

CONSERVATIVE OR SURGICAL MANAGEMENT OF DISTAL FEMORAL FRACTURES

A RETROSPECTIVE STUDY WITH A MINIMUM FIVE YEAR FOLLOW-UP

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We report the outcome of conservative and surgical management in 50 skeletally mature patients (average age 64.6 years, 36 females patients) with 51 supracondylar femoral fractures treated in our unit between June 1991 and December 1993. Thirty-six fractures were caused by low-energy trauma, and 15 were due to high-energy trauma. Open fractures occurred in 5 patients. Of the 34 patients (35 fractures) treated conservatively, 15 (46%) achieved a satisfactory result. Of the 16 patients treated by internal fixation, 10 (62%) reached a satisfactory outcome. Osteoporosis, severe comminution of the fracture, involvement of the knee joint, and soft tissue injury in open fractures were associated with unsatisfactory results. Conservative management of these fractures is associated with a lesser chance of achieving a good functional result. With the advent of new fixation devices and our experience that conservative management can actually lead to many complications, the proportion of patients operated upon is likely to increase.

Keywords : distal femur ; supracondylar ; fracture ; internal fixation ; conservative management.

Mots-clés : fémur distal ; supra-condylienne ; fracture ; ostéosynthèse ; traitement conservateur.

INTRODUCTION

Supracondylar femoral fractures tend to occur in two distinct patient populations. In the young age group, the fracture is commonly a result of high-energy trauma. The treatment consists of open reduction and internal fixation or occasionally trac-

tion, with satisfactory results in 70% to 90% of patients in most recent series (12, 18, 21, 22).

Although over the course of the last 20 years aggressive surgical management of these injuries has become commonly accepted, these fractures also occur in the frail elderly with severe disabilities (8, 11) and the complication rate in such patients has reached 40%, regardless of the management used (14). We report 50 patients (51 distal femoral fractures) in whom we evaluated the outcome of conservative and operative treatment after at least five years from the fracture.

MATERIALS AND METHODS

We studied 51 supracondylar femoral fractures in 50 consecutive skeletally mature patients treated in the Department of Orthopaedic and Trauma Surgery of Aberdeen Royal Infirmary, between June 1991 and December 1993. Five other patients treated during this period were excluded : three because they died of causes unrelated to the fracture (average age 84.7 years, range 72 to 81 years), and two patients because they were lost to follow-up having moved from our area six to nine months after the fracture, with no forwarding address.

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Table I. — Distribution of fracture types

Type of fracture	Group 1	Group 2
Supracondylar	25	2
Intercondylar	2	7
Unicondylar	6	7
Above a total knee replacement	2	0
Total	35	16
Type of fracture (AO Classification)	Group 1	Group 2
33-A1.2	7	1
33- A1.3	4	1
33- A2.1	5	0
33- A2.2	4	0
33- A2.3	2	0
33-A3.1	3	0
33-A3.2	2	0
33-B1.1	1	3
33-B1.2	1	2
33-B1.3	1	0
33-B2.1	1	1
33-B2.2	2	1
33-C1.1	0	7
33-C2.1	2	0
Total	35	16

We thus included 50 patients (51 fractures, five of which were open fractures) : 34 patients (35 fractures) were managed conservatively (Group 1), while the 16 patients in Group 2 underwent open reduction and internal fixation. The decision to treat a fracture conservatively or surgically was subjective, based on patient's general condition, nature of fracture, and surgeon's preference. There were 36 females and 14 males, with a mean age of 64.6 years (range 19 to 90 years).

The mean hospital stay for the entire group was 33 days (range 3-288 days). The average hospital stay for patients in Group 1 was 64.6 days (range 8 to 288 days), and 27.9 days (range 3 to 144) for patients in Group 2.

We classified the fractures into four types : supracondylar, 27 fractures ; intercondylar, 9 ; fractures of a single condyle, 13. Two patients sustained a fracture above a total knee replacement. Table I shows the distribution of the various fracture types between the two groups. Thirty-four patients (35 fractures) were treated conservatively (table II). The remaining 16 patients were treated by internal fixation (table III).

