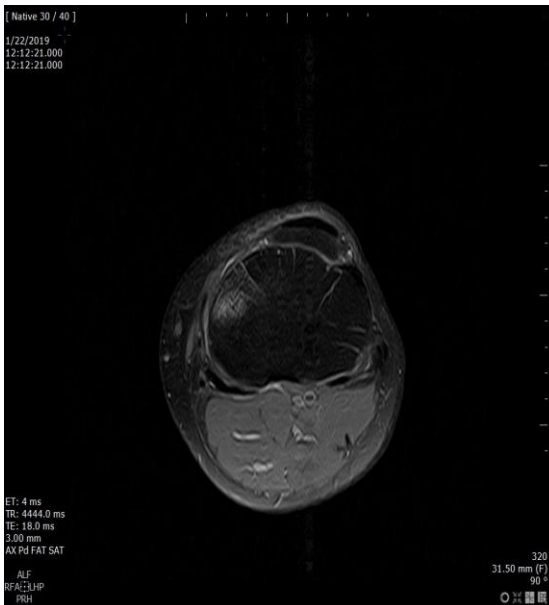


Figure 4 - transverse view of patient's subchondral insufficiency fracture, T2-weighted scan.

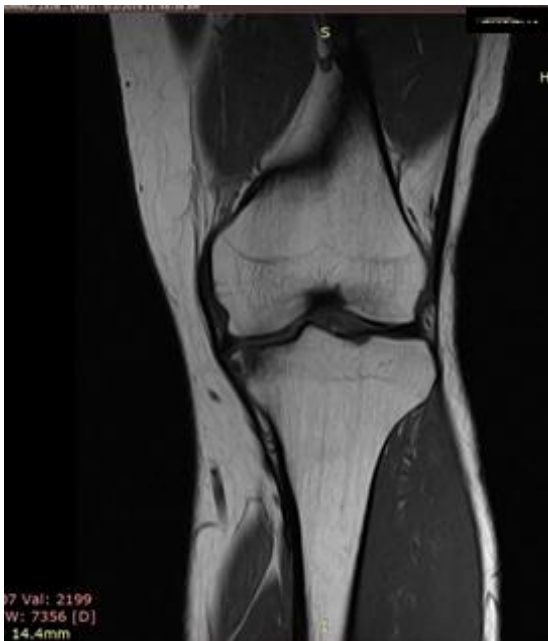


Figure 3 – sagittal view of complex tear at the posterior horn of medial meniscus, T1-weighted scan.

He was treated conservatively. He was counselled for non-weight bearing (NWB) ambulation with the usage of dual axillary crutches for three months. An individualized exercise program (IEP) was prescribed. The IEP consists of strengthening of the quadriceps, hamstrings, and calf muscles with elastic bands while maintaining NWB status.



*Figure 5 – Repeated MRI showing coronal view of patient's subchondral insufficiency fracture, T2-weighted scan.*



*Figure 6– Repeated MRI showing coronal view of patient's subchondral insufficiency fracture, T1-weighted scan.*

The patient was advised to increase the length of isometric contraction and resistance of elastic bands every two weeks for the purpose of progressive overload. Follow ups has shown good compliance. The option of surgical intervention was also given to the patient. Expectations and goals were also discussed with patient and a plan was concluded.

After 3 months, patient no longer has left knee pain. He was weaned off from dual axillary crutches and was allowed partial weight bearing as tolerated. He returned to work with a single axillary crutch. He was introduced to stationary cycling and the intensity of the isometric exercises were further increased.

At 4 months, MRI was repeated to determine the progression of SIFK. The repeated MRI reported improving bone bruise over medial tibial condyle. However, the complex tear of anterior and posterior horn of medial meniscus remains unchanged. Thickening of the medial collateral ligament and tendinosis of the semimembranosus were also still present, likely representing a chronic injury. At this point, patient no longer felt anymore knee pain. Hence, he was allowed full weight bearing.

At 5 months, the patient was able to start brisk walk, body weight partial squats and lunges without any knee pain.

After 6 months, he was able to progress to slow jogs and full squats. He denied of any knee pain, swelling, instability or locking. However, he has not return to his pre-injury level of activity.

## **Discussion**

Subchondral insufficiency fracture of the knee (SIFK) is a type of stress fracture that occurs below the chondral surface on a weight-bearing surface of a bone due to mechanic failure of subchondral cancellous bone.

The terms of spontaneous osteonecrosis of the knee (SONK) and subchondral insufficiency fracture are used interchangeably. (Ecker, & Lotke, 1994). Whereas Yamamoto & Bullough (2000) suggested that SONK is a sequelae of subchondral insufficiency fracture in a review of 14 cases of SONK, in which they have correlated MRI findings of osteonecrosis or pre-osteonecrotic bone to microfractures or disruptions in the subchondral bony trabeculae.

SINK commonly manifests in women of elderly age (Zanetti, Romero, Dambacher, & Hodler (2003). Zanetti et al. (2003) also postulated that most affected patients are elderly, potentially osteoporotic women in whom minor repetitive trauma may cause microfractures. Even though insufficiency fractures have also been reported in patients with systemic lupus erythematosus, post chemotherapy or radiation therapy, renal and liver transplant recipients, and long-term corticosteroid usage, we have yet to discover any literature that links histologic findings of insufficiency fractures to systemic diseases/conditions. In this patient, there was no reported use of corticosteroids. He also had no known medical illness.

