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THE EFFECT OF FRACTURE DISPLACEMENT ON LATE COMPLICATIONS IN FEMORAL NECK FRACTURES

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The importance of technical perfection in the operative treatment of cervical fractures of the upper end of the femur has been debated. Although it is clear that primary dislocation of the fracture following surgery may result from a poor technique, the opinions differ when it comes to whether a poor reduction in the long run may cause necrosis of the head or pseudarthrosis of the neck of the femur. Smith (1959), Garden (1961), Frangakis (1966) and others are in support of the concept of malposition after reduction and fixation as an important cause of complications later on; especially rotational and valgus position have been considered to be unfavourable. Claffey (1960) stressed that the site of the fracture was important; involvement of the lateral superior edge of the head of the femur would interrupt the circulation in the lateral epiphyseal vessels and thereby cause necrosis of the neck of the femur. However, Edholm, Lindblom & Maurseth (1966) failed to demonstrate any influence of malposition on the incidence of necrosis of the head of the femur.

The object of the present study was to compare, retrospectively, primary displacement, malposition after operation and internal fixation, the type of fracture and the age at fracture between cases with and without complications.

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MATERIAL AND METHODS

Available for this study were 60 cervical fractures of the upper end of the femur with a diagnosis of necrosis of the head of the femur and/or pseudarthrosis of the neck. All the cases had been followed roentgenologically for at least one year. Cases in which a primary dislocation had resulted in prosthetic replacement or other such procedure before one year were excluded on the grounds that the diagnosis of necrosis or pseudarthrosis at such an early time could not be verified. The average follow-up time was 30 months.

For comparison 56 cases were sampled with the same average follow-up time, 30 months, during which time no roentgenographic evidence of complication had been noticeable.

The films of these cases were reviewed with regard to:

Primary displacement, classified as total or non-total depending on whether there was any contact between the fracture ends or not. The primary displacement was also ranked depending on the angulation between the fragments in two classes, $< 20^\circ$ and $> 20^\circ$. The maximum angulation was used whether measured on the antero-posterior or the lateral film.

Residual displacement after reduction measured in degrees of angulation on an antero-posterior and a lateral roentgenogram.

All fractures except for 12 had been reduced and pinned; the procedure included the use of a television image intensifier.

Twelve *impacted fractures* in this study were defined as fractures which were not operated on the grounds that they were considered stable and in which the fracture remained stable and maintained the degree of displacement which was primarily observed.

With regard to *fracture localization*, the fracture types referred to in this study are demonstrated in Figure 1. Types 1 and 3 engaged the upper lateral margin of the femoral head, where the lateral epiphyseal vessels enter the bone (Claffey 1960).

RESULTS

There was no significant difference in age between cases with and without complications (Table 1). The *primary displacement* had been worse in complicated fractures as compared to non-complicated (Table 2). The *residual displacement* did not differ significantly between complicated and non-complicated cases. The malposition measured on the antero-posterior as well as on the lateral roentgenograms was even somewhat although not significantly less in the complicated group (Table 3).

Reduction to a position without noticeable residual displacement had been significantly more frequently obtained in totally displaced fractures than in less displaced fractures (Table 4). Between the different types of fractures the complications were distributed as shown in Table 5. The fracture types 1 and 3 with involvement of the lateral

Table 1.

	Complicated	Non-complicated	
Age	67.7 ± 11.9 (SD)	65.5 ± 13.1	Non-significant

Table 2.

	Complicated	Non-complicated	
Primary displacement			
Total	49	31	
Non-total	11	25	0.01 > P > 0.001

Table 3.

	Complicated	Non-complicated	
Residual displacement (degrees)			
Antero-post.	4.8 ± 1.1	6.0 ± 1.1	Non-significant
Lateral	3.1 ± 1.0	5.9 ± 1.3	0.1 > P > 0.05

Table 4.

	Primary displacement		
Residual displacement	Total	Non-total	
Noticeably displaced	34	18	
Not noticeably displaced	46	6	0.02 > P > 0.01

Table 5.

Fracture type	Complicated		Non-complicated
	Necrosis	Pseudarthrosis	
1	2	2	4
2	21	4	30
3	3	4	3
4	10	11	17
5	0	0	2

Table 6.

Fracture type	Complicated	Non-complicated	
1 + 3	11	7	
2 + 4 + 5	49	49	Non-significant

Table 7. Impacted fractures.

	Complicated	Non-complicated	
Non-impacted	59	45	0.01 > P > 0.001
Impacted	1	11	

Table 8. Nail slipping.

	Necrosis	Non-complicated	
Slipping	18	19	
Non-slipping	18	37	$0.2 > P > 0.1$

Table 9. Nail slipping.

	Pseudarthrosis	Non-complicated	
Slipping	18	19	
Non-slipping	6	37	$0.01 > P > 0.001$

epiphyseal vessels were not significantly more frequently complicated than the remaining groups (Table 6).

There were significantly fewer impacted fractures among the complicated cases than among the non-complicated (Table 7).

In 55 fractures nail slipping was observed. This observation was significantly more frequent in cases who developed pseudarthrosis of the neck of the femur but not in cases with femoral head necrosis only (Tables 8 and 9).

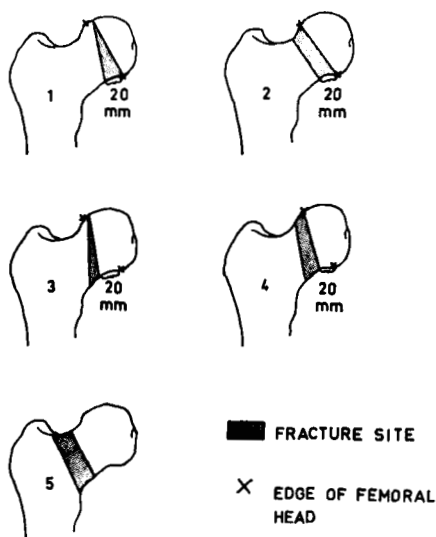


Figure 1. Types of fracture of the femoral neck.

DISCUSSION

Advanced age has frequently been considered to influence union. The findings in the present study support the conclusion of Gardner (1961) that age is not of major importance for the final results in fracture of the neck of the femur.

The conclusion of Claffey (1960), that a certain type of fracture which engages the upper lateral epiphyseal vessels would give almost one hundred per cent of femoral head necrosis, was not supported by the findings in the present study.

The position of the fracture after reduction and osteosynthesis seems, similarly, to be of no importance; on the contrary there is a tendency to the reverse. This may be explained by the fact that totally displaced fractures could more easily be reduced to a perfect position. The totally displaced fractures were also over-represented in the group of complicated cases. The conclusion must be that the fate of the femoral head is decided at the moment of the fracture. It should, however, be emphasized that a certain number of complications, not included in this study, depend on faults in the technical procedure which lead to dislocation of the fracture primarily or when weight-bearing is commenced. After one year, these cases have been sorted out and from this point the problem of viability and healing has little to do with the surgical procedure.

SUMMARY

The initial roentgenograms were reviewed in 60 cases of cervical fracture of the upper end of the femur who had developed pseudarthrosis or femoral head necrosis and compared to 56 cases with the same follow-up time who had not.

- (1) There was no age difference.
- (2) The complications could not be referred to any singular fracture type.
- (3) The position after reduction of the fracture did not influence the outcome with respect to pseudarthrosis or necrosis.
- (4) The initial displacement before reduction had been significantly worse in cases who had later on developed complications.

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