

## COMMINUTED DISPLACED PATELLA FRACTURE: A CASE REPORT

**D.G. Kinyanjui**, MBChB (UoN), MMed (Surg), FCS Ortho (COSECSA), Consultant Orthopaedics and Trauma Surgeon, Department of Orthopaedic Surgery, Kenyatta National Hospital, Nairobi, Kenya

**Correspondence to:** Dr. David G. Kinyanjui, P.O. Box 2784-00202, KNH, Nairobi, Kenya. Email: gitaukinyanjui2003@yahoo.com

### ABSTRACT

Comminuted displaced patella fractures are a challenge to manage by conventional methods as it is difficult to effectively reduce and fix the many small displaced fragments. Attempts at fixation often leads to poorly reduced articular surface with unstable fixation. This has resulted in some authors advocating patellectomy as the preferred method of management in such fractures. However, patellectomy has been shown to impair optimal knee function and patella preservation should be attempted whenever possible.

This case report presents an 8 year follow-up, of a 36 year old man who sustained an open, displaced comminuted left patella fracture and which was successfully treated by surgical debridement, reduction and internal fixation with wires.

The case report indicates that it is prudent to strive at retaining the patella, even when the goals of achieving anatomical reduction of articular surfaces are not achievable, as the long term knee function is satisfactory.

**Key words:** Patella, Comminuted, Patellectomy, Wiring, Ossification

### INTRODUCTION

Fractures of patella constitute 1% of all skeletal injuries. They occur secondary to both direct trauma such as anterior knee knocking on an object as well as indirect injuries when there is violent contraction of quadriceps with the knee flexed. Most comminuted displaced patella fractures are caused by a combination of both direct and indirect forces (1). For many years, the role of patella in the extensor mechanism was not fully appreciated.

Brooke in his 1937 study proposed that patella is not a functional organ and hence dispensable (2). However, later studies by Haxton, Kaufer, Peeples and Margo showed otherwise (3). Kaufer (4) showed that 15% to 30% more force is required to achieve full extension in a patellectomized knee, in a cadaver study whereas Peeples and Margo (5) demonstrated extensor lag in 15% of patients with patellectomized knees.

Maquet's proposal that the patella reduces tibiofemoral contact stresses has been established in experimental animal studies (6). Excision of the patella can cause pain, extensor weakness, extensor lag, knee instability, and decreased flexion arc. In one series, as many as 90% of patients undergoing patellectomy following fracture had continued pain, and 60% complained of instability (7-9).

The treatment of comminuted displaced fracture of patella has proponents on either divide of patellectomy versus patella preservation. Older literature favored patellectomy as compared to patella preservation procedures. Hey-Groves (10) and Watson-Jones (11) believed that the patella inhibited quadriceps function and concluded that the strength of the knee was improved after patellectomy. Blodgett and Fairchild (12) as well as Thompson (13) published additional

clinical series describing excellent clinical results with partial or complete patellar excision for fractures.

The appeal of total excision was tempered, however, by modest functional outcomes. Extension splinting was associated with high rates of residual pain, and permanent disability (14). Furthermore, laboratory and clinical studies raised concern regarding outcomes after patellectomy. Cohn (15) demonstrated degenerative changes on the femoral articular surface after patellectomy in a rabbit model. A high rate of patient dissatisfaction, decreased quadriceps strength, residual pain, and functional disability was also reported after total patellectomy (16,17).

Banstma *et al.* (18) and Levack *et al.* (19) demonstrated better results with patella fixation as compared to patella excision in comminuted, displaced patella fractures. Some surgeons have suggested that as little as 25% of the patella being retained will give better results than a total patellectomy (20). It is clear, based on the studies quoted, that patella preservation gives a better outcome as compared to patellectomy in comminuted displaced patella fractures.

### CASE REPORT

A 36 year-old salesman presented to a Nairobi hospital with injuries to his left knee, after the vehicle he was driving was involved in a head on collision with another on-coming vehicle. His left knee hit the dashboard of the car on impact. There was pain, swelling and deformity of the knee and could not bear weight on it. In addition, he sustained a deep laceration on the anterior aspect of the knee which was bleeding.

Examination revealed a patient in pain but with stable vital signs. There was a deep laceration on the anterior aspect of the knee joint which was communicating

with an underlying comminuted patella fracture. The patient had lost his ability to extend the left knee against gravity.

**Investigations**

X-rays were done and revealed displaced, comminuted left knee patella fracture but intact tibia and femur articular surfaces (Figure 1).

**Figure 1**

*Knee radiographs, lateral and anteroposterior views, showing the extent of patella displacement and comminution*



**Management**

The patient was prepared and taken to theater where severe comminution of the patella fracture was evident with disruption of the extensor mechanism. By gentle manipulation of fragments, the fracture was reduced and fixed with wires (Figure 2).

**Figure 2**

*An immediate post-operative radiograph, anteroposterior view, showing the wires configuration*



The patient was put on a cylinder cast, with knee in about 10 degrees flexion, which was subsequently replaced, at four weeks, with a ranger knee brace. Partial weight mobilization on crutches and graduated range of motion exercises were started after the application of the knee brace. Follow-up radiographs showed progressive union (Figure 3).

**Figure 3**

*Radiographs at six months, post-operative, reveals significant union*



The wires were removed one and a half years after clinical and radiological union of the fracture (Figure 4).