Table II. — Conservative treatment of supracondylar femoral fractures

Type of treatment	Number of fractures
Splinting	4
Cast immobilisation *	19
Skin traction and cast immobilisation **	3
Skeletal traction and cast immobilisation ***	9
Total	35

* Mean duration of immobilisation was 9.5 weeks (range 4 to 16 weeks).

** Skin traction for 2-3 weeks followed by mean cast immobilisation of 9.3 weeks (range 6 to 12 weeks).

*** Mean duration of skeletal traction was 5.4 weeks (range 3 to 8 weeks) followed by mean cast immobilisation of 8.5 weeks (range 4 to 24 weeks).

Table III. — Surgical treatment of supracondylar femoral fractures

Method of fixation	Number of fractures	Excellent/ Good	Fair/ Poor
Lag screws and DCS	6	3	3
Lag screws only	5	4	1
DCS only	3	2	1
Condylar blade plate	1	0	1
Kirschner wires	1	1	0
Total	16	10	6

Outcome

Following a preliminary study to ascertain that the mode of assessment was easy to administer, was reliable, valid and reproducible, the outcomes of management were classified on the basis of a combined evaluation of the final radiographic and clinical examinations performed by the senior author (NM) at the latest follow-up appointment, at an average of 6.3 ± 2.8 years (range 5 to 8 years) from the fracture, and were rated as follows :

- Excellent if the patient had no limp, deformity, or post-traumatic arthritis of the knee ; and the knee range of motion was from full extension to 125° of flexion or more.
- Good if the patient had only occasional pain on prolonged weight bearing ; a slight limp ; a mild radiological, but no significant clinical deformity ; slight

arthritis ; and a range of motion in the knee from 5° of extension to 100° of flexion.

- Fair if the patient had pain on moderate activity or prolonged sitting or standing ; a moderate limp or moderate radiological and clinical deformity ; and a range of motion in the knee from 10° of extension to 90° of flexion.
- Poor if the patient had pain on movement or upon weight bearing ; moderate-to-gross limp ; moderate-to-marked radiological deformity ; non-union ; degenerative arthritis with joint narrowing ; and less than 80° of total range of motion of the knee.

RESULTS

Mechanism of injury

Trauma was the sole cause of the fractures. In 36 instances, the fracture was caused by minor falls, and in 15 by high-energy trauma (road traffic accidents in 7 patients, direct trauma by heavy objects in 5, a fall in 2, and a sports injury in 1). The majority (31 of 35) of the fractures treated conservatively were due to minor falls, compared with only 3 of the 16 fractures treated by internal fixation.

Associated knee injuries

The ipsilateral patella was fractured in two patients : one had a vertical split requiring fixation by a transverse screw, and another sustained an undisplaced hairline fracture treated conservatively. One patient sustained a complete tear of the anterior cruciate ligament (ACL) and of the patellar tendon, and one had an incomplete tear of the medial collateral ligament, with a tear of the postero-medial capsule, and a bucket handle tear of the medial meniscus. Severe degloving injury with partial necrosis of the quadriceps and adductors occurred in another patient.

Age and sex

In Group 1, 30 of 34 patients (88%) were women. In Group 2, six patients were women, and 10 were men. Radiographically detectable osteoporosis was noted in 25 patients in Group 1 patients, and in four patients in Group 2.



Fig. 1. — Malunion of a conservatively managed fracture in a 63-year old lady.

Table IV. — Results of conservative management

Method	Number of fractures	Excellent/ Good	Fair/ Poor
Splinting	4	4	0
Cast immobilisation	19	11	8
Skin traction and cast immobilisation	3	0	3
Skeletal traction and cast immobilisation	9	4	5
Total	35	19	16

Results of conservative treatment

In the 35 fractures managed conservatively, 19 had excellent or good results, and 16 were rated as fair or poor (fig. 1) (table IV).

