

## IMMEDIATE WEIGHT-BEARING AFTER INTERNAL FIXATION OF FEMORAL NECK FRACTURES USING VON BAHR SCREWS

### *Preliminary Report of a Prospective Clinical Trial*

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Osteosynthesis of displaced femoral neck fractures using von Bahr screws was performed in 50 patients. Immediate postoperative weight-bearing was allowed. After a follow-up period of 1 year a high incidence (20 per cent) of early failure (dislocation of the fractures with or without screw movement) was found. Analysis of the material showed that the failure rate was influenced by the peroperative reposition of the fracture, especially the valgus/varus position of the caput fragment, and the position of the screws.

*Key words:* femoral neck fractures; screw osteosynthesis; early weight-bearing; mechanical failure

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The primary aim when treating femoral neck fractures, especially in the elderly, is to restore the patient's prefracture state in the shortest possible time. The patient should be able to start walking exercises immediately after operation preferably with full weight-bearing.

The failure rate following conventional internal fixation has up until now been high (for review, see Øhmann et al. 1969). It seems clear that the fixation device used for the osteosynthesis affects the stability of the operated fracture, but there is no agreement regarding which type of internal fixation is the best.

This paper presents our experience gained from a prospective study of treating patients with displaced, intracapsular femoral neck fractures with internal

fixation *ad modum* von Bahr (von Bahr et al. 1974) and allowing immediate weight-bearing.

### PATIENTS AND METHODS

During the period from October 1974 to August 1975, 50 patients with femoral neck fractures were treated in our hospital with internal fixation *ad modum* von Bahr. There were 37 female and 13 male patients ranging in age from 15 to 87 years (mean 69.2 years).

All patients were put on tibial traction until the operation. Prophylactic anti-thrombosis therapy with either Heparin 5000 IU twice a day s.c. or Dextran 70 were given. Concomitant diseases were treated when necessary. The internal fixation was performed from 1 to 26 days after admission (mean 2.8 days). (The only patient with a clinical postoperative thrombosis was operated 3 days after admission).

*Operative technique.* The von Bahr technique

for osteosynthesis of femoral neck fractures is a screw fixation in which two or more screws are inserted. Reduction is done with fluoroscopic monitoring with the patient on a traction table. Following reduction the lateral aspect of the proximal femur is exposed. The distal screw must be inserted first. A hole is drilled through the cortical bone and drilling is continued to the proximal fragment. The screw should be placed as steep as possible in the a.p. view and somewhat dorsal in the collum. It seems important that the distal screw is aimed a little too far distally as the screw when inserted encounters the calcar femoris and may veer off in a cranial direction. A second screw is introduced after pre-drilling approximately 2 cm proximal to the first screw. Alternatively three screws may be used, the two proximal ones must then be placed ventrally and dorsally at the same

horizontal level. Care is taken to ensure that the screws are parallel in both projections (Figure 1). A more detailed description of the technique is given by von Bahr et al. (1974) and includes an outline of the pitfalls of his technique.

*Postoperative treatment.* Postoperative X-rays were taken in the operating theatre or shortly after the operation. Mobilization with full weight-bearing was started as soon as possible and Figure 2 gives the time interval from operation to postoperative walking. Physiotherapy was given both in the hospital and after discharge.

*Mortality.* No patient died during the operation. Postoperative mortality was recorded 1 and 6 months after operation. During the first month two patients died. One patient died during the next 5 months.

