



## Preservation Of Traumatic Chondral Flap Injury In An Adolescent Girl: A Case Report

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### Abstract

**Introduction:** Chondral flaps are clinically simulable meniscal tears that are radiographically concealed articular cartilage damage and these injuries have to be treated surgically. These are intra-articular injuries that are associated with osteochondral fractures in adolescents. They are usually caused by direct impact or twisting injuries of the knee. We present a case of preserving a lateral femoral condylar cartilage flap and fixation of a largely displaced fracture involving the articular surface with headless screws in an eleven-year-old girl.

**Case presentation:** The patient presented with pain, deformity, and restriction of movements in the left knee following trauma. She was not able to bear weight on her limb following trauma. On examination, fixed flexion deformity of 20° noted i.e., there is an extension block terminally in her left knee noted. X-ray, CT, and MRI scan revealed a fracture with a chondral flap. Anatomically, the osteochondral fracture was reduced, and it was fixed using headless screws and the chondral flap was stabilized with a suture bridge. The main objectives include easing pain, addressing deformities, and improving the range of movements and early mobilization.

**Conclusion:** Suture bridge repair of chondral flap injuries had a promising result and should be considered in acute trauma.

**Keywords:** Chondral flap, fracture fragment, weight-bearing, preserving, internal fixation

### Introduction

The term "chondral delamination" refers to the debonding of the cartilage from the bone beneath. The hyaline cartilage can only repair to a certain extent. and lacks the natural ability to reestablish its normal structure or to mend the subchondral bone once it has been severed from it. These are rare and are associated with osteochondral fractures in adolescents. These are usually brought on by direct contact or a twisting force experienced during physical activity. Such injuries can cause significant knee joint pain and joint degeneration and these injuries create a particular challenge for orthopaedic surgeons in terms of the technical difficulty of the fixation as well as the lower healing potential in cartilage than in bone. Hereby, presenting a report of

a highly active adolescent girl with a traumatic chondral flap injury with a fracture of the articular surface of the left lateral femoral condyle for whom cartilage preservation along with primary fixation of a fragment in the knee was done.

### Case Presentation:

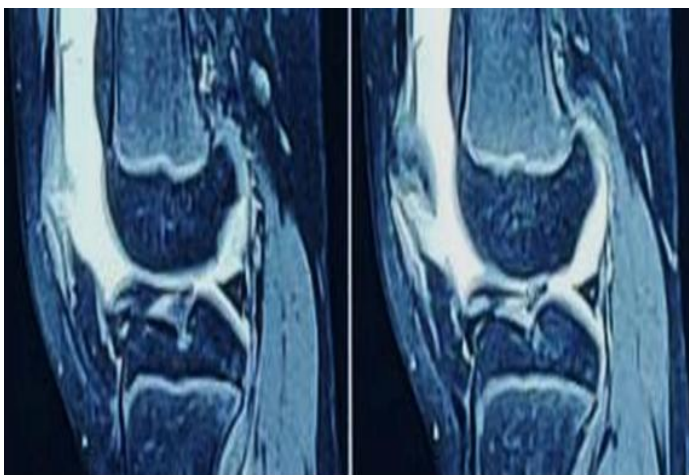
An adolescent girl sustained a twisting injury to her left knee whilst martial training. She presented with severe pain and swelling around her knee joint and was incapable of putting weight on the injured limb. Her overall health was good, and she had no notable history. She was a very active competitive athlete in the seventh grade. On examination, a fixed flexed attitude of 30° in the left knee was evident with mild effusion in the joint. Diffuse tenderness was present

over the distal femur with painful restriction of movements.

Radiographs demonstrated a free fracture fragment from the lateral condyle in the joint space.



[Figure 1: Osteochondral fracture in an eleven years old girl: Left knee radiographs showing a free fragment from lateral femoral condyle in the knee joint]. MRI scan showed focal subchondral bone edema with displaced fracture of the articular surface of the posterior aspect of the lateral condyle with the fragment in joint space; the presence of fluid between the fragment and the femoral condyle.



