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Floating knee: A modified Fraser's classification and the results of a series of 28 cases

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ABSTRACT

Aim: This work aims to design a modified Fraser's classification and report the clinical outcomes of a series of 28 floating knees.

Methods: Between January 2006 and December 2009, 31 consecutive patients with 31 floating knees were treated at the Affiliated Hospital of Nantong University. In total, 28 cases were available for analysis. The floating knees were classified based on a modified Fraser's classification. Twelve cases were temporarily stabilised by an external fixator. Definitive fixation was performed for tibia and femur fractures using either nailing or plating. Functional outcomes were assessed according to the criteria established by Kalstrom and Olerud. The patients were followed up for a mean of 29 months (range, 12–60 months).

Results: The floating knees were classified as three types: type I, extra-articular fracture; type II, articular surface involved; and type III, patella involved. Type II injuries were subdivided into type IIA injury (articular simple) and type IIB injury (articular complex). According to the modified classification, there were 11 cases of type I, 2 cases of type IIA, 8 cases of type IIB and 7 cases of type III injury. Complications were found in seven cases, including three cases of infection, two cases of knee instability and two cases of knee stiffness. The functional outcomes were 7 excellent, 13 good, 5 acceptable and 3 poor. The excellent or good rate was 91% (10/11) in type I, 100% (2/2) in type IIA, 63% (5/8) in type IIB and 43% (3/7) in type III injuries.

Conclusion: The modified Fraser's classification provides a more reliable basis for surgeons to monitor results and compare treatment results with other surgeons. According to the modified classification, the results of type IIA injury appeared to be comparable to those of type I injury. Type IIB and type III injuries represent the fracture types with the worst prognosis.

Introduction

Ipsilateral fractures of the femur and tibia are usually not compatible with good results and require surgery. The unsatisfactory outcomes are most likely attributable to complex fracture patterns, compromised soft tissues, associated ligament injuries and concomitant vital organ injuries.[1–3] However, some published studies have reported a high rate of good or excellent results.[4–7] However, in these series, the authors did not assess the results in relation to the fracture types. Blake and McBrydes'[8] classification and Fraser's[9] classification are the two most commonly used classifications for floating knees. In both classifications, type II injuries were found to be correlated with poorer results than type I injury.[10] Nevertheless, we found that the results varied widely in type II injury due to the different complexity of intra-articular involvement. We also found that the patella, the important structure located in the extensor apparatus of the knee, should be taken into consideration when this injury is classified. Therefore, we have designed a modified Fraser's classification and reported the clinical results of a series of 28 floating knees.

Materials and methods

Thirty-one patients with an ipsilateral fracture of the femur and tibia presented between January 2006 and December 2009. One died within 24 h of admission, and two were lost to follow-up. The remaining 28 patients, including 21 men and 7 women, with 28 floating knees were available for analysis. The mean age of the patients was 43 years (range, 18–87 years). Twenty-two cases of

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these fractures were caused by road accidents, four by falling and two by crushing injuries.

According to the Gustilo[11] classification, six femur fractures (one grade I, four grade II and one grade IIIA) and eight tibia fractures (two grade I, three grade II and three grade IIIA) were open. The floating knees were classified based on whether the articular surface was involved and the complexity of the articular fracture. The mean injury severity score (ISS)[12] of the 28 cases was 16 points (range, 9–41 points). Cranial injury was present in four cases, chest injury in five cases, abdominal trauma in two cases and other fractures in seven cases. There was no major vascular injury.

On admission, the affected lower extremity was temporarily stabilised by an external fixator, or traction or splinting. For open fractures, debridements were performed within 8 h. The overall time from injury to definitive fixation was 9 days. Internal fixation for both tibia and femur fractures was performed on the same day. A nailing or plating system was used as definitive treatment for femur and tibia fractures. Less invasive techniques were employed in every case to minimise additional damage to the blood supply

