A DIRECT APPROACH TO TRIMALLEOLAR FRACTURES

JAMES PATRICK, GLASGOW, SCOTLAND

From the Department of Orthopaedic Surgery, Glasgow Royal Infirmary

When the major portion of a weight-bearing joint such as the ankle is fractured and displacement occurs, accurate reduction is essential if late osteoarthritic changes are to be avoided. In many trimalleolar fractures the posterior malleolar fragment is small and simple manipulative treatment and plaster fixation is satisfactory. If, however, the posterior malleolar fragment constitutes one-third or more of the weight-bearing surface, it is essential to obtain perfect reduction, for, without it, the remaining weight-bearing area articulating with the talus eventually becomes osteoarthritic. Most attempts at open reduction of such a fracture have been done through a posterior incision and the posterior malleolus has been manipulated into place and screwed without a view of the fracture line on the joint surface. Experience shows that by such an approach perfect reduction is rarely obtained.

It seemed to me that a direct and easy view of the joint surface was essential in any operation. As ankle injuries with wide diastasis of the lower tibio-fibular joint treated by reduction and screw fixation have no permanent disability from the wide separation, this suggested an approach to the trimalleolar fracture by reflecting down the lower end of the fibula leaving it attached by the lateral [fibular collateral] ligament only. This approach was originally described and advocated by Gatellier (1931) and is also described by Bonnin (1950) but it does not appear to have achieved any degree of popularity.

ANATOMY OF THE INFERIOR TIBIO-FIBULAR JOINT

The lower tibio-fibular joint is a syndesmosis. Its stability is ensured by three strong ligaments (Fig. 1). The interosseous ligament runs from the tibia to join the fibula behind its
articular facet. The posterior tibio-fibular ligament reinforces the interosseous ligament; the two really form a single mass of ligamentous fibres. The fibres of the posterior tibio-fibular ligament run from the tibia forwards and downwards and this ligament binds the lateral malleolus firmly to the posterior malleolus. The anterior tibio-fibular ligament is a strong ligament running from the front of the tibia downwards and backwards to its attachment to the fibula along the anterior surface of the lateral malleolus. Its fibres are more oblique than those of the posterior tibio-fibular ligament.

The three bands which form the lateral ligament run from the lower part of the lateral malleolus and consist of the anterior band which is attached to the neck of the talus; the middle band attached to the lateral surface of the calcaneus; and the posterior band attached to the posterior tuberosity of the talus.

A recess from the cavity of the ankle joint runs up between the tibia and fibula above the articular facet and, when one takes a broad view of the ligamentous arrangement, one sees that there is an oblique line which runs downwards and forwards in the fibula and which lies between the two main groups of tibio-fibular ligaments. It is along this unsupported line of the fibula that fractures of the lateral malleolus commonly occur. It is usual to describe this fracture as having the malleolus slightly displaced backwards, but at operation it is clear that the displacement is due to a forward springing of the whole shaft of the fibula and not to any displacement of the malleolar fragment. The gap can be closed only by pushing the shaft back against the malleolus. The lateral malleolar fragment is firmly held against the posterior malleolus by the relatively short fibres of the interosseous and posterior tibio-fibular ligaments. If, however, the posterior malleolus becomes fractured, the lateral and posterior malleolus move as one (Fig. 2). The lateral malleolus also has strong ligamentous attachments through the lateral ligament to the tarsal bones, and so the lateral and the posterior malleolus and tarsus dislocate backwards as a single group on the tibia and give the typical picture of a displaced trimalleolar fracture. Often in a trimalleolar fracture the fibula is fractured above the level of the malleolus, and when this occurs the anterior tibio-fibular ligament is usually completely torn before any gross posterior displacement can occur.

SURGICAL APPROACH

An incision is made along the posterior edge of the fibula. Starting at the fracture line of the fibula the lower fragment is dissected away from the tibia by dividing all the interosseous ligament and the anterior and posterior tibio-fibular ligaments. The lower end of the fibula, now only attached by the three bands of the lateral ligament, is then turned down, revealing the fracture of the posterior malleolus extending across the articular surface of the tibia. In some cases small loose fragments unsuspected on radiographs may be encountered and can be picked out of the joint. The view of the fracture line on the joint surface is so good that perfect reduction can be obtained (Figs. 3 and 4). The reduction is made stable by inserting a screw across the lower end of the tibia. In the first few cases this screw was inserted through a separate posterior incision from behind forwards (Fig. 5), but latterly the screw has been inserted into the tibia from in front backwards (Fig. 6). It is easier to insert the screw from the front, and subsequent removal of the screw, if desired, is also a simple procedure. The fibula is then replaced and fixed to the tibia with a long cross screw. This screw often causes some discomfort later, because slight play normally takes place between the tibia and fibula on walking. In such an event the screw can be removed easily under a local anaesthetic. As an alternative, however, a small screw may be inserted across the fibular fracture (Fig. 6) and in two cases in which this was done stability of the ankle joint was obtained. When the operation is completed a non-weight-bearing plaster is applied for nine weeks. Weight bearing is allowed at the end of three months.
Figure 3—Photograph showing exposure of the tibia after reflecting the fibula downwards. Figure 4—Photograph showing reduction of posterior malleolus. A separate postero-lateral incision has been made and a screw inserted to hold the malleolus in place.

Figure 5—Trimalleolar fracture. A posterior screw has been used to fix the posterior malleolus.

Figure 6—Trimalleolar fracture two years after open reduction. An anterior screw has been used to fix the posterior malleolus. Instead of a cross screw between the tibia and fibula a small transverse screw has been used to fix the fracture of the fibula.
Occasionally, when the major fracture is of the medial malleolus rather than the lateral malleolus, the former is reflected to give access to the posterior malleolus. In some cases both medial and lateral malleoli must be reflected before a perfect anatomical reduction can be obtained.

RESULTS

Ten patients have been treated in this way. All recovered well, but two took over a year to regain satisfactory mobility of the ankle. Perfectly congruous ankle joint surfaces were reconstituted and osteoarthritis did not develop. One patient, in whom several small loose fragments had to be removed from between the posterior malleolus and the main part of the tibia, was left with 30 per cent loss of ankle mobility. The joint surface remained congruous, however, and after two years he was back working as a labourer and there was no radiological evidence of osteoarthritis.

SUMMARY

1. A direct approach to trimalleolar fractures is described.
2. It is considered that a direct view of the fractured joint surface is essential in operations on all trimalleolar fractures and that access must be planned accordingly.
3. Failure to get a perfectly congruous surface is likely to be followed by osteoarthritis.

REFERENCES
