

Implant Free Repair of Pediatric Patella Sleeve Avulsion Fracture

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Abstract

Introduction: Sleeve avulsion fractures of the patella are rare fractures that occur more commonly in children and adolescents. The diagnosis is difficult both clinically and radiologically since the distal bony fragment may be too small to be detectable by radiography. A high-riding patella and hemarthrosis are important signs of sleeve fractures.

Case Report: A 10-year-old boy was admitted to our ER after having felt a severe pain in his Right knee on kicking the ground while playing foot-ball two days earlier. Knee swelling, haemarthrosis and periarticular tenderness were noted. On physical examination, an extension lag of 15 was observed. The active range of motion of the injured knee was 45-60° of flexion. Radiography showed an avulsion fracture of the lower pole of the patella and a high-riding patella. We performed open reduction and internal fixation surgery with Transosseous Tunneling and Suture Pull Through using a multi-strand, long chain ultra-high molecular weight polyethylene (UHMWPE) wire. At 6 weeks after surgery, there was no extension lag, and the active range of motion of the injured knee was 0-140° of flexion. Callus formation over the fracture site and bone union was confirmed.

Conclusion: Although sleeve fractures in children are uncommon, it should be considered a possibility in children with complaints of pain around the knee postinjury. This technique of ImplantFree ORIF was effective in the treatment of sleeve fracture of the patella and alleviates the need for a resurgery for implant removal.

Key words: Sleeve fracture patella, open reduction and implant free fixation.

Introduction

Sleeve fractures are a rare type of patellar fractures affecting in children under 16 years [1]. The immature osteochondral junction in children are more vulnerable to injury than the entheses of the fully ossified adult patella, which leads to a sleeve avulsion off the main bony patella, usually from the lower pole [2].

The peak incidence is 12.7 years (range 8-16), and it is more common in boys

occurring at a ratio of 3:1 [3]. What is unique about the sleeve fracture is that it is a complete sleeve of osteopotent tissue that is pulled off from the full circumference of the patella. This has articular cartilage on the deep surface and periosteum and cartilage on the superficial surface. It slides distally taking osteopotent transformation zone cells from the osteochondral zone of the patella with it. This may result in elongation of quadriceps mechanism. The tissue can be all cartilage and periosteum and so will not be visible on X-ray. It means that there is a collection of potent bone forming tissue at the lower pole of the patella which will go on forming bone, resulting in enlargement or even duplication of the patella [4].

Case Report

A 10-year-old boy was admitted to our ER after having felt a severe pain in his right knee on kicking the ground while playing football 2 days earlier. Knee swelling, hemarthrosis, and periarticular tenderness were noted. On physical examination, an extension lag of 15 was observed. The active range of motion of the injured knee was 45-60° of flexion. Radiography showed an avulsion fracture of the lower pole of the patella and a high-riding patella (Fig. 1). The injured knee had an Insall-Salvati ratio of 1.48. Through a standard midline incision, patella was exposed and we found that half of the articular cartilage of the patella and a corresponding portion of the patellar retinaculum were avulsed, together with a small fragment of the bone (Fig. 2). We drilled four

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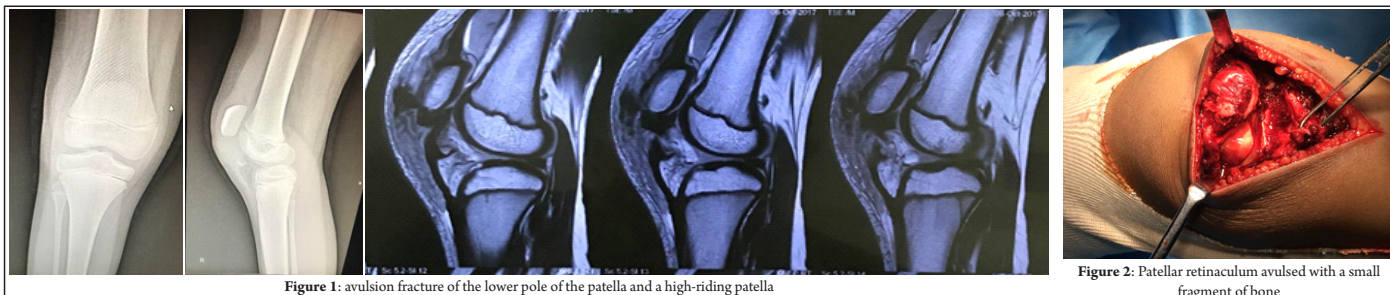


