Management of complex femoral and tibial non-unions using the Ilizarov technique and its cost implications

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We conducted a retrospective analysis of complex femoral and tibial non-unions treated with the Ilizarov frame.

Our aim was to assess the results of Ilizarov treatment in these patients with regards to time to union, functional outcome, number of days of hospital stay and cost of treatment.

Thirty seven (36 patients) complex femoral and tibial non-unions were treated at our institute using the Ilizarov fixator between January 1991 and December 2003. There were 5 femoral and 32 tibial nonunions. Twenty two were infected nonunions. The average number of operations prior to referral was 3.04 per patient (range 1—10). The mean delay between injury and Ilizarov treatment was 22.5 months.

Eighteen were treated with bifocal compression distraction technique, while the remaining underwent monofocal treatment. The mean time to union was 13.7 months. Two patients failed to unite and underwent a below knee amputation. 2 patients developed a refracture, 1 had a fracture of the regenerate and 2 had a poor regenerate.

All the patients with successful union were extremely satisfied with the outcome (96.9% on a visual analogue scale) despite having some functional restriction (SF36 physical capacity score = 36.4).

The expenses incurred from hospital stay (mean 48.7 days) and out patient follow up (mean 17.3 days) alone were £20,758 per patient. The total cost of treatment per patient was in excess of £32,000.

Complex non-unions of the femur and tibia can be successfully treated using the Ilizarov technique. Though the treatment is prolonged and expensive, the end result is rewarding.

Early referral and optimal primary surgery could have possibly decreased the patient morbidity and the cost of treatment in some of our patients.

The referring trusts should take into account the cost implications when transferring patients.

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A preliminary report on the treatment of complex tibial diaphyseal fractures using the Ilizarov method

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Introduction: Complex diaphyseal tibial fractures are rare injuries and can present significant challenges to the surgeon. Successful fixation and subsequent union can be difficult to achieve due to the relatively poor blood supply of the tibia. This study describes our early experience of treating fifteen patients with these injuries by the Ilizarov method.

Methods: Patients were prospectively identified. Follow up was performed in the out-patient clinic and by notes review. Fractures were classified using the AO classification. Bony union was evaluated on both a clinical and radiological basis, which included remodelling bone trabeculae on two radiographs and ability to weight bear without discomfort or walking aids on a dynamised frame. The mean patient age was 38 years with a male:female ratio of 11:4. Of the 15 patients 5 had concomitant injuries.

Results: There were two 42-B3 type fractures, six 42-C1 and seven 42-C3. Nine were open (seven IIIB, two IIIA) and six closed. We identified three groups: closed fractures, open fractures and open fractures with bone loss. The mean time to union in the closed group was 147 days (21 weeks) and 193.5 days (27.6 weeks) in the open group. The patient with 8 cm bone loss had a frame on for 445 days (63.5 weeks) with distraction osteogenesis through the most proximal fracture site (bone index = 56 days/cm). Five patients had an episode of superficial pin site infection, all of which settled with oral antibiotic therapy. There was no deep sepsis. One fracture went on to hypertrophic non-union and required further surgery. One patient had a local allergic reaction to pin site cleaning fluid. No patients required bone grafting.

Conclusion: The Ilizarov method offers safe, reliable and rapid healing for both closed and open complex tibial diaphyseal fractures.

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Application of recombinant BMP-7 in the treatment of persistent upper and lower limb non-unions: Our institutional experience

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Purpose: The purpose of this study was to evaluate the efficacy of human recombinant osteogenic pro-
tein 1 (rhBMP-7) for the treatment of persistent fracture non-unions.

Patients and methods: Between October 2001 and August 2004, 24 patients with 25 persistent non-unions were treated with rhBMP-7 in our institution. Successful completion of treatment was defined as a painless full weight bearing (clinical union) and presence of bridging callous of two cortices visible on two X-ray views (radiological union). The mean follow up was 11.4 months.

Results: The mean age of the 24 patients (18 males) was 39.1 years. The mean number of operations performed prior to rhBMP-7 application was 3.4. In 16 patients, rhBMP-7 was inserted in combination with autologous bone graft and in one patient the application was repeated. In 19/25 (76%) cases, both clinical and radiological union occurred within a mean time of 3.9 months and 5.4 months, respectively. One patient underwent a below knee amputation, secondary to recurrence of deep sepsis. Five cases are still under review. One patient had reapplication of rhBMP-7 for a femoral non-union. A patient with a clavicular non-union after treatment was asymptomatic but the radiological union was incomplete. The remaining three cases were initially open fractures. Two patients postoperatively developed superficial wound infection and were treated successfully with oral antibiotics. No other complications or adverse effects were encountered.

Conclusion: RhBMP-7 was used as a bone stimulating agent with or without conventional bone grafting with a success rate of 76%. This study supports the view that the application of RhBMP-7 is safe and a power adjunct to be considered in the surgeon’s armamentarium for difficult fracture non-unions.

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Are Orthopaedic Surgeons accurate in assessing healing rates of fractures?

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Background: In optimal conditions, injured bone can be reconstituted without a scar almost to its original shape.

No clinical tests can predict delayed fracture healing. Early knowledge about the individual prognosis of a fracture could help prevent severe complications and enable the physician to modify therapy. Plain radiograph remains the standard method to monitor fracture healing, but it reveals delayed healing only late in the course. Currently, research is underway into methods of predicting early problems with fracture healing. This audit aims to assess the accuracy of a group of surgeons at predicting healing rates of fractures and in particular identifying non-unions.

Method: Case studies were collected from the hospital database and the internet, the outcome of each case was known. Twenty-six cases were used in all, which included 12 cases that went on to delayed/non-union. Each case included X-rays of the initial fracture and a brief history. The cases were then randomised and presented to 10 surgeons (of varying grades) who were asked to predict the time to union for these fractures and identify those which could go on to delayed/non-union. The results were then compared to the actual outcome of each patient.

Results: There is moderate evidence that surgeons are better at predicting the healing time for normal healers than delayed unions. Though in both cases surgeons, on average underestimate the time to heal.

There is strong evidence that mean difference to time to heal is different between junior and higher specialist trainees. Junior surgeons also underestimate to a greater extent.

Overall only 24.2% of the predictions of delayed union made were correct, whereas 90% of the predictions of normal healing were correct.

Discussion: This study suggests that Orthopaedics Surgeons’ prediction of healing times of fractures improves throughout training. However, collectively non-unions are poorly predicted from X-rays alone.

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Outcome following surgery for proximal femur fractures in patients with recent myocardial infarction

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The mortality following surgery in patients with a recent MI is high. Standard advice is to wait for a minimum of 6 months. In urgent situations, this may not be possible. From January 2003 to August 2004, 10 patients were admitted with fracture neck of femur and a recent MI proven by ECG changes or raised troponin. There were seven females. The mean age was 79.5 years (59–95 years). The premorbid mobility and co-morbidities were noted. Echocardiography was done in all patients preoperatively to assess the cardiac function. All patients were seen by physicians and anaesthetist pre-operatively. The mean