The two patients with a fracture proximal to a total knee replacement had a satisfactory result. Two patients in Group 1 had open injuries. One was treated by skeletal traction, after initial debridement, because the fracture was extremely comminuted, and had a poor outcome. The second patient had an undisplaced fracture of the medial femoral condyle with a severe degloving injury, and was treated by repeated debridement, split skin graft, and simple splinting of her fracture with good result.

Unsatisfactory results after conservative treatment were attributed to marked restriction of the range of motion of the knee in seven patients ; to joint incongruity with secondary arthritis in five ; to malunion with significant shortening or deformity in four ; and to non-union requiring life-long orthosis in two. Other complications that did not affect the final outcome included recurrent urinary tract infection in four patients ; plaster pressure sores over the heel in three patients ; superficial pin tract infection in one patient ; a minor sacral pressure sore in one patient ; bleeding due to NSAID's (treated conservatively) in one patient ; septicaemia secondary to urinary tract infection (treated by antibiotics) in one patient ; and the development of adult respiratory distress syndrome with repeated chest infection in a patient with multiple trauma who required prolonged ventilation in the intensive care unit.

Results after internal fixation

Of the 16 patients treated by internal fixation, 10 had an excellent or good result (fig. 2), and 6 had a fair or poor result (table III).

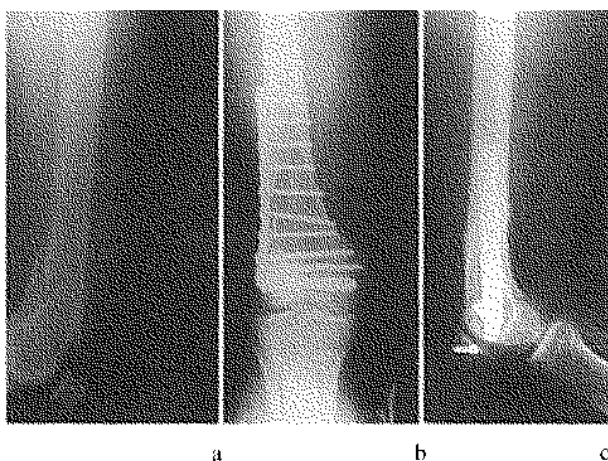


Fig. 2a. — Supracondylar femoral fracture in a 47-year old man.

Fig. 2b. — Anatomical reduction and internal fixation using a Dynamic Condylar Screw (DCS) and plate.

Fig. 2c. — Lateral view shows more clearly the single screw fixation of a coexisting patellar fracture.

Unsatisfactory results following internal fixation consisted of deep infection in one patient who needed removal of the hardware seven months postoperatively and arthrodesis of the knee joint 18 months after the original fixation ; loss of the fixation with delayed union managed with an orthosis in two patients ; significant varus deformity and joint incongruity with secondary arthritis in one patient ; marked restriction of the range of motion in the knee joint due to the severity of the associated soft tissue injury (ACL, patellar tendon, and postero-lateral joint capsule) in one patient ; and a lateral popliteal nerve injury at time of fixation in one patient.

A second operation for removal of the hardware was required in three patients : in one (see above) to control a deep infection ; in another to remove prominent screws ; and in a further one for persistent thigh pain. Manipulation of the knee under anaesthetic to increase the range of motion of the knee was performed in two patients six and seven months after the fixation.

Delayed union was noted in one patient after nine months from the injury. Two other patients had ankle pain and swelling from cast immobilisation. A superficial infection of the surgical wound was controlled by antibiotics in one patient, and temporary weakness of ankle dorsiflexion in one patient resolved after 12 weeks of conservative management. One patient developed a superficial plaster sore, again managed conservatively.

Three open fractures were included in Group 2 : two had good results, and one was rated as poor. The poor result was in a patient with comminuted fracture of his lateral femoral condyle with 20% bone loss and rupture of the ACL, patellar tendon, and the joint capsule that was treated by two lag screws fixation ; reconstruction of the ACL, patellar tendon, and capsule ; and McLaughlin wiring.

