FAILURE OF INTERNAL FIXATION OF DISPLACED FEMORAL NECK FRACTURES IN RHEUMATOID PATIENTS

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We reviewed the records and radiographs from 10 hospitals to identify 50 patients with rheumatoid arthritis (RA) who had sustained 52 femoral neck fractures. Most patients were female (88%), elderly (mean age 66 years) and had had severe polyarticular disease for a mean duration of 16 years. Over half had taken systemic corticosteroids, nearly all were severely osteopenic but few had rheumatoid changes in the hip.

Of the 20 fractures treated by internal fixation 12 had complications including nonunion (5), osteonecrosis (5), infection (1), and intertrochanteric fracture (1). Only one of the nine undisplaced fractures required re-operation, but seven of the 11 displaced fractures had revision surgery.

Twenty fractures were treated by primary total hip arthroplasty with only one early complication. The other 12 fractures had been treated by hemiarthroplasty (9), hip excision (1) or non-operatively (2).

Our results suggest that, in elderly rheumatoid patients, severely displaced femoral neck fractures should be treated by total hip replacement.

Fracture of the femoral neck occurs more frequently in patients who have rheumatoid arthritis than in the general population (Hooyman et al 1984) and there is a high rate of failure and re-operation after using nails to fix displaced fractures in these patients (Table I).

We have undertaken a review of similar cases treated at 10 Toronto hospitals, where sliding-screw plates were used for internal fixation. We have studied the characteristics of the patients, the treatment methods and the early complications.

PATIENTS AND METHODS

We searched the health records from seven teaching hospitals of the University of Toronto and three convalescent hospitals for patients with femoral neck fractures who had been diagnosed previously as having definite or classical rheumatoid arthritis. After excluding patients with inadequate documentation we identified 52 fractures in 50 patients and examined the hospital records, radiographs, and clinic notes. In addition, one of the authors reviewed 20 of the patients. Follow-up was for a minimum of 12 months after fracture, unless the patient had suffered a treatment failure or complications or had died earlier.

RESULTS

The mean age of the patients was 66 years (range 24 to 93). There were 44 women and six men; 47 had classical or definite rheumatoid arthritis and three had had juvenile rheumatoid arthritis with persistent disease activity.

Rheumatoid disease. The mean duration of rheumatoid disease before fracture was 15.6 years (range one to 46). In 27 of the 52 fracture incidents the patient had had previous orthopaedic procedures for rheumatoid arthri-
tis, and 27 were being treated with systemic corticoste-
roids. For one patient this information was not available.
Twenty-five of the 50 patients had had fractures at other sites since the onset of rheumatoid arthritis. Prefracture radiographs of many joints of the upper and lower limb had been obtained by rheumatologists; those that were available were classified according to a severity grading system (Larsen, Dale and Eek 1977). In the 33 patients with satisfactory multiple upper limb radiographs, the most affected joint was graded as moderately or severely involved (Larsen’s grades II to III, nine cases, grades IV to V, 24 cases). Lower limb joint involvement, excluding the hip, showed a similar pattern.

![Fig. 1a](image1a.png)  ![Fig. 1b](image1b.png)

A 78-year-old woman with rheumatoid arthritis had Knowle’s pinning for an undisplaced stress fracture of the femoral neck. At five days she sustained a subtrochanteric fracture (1a) which was treated by a sliding-screw plate (1b). The hip is involved by rheumatoid arthritis: this is a relative indication for primary total replacement.

**Hip fractures.** Twenty-eight right hips and 24 left hips were affected. The fracture was through the base of the femoral neck in four cases. Only three had radiographic evidence of previous arthritic involvement of the hip. Osteoporosis, as determined by the method of Singh, Nagrath and Maini (1970), was moderate or severe in every case in which the radiographs were adequate. In only one case did major trauma (from a motor vehicle accident) cause the fracture. Forty-five fractures were caused by a fall, six were stress fractures without trauma, and in one case the information was unavailable.

Seventeen fractures were undisplaced (Garden stages I or II) and 35 were displaced (stages III or IV, Garden 1961). Twenty fractures had been treated by reduction and internal fixation, (14 by sliding-screw plates, six by Knowle’s pins or screws), 20 were treated by total hip arthroplasty, nine by unipolar arthroplasty, one by Girdlestone resection arthroplasty and two by non-operative means.

**Complications.** Three patients died; three suffered bowel obstruction or ischaemia; three had cardiac failure; two had pneumonia and one each had a cerebrovascular accident and septicaemia. The systemic complications were equally distributed between the treatment groups.

