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Case Report

# Unusual Association of Osteochondral Fracture of Patella with Adjacent Osteochondral Defect of Lateral Femoral Condyle: A Case Report and Review of Literature

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## Abstract

**Background:** Incidence of osteochondral fractures with osteochondral bone defects without significant anterior cruciate ligament (ACL) injuries is rather uncommon with minimal literature available about the incidence rates of such lesions. Osteochondral injuries of the knee have different mechanisms of injuries like those following ACL rupture and patellar dislocation, which comprise direct and indirect modes of injuries. Various treatment modalities have been described for osteochondral defect depending upon the size of defect, such as debridement, lavage, microfracture technique, and osteochondral autograft transfer system (OATS) therapy. In case of osteochondral fractures, the main mode of management is surgical wherein osteochondral fractures are managed with headless compression screws and bioabsorbable implants. Robust management of the osteochondral fractures and osteochondral defects helps in achieving good prognosis for the patient.
**Case Report:** An 18-year-old young man presented with complaints of pain and inability to move his right knee following alleged history of twisting of right knee while playing football. On examination, the patient had moderate effusion in the knee with tenderness over the medial patellofemoral joint line. Radiological investigation revealed traumatic osteochondral fracture of the patella and incidental finding of osteochondral defect in the lateral femoral condyle which was managed surgically with Herbert headless screw fixation for fracture and debridement with microfracturing for osteochondral defect. Post-operatively, patient had good rehabilitation and regained his normal range of motion (ROM) at the end of 12 weeks.
**Conclusion:** The coincidental existence of both osteochondral fracture and osteochondral defect is a rare entity and warrants the need for surgical management to have better prognosis.

*Keywords:* Case Studies; Tissues; Microfractures

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## Background

Osteochondral bone defects post-trauma are a common lesion of the knee joint, which were first described by Milgram in 1943 (1). However, there is no general agreement regarding the management of this entity. Association of an osteochondral fracture with an osteochondral defect has an incidence in question. Most injuries around the knee joint are related to ligamentous injuries like disruption of the anterior cruciate ligament (ACL) and dislocation of the patella. The incidence of osteochondral fractures has been described as almost half of all traumatic patellar dislocations (2, 3). Incidence rate of cartilage defects including osteochondral fractures in ACL ruptures is 16-46 percent (4). Incidence of such osteochondral fractures with osteochondral bone defects without significant ACL injuries is rather uncommon, with minimal literature available about the incidence rates of such lesions.

Osteochondral injuries of the knee have mechanisms of injuries like those following ACL rupture and patellar dislocation, more specifically described by Kennedy et al. (5), comprising direct and indirect modes of injuries. A direct force to the patella can be responsible for significant traumatic patellar dislocation. In contrast, external rotation of the tibia or the femur in hyper extension or slight flexion can be the indirect causative mechanism of injury for such lesions. Osteochondral fractures can occur in every age group, but are rather rare in children before the calcification of the tidemark occurs.

Treatment options include three main strategies: fragment fixation, osteochondral fragment removal, and achieving healing of the injury with regenerative procedures. Previously described treatments include using conventional screws, sutures, and bioabsorbable implants. It is still unclear if adjuvant therapies provide better clinical results. Factors like age, location within the knee joint, and associated pathologies can influence the treatment decisions.

## Case Report

An 18-year-old young man presented to the orthopaedic outpatient department with complaints of pain and inability to move his right knee following alleged history of twisting of the right knee while playing football. Following injury, the patient could walk with support but could not bend his knee. On examination of his right knee, the patient had moderate effusion in the knee with

tenderness over the medial patellofemoral joint line. Patient also had tenderness over the lateral tibiofemoral joint line. He had restricted knee range of motion (ROM) due to pain. Special tests could not be elicited. Patient was further evaluated radiologically with the help of radiographs of right knee in anteroposterior (AP) and lateral views, which showed osteochondral fracture of right patella and radiolucency in the subchondral surface of lateral femoral condyle (Figure 1).


**Figure 1.** Anteroposterior (AP) (a) and lateral (b) views of knee radiograph showing osteochondral defect in lateral femoral condyle

Based on the radiographic findings, patient was further evaluated with the help of magnetic resonance imaging (MRI) and computed tomography (CT) scans which showed comminuted osteochondral fracture of the right patella along with osteochondral defect over lateral femoral condyle (Figures 2-4).

