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ULTIMATE BONY FUSION OF LOWER LIMB JOINTS FOLLOWING SEVERE TRAUMA

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Three patients presented with limb deformity some years after being run over and sustaining degloving injuries of their lower limbs. Spontaneous joint fusions were observed in each patient. The causes of these could be: i) Extensive intra-articular fracture, ii) Prolonged immobilisation due to the scar tethering the joint, or most likely, iii) A chronic low grade infection following compound joint injury with degloving.

Key words: articular joints; epiphyseal injury; spontaneous fusion; trauma

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It is well established that severe crush injuries to an epiphyseal plate will cause it to fuse prematurely and if significant growth potential remains, it will produce a shortened limb. This is the so-called type (v) injury of the epiphyseal plate described by Salter & Harris (1963). Spontaneous fusion of lower limb joints following injury is much less common. The purpose of this paper is to report three cases of this type and to comment on their possible aetiology.

CASE REPORTS

Case 1. A 24-year-old male complained of a stiff knee and shortening of the right lower limb. When 8 years old, his limb had been run over by a car, resulting in an extensive degloving injury of the entire limb and a fracture of the mid-shaft of the femur. The details of the initial treatment were not available but it was essentially replacement of the degloved skin and conservative management of the fractured femur.

On examination 16 years later, there were signs of extensive healed scars over the entire limb. There was bony ankylosis of the knee with 4 cm of limb shortening. Both the ankle and knee joints were fixed in 30° of flexion.

Radiographs confirmed bony fusion of all three compartments of the knee joint in addition to the ankle and subtalar joints (Figures 1, 2 and 3).

Case 2. A 16-year-old male had his right foot run over by a car when he was a child aged 8 years. There was no history of a fracture but there had been extensive degloving of the medial aspect of the ankle and foot. Radiographs 8 years later demonstrated fusion of the ankle joint with the lower tibial growth plate intact (Figure 4).

Case 3. A 16-year-old female presented with a valgus foot deformity. When aged 7 years, her right lower limb had been run over by a bus resulting in a degloving injury.

Radiographs revealed premature fusion of the growth plates at both ends of the fibula with separation of the superior tibio-fibular joint. There had been spontaneous fusion of the entire

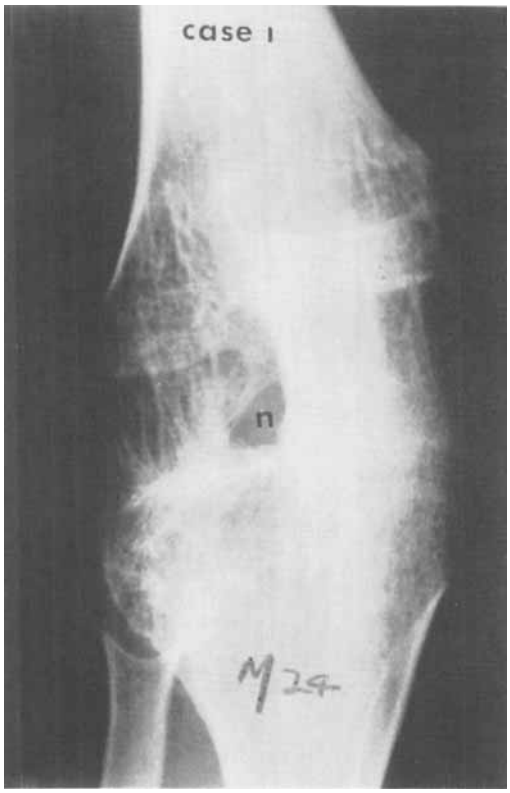

Figure 1. Case 1. Antero-posterior radiograph of right knee in 24-year-old male. Severe degloving injury of limb when aged 8 years. Note that bony fusion of the knee joint has occurred; inter-condylar notch still visible (n).

Figure 2. Case 1. Lateral radiograph of the same knee showing spontaneous bony fusion of the patello-femoral (arrow) and the tibio-femoral joints.

ankle joint with a valgus ankle yet the lower tibial epiphyseal plate was still visible (Figure 5).

