INTERNAL FIXATION FOR SUPRACONDYLAR FRACTURES
OF THE FEMUR IN THE ELDERLY PATIENT

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Supracondylar fractures of the femur may present difficult problems in their management at any age. These problems are frequently compounded when the fracture occurs in an elderly person. Treatment may involve plaster fixation or necessitate prolonged immobilisation of the leg on a Thomas’s splint, so occupying an acute hospital bed for many weeks. Such treatment is likely to be followed by stiffness of the knee, especially when arthritic changes are already present in the joint. Union is by no means assured with conservative treatment, and non-union is disastrous, both socially and surgically, in this age group.

Internal fixation has not achieved wide acceptance, largely perhaps for technical reasons. Neer, Grantham and Shelton (1967) reported only 52 per cent of satisfactory results in twenty-nine patients treated by internal fixation. Stewart, Sisk and Wallace (1966) reviewed sixty-nine patients and found that although 54 per cent of their patients had excellent or good results, 46 per cent were fair or poor. Included in this series were ten patients with non-union and ten with delayed union. All these workers felt that supracondylar fractures of the femur were generally unsuitable for internal fixation, and in many of their patients internal fixation was unable to stabilise the fracture without the addition of some other form of external support.

It is our contention that the poor results of internal fixation are due essentially to the use of inadequate mechanical devices. Nail-plates or Rush nails, with or without screws and cross bolts, in the majority of cases fail to control the distal fragments or fragment. The distal end of the femur is composed of soft cancellous bone with an overlying thin cortex. Only the cortex offers any firm fixation, and even then fixation can only be firm if the widest grip possible can be made by the appliance used. This is particularly important in the intercondylar type of fracture in which the condyles tend to be pushed apart by the methods of internal fixation in use today.

Müller (1962) advocated a blade plate with vertical compression using two lag screws to add stability to the lower fragments. Although this method will give firm fixation in normal bone, it is doubtful if enough lateral compression can be obtained by two lag screws in comminuted intercondylar fractures in porotic bone.

In order to obtain fixation of the distal fragments it is essential that the appliance should obtain a firm grip on both sides of the condyles. As the latter, in the elderly, are often thin and porotic, the pressure must be spread over as large an area as possible. For this reason a nail-plate has been adapted by adding an additional compression plate applied to the medial aspect of the femoral condyle and drawn to the trifin nail by the use of a threaded bolt. In this way firm fixation is obtained of the distal fragments, even in comminuted fractures through porotic bone. The nail-plate (Fig. 1) consists of a stainless steel four-hole plate 13·25 centimetres in length, curved at the distal end to accommodate the lateral femoral condyle. The triflanged nail, either 5 centimetres or 6·45 centimetres in length, is cannulated and coarsely threaded. The medial compression plate measures 2·85 centimetres by 2·22 centimetres. Each corner ends in a spike directed centrally, which perforates the outer cortex of the femoral condyle as compression is applied through a bolt screwed into the cannulated trifin nail. The shape of the medial compression plate ensures that strong lateral compression can be applied over a wide area, even in osteoporotic bones. A simple locking device prevents the bolt from working loose after the compressing force has been neutralised in the early weeks of convalescence.

THE OPERATION

The operation is done with the patient supine. It is an advantage to the insertion of the medial plate to support and raise the knee with a sandbag behind the joint and lower thigh.
The lower shaft of the femur is approached through a mid-lateral incision, the vastus lateralis being retracted anteriorly. After exposure of the lower end of the femur, the fracture is reduced and a guide wire is inserted transversely through the femoral condyles. One aims to insert the guide wire 2.54 centimetres to 3.5 centimetres above the articular surface of the condyles and it is made to emerge from the skin over the medial condyle. The position and direction are checked by an antero-posterior radiograph (Fig. 2) and, if satisfactory, a cannulated 6-millimetre drill is used to perforate the cortex. The trifin nail is introduced over the guide wire and driven home, maintaining the plate parallel with the shaft of the femur. Either a 5-7-centimetre or 6-35-centimetre nail is used after measurement of the width of the condyles on the guide wire. A 5-centimetre incision is now made over the medial condyle centred on the emerging guide wire. This incision may be vertical or transverse according to
which position it would seem better to allow the medial plate to adopt. In the earlier operations a vertical lie was adopted, but it soon became evident that a transverse or oblique lie gave a firmer hold in some cases. The incision goes straight down to the condyle which is cleared. A 6-millimetre hole is now made in the cortex using the cannulated drill. The bolt with the medial plate and locking device is introduced over the guide wire and screwed strongly home into the trifin nail (Fig. 3). In very soft bone some difficulty may be experienced in engaging the bolt and trifin nail. It will be found that counter-pressure on the plate from the lateral side will prevent the nail-plate from being extruded rather than engaged by the ondriven bolt and so obviate the difficulty of engagement in such circumstances. A cannulated box spanner is helpful at this stage to screw the bolt home, and when good compression has been obtained the locking device is closed over the hexagonal bolt head. Returning to the lateral incision, the reduction of the fracture is checked and the plate screwed firmly on to the lower shaft of the femur (Fig. 4). The wounds are closed using suction drainage for the lateral wound. A crepe and wool bandage, as commonly used after a meniscectomy, is applied over the dressings to support the limb.

Following operation the leg is supported on a pillow and static quadriceps exercises are started twenty-four hours later. The bandages are reduced and knee flexion exercises started at ten to eleven days. Depending on the comminution of the fracture and the need for early mobilisation, the patient may sit out of bed within four to fourteen days of the operation. Walking with partial weight-bearing is started three to four weeks after surgery and the patient is allowed home when he is reasonably independent. If necessary, physiotherapy may be continued as an out-patient.