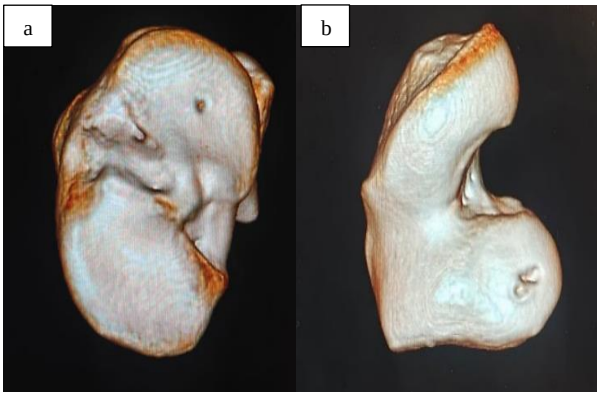


**Figure 2.** Three-dimensional (3-D) computed tomography (CT) scan showing osteochondral defect on lateral femoral condyle (a and b)

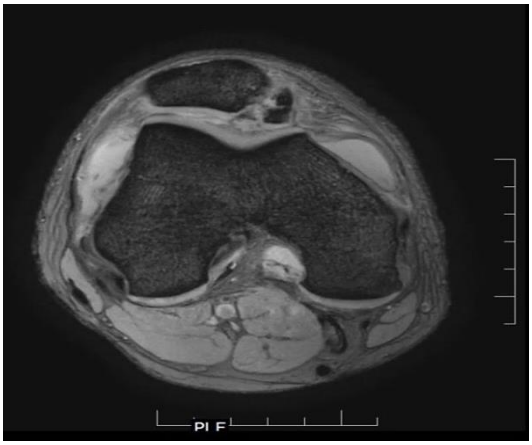


**Figure 3.** Axial magnetic resonance imaging (MRI) of knee showing comminuted osteochondral fracture of the right patella

Based on the above findings, patient was planned for open reduction and internal fixation (ORIF) of osteochondral fracture with headless compression screw.


**Figure 4.** Sagittal and coronal magnetic resonance imaging (MRI) sections of the knee showing osteochondral defect over lateral femoral condyle (a and b)

Intraoperatively, through medial parapatellar approach, osteochondral fracture of patella was identified, edges were freshened, and 2.4mm headless compression screw was used to fix the fracture (Figure 5). Reduced patella fracture was flipped and cartilaginous osteochondral defect was identified over articular surface of lateral femoral condyle measuring around 1.5 cm × 1 cm (Figure 6).

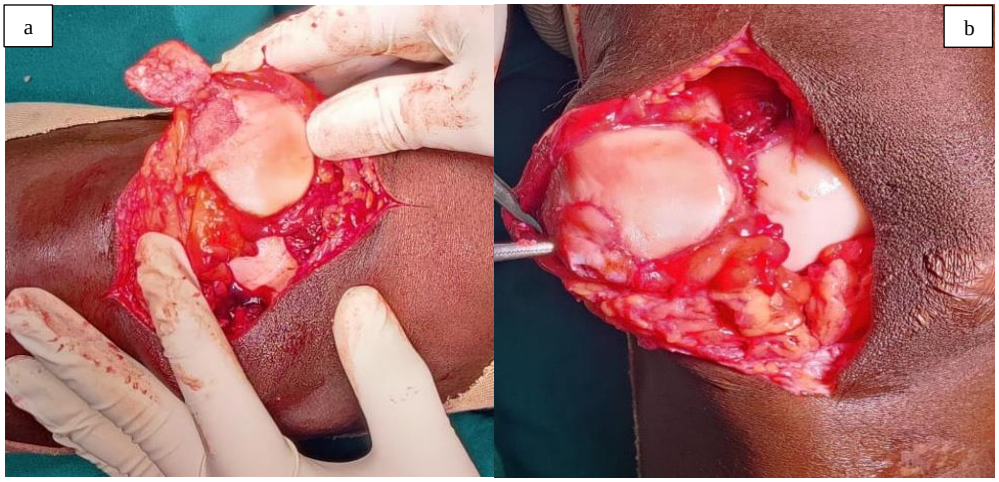


**Figure 5.** Intra-operative images showing pre-fixation and post-fixation of osteochondral fracture of patella with Herbert screw (a and b)

