

Case Report

Case of Successful Treatment of a Patient with Subchondral Fracture of the Knee Joint using Subchondral Platelet-Rich Plasma Injection

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Abstract

We report the treatment of a patient with a pronounced knee pain syndrome related to a subchondral knee joint fracture in the context of osteoarthritis. Traditional treatment methods for this pathology have demonstrated limited efficacy. In our approach, we utilized subchondral Platelet-Rich Plasma (PRP) injections to alleviate the pain syndrome and stimulate reparative regeneration. Notably, we achieved a stable and rapid reduction in knee pain, with observed regression of pathological changes on MRI scans after a two-month follow-up.

Keywords: SIFK; PRP; Intraosseous Injection; Osteoarthritis

Introduction

Pain in the knee joint area is a pressing issue in modern orthopedics. One of the conditions that causes significant knee pain and is often underdiagnosed is Subchondral Knee joint fracture (SIFK). SIFK is a microfracture associated with repetitive physiological stress on the knee joint. It is a common cause of knee pain in middle-aged and older individuals.

1. It is characterized by an acute or subacute onset and is manifested by severe knee pain during load-bearing activities and at night

SIFK is often not a standalone condition and typically occurs in patients with osteoarthritis. Between 50% and 100% of individuals with SIFK have concomitant meniscal injuries

2. Since SIFK is often not recognized in a timely manner, there have been few studies investigating treatment strategies, and no standardized treatment recommendations have been developed

3. However, late diagnosis and improper treatment of SIFK can lead to secondary osteonecrosis and bone collapse

Methods

We observed a 60-year-old active female patient with complaints of intense knee pain exacerbated during walking and persisting at night and during rest. Visual Analogue Scale (VAS) pain score was 60-70 mm. In the patient's medical history, she experienced knee pain a month before her visit, following prolonged walking. Over the course of a week, she noticed swelling in the knee joint area. Previous treatments included Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) and physical therapy without improvement. Knee joint X-ray revealed grade 2 osteoarthritis. One month after the onset of pain, a knee joint MRI was performed, and the diagnosis was as follows: aseptic necrosis of the internal condyle of the tibia. Meniscal tear. Total knee arthroplasty was planned.

Upon examination in the clinic, limb alignment was normal. Proliferative changes were observed in the knee joint. Range of motion: extension 180°, flexion 70°. Palpation of the inner knee joint area elicited sharp tenderness, more pronounced in the meniscal region than in the tibia. The patient had an antalgic gait.

The diagnosis was revised: Complex tear of the posterior horn and body of the internal meniscus (grade III B), subchondral fracture of the tibia's internal condyle, massive subchondral edema of the tibia's internal condyle, delamination of the lateral facet of the patella, old partial tear of the anterior cruciate ligament, and grade 2-3 osteoarthritis of the knee joint. Acute pain syndrome was present.

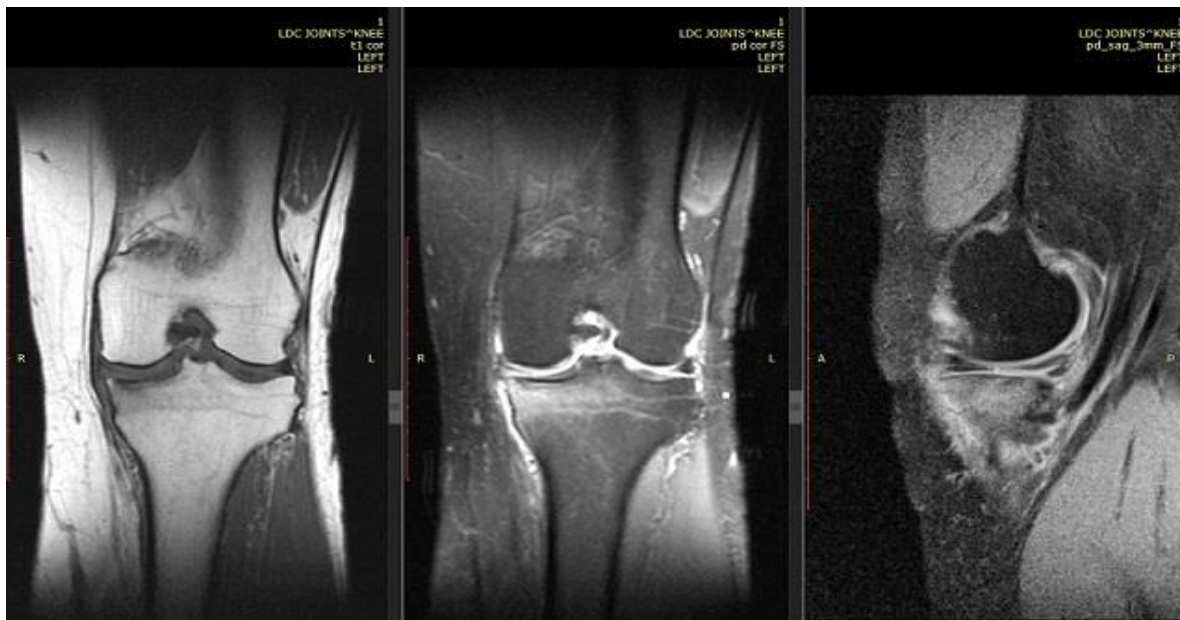


Figure 1: Pretreatment MRI.