**Failure of internal fixation.** Local complications and failures in these 20 cases included loss of fixation and secondary displacement (5), avascular necrosis with segmental collapse (5), postoperative intertrochanteric fracture (1) and deep infection (1). Eight hips required second operations. There was no detectable difference between those treated by sliding-screw plates and Knowle’s pins or screws.

![Fig. 2a](image2a.png)  ![Fig. 2b](image2b.png)

A 61-year-old woman with polyarticular rheumatoid arthritis sustained a Garden IV femoral neck fracture in a fall (2a). Fourteen days after reduction and Knowle’s pinning, secondary displacement necessitated revision to an arthroplasty (2b).

**Undisplaced fractures.** In nine patients with Garden stage I or II fractures, the only complication was a subtrochanteric fracture in one, at the entry site of a Knowles pin. This required further internal fixation (Fig. 1). One undisplaced fracture treated non-operatively became displaced, developed avascular necrosis and required total hip arthroplasty.

**Displaced fractures.** Of the 11 patients with Garden III and IV fractures treated by internal fixation, eight suffered local complications; seven were converted to unipolar (2) or total (5) hip arthroplasty (Fig. 2).

**Failure of total hip arthroplasty.** One of the 20 hips dislocated on one occasion and was reduced by manipulation. This was the only local complication in this group (Fig. 3).
Failure of unipolar arthroplasty. Two of the nine patients developed acetabular protrusion, but were not re-operated. One infected prosthesis was removed and the hip left as a resection arthroplasty.

DISCUSSION

The patients with rheumatoid arthritis who suffered femoral neck fracture all had severe osteoporosis with polyarticular disease of long duration; most had no obvious evidence of rheumatoid activity in the affected hip. Our retrospective review has shown a very high rate of failure after internal fixation of displaced femoral neck fractures; it is possible that our review has missed other complications and therefore underestimated the risk. By contrast, the rate of failure in the minimally displaced or undisplaced fractures treated by internal fixation was low, as suggested by Hägglund, Nordström and Lidgren (1984).

The group treated by primary total hip replacement suffered only one early complication, a postoperative dislocation which was reduced. The selection of patients for internal fixation or arthroplasty was made on an individual basis by a number of surgeons. This selection was not random and direct comparison between the results of these two methods is not possible.

Earlier Scandinavian and British reports of failed osteosynthesis of displaced femoral neck fractures largely concerned the use of single or multiple large fixed nails (Vahvanen 1971; Stephen 1980; Hadden, Abernethy and Haw 1982; Strömqvist 1984; Strömqvist, Kelly and Lidgren 1988). The results in these series were much the same as our experience with sliding-screw plates or multiple pins and screws. From Toronto, Goodman and Schatzker (1986) reported the results of internal fixation of femoral neck fracture in non-rheumatoid patients during the same decade as our series. In these patients the re-operation rate for originally displaced fractures was 30%, substantially lower than the 64% in the rheumatoid group we now report. In contrast there was little difference in re-operation rate after internal fixation of undisplaced fractures between the two groups. Goodman and Schatzker’s series is not an ideal control group, but the better results for displaced fractures support our conclusions.

We had few early complications after total hip replacement in our series, but a prospective long-term study is required to determine the late outcome. However, we consider that our results and other reviews justify consideration of arthroplasty in most severely displaced fractures in rheumatoid patients. Because of the risk of pain and erosion, we prefer total replacement to unipolar or bicentric arthroplasty. Internal fixation should be reserved for minimally displaced fractures (Garden I and II), for displaced fractures in the young rheumatoid patient, and for the uncommon minimally affected patient who remains very active.

The main causes of early failure of internal fixation in these patients are secondary displacement and loss of fixation. We have shown that there is diminished trabecular bone volume, thinning of trabeculae and diminution of hydroxyapatite content in the femoral head of rheumatoid patients after femoral neck fractures (Lieberman et al 1988), as part of a ‘high turnover’ state of increased bone remodelling. This is similar to that found in our studies of cancellous bone in experimental...
inflammatory arthritis (Bogoch et al 1988; Lucas, Bogoch and Grynpas 1989). There is diminution of both bone substance and bone mineral. This is not classical osteomalacia, but rather a reduction in mineralisation of the entire bone sample, which probably contributes to the poor mechanical stability of the implant within the bone.

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REFERENCES


