COMBINED ANTERIOR AND POSTERIOR APPROACHES
FOR COMPLEX TIBIAL PLATEAU FRACTURES

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We report the use of combined anterior and posterior approaches for the reduction and fixation of complex tibial plateau fractures involving a large split posteromedial fragment. In four patients, we used a posterior plate to fix the posteromedial fragment.

All fractures united in good position with no significant complications, and all patients had a good range of knee movement. This technique should be considered for complex fractures in which there is a substantial posteromedial fragment (split) component.

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Fractures which involve the articular cartilage of the proximal tibia often require open reduction and internal fixation to restore the joint surfaces and the alignment of the limb. A single anterior incision is commonly used (Moore 1981; Fernandez 1988; Schatzker 1988; Muller et al 1991), but in some cases it is difficult to gain adequate exposure, especially for the fixation of posterior fragments. A second posterior incision may be necessary (Schatzker 1988).

PATIENTS AND METHODS

From 1990 to 1992, we treated four patients with severe closed bicondylar tibial plateau fractures, using combined anterior and posterior skin incisions. All the patients were men, with an average age of 32 years (Table I). No patient had any neurovascular damage. Preoperative evaluation included plain radiography and anteroposterior and lateral tomography.

In all four cases there was considerable intra-articular comminution and a large posteromedial fragment (Hohl 1967; Bowes and Hohl 1982; Hohl and Moore 1990). The posteromedial split fracture was best seen on lateral tomograms of the medial plateau (Fig. 1) and was sometimes barely visible on routine anteroposterior views (see Fig. 4a). Many of these fractures were very unstable and could be regarded as fracture-dislocations (Fig. 2; Duparc and Filipe 1975; Moore 1981). On the basis of preoperative radiographs a two-incision approach was planned in each case.

Operative technique. After induction of general anaesthesia and antibiotic prophylaxis with 1 g of intravenous cefazolin, the stability of the knee is assessed. The patient is then placed supine on the operating table, with the opposite hip elevated by a pad. The fractured leg and the contralateral anterior iliac crest are prepared and draped. A tourniquet is not used.

The involved leg is then internally rotated at the hip so that the patella faces upwards. The anterior incision is longitudinal, in the midline or anterolaterally, and is extended to allow a medial or lateral arthrotomy as indicated by the fracture pattern. If a medial arthrotomy is necessary, it can be performed by a subvastus approach (Hofmann, Plaster and Murdock 1991). The major intra-articular portion of the fracture is thus exposed.

Gentle external rotation of the involved leg on the tilted pelvis then allows easy access to the posteromedial aspect of the knee. A longitudinal posteromedial incision is made over the medial head of gastrocnemius, leaving a wide skin bridge between it and the anterior incision (Fig. 3). The deep dissection is that described for access to the posterior cruciate by Burks and Schaffer (1990). After opening the deep fascia, the interval between the medial head of gastrocnemius and semitendinosis is identified, and the medial head of gastrocnemius is retracted laterally, helping to protect the neurovascular structures. The posterior aspect of the proximal tibia is then palpated and exposed. If necessary, the medial aspect of popliteus is freed from the bone and retracted laterally. Even better access can be gained by section of the medial head of the gastrocnemius (Burks and Schaffer 1990) but we did not find this necessary.

The posteromedial fragment is then exposed and reduced. To aid reduction, a femoral distractor is sometimes placed across the knee from the distal femur to the proximal tibia (Schatzker 1988), using local stab incisions (see Fig. 3). The posterior plate is placed to buttress the fragment, and lag screw fixation through the plate can also be used. The reduction of the medial joint surface is achieved indirectly, but can be inspected through the anterior incision when a medial arthrotomy has been performed. A contoured 4.5 mm half-tubular plate or a T-buttress plate is used for fixation (Synthes, Paoli, PA) and bone graft from the iliac crest is applied as needed. The wounds are closed over suction drains.