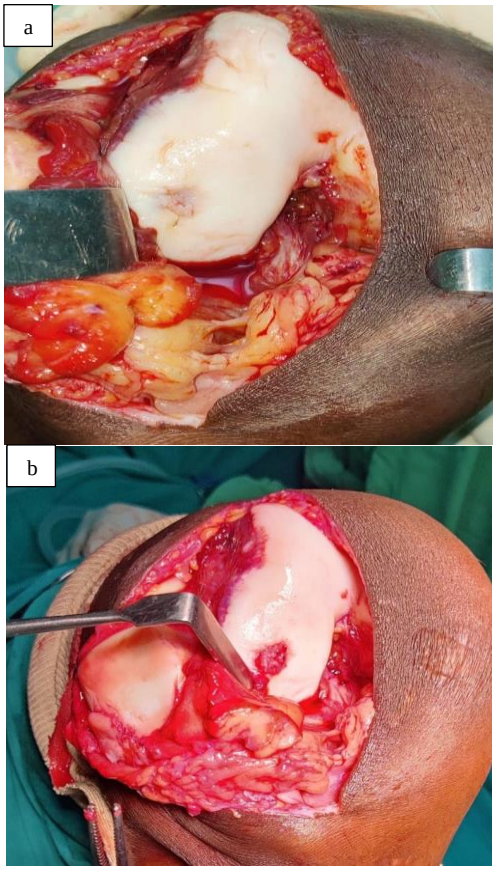


**Figure 6.** a) Intra-operative images depicting the osteochondral defect over the lateral femoral condyle; b) Microfracturing done at the defect

Defect was drilled with 1mm Kirschner wire (K-wire) multiple times to enhance the healing. Synovial fat pad was used as a padding graft over the microfracture site of osteochondral defect (Figure 7).

Procedure went uneventful and patient was started on static quadriceps exercises and long knee brace immobilization post-surgery. Patient was kept on non-weight-bearing mobilization till 6 weeks.

Regular follow-ups were done at the end of 3 weeks, 6 weeks, 9 weeks, and 12 weeks.

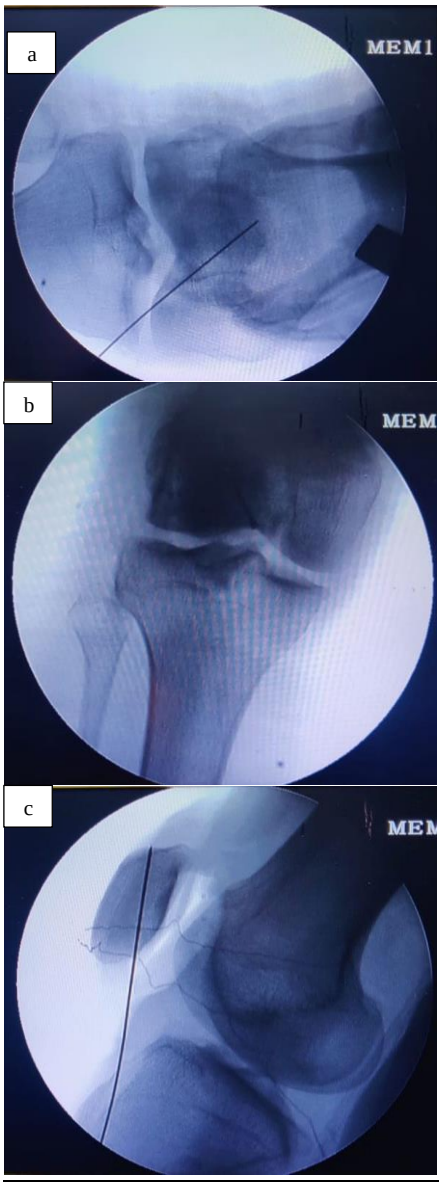


**Figure 7.** Intra-operative C-arm radiographs (a, b, and c)

Patient was gradually mobilised at the end of 6 weeks with partial weight-bearing and knee mobilization exercises. He attained near normal ROM without any pain by the end of 12 weeks. Sequential radiographs were also taken that showed proper osteochondral fracture union (Figure 8).

