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IMPACTED FRACTURES OF THE FEMORAL NECK TREATED BY EARLY MOBILIZATION AND WEIGHT-BEARING

B. ASSER HANSEN & SØREN SOLGAARD

Department of Orthopaedic Surgery T 2, Gentofte County Hospital, Hellerup, Denmark

Among 280 patients with femoral neck fractures 46 were classified as having impacted fractures according to the criteria mentioned below. The treatment of patients with impacted femoral neck fractures was determined to be mobilization with partial weight-bearing from the first day of admission. Among the 42 patients successful in immediate mobilization there were eight whose fractures disimpacted. Three cases of avascular necrosis were recorded but no cases of non-union. In order to determine the predictive signs of secondary dislocation the X-ray findings were subjected to statistical analysis. The inclination of the fracture line, dislocation into a valgus or varus position and the presence of retroversion did not influence the tendency to disimpaction. More than 80 per cent of the fractures healed without disimpaction.

Key words: femoral neck; fracture, impacted, stable, abduction

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PATIENTS

During the period March 1971 to April 1975, a total of 280 patients were admitted to the Gentofte County Hospital, Department of Orthopaedic Surgery T 2, for treatment of fractures of the femoral neck. All patients with subcapital and midcervical fractures with good contact between the fracture ends were accepted for non-operative treatment if they fulfilled the single clinical criterion of being able to raise the straight leg in the supine position. According to these criteria 46 patients had impacted fractures. This study was performed to examine the effect of immediate mobilization and weight-bearing in conjunction with non-operative treatment. Four patients who could not be mobilized within 2 weeks of admission due to debility were therefore excluded. Thus the study comprises 42 patients. Age and sex distribution are shown in Figure 1.

TREATMENT

The patients were treated with immediate mobilization with partial weight-bearing on two crutches. In debile patients full weight-bearing was allowed. During the first 6 weeks frequent radiographic examinations were performed to check for possible secondary dislocation. If secondary dislocation leading to instability and pain occurred, the patients were operatively treated according to the usual principles of the department.

METHODS

Anterio-posterior X-rays were studied to determine the inclination of the fracture line in the femoral neck, and the rotation of the femoral head into a valgus or varus position was observed. The technique is illustrated in Figure 2, and the results are shown in Table 1. Lateral X-rays were studied to register the presence of anteversion or retroversion of the femoral head. The fractures were thus divided into three groups: anteverted, neutral and retroverted. The results are shown in Table 1. No attempts were made to determine if the fractures were radiographically impacted.

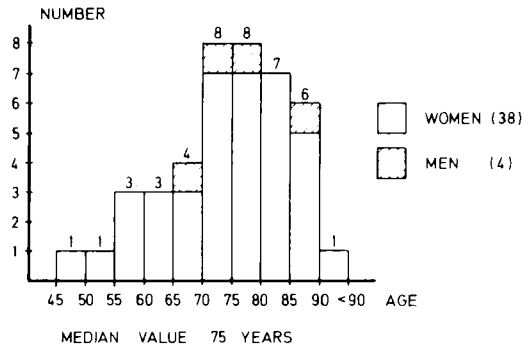
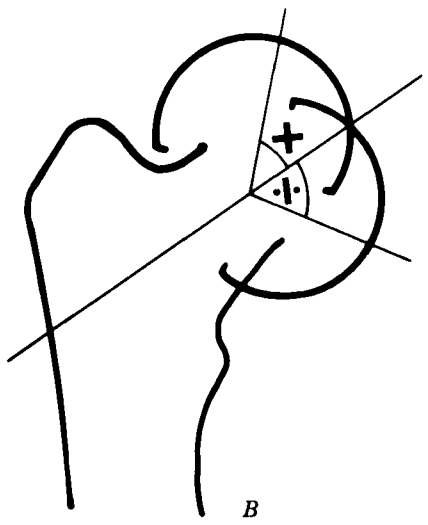
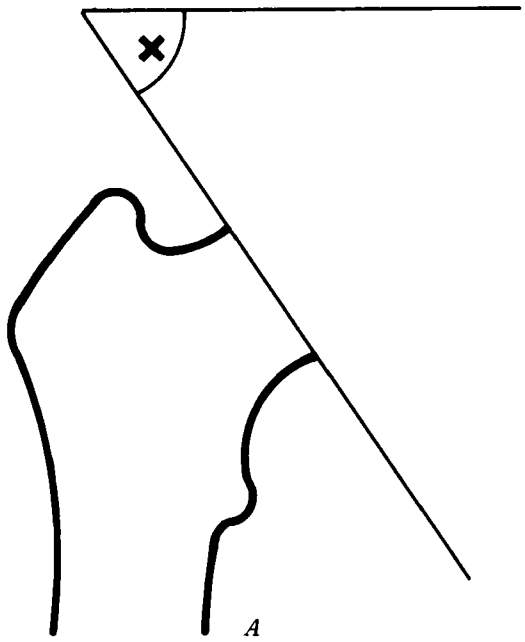