Patient underwent an interventional procedure. To activate the reparative process, three injections of autologous Platelet-Rich Plasma (PRP) were administered at one-week intervals. Intraosseous injections were performed under local anesthesia using a lidocaine solution, guided by continuous fluoroscopic monitoring. A spine cannula 19G needle was used for bone marrow aspiration. 1st Injection: Intra-articular PRP injection; 2nd Injection: After trephination of the cortical layer of the tibia's internal condyle, intraosseous subchondral injection into the subchondral fracture zone, guided by fluoroscopy. Simultaneous intra-articular injection; 3rd Injection: After trephination of the cortical layer of the tibia's internal condyle, intraosseous subchondral injection into the subchondral fracture zone, guided by fluoroscopy. Simultaneous intra-articular injection.

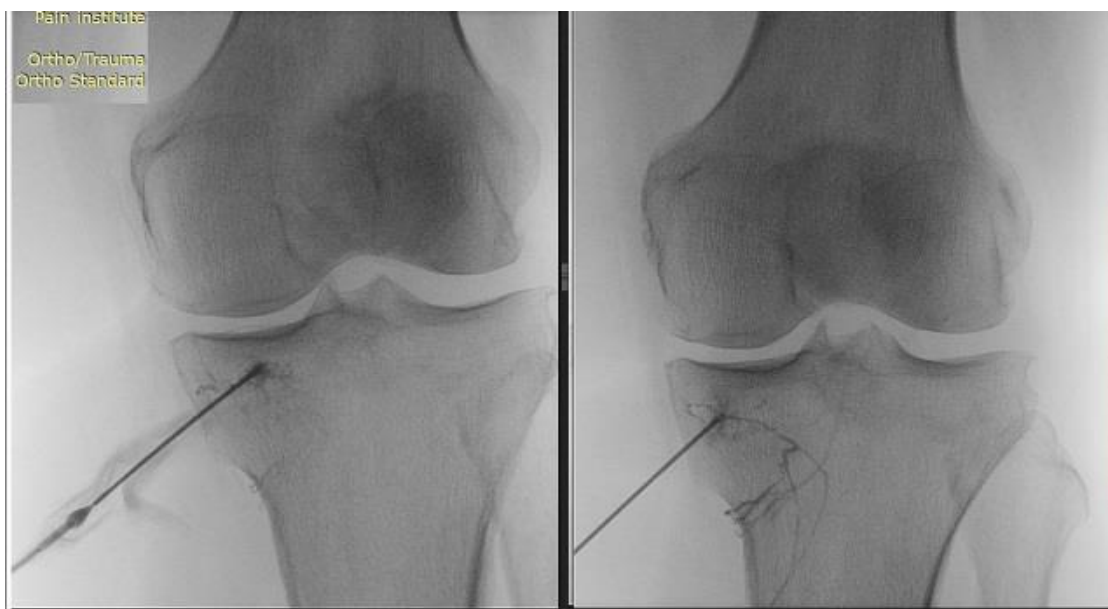


Figure 2: Intraoperative X-ray control of needle position and dye spread.

Patient Follow-up

Following the first subchondral injection, a significant and sustained reduction in pain was noted, with a VAS score of 10-20 mm. We monitored the patient for 2 months, and she remained pain-free throughout the observation period, with a VAS score of 0-10mm. After 2 months, a follow-up MRI examination revealed complete regression of bone marrow edema and the subchondral fracture of the tibia's internal condyle. The patient was allowed to resume full weight-bearing. Two weeks later, she returned to full and active loading.