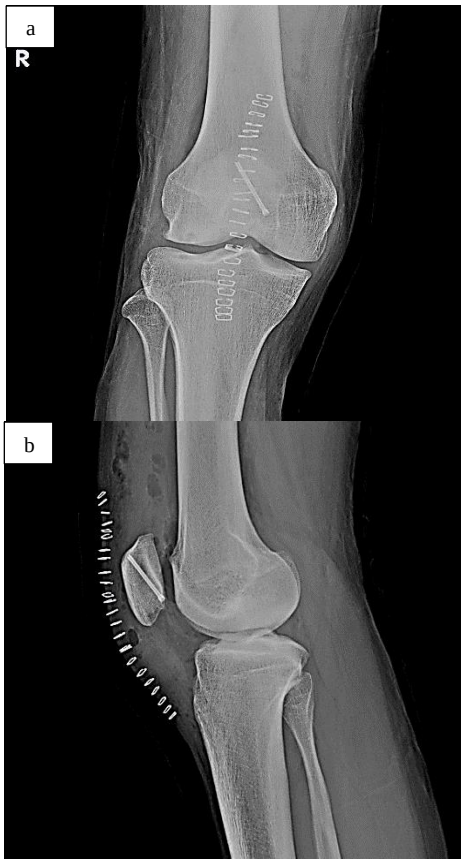


**Figure 8.** Post-operative radiographs of osteochondral fracture fixed with headless compression screw (a and b)

## Discussion

Osteochondral defects along with osteochondral fractures are rare coincidences. In patients with fewer symptoms and osteochondral lesions as incidental findings, specifically lesions measuring less than 2 to 3 $cm^2$, palliative methods such as debridement and lavage should be used.

Stimulation of subchondral bone tissue is a method reserved for cartilaginous lesions measuring 1 to 5 $cm^2$ particularly in younger age groups and more active patients (6).

A promising technique gaining popularity is the micro-fracturing method (7). Ingression of pluripotent mesenchymal cells occurs because of drilling the subchondral bone tissue; these pluripotent mesenchymal cells arise from the vascular system, which along with growth factors, enter the defective region, achieving adherence to the surface of the bone (7, 8). Haematoma formation is a consequence of bleeding which occurs post procedure, filling the defective region, followed by fibrin plug formation. Ultimately, granulation tissue formation ensues (7, 8).

There are several studies that show favourable outcomes following management of the chondral defect in the weight-bearing surface of the femoral condyle with the microfracturing technique. One of the studies includes the use of the microfracture technique in the age group under 45 years in a total population group of 71 patients with chondral defects of traumatic aetiology without any concomitant lesion. This study found increased Lysholm scores from 59 to 89 points and a mean Tegner score from 3 to 6 points in these patients over a span of 11 years of follow-up (8).

A randomized controlled trial (RCT) study compared two groups, one undergoing autologous chondrocyte transplantation and another undergoing microfracturing. Better clinical outcomes were found in younger individuals, particularly below 30 years of age, in both groups (9).

Age-dependent clinical results are found after the microfracture of Clanton and DeLee grade III osteochondral lesions in the knee. After 18 months of surgery, deterioration begins, which is more pronounced in patients older than 40 (10). On the other hand, the best long-term results are found in younger patients with defects in the femoral condyle.

In our case, the patient had a twisting injury to the knee, which caused patellar subluxation along with the fracture of the osteochondral surface of the patella. We also had a coincidental finding of an osteochondral defect in the lateral femoral condyle in CT screening. Previous studies have demonstrated active surgical management of osteochondral fractures with Herbert screw fixation, fibrin glue fixation, or use of bioabsorbable implants (11-13). Several theories have been hypothesized regarding the occurrence of osteochondral defect, but there is very minimal literature to support the presence of osteochondral defect along with an osteochondral fracture.

Our case report signifies the importance of treating both the osteochondral defect and osteochondral fracture with robust management so that the patient can have a better prognosis. We want to hypothesize that the surgical treatment of both osteochondral fracture and osteochondral defect helps in achieving maximal joint function.

Only two studies are eligibly highlighting cartilage repair with debridement techniques alone and there is no role of conservative management described by authors, thereby reflecting that osteochondral fractures must be managed by surgical methods.

A study including 180 patients conducted by Paar et al. is also one of the largest available studies in which 118 patients were included with the diagnosis of osteochondral fracture. A follow-up of 30 months was observed to identify complications like post-traumatic osteoarthritis (OA); this study included a variety of surgical procedures, like wound debridement alone, K-wire fixation, fibrin glue fixation, and fixation using bioresorbable implants. Since this study was large, it lacked a definite scoring system for post-operative function evaluation. Patients in a low proportion (n = 9) had ongoing pain and 6 fixed fragments did not heal (14).

### *Conclusion*

The coincidental existence of both osteochondral fracture and defect is a rare entity that warrants surgical management to improve the prognosis. The patient's athletic nature, which resulted in multiple minuscule traumas to the knee joint, might have led to the occurrence of osteochondral defect, and one episode of

severe twisting injury caused osteochondral fracture. Irrespective of the pathophysiology of these injuries, young patients need to be treated with surgical management, such as debridement and microfracturing, along with fixation of the osteochondral fracture.

## Conflict of Interest

The authors declare no conflict of interest in this study.

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