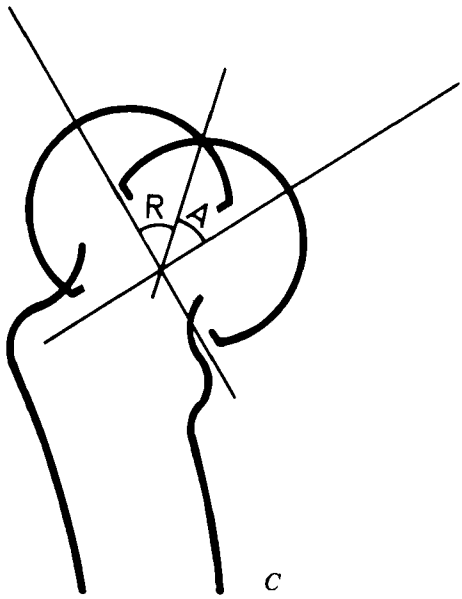
Figure 1. Age and sex distribution of 42 patients with impacted fractures of the femoral neck.



AP – RADIOGRAPH
ROTATION INTO VALGUS (+)
ROTATION INTO VARUS (÷)



AP – RADIOGRAPH
INCLINATION OF THE
FRACTURE IN THE
FEMORAL NECK TO THE
HORIZONTAL PLANE (×)



LATERAL RADIOGRAPH
RETROVERSION (R)
ANTEVERSION (A)

Figure 2 A, B and C. Method of measuring inclination of the fracture line and primary dislocation.

Table 1. Fracture type and primary dislocation in healed and secondary dislocated fractures

Rotation of femoral head in lateral X-rays (Fig. 2C)	Inclination of the fracture line in the femoral neck (Fig. 2A) (degrees)	Rotation into valgus or varus (÷) position (Fig. 2B) (degrees)	Healing	Secondary dislocation	Followed radiographically for less than 3 months
Anteversion	40	0	×		
	45	10			×
	45	5			×
Neutral position	15	10	×		
	25	15			×
	25	35		×	
	30	10	×		
	30	20	×		
	30	20	×		
	30	25	×		
	30	25		×	
	40	20	×		
	40	25	×		
	40	25	×		
	40	30	×		
	45	10		×	
	45	30	×		
	45	40	×		
	50	30	×		
	50	10		×	
	50	10			×
	50	÷25			×
	55	5			×
	60	20			×
	60	25			×
	60	0	×		
	60	5	×		
Retroversion	30	25		×	
	30	30			×
	35	5	×		
	35	5	×		
	35	0			×
	35	10		×	
	35	10		×	
	35	25	×		
	40	10	×		
	40	20	×		
	40	30	×		
	40	30	×		
	40	25		×	
	45	25	×		
	70	÷10	×		

RESULTS

Secondary dislocation occurred in 8 of the 42 patients. Of these eight patients, four had a Moore prosthesis inserted, two were treated with osteosynthesis with a sliding-nail, one patient was unfit for surgery and consequently treated conservatively, and one patient died before the planned operation was performed. The secondary dislocations occurred 5 to 48 days after admission (median 16 days). Ten patients were followed radiographically for less than 3 months. Some of these fractures might have disimpacted, in which case our rate of secondary dislocation would be higher. The median age for patients with secondary dislocation was 82 years (range 64 to 93 years); for patients without secondary dislocation the median age was 74 years (range 47 to 88 years).