SIFK and its counterparts are more commonly described in the weight bearing medial femoral condyle of the knee, which is due to the associated repetitive loading (Yamamoto & Bullough, 2000). The typical presentation of SIFK was inconsistent with this case as the location of the lesion was at the medial tibial condyle.

The correlation of insufficiency fracture with medial meniscus injuries were discovered as early as 1968 (Ahlback, Bauer & Bohne, 1968). A more recent research by Wilmont, Ruutiainen, Bakhru, Schweitzer, & Shabshin. (2016) also found to be supporting this statement. This finding was also seen in our patient, in which he had a complex tear of anterior and posterior horn of the medial meniscus with extrusion of the medial meniscus in the same knee. The question of whether longstanding medial meniscus injury is a precursor to insufficiency fractures has yet to be answered. Despite the statement above, we strongly believe that untreated medial meniscus injuries will lead to SIFK. This is possible due to the increased loading forces on the weight-bearing areas of the knee.

A newer study done by Wilmont et al. (2016) revealed that SIFK is commonly presented with soft tissue oedema. In the 74 cases that were reviewed, 68% showed oedema abutting the posterior distal femoral cortex, 51% showed oedema extending to the vastus medialis fascia and another 24% presented with extension of oedema into vastus lateralis fascia. 78% of the cases also had soft tissue oedema surrounding the MCL (Wilmont et al., 2016)

Whereas in this case, the patient had thickening of the medial collateral ligament with medial meniscus extrusion, swelling of the overlying tissue and tendinosis of the semimembranosus which presents differently from the usual cases of SIFK.

Manco, Schneider, & Pavlov. (1983) concluded that the linear density representing an insufficiency fracture, even when present on initial radiographs, may be subtle and often overlooked or misinterpreted. Magnetic resonance imaging remains the gold standard for diagnosis of SINK as it can detect the disease early. Early detection of SIFK is the key to avoid altogether the complications of the disease, which may range from subchondral fragment detachment and fragmentation, subchondral collapse, osteonecrosis, to rapidly progressive osteoarthritis.

To date, there is extremely limited literature regarding management of SIFK. Hence, there are no standardized guidelines regarding its treatment. The prescription of restricted weight-bearing (either non- or partial) with individualized physical therapy regimes are cornerstones of the conservative management. Based on a study by Wright et al. (2000), there is also the possibility of returning to pre-injury activity level after 12 months. The use of other non-operative treatments such as anti-inflammatory drugs, bisphosphonates, and bone stimulators have been proposed (Yamamoto & Bullough, 2000). However, as of date there are no data supporting the use of these agents in subchondral insufficiency fracture involving the knee. More high-quality research need to be done to see the effects of these drugs on the management of SIFK.

The progression of the disease despite aggressive conservative treatment or development of complications such as subchondral fragment detachment and fragmentation or subchondral collapse will warrant the need for surgical intervention. The treatment options are proposed to achieve symptomatic relief, includes uni-compartmental and total knee arthroplasty or osteochondral allografts. The decision for selection of surgical treatment is best based on a holistic approach depending on the size, location, and severity of the joint destruction, as well as patient and surgeon related factors (Mont, Marker & Zywiell, 2011).

## **Conclusion**

It is of paramount of importance to diagnose subchondral insufficiency fracture of the knee (SIFK) early to prevent catastrophic complications. MRI is a useful adjunct to distinguish them from meniscal or ligament injury. Conservative management which includes non-weight bearing ambulation and physiotherapy would have sufficed if patients are diagnosed in the early stages of the disease. Whereas if SIFK was diagnosed late, the management of the debilitating complications such as subchondral fragment detachment and fragmentation or subchondral collapse will warrant the need for surgical intervention. This will eventually lead to longer inpatient stays, longer sick leaves, and higher overall costs (surgery, surgical implants, etc).

## **References**

- Ecker, M. L. & Lotke, P. A. (1994). Spontaneous osteonecrosis of the knee. *J Am Acad Orthop Surg*, 2, 173–178.
- Yamamoto, T. & Bullough, P. G. (2000). Spontaneous osteonecrosis of the knee: the result of subchondral insufficiency fracture. *J Bone Joint Surg Am*, 82, 858–866.
- Wilmont, A. S., Ruutiainen, A. T., Bakhru, P. T., Schweitzer, M. E. & Shabshin, N. (2016). Subchondral insufficiency fracture of the Kkee: A recognizable associated soft tissue edema pattern and a similar distribution among men and women. *European Journal of Radiology*. 10, 1016.
- Zanetti, M., Romero, J., Dambacher, M. A. & Hodler, J. (2003). Osteonecrosis diagnosed on MR images of the knee. Relationship to reduced bone mineral density determined by high resolution peripheral quantitative CT. *Acta Radiol* 44, 525–53.
- Ahlback, S., Bauer, G. & Bohne, W. (1968). Spontaneous osteonecrosis of the knee. *Arthritis* 11(6), 705-733.
- Manco, L. G., Schneider, R. & Pavlov, H. (1983). Insufficiency fractures of the tibial plateau. *AJR AM J Roentgenol*. 140(6), 1211-5.
- Mont, M. A., Marker, D. R. & Zywiell, M. G. (2011). Osteonecrosis of the knee and related conditions. *J Am Acad Orthop Surg*. 19, 482–494.