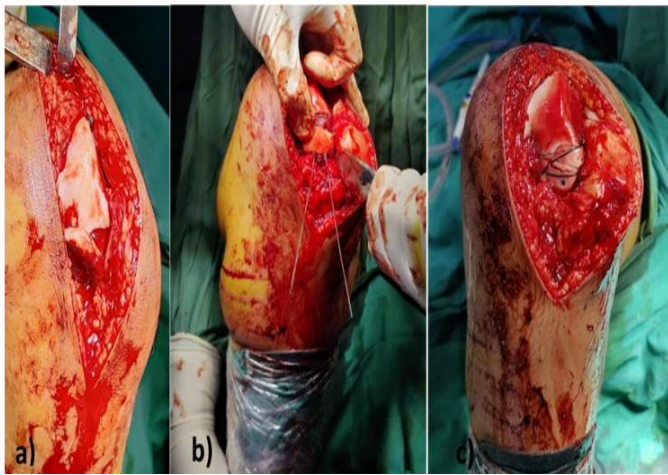
[Figure 2: Osteochondral fracture with subchondral plate depression in an eleven years old girl: MRI of the left knee showing focal subchondral bone edema with displaced fracture of the articular surface of the posterior aspect of the lateral condyle with the fragment in joint space]. A 3D CT scan was done to understand the anatomy and size of the fragment. It measured 2.2cm long by 1.8 wide, at depth of 0.6cm (cartilage depth) .



[Figure 3: Osteochondral fracture fragment in an eleven years old girl: 3D-CT scan displaying the size of the fragment].

The lateral parapatellar technique was used to perform an arthrotomy. Intraoperative findings revealed a chondral flap with a 2 cm long and 2 cm wide fragment with marginal scratching and tattering on the distal lateral corner of the fragment. Because of the chondral defect's dimensions and age, the authors decided to secure the detached cartilage to the original surface and fix the fracture fragment. The fracture fragment was reduced and fixed temporarily with 1.2 mm K-wires followed by definite and stable fixation with three headless screws following the AO principles for intra-articular fractures and the screw head was flushed with the bone. Curettage was performed at the site of the condylar defect followed by securing the chondral flap with suture bridge repair .





[Figure 4: Intra-op imaging of patient: a) Lateral parapatellar approach b) reduction of the fragment with K-wires c) Fragment fixation with headless screws and preserving the chondral flap with suture bridge repair]. Post-fixation, the retinaculum was securely sutured. Stable fixation and good anatomic reduction were accomplished. Immediately following surgery, radiographs were taken.

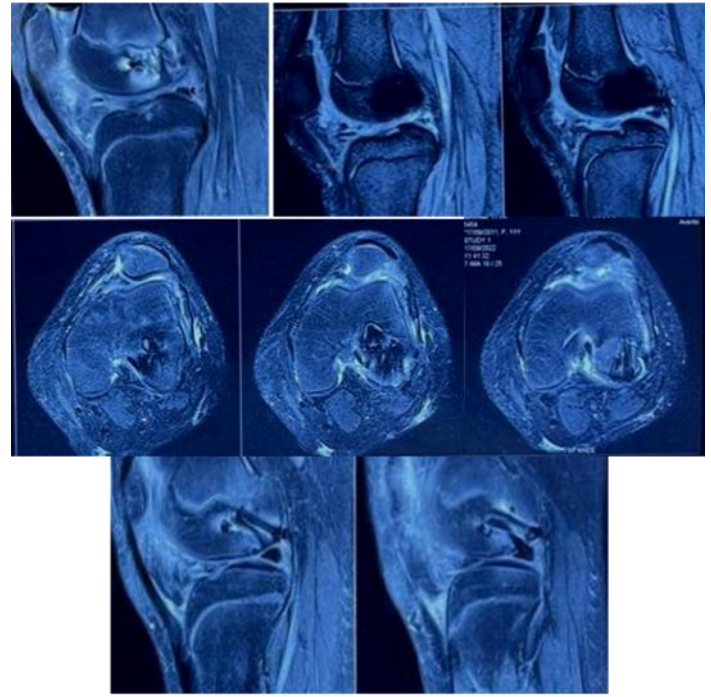


[Figure 5: Post-operating imaging of patient: Anteroposterior and lateral radiograph of the left knee showing fixation with headless screws and anchors].