MATERIAL

Twenty-two operations have been done over the past three years in twenty-one patients, one with bilateral fractures. The cases were consecutive and unselected. There have been
seventeen supracondylar (Fig. 5) and five intercondylar fractures, with varying degrees of comminution. The injuries were the result of relatively minor trauma, except in one patient of fifty-nine who was involved in a severe road accident.

The triviality of the violence in our series is no doubt related to the age of the patients, which ranged from fifty-nine to ninety-four years, with an average of seventy-seven years. Twelve patients were over eighty and only four were below the age of seventy. This is a much older average age than that reported by Stewart and his associates (1966) of forty years and the somewhat similar incidence reported by Neer and his colleagues (1967). The difference is probably accounted for by the fact that the population served by our hospitals has a relatively high proportion of elderly people, and by selection of cases. This method of fixation was developed in an attempt to shorten the protracted hospitalisation associated with the fracture in old people. Experience with the method would now lead us to extend its use to suitable fractures in younger patients.

RESULTS

It is emphasised that the results which emerge from this series of patients must be related to the problem posed by an injury at a particular age. The patients who have been treated were elderly, often in poor social circumstances which might well deteriorate further if removal from their environment were prolonged. Their physical activities in many cases were curtailed prior to the injury by age and infirmity, with or without arthritic changes as well. The aim of treatment in these circumstances must surely be to mobilise the patient as soon as possible and to proceed to ambulation and discharge from hospital with the least delay. A range of movement in the knee to allow comfort in sitting is desirable, but a range beyond 65 degrees of flexion should be regarded as a bonus.

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<th>TABLE I</th>
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<td>RESULTS IN NINETEEN PATIENTS</td>
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<td>Average time in bed . . 10 days</td>
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<td>Average time to walking . 4 weeks</td>
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<td>Average stay in hospital . 8 weeks</td>
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<td>Knee flexion beyond 65 degrees . 18 patients</td>
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Two patients died, one immediately after the operation from a coronary occlusion, and the other ten days after surgery from broncho-pneumonia. The results in the survivors are summarised in Table I.

It will be seen that the average patient could expect to be sitting out of bed in ten days, walking in four weeks with partial weight-bearing, and discharged from hospital in eight weeks. Thirteen patients were discharged four to six weeks after surgery, and the delay in the others was almost entirely related to their social problems. Knee flexion returned surprisingly quickly in view of the injury and age of the patients, and all but two of the patients regained 65 degrees of flexion within ten to twelve weeks. The exceptions had fairly severe arthritic changes at the time of the injury.

Complications—Of the survivors, one developed a deep vein thrombosis. The oedema of the leg took many weeks to subside and return of knee flexion was delayed, although a range of 95 degrees was eventually obtained.

The medial plate became loose on two occasions. This occurred before the locking device was used and simple removal of the medial plate relieved the symptoms in both cases.

Infection occurred in the medial incision in one patient, necessitating removal of the compression plate. A minor loss of position occurred in two patients (Fig. 6).
DISCUSSION

To advocate internal fixation in the treatment of supracondylar fractures is open to criticism on the grounds that previous experience with this form of treatment has been that it gives poor results, especially when there is comminution of the fragments. Even White and Russin (1956), while advocating internal fixation, reported ten poor results in forty-six patients with the use of a Blount blade-plate. Other forms of fixation include nail-plates with or without vertical compression, Rush nails, and screw plates and bolts in various combinations. In many patients these methods do not control the distal fragments and most of the radiographs shown in the literature give a horrific view of inadequate fixation. It is not surprising, therefore, that complications such as infection, non-union, malunion, deep vein thrombosis and stiff joints have been commonly reported in these circumstances. If, however, the fixation is firm enough to allow the unsupported use of the limb, sufficient to allow partial weight-bearing in three to four weeks, such complications should be reduced to a minimum. Non-union did not occur in this admittedly small series, nor has loss of position of the fracture been a problem. Some restriction of knee flexion is inevitable in the majority of patients with these fractures, and the range of 65 degrees or more obtained by all but two patients compares favourably with any series treated conservatively. Rather surprisingly, although a lag in extension was present in every patient for some weeks following the operation, in no case did it persist unless there had previously been a fixed flexion deformity.

The ease of nursing following surgery is a boon to the patient and nursing staff which is often denied with conservative treatment. The ability to sit out of bed within two to three days of the operation is of inestimable benefit to elderly patients involved in our series. Finally, the earlier discharge from hospital is of great advantage to the orthopaedic and traumatic unit beset by a shortage of beds.

Devas (1970) at Hastings, faced with the same problem, has been working independently on similar lines to ours. He tells us that so far he has used the device in twelve patients with encouraging results.

SUMMARY

1. A method of internal fixation for the supracondylar fracture of the femur in the elderly patient is presented.
2. The fixation obtained allows the unsupported use of the limb and early partial weight-bearing. Convalescence is thereby considerably shortened.
3. The disappointing results of internal fixation previously reported can be largely related to poor methods of fixation.

It is a pleasure to acknowledge the assistance of Mr J. R. Addison in the preparation of this paper and for the permission to include his patients in this series. We would also like to thank Mr W. N. Lawrence and Mr J. R. Briggs for referring patients.

The appliance is made by The London Splint Company.

REFERENCES