DISCUSSION

The management of distal femoral fractures is still unsatisfactory. In the elderly, these fractures have a high mortality and morbidity rate (11, 14, 16, 17, 23, 26). Roberts et al. suggested that primary above-knee amputation should be considered in

patients with severe knee contracture and cognitive dysfunction, to provide immediate pain relief, ease nursing care, and prevent late complications without sacrificing functional outcome (14).

Several authors have noted a substantial increase in the incidence of fractures of the distal femur, particularly in frail non-walking patients with cognitive impairment in nursing homes (1, 6, 14).

Since the development of the AO principles of fixation of supracondylar femoral fractures in the 1970s, many publications detailed the results of surgery in these fractures, reporting the good results that can be achieved with stable internal fixation (2, 7, 10, 12, 18, 21, 22, 25). However, poor bone quality continues to cause problems (14, 19, 23, 26). To supplement the internal fixation in osteoporotic bone, we used cast bracing, but loss of fixation occurred in one third of such patients. Promising results have been reported recently using cemented internal fixation (18, 19, 24, 26).

Marked comminution was present in 83% of the patients with unsatisfactory results after internal fixation. Recently, the use of supracondylar nails, especially in multifragmentary fractures, has resulted in improvement in outcome, and the distal locking in osteoporotic bone can be enhanced with the use of special flared nuts and by injecting cement into the distal fragment (19, 26). Biological bridge plating of comminuted fractures has also been reported to be associated with better results by preservation of the blood supply to the fracture fragments (fig. 3).

In this series, open fractures resulted in 60% of satisfactory results. The soft tissue injury associated with open fractures was the main factor that greatly compromised the outcome. We had two patients with moderately displaced fractures proximal to total knee replacement who had satisfactory results after closed treatment. Other authors recommended that open reduction and internal fixation should be performed without an attempt at conservative management for displaced fractures (4, 8, 9). There is no doubt that periprosthetic supracondylar fractures are a challenge, and their management is still controversial.

A limitation of the present study lies in its nature. Although the patients are part of an ongoing

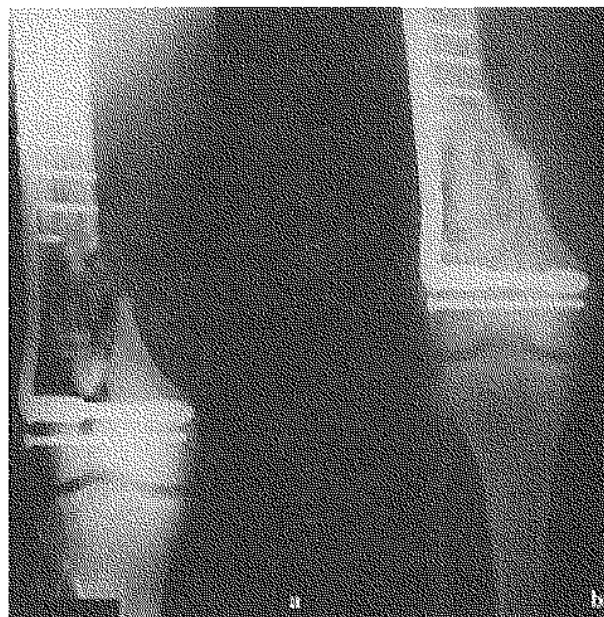


Fig. 3a. — “Biological fixation” with DCS and plate leaving comminuted area undisturbed.

Fig. 3b. — Radiographic appearance seven months following surgery.

study, and they were followed up prospectively as part of their clinical evaluation process, the conception of the present investigation is retrospective. Also, the patient groups are heterogeneous, including both high and low velocity injuries: this very much reflects every-day clinical practice in a large teaching hospital. However, the number of patients lost to follow-up is remarkably small, reflecting the fact that our centre is the only one serving a population of about 600,000 people, with the nearest hospital 50 miles away.