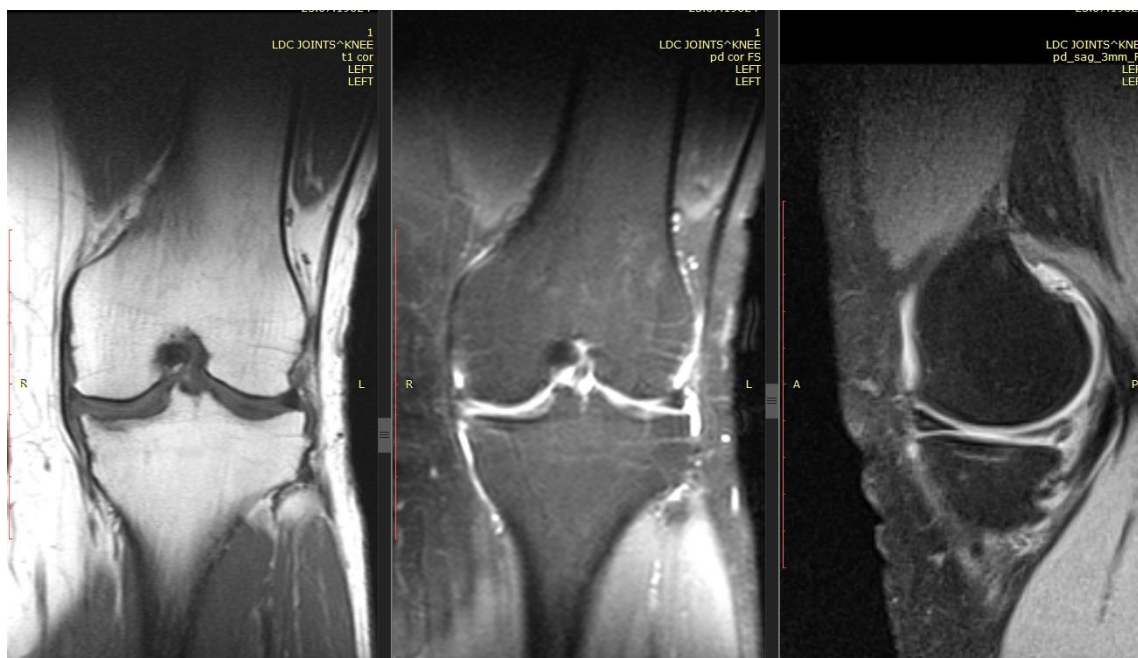


Figure 3: MRI 2 months after treatment.

Discussion

Conservative treatment is the primary choice for early-stage subchondral knee fractures. It typically involves partial or complete unloading of the affected leg to accelerate healing, the use of Nonsteroidal Anti-Inflammatory Drugs (NSAIDs), and, in some cases, bisphosphonates [4]. However, in cases of delayed diagnosis, conservative treatment is often ineffective, and the pain recurs, leading to the progression of the condition, bone collapse, and the development of severe osteoarthritis.

One potentially effective treatment modality for musculoskeletal issues is biological agents, such as Platelet-Rich Plasma (PRP) [5]. Recently, PRP has shown promise in the treatment of various orthopedic, musculoskeletal, and pain syndromes. PRP consists of various components, including platelets and other cell types, growth factors, and cytokines. The main premise is to create an environment that promotes healing by directing cell proliferation, chemotaxis, and angiogenesis [6].

Most studies regarding the efficacy of PRP have focused on its intra-articular or periarticular administration in the vicinity of tendons and ligaments. However, in the case of SIFK and massive bone marrow edema as evidenced by MRI, we proposed a technique of intraosseous PRP injection into the subchondral fracture zone under fluoroscopic guidance. The PRP product used in this procedure is manufactured using a technology ARM system that offers prolonged therapeutic effects. It has been previously shown that bone marrow edema of the knee joint leads to a local area of high bone metabolism with an accumulation of cytokines and angiogenic factors, essentially constituting localized inflammation [7]. The positive dynamics in patients' conditions following the application of PRP supports the theory of a pronounced anti-inflammatory effect of locally administered platelet-rich plasma.

This technique is minimally invasive and accessible for the treatment of SIFK, and its execution under local anesthesia allows for repeated procedures with minimal risk to morbid patients. Accurate needle positioning under x-ray control can be a determining factor in the success of these procedures, as it facilitates precise access to the target subchondral bone zone. The tracked dynamics

of pain intensity measured by VAS, patient activity, and regression of bone marrow edema according to MRI data over 2 months may indicate the effectiveness of the proposed method.

Conclusion

Early detection of SIFK is especially crucial for any patients. In cases of persistent pain over one month, we recommend conducting an MRI diagnostic. Biological agents, such as platelet-rich plasma, have demonstrated their effectiveness in reducing inflammation and influencing reparative functions. When PRP is administered to the target subchondral bone zone, we achieve positive results in terms of pain reduction and potentially impact the process of subchondral bone repair. In our clinical case, within one week, we relieved the patient of pain, and within 2 months, we achieved the regression of bone marrow edema according to MRI data. Therefore, we consider intraosseous PRP injection into the damaged subchondral bone as a key and potentially effective treatment method for patients with SIFK.

Conflict of Interest

The authors have no conflict of interest to declare.

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