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# Surgical management of neglected fractures of the patella

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**KEYWORDS**
Fracture fixation;
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**Summary** Between April 1996 and May 2002, 22 people (18 men, 4 women) were treated for neglected fractures of the patella at our hospital. The median patient age was 43 (range 22–55) years. The majority of the fractures were caused by a direct fall on the knee. In all they comprised 18 transverse, 2 comminuted and 2 lower pole fractures, most of which had been treated by traditional methods initially. The median time between injury and surgery was 3 (range 2–6.5) months. Treatment methods in the orthopaedic department included tension band wiring in 16 cases, tension band wiring with cerclage in 3 cases and patellectomy in 3 cases. Results were evaluated after a median follow-up period of 5.5 (range 2–9) years and were based on Bostman criteria. Excellent results were achieved in 5 and good results in 15 cases. The poor results in two cases were due to infection and implant failure. Surgical treatment of neglected fractures of patella can thus lead to favourable outcomes.


## Introduction

Patellar fractures account for approximately 1% of all skeletal fractures. Non-union of the patella is rare, with an incidence of 2.4–12.5%.[3] Non-union or delayed union may be well tolerated by the people with limited and decreased functional demands on the knee. On the other hand, for symptomatic people with painful non-union and for active young individuals, surgical intervention is needed to successfully restore quadriceps power without compromising the pre-existing mobility of the knee.[10]

The management of non-union of the patella poses several unique challenges. First, patients may have relatively few symptoms and may be able to manage the activities of daily living. However, they find themselves incapacitated if they try to return to heavy physical work. Secondly, the decision needs to be made whether to surgically fix the patella or to perform a patellectomy. We present

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here our experience in the management of this challenging problem.

## Materials and methods

Between 1996 and 2002, 22 people presented to our hospital with non-union of the patella. We also received an average of 88 fresh patellar fractures annually during this period. The hospital is a tertiary referral centre serving a large population, most of whom are from lower socio-economic groups. Among the 22 people with patellar non-union, 18 were men, and 19 had undergone native treatment in the form of splinting. The median time between injury and presentation was 3 (range 2—6.5) months. The mechanism of injury was road traffic accident in 8 cases, and a fall onto the knee in 14 cases of which 6 were related to manual labour. Right and left sides were involved with equal frequency. On radiography, the fracture configuration was transverse in 18 cases, lower pole fracture in 2 cases and comminuted in 2 cases (Figs. 1—3).

The most common symptom was weakness, with the knee giving way and restriction of motion. Pain was very severe in only four cases. None of the patients could return to their previous occupation. On clinical examination, the gap between the fractured ends was obvious in all cases, was less than 5 cm in 13 cases and 5—8 cm in 9 cases. The preoperative knee flexion was between 10° and 100°; 13 individuals had fixed flexion deformity averaging 20°. All patients had an extensor lag.

## Management

The types of surgery performed comprised tension band wiring in 16, tension band wiring with cerclage in 3 and patellectomy in 3 cases (Table 1). Transverse, midline longitudinal or lateral parapatellar incisions were used, depending on the type of fracture. In cases of severe retinacular disruption, a transverse incision followed this disruption and minimised the development of flaps. In more comminuted fractures, a midline longitudinal incision or a large parapatellar incision was necessary. The fibrous tissue between the fracture ends was cleared and the ends were freshened and reduced without bone graft. There was no correlation between the duration of delay in presentation and the ability to obtain a good reduction. The reduction was difficult in most cases, and was achieved by application of initial cerclage wiring. Over this, figure-of-eight tension band wiring was applied. The cerclage wiring was removed after the application of the tension band, unless it was needed to maintain stability of fixation.