The outcome of management of distal femoral fractures in the present study is less impressive than was reported by other authors (2, 10, 12, 22). This probably reflects the fact that, during the years, the Fracture Service in our unit was undergoing profound changes from a consultant-based to a consultant-led service. However, the rate of success reported here is probably more representative of the norm, and is an indication of the expected outcome within the National Health Service (3). Also, the age of our patients is higher than in other stud-

ies (10, 22), as is reflected by the large proportion of them sustaining low-energy trauma, and by the high prevalence of osteoporosis. Also, their mental state and initial low physical activity level may have contributed to a less optimal result. Finally, we reported the results without selecting out the initial patients in our learning curve (15), and this may have negatively influenced the results.

The problems encountered with surgical treatment show the importance of thorough preoperative planning (4) and careful surgical technique (20). The patients with unsatisfactory results after surgery underline the importance of choosing the appropriate device and of positioning it properly. With the advent of intramedullary fixation devices (5, 20) and the finding that conservative management probably induces many complications, the proportion of patients with such fractures undergoing surgery is likely to increase. Also, the use of combined internal fixation and Ilizarov techniques in fractures previously considered unreconstructable has been added to our armamentarium. However, these changes have only occurred within the last two or three years, and we are still waiting to develop sufficient expertise with this modality of treatment before reporting our middle-term results.

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SAMENVATTING

A. M. NASR, I. MC LEOD, A. SABBOUBEH, N. MAFFULLI. Resultaten bekomen met conservatieve en heelkundige behandeling van supracondylaire femurfracturen. Een retrospectieve studie met een minimum follow-up van 5 jaar.

Het ging om 50 patiënten met 51 fracturen, gemiddeld 64,6 jaar oud ; 36 waren vrouwen. Allen werden behandeld tussen juni 1991 en december 1993. Het trauma was 36 maal energetisch, en 15 maal hoog energetisch. Er waren 5 open fracturen. Van de 34 patiënten (35 fracturen) die conservatief behandeld werden bekwamen 15 tot 46% een bevredigend resultaat. Van de 16 patiënten die heelkundig behandeld werden bekwamen 10 of 62% een bevredigend resultaat. Minder goede resultaten hielden verband met osteoporose, uitgesproken comminutie, articulaire uitlopers of weke delenletsels bij open fracturen. Het bleek dus dat conservatieve behandeling minder efficiënt was. Wegens de frequente verwickelingen bij conservatieve benadering werden de

auteurs meer ingrijpend, mede wegens de recente vooruitgang in de osteosynthesetechnieken.

RÉSUMÉ

A. M. NASR, I. MC LEOD, A. SABBOUBEH, N. MAFFULLI. Résultat du traitement conservateur ou chirurgical des fractures du fémur distal. Étude rétrospective avec un suivi minimum de 5 ans.

Les auteurs ont étudié les résultats obtenus, après traitement conservateur ou chirurgical, chez 50 patients adultes (âge moyen 64,6 ans ; 36 patients de sexe féminin) qui présentaient au total 51 fractures supracondyliennes du fémur et qui ont été traités dans leur service entre juin 1991 et décembre 1993. Trente-six fractures résultaient d'un traumatisme à faible énergie, les 15 autres étaient dues à un traumatisme à haute énergie. Il s'agissait cinq fois de fractures ouvertes. Parmi les 34 patients (35 fractures) traités de façon conservatrice, 15 (46%) ont obtenu un résultat satisfaisant. Parmi les 16 patients traités par ostéosynthèse, 10 (62%) ont eu un résultat satisfaisant. Les résultats non satisfaisants ont été observés en relation avec l'ostéoporose, avec une comminution marquée de la fracture, avec l'atteinte de l'articulation du genou ou avec des lésions des tissus mous en cas de fractures ouvertes. Le traitement conservateur de ces fractures a moins de chances d'assurer un bon résultat fonctionnel. Leur attitude dans le traitement de ces fractures est maintenant devenue plus chirurgicale, pour avoir constaté que le traitement conservateur expose à de nombreuses complications, étant donné les perfectionnements récents des techniques d'ostéosynthèse.