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THE USE OF BONE CEMENT AS AN ADJUNCT TO INTERNAL FIXATION OF SUPRACONDYLAR FRACTURES OF OSTEOPOROTIC FEMURS

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Bone cement was used as an adjunct to internal fixation of 14 supracondylar femoral fractures. The fractures were stabilized with ASIF plates. In all these fractures severe osteoporosis made a stable fixation impossible without the use of bone cement. The average age of the patients was 75 years. Eight of the patients had previously been operated on because of fractures of the same extremity and three suffered from disabling diseases. Twelve fractures healed without complications, despite early mobilization. One fracture needed additional external fixation before it healed and one lead to non-union. No infections were seen. It is concluded that use of bone cement as an adjunct to the internal fixation of supracondylar fractures secures a stable fixation of even the most severe osteoporotic femora, and this aids healing in most cases of such fractures. The method is recommended in selected cases of elderly patients.

Key words: internal fixation; supracondylar femoral fracture; bone cement

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Until a few years ago conservative treatment was considered superior to internal fixation of supracondylar femoral fractures in adults (Stewart et al. 1966, Neer et al. 1967). However, the development of new fixation devices and techniques has, according to several investigations, improved the results of the treatment of these fractures. Thus, the use of the ASIF-condylar plates, as suggested by Müller et al. (1965) in most cases secures a stable fixation of an ideally reduced fracture and makes early mobilization possible, resulting in excellent or satisfactory results (Slätis et al. 1971, Olerud 1972, Chiron et al. 1974). Nevertheless, in supracondylar fractures of severe osteoporotic femora there are still problems in obtaining a stable fixation.

The use of bone cement as an adjunct to internal fixation of fractures, as suggested by Müller (1962), may also be applied in the treatment of supracondylar fractures of the severely osteoporotic femur. In our department, bone cement has been used as adjunct to internal fixation in such fractures since 1968. The purpose of this paper is to present the results of the method.

PATIENTS AND METHODS

There were 14 female patients with fractures through the supracondylar region of the femur without affection of the knee joint. Severe

Table 1. Summary of case histories.

Case	Age (Yrs.)	Type of fracture	Previous disease or operatively treated fracture	Healing time in months	Follow-up	Walking function		Axis
						Before injury	After healing	
1	86	Transverse, comminuted	Hemiplegia	3½	10 months	Confined to bed	Confined to bed	Recurvation 10 degrees
2	74	Oblique, comminuted	Coxarthrosis	Non-union	16 months	1 stick	2 crutches	Normal
3	82	Oblique, comminuted	Polyarthritis	3	6 years	Confined to bed	Confined to bed	Recurvation 5 degrees Varus 5 degrees
4	63	Transverse, comminuted	None	4½	6 years	No aids	1 stick	Valgus 5 degrees
5	74	Short, oblique	Tibial shaft fracture Tibial condylar fracture	4½	3 years	No aids	No aids	Normal
6	84	Transverse	Femoral neck fracture Supracondylar femoral fracture	4	7 months	No aids	No aids	Valgus 5 degrees
7	84	Long, oblique	None	4	4 years	No aids	No aids	Varus 15 degrees
8	71	Long, oblique	Femoral neck fracture	3	8 months	2 crutches	2 crutches	Normal
9	58	Short, oblique	None	4	5 years	No aids	No aids	Normal
10	92	Oblique, comminuted	Femoral neck fracture	3	4 months	Confined to bed	Confined to bed	Normal
11	71	Long, oblique	Femoral neck fracture (nailed, femoral head prosthesis, total hip prosthesis) Femoral shaft fracture	4	14 months	2 crutches	2 crutches	Normal
12	76	Transverse	Tibial condylar fracture	3	18 months	No aids	1 stick	Normal
13	71	Transverse	Femoral neck fracture (nailed, Cup-a. pl.) Supracondylar femoral fracture	4	10 months	2 crutches	2 crutches	Normal
14	75	Long	Femoral neck fracture (nailed, femoral head prosthesis, total hip prosthesis)	4	5 months	2 crutches	2 crutches	Recurvation 5 degrees

Figure 1. A. and B. Radiographs of a supracondylar femoral fracture (Case no. 8, Table 1). The pictures demonstrate a severe osteoporosis in the supracondylar region.

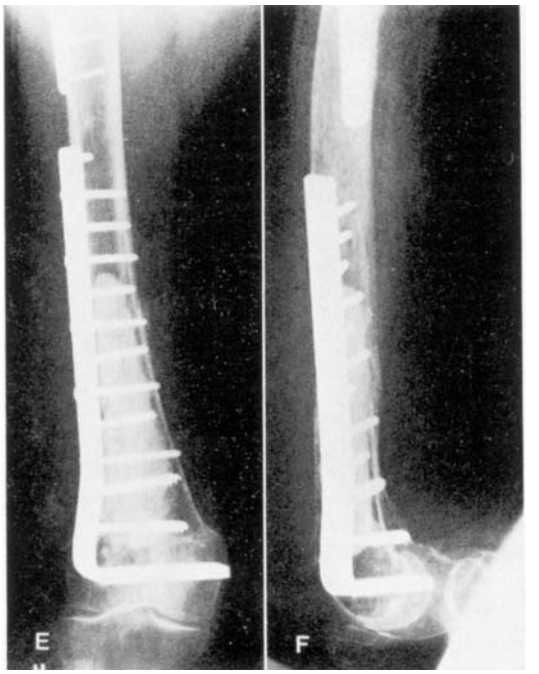

Figure 1. E. and F. Radiographs 3 months after operation. The lateral view reveals that the fracture has been bridged by bone posteriorly. There is no abundant periosteal callus formation. No signs of loosening of the screws are seen. The axes are unchanged from the first postoperative examination (compare with Figure 1. C. and D.).