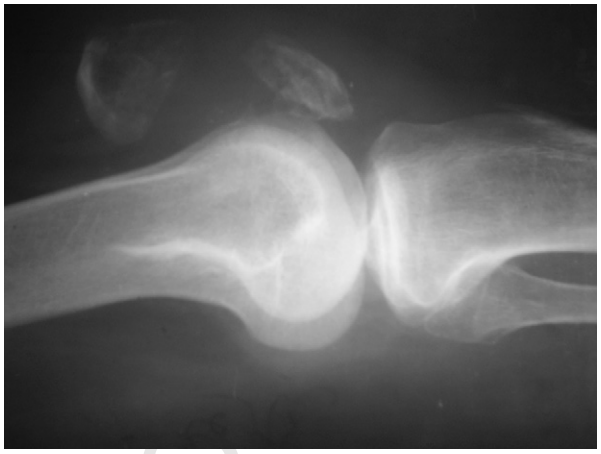

**Figure 1** Preoperative radiograph of patella showing non-union (lateral view).

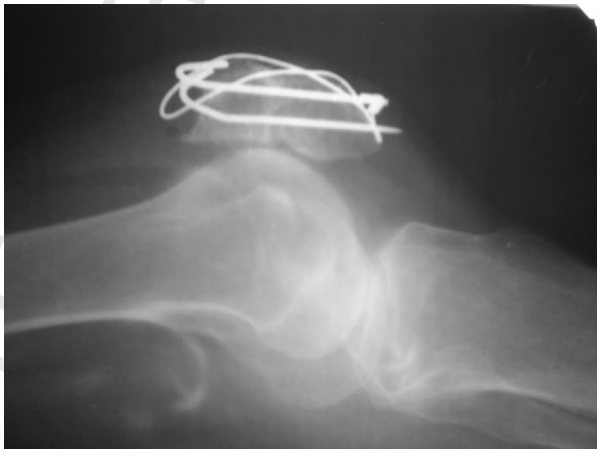

**Figure 2** Postoperative radiograph showing features of union (lateral view).

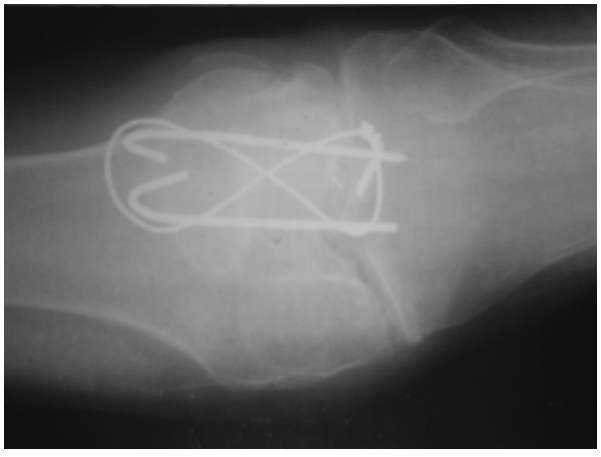

**Figure 3** Postoperative radiograph showing features of union (anteroposterior view).



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**Table 1** Demographic and clinical data

| Patient | Age in years/ gender | Fracture type | Native treatment | Delay (months) | Preop knee flexion | Type of surgery | Follow-up (years) | Postop knee flexion | BKS | Complications |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 50/M | T | + | 3 | 2–40 | TBW + CL | 9 | 0–140 | 30 | NIL |
| 2 | 52/M | T | + | 3 | 0–50 | TBW + CL | 8.5 | 0–100 | 24 | NIL |
| 3 | 50/M | T | + | 2 | 30–80 | TBW | 7.5 | 0–120 | 25 | NIL |
| 4 | 45/M | D | + | 3 | 0–40 | TBW | 7.5 | 0–135 | 30 | NIL |
| 5 | 49/M | C | – | 6.5 | 0–10 | PAT | 7 | 0–100 | 20 | NIL |
| 6 | 47/M | T | + | 4 | 30–100 | TBW | 6.5 | 0–100 | 27 | NIL |
| 7 | 52/M | T | – | 6 | 40–100 | TBW | 6 | 10–120 | 27 | NIL |
| 8 | 55/F | T | + | 6 | 30–100 | PAT | 6 | 0–120 | 20 | NIL |
| 9 | 38/M | T | + | 2.5 | 0–20 | TBW | 6 | 0–120 | 26 | NIL |
| 10 | 43/M | T | + | 2 | 10–40 | TBW | LOST | 0–110 | 27 | NIL |
| 11 | 22/F | T | + | 6 | 20–120 | TBW | 3.5 | 0–120 | 28 | NIL |
| 12 | 48/M | T | + | 6 | 10–40 | TBW | 5.5 | 0–110 | 26 | NIL |
| 13 | 34/M | T | + | 2 | 0–30 | TBW | 5 | 0–90 | 23 | NIL |
| 14 | 25/M | C | – | 2.5 | 0–10 | TBW | 5 | 10–120 | 24 | NIL |
| 15 | 43/M | T | + | 6 | 10–30 | TBW/PAT | 5 | 0–70 | 17 | Infection (patellectomy) |
| 16 | 40/M | T | + | 6 | 20–100 | TBW | 4.5 | 0–110 | 23 | NIL |
| 17 | 28/M | T | + | 6 | 0–30 | TBW + CL | 5.5 | 0–90 | 24 | NIL |
| 18 | 41/M | T | + | 3 | 10–40 | TBW | 4 | 10–120 | 30 | NIL |
| 19 | 50/M | T | + | 3 | 20–100 | TBW | 3.5 | 0–70 | 24 | NIL |
| 20 | 50/F | T | + | 3 | 20–100 | TBW | 5.5 | 0–70 | 15 | Infection (implant exit) |
| 21 | 45/M | T | + | 3 | 20–90 | TBW | 2 | 10–120 | 30 | NIL |
| 22 | 45/F | D | + | 6 | 30–90 | TBW | 2 | 10–100 | 23 | NIL |

M, male, F, female; T, transverse; C, communited; CL, circlage; TBW, tension band wiring; PAT, patellectomy; BKS, Bostman knee score.