Figure 1: avulsion fracture of the lower pole of the patella and a high-riding patella

Figure 2: Patellar retinaculum avulsed with a small fragment of bone

transosseous tunnels through the proximal patella using a 2.25-mm beath pin, and a transosseous suture pull through repair was done with ultra-high-molecular-weight polyethylene wire which bites were taken using free needle in the distal bony fragment and patella tendon. Knot-tying was done on the upper pole of the patella. We subsequently sutured the patella retinaculum with polyester suture thread (Fig. 3). We confirmed the distal bony fragment to be reduced and in a good position by multiple cyclic loading intraoperatively by flexing up to 90°. Immediate post-operative X-ray revealed a fairly good reduction (Fig. 4).

Post-operative protocol followed

Knee brace was given for 3 weeks. Partial weight bear walking with elbow crutches for 3 weeks with the knee brace followed by full weight bear walking. Knee range of motion started only by the 3rd week and gradually progressed to 90° flexion by the 6th week. The patient was reviewed at 6 weeks after surgery. We found that there was no extension lag, and the active range of motion of the injured knee was 0–140° of flexion. Check X-ray revealed good fracture union (Fig. 5).

Discussion

The mechanism of sleeve fracture is a rapid contraction of the quadriceps on a flexed knee. Sleeve fractures usually occur in individuals involved in explosive acceleration activities such as jumping and high-energy sports [5]. As the distal bony fragment in sleeve fractures is often very small, the correct diagnosis may be delayed or missed altogether. Hence, it is important to carefully elicit the clinical history, which generally involves a sudden onset of severe pain after an explosive acceleration such as jumping rather than a fall, and the symptoms, which include pain and a swollen knee. The two clinical signs which are very important are the palpable gap at the lower pole of the patella and a high-riding patella. If there is no gap or high-riding patella, magnetic resonance imaging can be useful to identify avulsion of the lower pole of the patella [6, 7], and the diagnosis can be confirmed by ultrasound [8]. Although diagnosis may be difficult in the presence of pain and tense hemarthrosis, an awareness of the injury together with the characteristic radiological features should confirm the diagnosis. If a bony fragment is visible on radiography and the displacement is <2 mm, conservative treatment with

cast immobilization in the extended position of the knee joint is indicated. However, the results of conservative treatment are often unsatisfactory [4, 5]. If surgery is performed properly without delay, the good results have been reported, except the slight limitation of the knee flexion [9, 10].

Conclusion

Diagnosing sleeve fracture is difficult both clinically and radiologically since the distal bony fragment may be too small to be detectable by radiography. This technique of implant free open reduction and internal fixation was effective in the treatment of sleeve fracture of the patella and alleviates the need for a resurgery for implant removal.

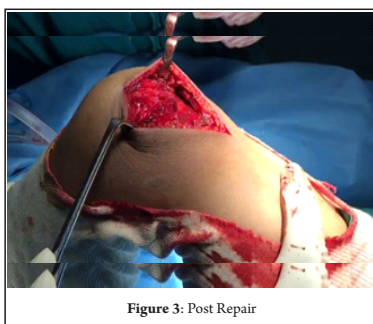


Figure 3: Post Repair

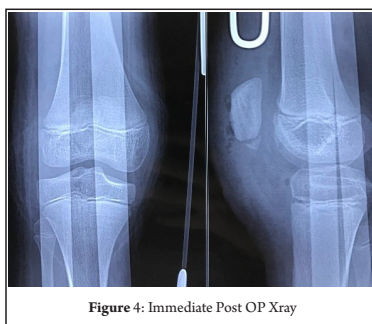


Figure 4: Immediate Post OP Xray



Figure 5: 6 weeks post Op Xray

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