**Figure 4**

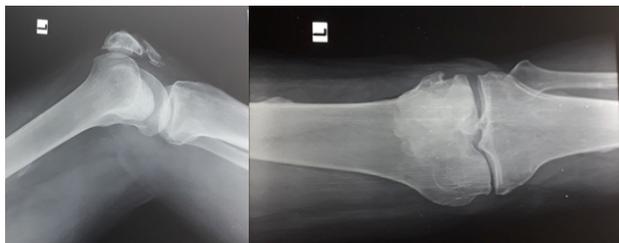
*An immediate post-operative X-ray after removal of wires showing fracture union*



At this particular time, the patient was on full weight bearing without walking aid, had full extension of the knee and could achieve flexion of up to 80 degrees. The knee flexion progressively improved and at 8 years, had no pain, flexion was at 140 degrees and had resumed his pre-accident activities. Radiographs done at 8 years showed significant remodeling of the patella. There was heterotrophic ossification of the patella tendon which was asymptomatic.

**Figure 5**

Radiographs done at 8 years showing remodeling of the fracture. Note the heterotrophic ossification of the patella tendon which is asymptomatic



Although there was initial wasting of the quadriceps muscles, the patient has now complete extensor mechanism, as good as the opposite side (Figure 6).

**Figure 6**

The picture demonstrates complete re-establishment of the extensor mechanism

**Figure 7**

The picture reveals flexion of 120 degrees while seated and is able to reach 140 while squatting



## DISCUSSION

Comminuted fracture patella can be managed with patella preservation as above case study indicates. The reduction and fixation with wires, applied using tension band wiring technique, though difficult and may not produce accurate anatomic reduction, gives reasonable stability needed to start early mobilization. In this particular patient, the fixation was initially

protected with a cylinder cast before replacement with a ranger knee brace. However, partial weight bearing was started early; 1<sup>st</sup> day post-operative. The early mobilization helped to maintain the muscle strength and bone density whereas range motion exercises, started after the cast removal, were essential in re-establishment of the knee function.

Although he developed heterotrophic calcification of his patella tendon, which is asymptomatic, and has not fully regained full flexion, he has sufficient function to perform his daily routine which involves a significant amount of walking as per his salesman's duties. Above all, he is painless and highly satisfied with his knee function. This may not have been the case had we opted for patellectomy as the primary mode of management.

The remodeling process took long, as shown by post-operative X-rays, but this was not clinically significant as he was absolutely pain free at 3 months, post-operatively.

The patient is still on follow up and how much more flexion he regains as well as whether he develops patellofemoral osteoarthritis shall be of interest.

## CONCLUSION

Patella preservation is an option in management of comminuted displaced fractures of patella and has several advantages relative to patellectomy as a mode management. This is a case study which should lead to a randomized controlled study to validate this method of management.

## REFERENCES

1. McMaster, P.E. Fractures of patella. *Clin Orthop.* 1954; **4**:24.
2. Brook, R. The treatment of fractured patella by excision. A study of morphology and function. *Br J Surg.* 1936; **24**:733.
3. Haxton, J., Kaufer, H., Peebles, R.E. and Margo, M.K. Patella biomechanics. *Clin Orthop.* 1979; **144**:51.
4. Kaufer, H. Mechanical function of patella. *J Bone Joint Surg.* 1971; **53-A**: 1551.
5. Peebles, R.E. and Margo, M.K. Function after patellectomy. *Clin Orthop.* 1978; **132**:18.
6. Maquet, P. Mechanics and osteoarthritis of the patellofemoral joint. *Clin Orthop.* 1979; **144**:70.
7. Sutton, F.S. Jr, Thompson, C.H., Lipke, J., *et al.* The effect of patellectomy on knee function. *J Bone Joint Surg.* 1976; **58-A**:537.
8. Wilkinson, J. Fracture of the patella treated by total excision: A long-term Follow-up. *J Bone Joint Surg.* 1977; **59-B**: 352.
9. Einola, S., Aho, A.J. and Kallio, P. Patellectomy after fracture. Long-term follow-up results with special reference to functional disability. *Acta Orthop Scand.* 1976; **47**:441.

10. Hey-Groves, E.N. A note on the extension apparatus of the knee Joint. *Br J Surg.* 1937; **4**:747-748.
11. Watson-Jones, R. Excision of the patella. *Br J Surg.* 1945; **2**:195-196.
12. Blotgett, W. and Fairchild, R. Fractures of patella. Results of total and partial excision of the patella for acute fractures. *JAMA.* 1936; **106**:2121-25.
13. Thompson, J.E.M. Fractures of patella treated by removal of the loose fragments and plastic repair of the tendon. *Surg Gynaecol obstet.* 1942; **74**: 860-866.
14. Dobbie, R. and Ryerson, S. The treatment of fractured patella by excision. *Am J Surg.* 1942; **55**: 339-373.
15. Cohn, B. Total and partial patellectomy. *Surg Gynaecol Obstet.* 1944; **79**:536.
16. Einola, S., Aho, A. and Kallio, P. Patellectomy after fracture. *Acta Orthop Scand.* 1976; **47**: 441-447.
17. Jakobsen, J., Christensen, K. and Rasmussen, O. Patellectomy: a 20-year follow-up. *Acta Orthop Scand.* 1985; **56**:430-432.
18. Baustman, O., Kivilvoto, O. and Nirhano, J. Comminuted displaced fractures of the patella. *Injury.* 1981; **13**:1.
19. Levack, B., Flannagan, J.P. and Hobbs, S. Results of surgical treatment of patellar fractures. *J Bone Joint Surg.* 1985; **67**:416.
20. Catalano, J.B., Iannacone, W.M., Marczyk, S., *et al.* Comminuted, displaced fractures of the patella: long-term functional outcome. *J Trauma.* 1995; **39**:439-444.