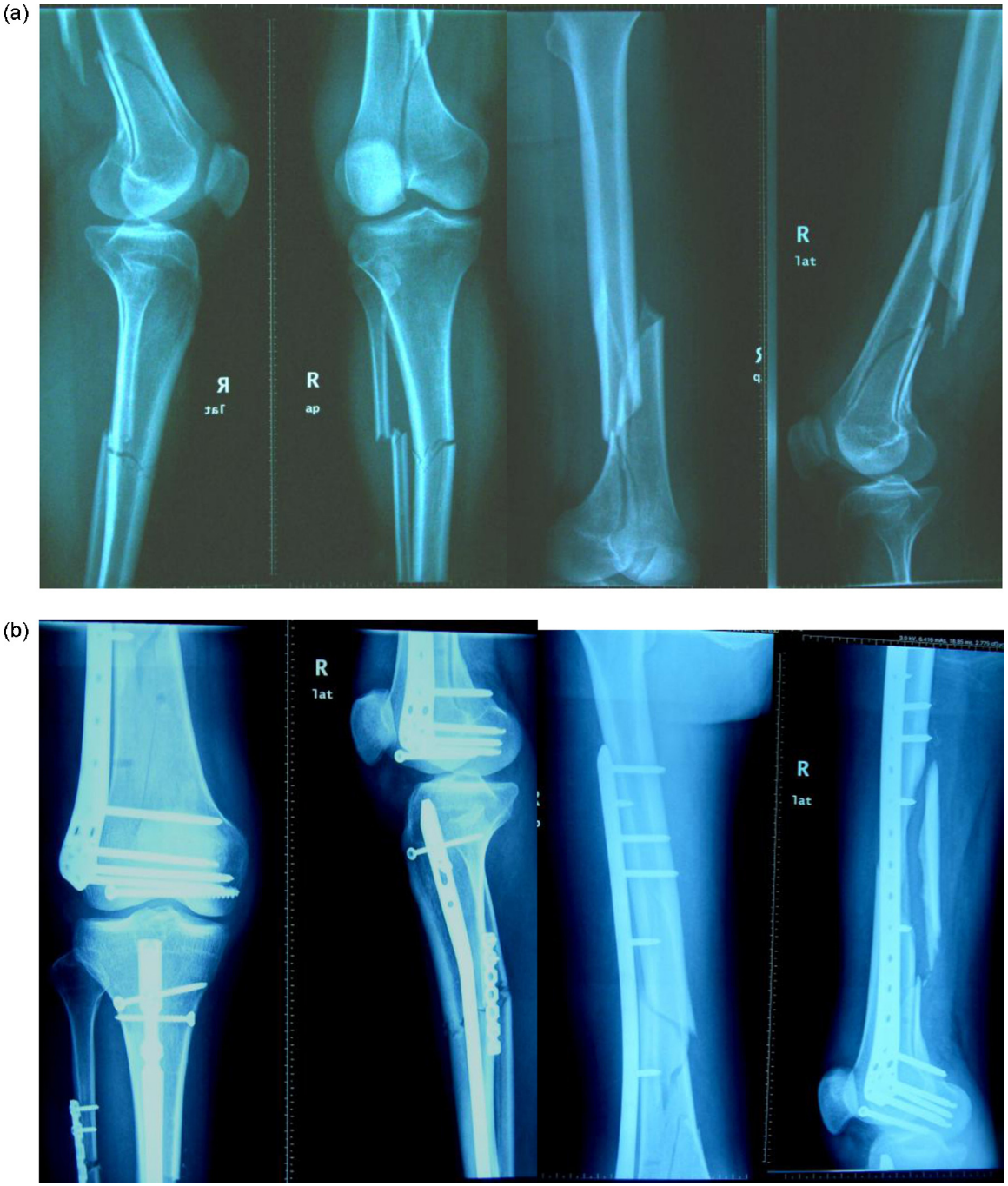

Fig. 1. A 48-year-old patient sustained a type IIA (articular simple) floating knee. A single incision was used for stabilisation of both fractures. The LISS was used for the fixation of femur fracture and UTN (unreamed tibia nail) for tibia fracture. (a) Radiographs before surgery. (b) Radiographs immediately after surgery. Close reduction technique was used for both shaft fractures. Note the posterior fragment in the femur shaft was untouched during surgery. (c) Radiographs 6 months postoperatively demonstrated bridging callus. (d) The patient had an excellent result.