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Postoperatively, we use a continuous passive motion machine, set from full extension to 30° of knee flexion. The arc of motion is increased approximately 10° daily. The drains are removed after 24 to 48 hours, and intravenous antibiotics are discontinued. Most patients without significant associated injuries (three out of four in this series) are discharged from hospital less than a week after surgery, and then attend for outpatient physiotherapy with emphasis on regaining active knee motion and quadriceps strength. Non-weight-bearing on crutches continues for a total of three months.

RESULTS

All four knees were grossly unstable under general anaesthesia. Satisfactory reduction of the fracture was possible in all cases (Figs 2 and 4), and all knees became clinically stable. There was no loss of fixation and no problems with wound healing. The average time in the operating room, including set-up and anaesthesia was 5.2 hours, and the average blood loss was 775 ml. No patient required blood transfusion as a result of the procedure.

All four fractures healed uneventfully and all patients regained normal leg alignment. At review, extensor lag ranged from 0° to 5°, and knee flexion ranged from 120° to 145° (Table I).

There were no serious complications. Two patients had transient paraesthesia of the saphenous nerve; both resolved completely. In one patient a proximal cancellous screw backed out and became prominent, requiring removal under local anaesthesia one year later.

DISCUSSION

The fractures we report are difficult to classify. We have used the AO classification (Müller et al 1990), although all the patients had an additional large posteromedial fragment.
Case 3 – Preoperative anteroposterior (a) and lateral (b) views of a fracture-dislocation of the knee, showing a large posteromedial fragment. Postoperative anteroposterior (c) and lateral (d) views at 20 months show the position of the posterior plate.

Healed anterior midline and posteromedial knee incisions viewed from the front and the medial side. The very large skin bridge between the incisions is shown, as are the sites of the stab incisions used for the application of a femoral distractor.
Case 1 – Preoperative anteroposterior (a) and lateral (b) views of a complex tibial plateau fracture in a 140 kg man. The large posteromedial fragment is not visible on the anteroposterior view, but is clearly seen on a lateral tomogram (c).

Postoperative radiographs show the position of the lateral and posterior plates.

Radiographs at 23 months show sound union in good position.
that contributed to instability. These injuries are uncommon (Hohl 1967; Bowes and Hohl 1982; Hohl and Moore 1990), and their treatment is difficult. Small stable split fractures can be held by casting in extension (Hohl and Moore 1990), but in our patients surgery was indicated for instability and joint incongruity.

The classical approach is through a single anterior incision (Fernandez 1988; Müller et al 1991) through which an undisplaced posteromedial fragment can be stabilised by screws placed from front to back. A medial plate is sometimes applied (Schatzker, McBroom and Bruce 1979), but this is not without risk and it is difficult to achieve adequate exposure, reduction, and stabilisation of such fragments through an anterior incision. This may require acute knee flexion, and a large skin flap with extensive medial dissection and periosteal stripping. Moore, Patzakis and Harvey (1987) reported that nine of 11 patients treated by medial and lateral plating through an anterior incision became infected or had wound problems. Mast, Jakob and Ganz (1989) have described the substitution of a medial plate by temporary external fixation.

The use of a second, posterior, incision has been reported by Schatzker (1988) and combined incisions for complex plateau fractures have been described in the French literature (Samuel, Leroux and Blanchard 1966; Duparc and Filipe 1975; Chaix et al 1982), but these are commonly termed small counter-incisions, and few surgical details are given. Moore (1981) reviewing 132 fracture-dislocations, reported that a posterior incision was never necessary. Other large reviews of plateau fractures make no mention of a second incision (Schatzker et al 1979; Moore et al 1987).

The advantages of a second postomedial incision include the provision of access to directly reduce and buttress the fracture in a very stable manner. It also removes the need to raise large skin flaps, which is important when the soft tissues have already been injured. After operation, a medial plate is often prominent and palpable under thin soft tissues. By contrast, a posterior plate is covered by a large muscular envelope and is not palpable.

Open reduction and internal fixation of tibial plateau fractures always require careful preoperative planning. For fracture patterns which include a large posteromedial split fragment, consideration should be given to posterior plating through a second incision.

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REFERENCES