An extended knee brace was then worn for three weeks following wound closure. Knee mobilization started when the pain subsided. Weight-bearing was prohibited during the first three months. At regular intervals, the patient was examined with methodical clinical and radiological evaluations.

After three months, knee flexion was limited to 40°. MRI scans were done at three months and

demonstrated good congruence of the articular surface and minimal fluid between the fragment and the femoral condyle, suggesting satisfactory ongoing integration with no evidence of necrosis.



[Figure 6: Post-operative imaging of patient at 3 months: MRI scan- sagittal and axial sections showing good congruence of the articular surface and minimal fluid between the fragment and the femoral condyle]. Revisit arthroscopy was done for arthrolysis and fiber wire removal. Upon cartilage inspection, a smooth-surfaced, healed cartilage flap was observed



[Figure 7: Intra-operative imaging of patient at 3 months: Arthroscopic view showing healed cartilage flap.]

Currently, she has complete full pain relief, walking full weight bearing, with knee flexion of 110° and complete extension.

### Discussion:

An important category of knee injuries is chondral flaps with fractures. Typically, they are brought on by direct trauma or a rotational injury. In skeletally mature individuals, injuring forces preferentially propagate along the tidemark, a natural cleavage plane that separates the deepest calcified layer of cartilage and subchondral plate from the overlying nonmineralized cartilage layers [1, 2, 5, 6]. The outcome is that full-thickness chondral detachment from the underlying bone characterizes the majority of traumatic cartilage injuries [8]. In adolescents, osteochondral fractures are caused by the same causes. In skeletally immature patients, the interface between the bone and cartilage is the weakest transitional area in the joint, and a defined tidemark is not present with a biomechanical strength lower than that of a mature osteochondral junction, theoretically allowing pressures to penetrate down into the bone from the chondral layers [4, 5]. Thus, although pure chondral injuries occur during adulthood, these osteochondral injuries are far less common during childhood and the first few years of adolescence. The chondral flap is the hyaline cartilage, which has a limited capability for healing and is incapable of naturally regaining its normal anatomy or of repairing the subchondral bone once it has been severed from it, so its preservation is paramount for joint health and mobility [13, 14, 15]. This uncommon injury pattern of the condyle and following preserving chondral flap is rarely documented in the orthopaedic literature.

If any fracture is suspected, anteroposterior, lateral, skyline, and tunnel radiographs should be performed because primary fixation depends on an early diagnosis [6, 7]. MRI scans are useful in diagnosing chondral delamination. CT helps to determine the size and its site of origin.

Restoring articular congruity of the joint surface and averting further osteoarthritis are the main objectives of treatment. Older, nonspecific interventions such as

joint lavage and debridement have produced disappointing long-term results, with either incomplete healing or production of fibrocartilage, which lacks many of the mechanical properties of hyaline cartilage and eventually degenerates. When the fracture block is less than 1 cm or when it cannot be healed, straightforward removal of the fracture block may be the preferred course of action for treating the fracture fragment [8]. But in our case, the fragment size is more than 1 cm and thereby needs to be fixed. After ten days, fibro-cartilage begins to fill the articular surface of severe osteochondral fractures, hence Mathewson and Dandy [10] advised early primary repair. Metal pins, allograft cortical bone, osteochondral autogenous transfer (mosaicplasty), fibrin adhesive, autologous chondrocyte implantation, absorbable sutures, and biodegradable screws can all be used to fix major osteochondral fractures [11, 12]. No studies in the literature present the results of preserving the chondral flap with fiber wires along with fixation of the fragment with headless screws, nor the integration of sutured cartilage to the subchondral bone. In light of these facts, our study demonstrates the integration of cartilage to subchondral bone following the internal fixation of the fragment with preserving the flap.

### Conclusion:

A chondral fracture with a flap injury involving the articular surface of the femoral condyle is a rare lesion. Preserving the chondral flap with suture bridge repair in adolescent patients along with the fixation of fragment results in early joint mobility and better functional outcome.

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