The cumulative mortality rate 6 months after the injury was 16.7 per cent (7 deaths in 42 patients). The six months cumulative mortality rate for patients with secondary dislocation was 25 per cent (2/8) compared with a mortality rate for patients without secondary dislocation of 14.7 per cent (5/34).

In order to find out whether certain radiological features would enable us to predict secondary dislocation, we examined the X-rays, both the anterio-posterior and lateral projections, as recorded in Table 1. The group with anteversion of the femoral head was so small that it was excluded from the statistical analysis.

The patients were separated into two groups: Those with and those without secondary dislocation. First we compared the results with regard to the inclination of the fracture line in the frontal plane. The angulation of the fracture line to the horizontal plane did not differ in the secondary and the non-secondary dislocated fractures (Mann-Whitney rank sum test, $P > 0.1$). The group showing no dislocation in the lateral radiographs was then matched against the group showing retroversion. A χ^2 – test showed no difference between dislocated and non-dislocated fractures ($P > 0.1$). Finally the degree of rotation of the femoral head into valgus or varus as a possible cause of secondary dislocation was tested. The range of rotation was between 40° valgus and 25° varus. The Mann-Whitney rank sum test showed no difference in rotation in the secondary dislocated and non-dislocated group ($P > 0.1$).

FOLLOW-UP STUDY

To investigate the results of early mobilization of these patients a follow-up study was carried out. Of the 42 patients those with secondary dislocated fractures (8 cases) were excluded and 10 of the remaining 34 patients had died. Three patients did not want to participate, but declared by telephone, that they were feeling well without pain or other inconvenience from the hip. Thus 21 patients were available for the follow-up study.

At the examination radiographs were taken in two planes. The patients were asked if they had pain while walking and/or at rest. Simple tasks were performed (standing up from a chair, climbing stairs with or without alternating the feet). The late objective results were classified as excellent, good or poor.

The observation time ranged from 9 to 60 months (median 34 months). Avascular necrosis with or without osteoarthritis was seen in 14 per cent (3/21). One patient had pure osteoarthritis. All four had a total hip prosthesis inserted. There were no cases of non-union.

Late objective results: If the conservative treatment proved to be successful, i.e., there was no secondary dislocation, the late objective results were excellent in 76 per cent (16/21). One patient was classified as having a good result.

Late subjective results: Twelve patients had no pain at all (57 per cent), and four patients only functional pain (4/21 = 19 per cent). One patient declared that she had pain at rest, but no functional pain.

DISCUSSION

In order to decide whether patients with impacted femoral neck fractures should be treated non-operatively or by osteosynthesis, one should evaluate the results of the treatment with regard to mortality, secondary dislocation, avascular necrosis and pseudarthrosis, and also the outcome of the final treatment of those patients in whom secondary dislocation occurs. A comparison of different series fails owing to a lack of comparability of the definitions and terminology. In this study an impacted femoral neck fracture was defined as any subcapital or transcervical fracture with good contact between the fracture ends, the patient being able to raise the straight leg in the supine position. Bunata et al. (1973) share this opinion, but a wide range of definitions are found. Eklund & Eriksson (1964), Flatmark & Lone (1962) and Hilleboe et al. (1970) are most restrictive, only accepting abduction fractures dislocated into valgus without or with only slight ante- or retroversion.

In the present study, where none of the patients were excluded due to the radiological findings, analysis of the fracture types and dislocations provided no radiological predictive signs as to whether the femoral neck fracture would disimpact or not.

