THE RESULTS OF EARLY AND DELAYED INTERNAL FIXATION OF THE SHAFT OF THE FEMUR

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INTRAMEDULLARY fixation of the fractured femoral shaft is now well established as a method of treatment but the timing of the operation continues to provoke discussion. Smith (1964) recommended delaying the operation because his non-union rate was 23% when operation was performed within seven days, whereas it was 0.8% if operation was delayed. Charnley and Guindy (1961) had similar results with 25% non-union in early fixation and 7% in delayed; they recommended delaying operation until repair at the fracture had become active. Being unconvinced of the validity of this suggestion, a further consecutive series has been reviewed with contradictory findings. There is a much lower rate of non-union when operation is performed early than they report.

Clinical Material

During ten years from 1953 to 1963 seventy-one fractures were operated on within twenty-eight days of injury and fixed with a Küntscher nail. The patients were operated on by different surgeons at three hospitals but the after-treatment was along similar lines. Simple, open and pathological fractures have all been included. The only reasons for delaying operation were failure of conservative treatment in those for whom it was initially thought to be the method of choice, or associated injuries of higher priority. The ages of the patients, the levels of fracture, and the time intervals between injury and operation are summarised in Tables 1 and 2. Early fixation is defined as that done within the first six days of injury and delayed fixation as that done after the first week and within twenty-eight days. In the early operation group, forty-three out of fifty patients were operated on within forty-eight hours of injury.

Assessment of Union

This has been based on radiological evidence and the subsequent satisfactory progress of the fracture. Primary union is that occurring within six months. Delayed union is that which occurred after six months but did not necessitate further operation. Non-union is defined as a failure of bony union which required a graft.

TABLE 1
THE AGE OF THE PATIENTS

Age (years)	Early Operation	Delayed Operation
15-19	8	7
20-29	13	9
30-39	1	0
40-49	7	0
50-59	4	1
60-69	8	2
70-79	6	2
80-89	3	0

TABLE 2
LEVEL OF THE FRACTURES

Level of Fracture	Early Operation	Delayed Operation
Upper third of Femur	10	4
Middle third of Femur	30	15
Lower third of Femur	10	2

Results

These are given in Table 3. Fifty fractures were treated by early operation; one patient in this group died on the third day from multiple fat emboli and is therefore excluded from the results. Two fractures failed to unite, a non-union rate of 4%. There were no cases of non-union in the delayed operation group.

One of the two failures was a patient aged seventy-three with a closed comminuted fracture in the upper and middle thirds of the femoral shaft treated by a plate in addition to the Küntscher nail because of unstable fixation; she eventually failed to attend for examination but three years after operation she was walking with sticks taking full weight with little pain,

TABLE 3
RESULTS OF INTERNAL FIXATION

	Early Operation				Delayed Operation			
	Number	Primary Union	Delayed Union	Non-Union	Number	Primary Union	Delayed Union	Non-Union
Compound Fracture	3	2	1	—	2	2	—	—
Closed Fracture	46	36	8	2	19	12	7	—
Totals	49	38	9	2	21	14	7	—

although the fracture remained ununited radiologically. The second patient, who was aged twenty-two, had a closed transverse fracture of the mid shaft, was taking weight on crutches at four months and was thereafter not seen for ten months. When he returned complaining of pain, a radiograph demonstrated non-union which was successfully grafted.

Discussion

A non-union rate of 4% for fractures treated by early fixation is appreciably lower than results previously published which vary between 23% and 25%, and both cases of non-union had extenuating circumstances. There are many factors such as fracture selection, the fit of the nail, age and sepsis, which might influence these figures but the marked difference appears to be in the post-operative management. It is suggested that this may be a very important factor in obtaining satisfactory union.

In Smith's (1964) patients, the limbs were supported in Thomas' splints for periods of "up to twelve weeks and weight bearing was not allowed until union was well advanced". Charnley and Guindy (1961) only gave details of the after treatment in one patient with a fracture which was slow to unite after immobilisation in a Thomas' splint for twenty-five days. The aim in our patients was to get them up non-weight-bearing on crutches as soon as the wound had healed and the quadriceps had sufficient power to control knee extension. Although the amount of weight taken was determined by the type of fracture and the fixation obtained by the nail, this was started as soon as possible to compress the bone ends and encourage union. Table 4 shows the time of walking with and without weight-

bearing in the patients treated by early fixation. It will be seen that thirty-eight out of forty-nine were walking without weight bearing within the first month and that twenty-five were taking full weight within three months. It is suggested that this early return of function to the muscles of the thigh may have improved the circulation and impaction at the fracture and so considerably reduced the cases of non-union.

The advantages of delayed fixation are said by some to be considerable and include time for resuscitation and treatment of associated injuries, less risk of infection in compound fractures if the wound is excised and allowed to heal, and internal fixation can be performed at convenient times. There are, however, many disadvantages of delay: namely a more prolonged painful period, and the risk of increasing morbidity by keeping elderly patients in bed. Furthermore, nursing care is more difficult if the fracture is splinted, operation may be technically more difficult. Also the delay is often wasteful of time and beds.

Lloyd Roberts (1951) reviewed twenty femoral fractures treated by early fixation with a Küntscher nail without non-union. He insisted that unless intramedullary fixation was sufficient to dispense with additional external fixation or traction, allowing the early unhampered movement of both the patient and the limb, the advantages of operation were lost. In his series, the average time for getting up on crutches non-weight-bearing was just over three weeks, that for partial weight-bearing was just over two months and full weight-bearing just over four months. This remains our standard practice.

This review confirms that union may be relied upon after delayed operation but shows that the rate of non-union after early operation

TABLE 4
TIME OF MOBILISATION IN THE
FRACTURES TREATED BY EARLY FIXATION

	Non Weight-Bearing on Crutches			Partial Weight-Bearing on Crutches				Full Weight-Bearing			
	Within 1 Month	Within 2 Months	After 2 Months	Within 1 Month	Within 2 Months	Within 3 Months	After 3 Months	Within 1 Month	Within 3 Months	3-6 Months	After 6 Months
Single Injury	27	4	4	6	7	14	8	1	15	14	5
Multiple Injuries	11	—	3	4	6	—	4	2	7	4	1
TOTALS	38	4	7	10	13	14	12	3	22	18	6

can be significantly lower than recent reports suggest.

If the fracture is such that intramedullary fixation will not allow freedom of movement without additional support, then it is better treated conservatively, because many of the advantages of the operation may well be neutralised if this is necessary.

Exceptions are fractures which must be fixed internally because conservative treatment has failed, and those complicated by a fracture of the tibia on the same side, when the operation may well be delayed.

Summary

1. The results of seventy-one fractures of the shaft of the femur in adults treated by internal fixation have been reviewed.
2. A comparison has been made between the results of early and delayed internal fixation.
3. Forty-nine cases treated by early fixation gave a non-union rate of 4%. Twenty-one cases treated by delayed operation all united.
4. It is suggested that early mobility may influence the rate of union in fractures

of the shaft of the femur treated by early operation.

5. It is concluded that fractures which cannot be rigidly fixed by an intramedullary nail allowing early mobilisation, will be better treated conservatively because the advantages of operation are lost if a long period has to be spent in a splint or on traction.
6. If intramedullary nailing has to be performed and rigid fixation of the fracture is unlikely to be the result, then operation may well be delayed.

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