Acta Scientific Orthopaedics (ISSN: 2581-8635)

Volume 6 Issue 11 November 2023

Case Report

Single Stage Tension Wire Management of Old Non-Union Patella with Quadriceps Contracture

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DOI: 10.31080/ASOR.2023.06.0850

Received: September 25, 2023

Published: October 12, 2023

Abstract

Nonunion of patella is uncommon orthopaedic condition which in some cases associates with quadriceps contracture. As the findings unusual, so only few cases were reported in the literatures. Our patient was 39-year-old male healthy and sporty male when presented in 2019 with posttraumatic failed operative non-union patella since 16 more years, with complaints of weakness and restriction of movement. Clinical examination and radiological findings revealed the case. He underwent successful single stage management in the form of tension band wiring and bone graft without the need for quadricepsplasty, and after continuous physiotherapy he reached 135 degrees of flexion and full strength in extension. We conclude that single stage surgery in management of nonunion patella can be achieved, in some cases, without quadricepsplasty.

Keywords: Single Stage; Tension; Wire; Non-Union; Patella

Introduction

Non-union patella is an unusual orthopaedic finding. Very few publications have been recorded in the past with this complication. Fracture of the patella contributes to 1% of all skeletal injuries [1], and the incidence of non-union or delayed union of patella fractures is rare and ranged from 2.7-12.5%, [1] (Table 1).

Author	Year	Number of patients	Nonunion and delayed union
Nummi [9]	1971	355	17 (4.78%)
Torchia and Lewallen [5]	1995	28	2 (7.14%)
Klassen and Trousdale [1]	1997	736	20 (2.7%)
Uvaraj., *et al.* [7]	2007	88	22 (25%)

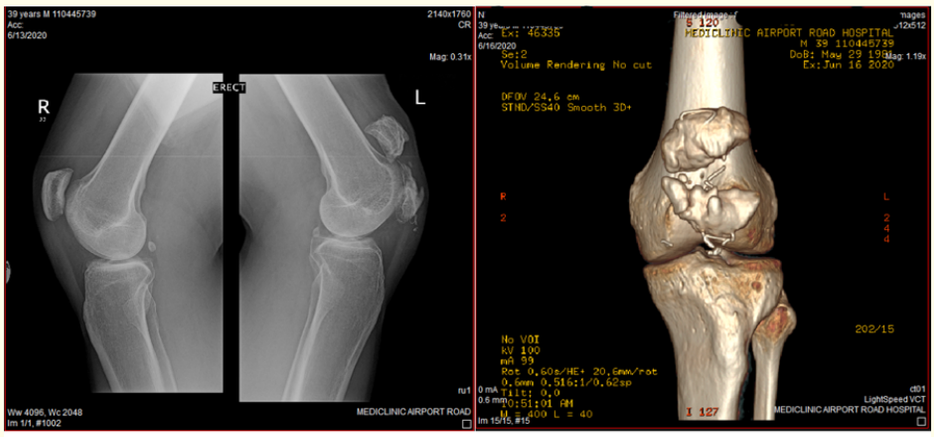
Table 1: Incidence of patella fracture nonunion and delayed union.

The management of patella fractures is based on the functional demands of the patient, the factors that led to the development of the non-union, the potential impact of the biomechanical effects of a total patellectomy, and the presence of an intact extensor mechanism of the knee for later reconstructive procedure. Thus the decision to perform surgery to improve the quality of life based upon repairing the nonunion or excising the patella is difficult and requires an evidence-based approach. It is essential to maintain the length of the contracted tissues by allowing further flexion of the knee. In nonunion patella with a big gap between the distal and proximal fragment, the major challenge is to bring the fragments together and restore the extensor mechanism either by bone to bone or bone to tendon union.

To our knowledge there is limited evidence to guide clinicians on the management of nonunion or delayed union of patella fractures. Furthermore, to our knowledge there is no previous publication or case report of management of ununited patella fracture for 15 years.

Case Report

A 39-year-old male presented with a complaint of defect and instability in his left knee since he had a history of a patella fracture 16 years back which was treated surgically. Unfortunately the surgery was failed and he lived with non-united patella until he was presented at our clinic in 2021 with mild weakness in in walking and stairs climbing. Clinically, anterior defect was noted, and on palpation a gap was significantly noted between distal and proximal patella fragments. The patient can do full knee flexion but the extension lacks five degrees, extension and extension strength was 4.5 out of 5. X-ray and CT scan revealed a big gap between the superior and inferior two major fracture fragments, and fragments of a thin cerclage from previous surgery were noted (figure 1 (A, B)).



