Fig. 3

after avulsion of the common flexor origin from the epicondyle and severe soft-tissue disruption has been described (Mains and Freeark 1975; Wilmschurst, Millner and Batchelor 1989). In a fracture, the nerve retains its relationship to the epicondylar and ulnar heads of pronator teres and passes back through the fracture site. It may produce a gap or groove in the callus as the fracture heals called Matev's sign (Matev 1976), as seen in this case.

Three types of entrapment of the median nerve have been described after elbow dislocation (Hallett 1981). In one the nerve passes into the joint as above; in another it remains in the fracture site and develops a bony tunnel as the fracture heals; and in the third, not associated with fracture, the nerve is stretched and loops backwards into the joint. In the case which we describe the nerve had passed through the fracture to lie behind the epicondyle, but had not slid into the joint or remained within the fracture site. The initial traction injury had not therefore been made worse by crushing the nerve in the joint.

We have described a fourth mechanism of entrapment of the median nerve at the elbow after posterolateral elbow dislocation which may have a more favourable prognosis. The result in this case is better than would have been expected after excision and grafting of the damaged segment.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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A NEW OPERATION FOR RECONSTRUCTION OF THE FEMORAL NECK

LI WEN-GUAN, LI YU-JUN, YUN HUA

We have devised a new method for the late reconstruction of the ununited fractured femoral neck using two bone grafts from the iliac crest, one based on a vascular pedicle from the deep circumflex femoral vessels and the other on a muscle pedicle of the sartorius.

Case report. In 1991 a 15-year-old girl suffered a

subcapital fracture of the right femoral neck from a fall. Three months after the injury she was admitted to hospital having been treated in the interim by 'bone-setting' and bed rest. The right leg was 3 cm short and lay in external rotation. There was muscle atrophy, and tenderness persisted in the groin and over the greater trochanter. The active range of movements was from full extension to 30° flexion, 5° adduction, 30° abduction, 5° internal rotation and 5° external rotation. These movements were all painful. Radiography (Fig. 1) showed absorption of the femoral neck but no cystic degeneration in the femoral head.

Operative technique. Before the operation, skeletal traction was applied through the tibial tubercle for two weeks. Under continuous extradural anaesthesia the hip was exposed through a Smith-Petersen incision. The

Li Wen-guan, Doctor in Charge
Li Yu-jun
Yun Hua
Orthopaedic Hospital, 21 North Jian She Road, Tangshan, Hebei, China.
Correspondence to Dr Li Wen-guan.

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Fig. 1

Fig. 2

Fig. 3

Fig. 4

necrotic bone ends were freshened and bone channels were made into the femoral head and into the remnant of the neck. When cutting into the femoral head care was taken to preserve an adequate thickness of bone all around the channel. In the femoral neck the channel was made not by curetting the spongy bone but by impacting it down into the greater trochanter. The size of the bone graft required was calculated from the radiograph of the patient's right femoral neck. To preserve the blood supply of the graft and to avoid injury to its periosteal attachments dissection during the Smith-Petersen approach was made along the outside of the iliac crest. A second incision was made from the centre of the groin to the anterior superior iliac spine to display the proximal part of the deep circumflex iliac vessels. Two bone grafts were then cut as shown in Figure 2 and inserted into the bone channels by intramedullary grafting so that the pedicles of the iliac vessel and the sartorius muscle approached the reconstructed neck from above and below respectively and were under no tension. Fixation was with three 3 mm pins (Fig. 3). Skeletal traction was continued for six weeks

after the operation. Three weeks after it had been discontinued, gentle hip exercises were started.

Postoperative measurement showed that the leg length had been completely restored. Six weeks after the operation union was occurring and at ten weeks it appeared radiographically to be complete. Three months after the operation, the patient could walk with a stick and at four months without support. Six months later, the function of the hip was completely restored and radiography showed trabeculation of the reconstructed femoral neck (Fig. 4).

Discussion. The procedures usually adopted for the treatment of long-standing nonunion of the femoral neck are either open reduction, internal fixation or insertion of a vascularised bone graft into a channel cut along the neck. Disadvantages of the last procedure include the inability to remove necrotic bone at the fracture ends without serious shortening of the femoral neck, difficulty in providing an adequate blood supply to the graft because

of the small surface through which blood can enter it, and the production of coxa vara and shortening of the leg if the femoral neck has been resorbed. In addition, if the channel for the graft is made after internal fixation of the fracture, the fixation may be prejudiced.

By utilising two bone grafts, each with its own blood supply, we were able to reconstruct a nearly normal femoral neck while at the same time thoroughly clearing

all necrotic bone from the fracture surfaces. Intramedullary grafting ensures good contact with the host bone and increases the likelihood of union. By delaying the osteosynthesis until after the grafts had been inserted we were able to adjust the position of the fragments to avoid coxa vara while ensuring firm fixation.

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