SHORT REPORT

# Clinical and functional outcome of traumatic osteochondral fracture in adolescent patella

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## Abstract

The objective of this descriptive cross-sectional study was to assess the functional outcomes of adolescents who had undergone internal fixation for patellar post-traumatic OCD fracture from 2019-2021. The injury mechanism was divided into two categories: a) torsional mechanism and b) direct contact injury. All candidates underwent X-ray and MRI/CT scan prior to the surgery to confirm the diagnosis. Operative treatment was open reduction and internal fixation (ORIF) of osteochondral fragment using headless screws. All patients were assessed pre-operatively with knee-ROM/IKDC (International Knee Documentation committee) score and satisfaction score, and post-operatively at one year follow-up. Fourteen patients were selected, with the mean age of 16.1±3.2 years. On one-year follow-up, no difference was noted in ROM when compared to the unaffected limb. The mean satisfaction score was 86±6.3 %. The mean pre-operative-IKDC score was 47.6±5.8 out of 100, whereas on one-year follow-up it was 88.6±2.2 which was statistically significant ($p$<0.05). Excellent outcomes can be achieved with headless screws for urgent ORIF (next elective list) of the osteochondral fragment.

**Keywords:** Osteochondral Defect, Adolescent Patella.

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## Introduction

Fractures of osteochondral interface occur after dislocation or indirect shearing of patella by distal femur during knee rotation. Teenagers are prone to osteochondral defect (OCD) fracture because of ligamentous laxity and reduced biomechanical strength at bone-cartilage interface.[1] The commonest location of OCD fracture is medial aspect, followed by central under-surface, and lastly lateral trochlear grove.[1] Osteochondral fracture is fixed within 14 days, with open reduction and internal fixation (ORIF) using metallic or bio-absorbable screws.[2] Bio-absorbable screws do not need extraction, but they cause tissue reactions.[2] With delayed presentation, the fragmented pieces become unviable for fixation and require excision. In previous studies, fixation outcomes are better than excision.[2]

The resulting OCD fills up with fibrocartilage, which exhibits inferior resilience, stiffness, and wear properties, and hence accelerates arthritis, as compared to hyaline-articular cartilage.[3] The objective for fixation is restoring continuity of normal hyaline cartilage to achieve joint congruency, pain relief, and minimise arthritis. These defects are diagnosed with X-ray and MRI, and are classified with the International Cartilage Repair Society (ICRS)[4] on a degree of 0 till 4 in which arthritis occurs in grade 3 and grade 4. Surgical management depends on fragment size, lesion stage, aetiology and location, timing, and age. Headless metal screws provide excellent compressing strength across the fracture, but they must be removed during a second surgery.[5] Suture-only methods possess good stabilisation strength for small-sized fragments that are unamenable for screw fixation and do not need subsequent removal. The disadvantage of this method is the insufficient compressing force across the fracture interface.[6] Bio-absorbable screws are an alternative for large-sized fracture fragments as it does not require a second procedure for removal but it is not suitable for multi-fragmented or small pieces which are not able to sustain more than one screw and may cause tissue reactions.[7]

Andriolo studied 12 patients with post-surgical fixation where arthroscopy was done for implant removal, all the defects appeared healed and stable.[8] Another study showed OCD with mean fragment size 1.2 cm$^2$ in four candidates were fixed and OCD with mean fragment size 3.2 cm$^2$ in five cases were excised. The fixation subset had International Knee Documentation Committee (IKDC)[9] score at 63.9±18 whereas the excision subset was 76.1±11.7.[8] This shows that there is unclear consensus whether to fix or excise the patellar OCD in teenagers. Our objective was to assess the functional outcomes of individuals who had undergone internal fixation for osteochondral fractures of the patella.

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## Methods and Results

After ethical approval, a retrospective study was conducted from January 2019 to December 2021 at Liaquat National Hospital, Karachi. Patients below the age of 18 years with patella OCD were included. Biodata and outcomes at one year were retrieved from hospital records. Patients with history of instability or dislocations, previous knee surgery, and congenital knee pathology were excluded from the study. All patients had X-rays and CT/MRI done to confirm the diagnosis and to assess the fragment size depicted in Figure 1. After informed consent for surgery, diagnostic arthroscopy was done to exclude any other pathology, followed by ORIF using midline incision with medial parapatellar approach. Complete displacement of fracture fragment was seen in 11 patients and partial displacement in three patients. Fracture fragments were removed, and the articular defect was covered by irregular, fibrous tissue. The fibrous tissue was curetted till healthy bleeding bone was reached. The fracture fragment was anatomically repositioned and fixed using headless 2mm screws buried beneath the articular surface as shown in Figure 2. Rehabilitation included six weeks of non-weight-bearing, quadriceps isometric exercises, straight leg raising and knee range of movement (ROM) exercises, which were started from first post-operative day. After one-year post-surgery, all candidates were assessed for IKDC score, knee ROM, and Satisfaction score.[10] All information was evaluated with SPSS Statistics v25 IBM. Mean, standard deviation was calculated for quantitative parameters. Qualitative variables were expressed as frequency and percentages. Differences in means were compared by using T-test with P-values<0.05 labelled as significant. A total of 14 patients, including two females and 12 males were evaluated one year after surgical stabilisation of osteochondral fractures. The mean age was 16±3.2 years. Average fragment size was 2.85±1.4 $cm^2$. Average time from symptoms to surgical fixation was 5±2.2 weeks. At one-year check-up, no difference was appreciated on knee range of movement (ROM) when compared to the unaffected limb. The average satisfaction score was 86±6.3%. Mean pre-operative IKDC score was 47.6±5.8, whereas on one-year follow-up it was 88.6±2.2 which was statistically significant (*p*-value <0.05). A study shows short-term outcomes of fixation of osteochondral fractures using screws in skeletally immature patients; nine candidates with an average age of 11 years and an average follow-up period of 26 months showed the mean knee score was 86.7 and the mean IKDC score was 90.34, displaying excellent short-term outcomes, which is comparable to our study.[11,12]