## Results

Follow-up ranged from a minimum of 2 years to a maximum of 9 years, median 5.5 years. Two individuals were lost to follow-up. Analysis of knee function was performed using the Bostman knee score, which takes into consideration factors such as range of motion, pain, ability to return to work, muscle atrophy, use of aids, effusion, instability of the knee and ability to climb stairs.[1] Out of a maximum score of 30 points, an excellent outcome is between 30 and 28 points, a good outcome between 27 and 20 points and a poor outcome is less than 20 points. The results we obtained are detailed in Table 2. All patients showed improvement of knee flexion and none had extensor lag. In all cases treated with fixation of the patella, near normal reconstruction of the articular surface was achieved. There was no correlation between the initial reduction and functional outcome; the most important factor determining functional outcome was the range of motion of the knee.

The only complication encountered by us was infection, which occurred in two cases. In one case, the fracture did unite and the implant was removed to control the infection. In the other case, although antibiotics controlled the infection, persistent non-union and a poor knee score necessitated a patellectomy. These two people had significant postoperative stiffness and poor knee scores.

Neglected fractures of the patella are common in developing nations because of the prevalence of

**Table 2** Results

| Procedure | No. of patients | Results | | |
|---|---|---|---|---|
| | | Excellent | Good | Poor |
| Tension band wiring | 16 | 4 | 11 | 1 |
| Tension band wiring + cerclage | 3 | 1 | 2 | |
| Patellectomy | 3 | | 2 | 1 |
| Total | 22 | 5 | 15 | 2 |

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native treatment by traditional bonesetters. Since this injury occurs mostly among men whose work involves hard manual labour, it demands the best possible functional restoration. The long-term outcome as well as the potential complications of the various surgical methods should be given due consideration. In the scenario of neglected fractures, the various issues to be considered include postoperative muscle strength, the duration of rehabilitation required and the long-term articular complications due either to incongruity or altered biomechanics. Fractures of the patella, being intraarticular, require perfect anatomical restoration of the articular surfaces, rigid fixation and early mobilisation to prevent joint stiffness and secondary osteoarthritis. The ideal option for the management of patellar fractures has always been a topic of debate, with various authors advocating internal fixation and patellectomy.[1,2,9]

The function of the knee muscles has been found to be compromised after patellectomy, which reduces the efficiency of the extensor mechanism by as much as 30%.[4,6] When the patellectomised knee flexes, the patellar tendon sinks into the intercondylar notch and the length of lever arm of the extensor mechanism is reduced, causing a relative quadriceps insufficiency leading to inability to support the loaded flexed knee.[4,11,12] The resulting abnormal relationships between the quadriceps and hamstrings create additional disturbances in the alignment or stability of the knee joint.[12] Individuals with poor results following patellectomy typically complain of weakness and instability due to loss of quadriceps strength, compared with those treated by osteosynthesis.[6,8,11] The long duration of rehabilitation after patellectomy has also been a matter of concern; recovery may take several years, requiring more intense and prolonged rehabilitation when compared with tension band wiring.[4,6,13] These significant observations have led to the concept of preservation of the patella in neglected fractures, although accurate anatomical reduction may be difficult.

Because neglected fractures of the patella present late for surgical management, it may sometimes be technically difficult to achieve anatomical reduction and stable fixation. We achieved satisfactory reduction using a cerclage wire, after which a figure-of eight-tension band wire was applied. Quadricepsplasty was not found to be necessary, as observed by other authors.[10] Since adequate reduction was obtained in all cases, bone grafting was not used; grafting is necessary only when there is a significant bone defect.[5] The stability of the fixation is also an issue of importance in these situations. Satku and Kumar[10] have stated that there is a risk of disruption of the tension band in the presence of osteoporotic bone. They advocated an additional tension loop between the proximal fragment and the tibia, to protect the fixation of the fragment and also to function as an internal traction of the proximal pole to stretch the contracted quadriceps, as the knee was mobilised. There was, however, no incidence of implant failure in our series and we feel that this additional loop is unnecessary.

We have observed that tension band wiring achieved superior results when compared with patellectomy. These results compare well with those of Klassen and Trousdale,[5] who analysed the results of operative and non-operative management of patellar non-unions. They found that none of the fractures treated non-operatively united, whereas 89% of the fractures treated by surgery achieved union. They have recommended that tension band wiring was the treatment of choice in these cases, and that patellectomy should only be considered when fracture pattern or fragment size made internal fixation impossible. Marya et al.[7] have also shown that, following osteosynthesis, excellent results were achieved in 80% of cases compared with 50% after patellectomy.

## Conclusion

Surgical management of neglected fractures of the patella is necessary in order to minimise pain and restriction of knee movements and to preserve the quadriceps function. In our series, we found that tension band wiring was the method of management that gave the best results. Failure of the implant due to osteoporosis did not occur, and there was no need for an additional tension loop. Reduction could be achieved by the initial application of cerclage wiring, and quadricepsplasty was not necessary. Although preservation of the patella may maintain the strength of the quadriceps, early development of patellofemoral arthritis is a possibility requiring regular follow-up to be maintained. Patellectomy does have a definite role in severely comminuted fractures and when patellofemoral arthritis has already developed. However, every effort must be made to preserve the patella and give the patient the benefit of a biomechanically stable knee. We have observed that, by achieving accurate reduction and stable fixation, good functional results can be obtained in this scenario, with minimal complications.

## Conflict of interest

The author(s) hereby declare that they have no conflicts of interest.

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