Figure 1. C and D. Postoperative radiographs. The intramedullary cavity is filled with bone cement. The condylar plate has been fixed with screws through the implanted cement.

osteoporosis was found during operation in all these patients. The degree of osteoporosis was so severe that fixation by plates and screws was insufficient without adjunctive use of bone cement. Eight of the patients had previously been operated on for fractures of the same extremity, three suffered from disabling disease of the locomotor system while three suffered from osteoporosis only. Their ages varied from 58 to 92 years, with an average of 75 years. The relevant data are given in detail in Table 1. The total number of patients admitted for supracondylar femoral fractures in the corresponding age group was 57, only seven of these were treated conservatively.

Operation method

The fractures were all operated on according to the ASIF principles using condylar plates (Müller et al. 1965), except in one case where a straight plate was used. The fractures were reduced and a channel for the blade of the plate was prepared with a special chisel. Bone cement

(Simplex P) of a doughy consistency was packed into the medullary cavity and the blade of the plate was inserted before the cement had cured. If there was not a considerable defect at the fracture site due to comminution of the fracture, the fracture had to be redislocated in order to install the cement. Subsequently the fracture was finally reduced. Attempts were made to place the cement strictly intramedullarily. After the cement had cured, holes were drilled through the bone and the cement, the holes were tapped and the cortical screws were fastened, giving a firm attachment of the plate to the femur. One example of an operated fracture is shown in Figure 1.

The operations were performed without sterile enclosure. Prophylactic antibiotics were not used.

Postoperative treatment

The patients were generally kept in bed for a couple of days, the knee of the operated leg being immobilized in a semiflexed or ninety-degrees flexed position by use of a splint. Walking exercises were then started, the patients using a walkerette and later crutches. Only partial weight-bearing was allowed until the fracture was found to be consolidated.

RESULTS

The results were examined by clinical and radiological investigations at varying intervals. The length of the follow-up periods varied from 3 months to 6 years. Details are given in Table 1.

One patient died of pneumonia after reoperation for non-union (case no. 2). The fractures of all the other patients healed from 3 to 5 months after operation. All these fractures healed without change of the axis established at the operation, except one which had to have a plaster cast for two months following redislocation of the fracture two months postoperatively (Case no. 7). Some of the other fractures healed with slight angulation, this was due to inaccurate reposition and not to failure of the fixation. There were no refractures. Periosteal bone formation was rather scanty in most of the fractures (Figure 1).

No exact information can be given about the influence of the fracture on the mobility of the knee joint, most of the patients had a reduced mobility of the knee even before they sustained their supracondylar fracture. The walking function after healing of the fracture was in most patients slightly or moderately impaired.

DISCUSSION

The material presented represents the most unfavourable cases of supracondylar femoral fractures in a group of elderly patients. All the patients suffered from severe osteoporosis and impaired walking function due to previously sustained fractures of the same extremity or to disabling diseases. The findings at the operations revealed that stable fixation was impossible without the use of bone cement. Hence, the results cannot be compared with results obtained in unselected materials.

The fact that 12 of the 14 fractures healed without changes of alignment after 3 to 5 months despite early mobilization shows that supracondylar fractures even in the presence of severe osteoporosis are likely to heal when bone cement is used as an adjunct to adequately placed ASIF plates. It is worth noting that the failures of fixation, one leading to non-union and one necessitating additional external fixation, were due to technical errors in the application of the plates and not to loosening of the screws from the bone cement itself.

According to Cameron et al. (1975), the strength of the cement-screw complex is significantly higher when the screws are pushed into soft cement than when the screws are fixed after drilling and tapping in cured cement. However, the latter method which was employed in the present study proved reliable for securing a firm fixation in the severely osteoporotic femur.

The application of bone cement did

not seem to prevent the process of healing. This might be due to the efforts of confining the bone cement to the medullary cavity. Similar findings have been made when bone cement has been used in the upper end of the femur in the stabilization of intertrochanteric fractures (Harrington 1975). On the other hand, no abundant periosteal bone formation could be seen as an effect of the use of bone cement. This is in contrast to what was seen when bone cement was used in intertrochanteric fractures (Harrington 1975).

In some cases it was difficult to assess radiologically the exact extent of the fracture healing, since some parts of the fracture space were hidden by the applied cement. However, the fact that there were no cases of refracture indicates that firm osseous healing really occurred. It seems unreasonable that the fractures should remain stabilized only because of the internal fixation itself. However, it should be noted that not all the operated limbs were exposed to maximal weight-bearing. Most of the patients used some walking aids, partly because they were more or less disabled before they sustained their supracondylar femoral fracture.

Even though there were no cases of postoperative wound infections in the present series, the risk of this complication must not be neglected since infection after use of bone cement might be disastrous to the end result. On the other hand, if stable internal fixation is not obtained, this may lead to delayed union or non-union. Unstable internal fixation of supracondylar femoral fractures also implies a greater risk of infection (Stewart et al. 1966, Neer et al. 1967). Occasionally, inadequate fixation may even lead to a combination of complications necessitating amputation of the limb (Haukebø 1976).

When severe osteoporosis is present, traction treatment might be an alternative method to internal fixation with adjunctive use of bone cement. However, traction treatment includes the risks of general complications of long-lasting immobilization of elderly patients and necessitates a prolonged stay in a surgical unit.

Taking account of these considerations and the results of the operations, it seems advisable to recommend the adjunctive use of bone cement for internal fixation of supracondylar fractures of the severely osteoporotic femur in elderly patients.

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