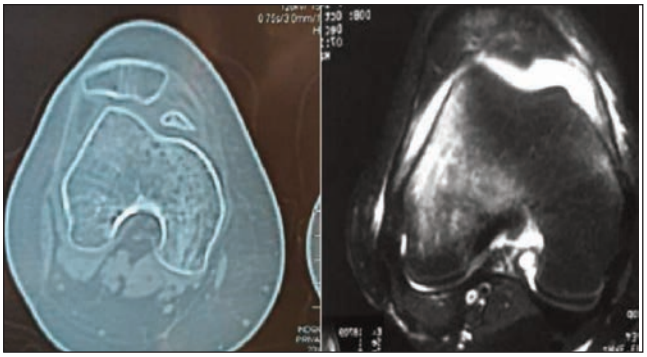

**Figure-1:** CT scan and MRI showing osteochondral displaced fracture of patella.

## Conclusion

Osteochondral fractures of the patella require acute surgical management for restoring the innate articulating cartilage surface. Surgically fixing the fracture is recommended if the fracture piece is partly or completely detached, or if present within a weight bearing area or its dimensions > 1 $cm^2$. Fracture pieces smaller than 1cm2 are prone to breakdown or osteolysis during drilling and fixation and are best excised. Fragments larger than 12$mm^2$ size, fragment instability, young age group, locked knee and joint swelling are likely to have a poor prognosis; hence they are ideally managed with surgical fixation. Excellent results can be obtained with the fixation using metallic

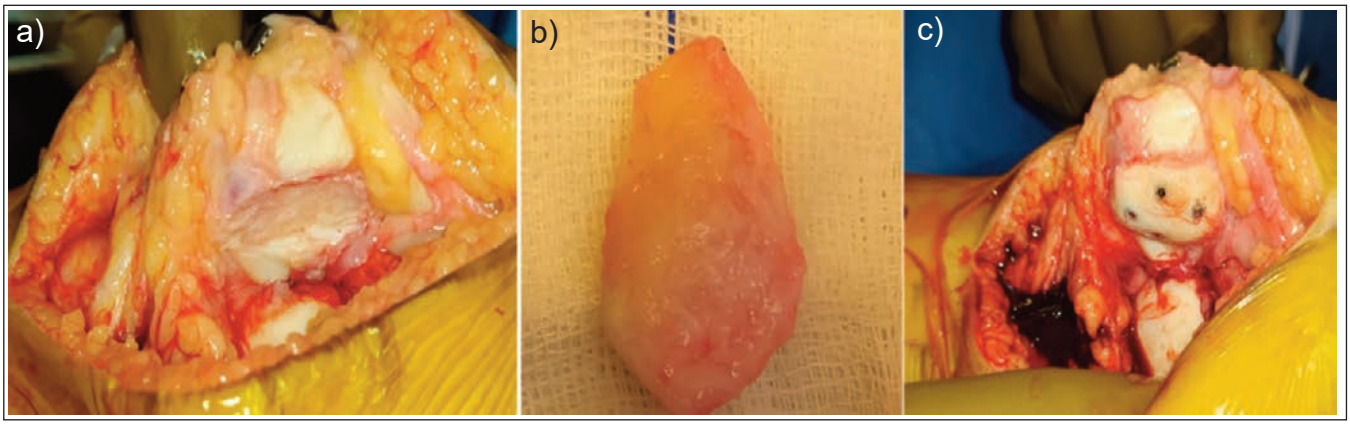


**Figure-2:** Intra-operative image showing (a) osteochondral fracture bed, (b) fragment preparation, (c) fixation done by using Headless screws

headless screws for osteochondral fractures of the patellar bone-cartilage interface. Such intra-articular trauma must be considered for urgent (next elective list) open anatomical reduction and stable internal fixation. Diagnosis of the osteochondral fracture is critical, as failure to intervene timely will ultimately end up in accelerated degenerative changes.

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**Author Contribution:**
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