The non-operative treatment varies greatly from immediate ambulation and partial weight-bearing as in this material to very restrictive and lengthy treatment with prolonged bed rest and non-weight-bearing for up to 12 months, as advocated by Bunata et al. (1973), Crawford (1969) and Flatmark & Lone (1962). Their low frequencies of secondary dislocation of 12 per cent, 8 per cent and 5 per cent, respectively, contrast with ours of 19 per cent. Their long and restrictive treatment may be justified if patients having secondary dislocations have a much poorer prognosis for survival and rehabilitation. Out of our eight patients with secondary dislocations, four had a Moore prosthesis inserted (one of these patients died within 6 months due to cardiac failure), two had sliding-nails inserted and healed successfully, one patient was unfit for surgery and was treated conservatively, and one patient died of pulmonary embolism before the operation was performed.

In the materials published by Bentley (1968), Crawford (1969) and Flatmark & Lone (1962) secondary dislocation apparently frequently occurred while the patients were still confined to bed. Thus the benefit of bed rest has to be questioned.

Weight-bearing may impact the fractures further. This would certainly be true for a Pauwels' grade I fracture according to Pauwels (1935) and Rydell's (1966) biomechanical experiments and calculations. Flatmark & Lone (1962) found only two disimpactions among 28 Pauwels' grade III fractures. In the present study three of the eight disimpactions were Pauwels' grade I fractures, and the above-mentioned statistical analysis showed that the angulation of the fracture line in the femoral neck did not influence the tendency to secondary dislocation.

The mortality of operative or non-operative treatment is important in deciding which of these treatments should be preferred. In elderly patients with fractures around the femoral neck, Hansen & Niedhardt (1970) found that the survival rate returned to that of the normal population 6 months after the injury. For impacted fractures their 6 months cumulative mortality rate was 6 per cent and Eklund & Eriksson (1964) found a 12 months mortality rate of 7 per cent. The cumulative mortality rate at 6 months after injury was, in the present material, 17 per cent for all of the patients; for secondary dislocated patients it was 25 per cent and for non-secondary dislocated patients 15 per cent. In most studies concerning nailed femoral neck fractures, displaced as well as undisplaced, there is a mortality rate between 10 and 25 per cent. Gossling & Hardy (1969) found that out of 42 impacted fractures treated with nails or multiple pinning only one patient died. The average age in their material was 74 years.

The observation period is not mentioned. This low mortality rate could suggest that it might be advisable to perform some sort of fixation, e.g., percutaneous pinning.

The final considerations on impacted fractures deal with avascular necrosis of the femoral head and pseudarthrosis. Pseudarthrosis is seldom mentioned in connection with impacted femoral neck fractures. There was none in this material.

The incidence of avascular capital necrosis increases with the observation time. This was most pronounced in the patients reported by Flatmark & Lone (1962), who found that 44 per cent of the patients had avascular necrosis, if followed for 4 years or more. Bentley (1968) found 14 per cent after 3 years, Bunata et al. (1973) 17 per cent and Hilleboe et al. (1970) 8 per cent after 2 years. Our rate was 14 per cent after a mean observation time of 34 months.

Conclusion

In patients with subcapital and midcervical femoral fractures who are able to raise their straight leg in the supine position within the first 2 days of admission, around 80 per cent will heal without further dislocation, despite conservative treatment consisting of immediate ambulation and partial weight-bearing. The prognosis for patients with secondary dislocation does not seem to be worse as far as survival is concerned.

The inclination of the fracture line in the femoral neck, dislocation of the femoral head into a valgus or varus position or retroversion seen in the lateral radiograms, does not influence the rate of healing or the tendency to secondary dislocation in these patients. This particular fracture has been recognized as an entity and studied since 1944 (Linton 1944), yet little is known about selection for treatment, whether the fractures should be treated operatively or non-operatively, or how non-operative treatment should be managed. This study has not solved these problems, and we think that this can only be accomplished by a prospective study with random allocation into different treatment groups and with particular consideration of secondary dislocation, 6 months survival and rate of avascular necrosis after an observation period of at least 3 years.

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Correspondence to: B. Asser Hansen, Gyldenlundsvej 33 B, 2920 Charlottenlund, Denmark.