A B

Figure 1: (A): Lateral view of affected knee (left) and the normal right knee, showing the fragments of patella and broken cerclage from the previous fixation. (B): Pre-operative CTscan

Considering that the fracture was previously operated and it's been 16 more years in non-union with a big gapping, hence it carries a hurdle of bringing the fragments closer, with or without quadricepsplasty or single or double-stage surgery.

In our case, we put a plan for a single-stage surgery with tension band wiring considering the probability of the need for quadricepsplasty. The surgery was performed by anterior approach, the old wire fragments were removed. Fortunately we were able to reduce the fragments, then clamped the fragments temporarily to evaluate the tension on the fracture at 90 degrees of knee flexion and under image intensifier control, the tension was accepted so there was no need for quadricepsplasty, then proceeded with tightening the tension band wire. Further biomechanical assessment the fracture stability after tensioning the band wire was performed and shows satisfactory stability. Retinaculum was repaired. Bone allograft substitute was added in the fracture site.

The patient was placed in a long leg cylinder cast, meanwhile dynamic quadriceps strengthening and active straight leg raising exercises were initiated. After two weeks the sutures were removed, the cast discontinued and long leg knee brace was worn. Physiotherapy sessions were started after 3 weeks focusing on muscle strengthening and gradual, controlled knee range of motion which reaches 90 degrees inflexion and -5 degrees of extension during which the patient was monitored by X-rays which were showing stable and rigid fixation. The knee range of motion reached 0-135 of flexion and full strength of quadriceps muscle in 6 months of continuous physiotherapy.

The fracture healing was confirmed at 15 months post –operative, see (figure 2 (A,B)).

A B

Figure 2: (A): 15 months post-operative lateral view. (B): 15 months post-operative AP view.

Discussion

Fracture of the patella contributes to 1% of all skeletal injuries [1], and the incidence of non-union or delayed union of patella fractures is rare and ranged from 2.7-12.5% [2]. In the literature there is numerous evidence in the management of patella fractures but in contrast, the evidence of treatment of patella non-union and delayed union was limited in the literature, that lead to the absence of consensus protocol and presents significant challenges to the surgeon on which protocol to carry out, whether to salvage the patella or to proceed with a patellectomy. As patellectomy compromises the length of the lever arm of the external apparatus mechanism, thereby causing excessive stress on the knee joint during extension [3], this ultimately causes early degenerative changes and is therefore a relative contraindication for young individuals [4], so we opted for avoidance of such procedure if applicable.

Here we are reporting this case because to our knowledge there is no previous report of surgical management of non-union of patella neglected for 16 more years. The modes of internal fixation of primary fracture vary from tension band wiring, cerclage wiring, Bunnell wiring, and screw fixation, however tension band wiring was the most reliable method. The risk of developing delayed union of patellar fractures are not clearly defined in the literatures. However, open fractures, transverse fractures, and conservative management seem to have correlations with the development of these complications [5]. The mechanism is most likely a direct compressive force on the knee or indirect tensile forces. The tensile force across a patella increases in athletes twice as much as the normal tensile force. The generated patella femoral compressive forces are three times greater than that of the body weight during routine daily activities and may reach seven times the body weight while climbing stairs and even more during squatting. These forces act on the proximal pole in fractures associated with tears in the medial and lateral expansions, which allows a progressive increase in the gap between the fragments.

A study by Uvaraj., *et al.* compared tension band wiring to patellectomies in neglected fractures of the patella. They noted that the function of the quadriceps after a patellectomy was significantly compromised. They reported a reduction of the efficiency of the extensor mechanism by about 30% [7]. Nathan., *et al.* concluded that tension band wiring is superior to patellectomies in terms of patient functional outcomes [6].

Sutton FS, Jr., *et al*. reported loss of 18° or more of motion, instability of the knee, a 49% reduction in the strength of the extensor mechanism, and a reduction in stance face flexion excursion in both level walking and stair climbing.

Conclusion

In our case, preservation of the patella and avoidance of quadricepsplasty were a priority in our strategy to avoid the complications were reported following these two procedures. In spite of the challenges due to nonunion with big gapping for many years in a high demanding patient, fortunately, it was performed in one stage and the patella was salvaged without the need to quadricepsplasty, which was the first preferred solution that mentioned in the literatures.

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