DISCUSSION

All three patients had been run over and sustained severe degloving injuries to their limbs. Although the history of the initial injury was not complete in every instance, only in case 1 was a definite history of an associated fracture at the time of injury elicited.

A factor common to all patients was the extent of the soft tissue injury particularly around the joints which finally became fused.

Several possibilities exist to explain this phenomenon of spontaneous joint fusion. If the trauma had produced extensively comminuted intra-articular fractures, then bone of the adjacent epiphyses would have been brought into contact and this would inevitably have resulted in joint fusion. It is likely that if this were the case, then injury of such magnitude should have damaged in addition the adjacent epiphyseal plates but this did not occur.

Enneking & Horowitz (1972) recently reported the intra-articular effects of long periods of immobilisation of ten human knees. Where articular cartilage had been in direct contact for extended

Figure 3. Case 1. Lateral radiograph of foot and ankle of same patient. Note that fusion of the ankle and the subtalar joints have occurred with the foot in an equinus position. No radiological signs of premature epiphyseal plate fusion.

Figure 5. Case 3. Antero-posterior radiograph of leg of a 16-year-old female who had a severe degloving injury of the limb when aged 7 years. Fusion of the upper and lower fibular epiphyseal plates has occurred, also fusion of the ankle joint with the ankle in a valgus position.

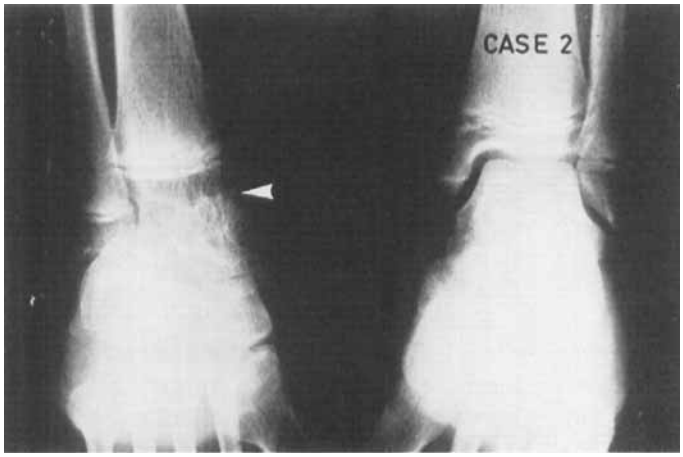

Figure 4. Case 2. Antero-posterior radiograph of both ankle joints showing bony fusion of the right ankle joint. Site of previous right ankle is level with lower fibular epiphyseal plate.

periods of time, it was totally replaced with intra-articular fibrosis and eventually bone ankylosis.

The scar tissue replacing skin and fatty tissue around the affected joints in this present series could have acted as a tether and a form of external bracing to the contained joints providing a degree of external prolonged immobilisation.

An additional factor could have been the reduced blood supply to the joint with consequent poor cartilage nutrition and its subsequent atrophy. All the affected joints reported here were largely covered by unstable thin skin graft or by tough, thick scar tissue, the result of healing by granulation and then fibrosis.

A likely precursor to joint fusion is the presence of chronic low grade infection destroying articular cartilage. All these injuries were the degloving type after being run over, and it must be assumed that there was a high incidence of compound injuries making joint infection a likely sequela. With this destruction of cartilage the naked bony epiphyses are placed in contact and inevitably bony fusion will occur.

This type of traffic injury to the lower limbs is common in children in Hong Kong where roads are narrow and both cars and children numerous. These late findings are less common in European communities where, with extremely severe lower limb trauma, amputation is more likely to be carried out as a primary method of treatment. In Hong Kong this is rarely the accepted treatment.

REFERENCES

Enneking, W. F. & Horowitz, M. (1972) The intra-articular effects of immobilisation on the human knee. *J. Bone Jt Surg.* **54**-A, 973–985.

Salter, R. B. & Harris, W. R. (1963) Injuries involving the epiphyseal plate. *J. Bone Jt Surg.* **45**-A, 587–622.

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