*Complications.* This includes all complications

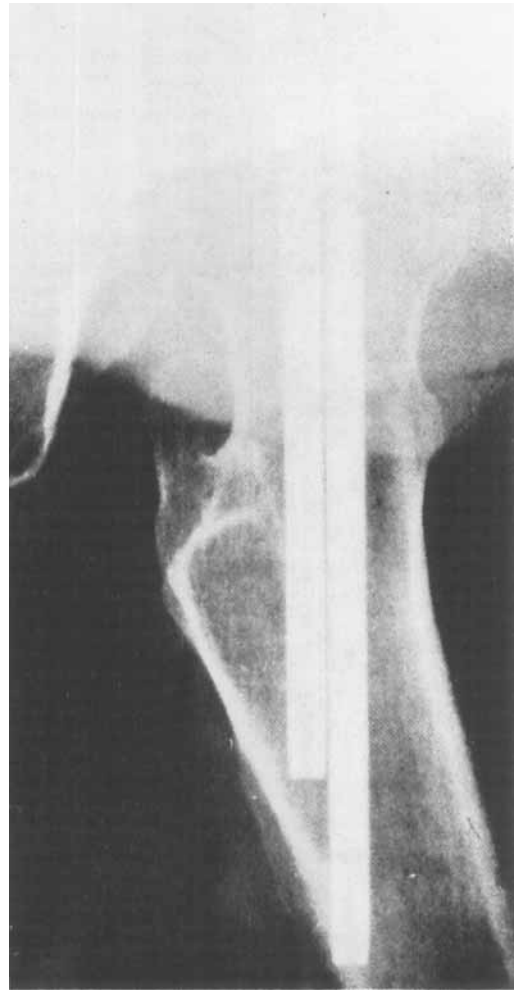


Figure 1. X-rays showing von Bahr screws used in femoral neck fractures.

in the first postoperative month not concerning the fracture. The complications are listed in Table 1.

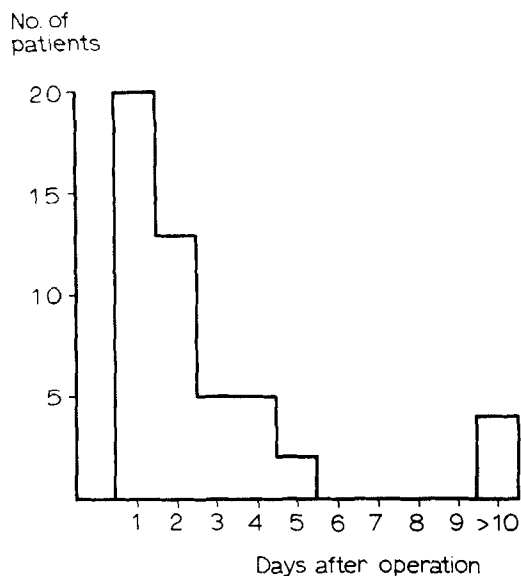


Figure 2. Number of days before weight-bearing after operation (one patient died before mobilization).

Table 1. Postoperative complications.

Complications		No. of patients
Local	Deep infection	0
	Superficial infection	1
	Wound haematoma	1
General	Thrombosis/embolism	1
	Cardio-pulmonary	3

## RESULTS

Every patients was followed closely for the first 6 months after discharge from the hospital. All surviving patients were asked to come for a complete examination and X-ray review 1 year after the operation.

Of the original 50 patients, five were dead. Eight patients had received and one was waiting for a femoral head

prosthesis; these patients were not examined. Thirty-five patients were examined in our department by one of the authors. No information is available concerning the one remaining patient.

*Hip assessment.* Stinchfield's modification (Stinchfield et al. 1957) of the Judet classification system was used. Table 2 shows the Stinchfield system and the criteria for grading clinical results. The complete results of the follow-up examinations are given in Table 3.

*Range of movement.* The range of movement in the operated hips according to Spangfort's scheme is given in Figure 3.

*Failures.* During the first year, 8 patients were reoperated with prosthetic replacement due to early mechanical failure of the primary osteosynthesis.

Table 2. Stinchfield's hip assessment system. Grading of disability according to pain, movement and walking ability.

### PAIN

Severe—loss of sleep	1
Severe when walking, unable to work	2
Moderate—able to do light work	3
Pain after effort—relieved by rest	4
Slight and intermittent	5
Absent	6

### MOVEMENT

Fixed in poor position	1
Fixed in good position	2
0°–70°	3
70°–140°	4
140°–200°	5
More than 200°	6

### WALKING

Impossible or almost so	1
Short distances only	2
Restricted, e.g. an hour with stick	3
Long distances with stick, short without	4
No stick, but limping	5
Normal	6

### CLASSIFICATION

Excellent	16 points or more
Good	12–15 points
Fair	9–11 points
Poor	8 points or less

Table 3. Results of follow-up examination based upon the patient's personal opinion (when available) and the objective hip assessment according to Stinchfield's classification system.

	Classification				Unable to give personal opinion
	Excellent	Good	Fair	Poor	
Personal opinion		18	12	1	4
Hip assessment	16	12	5	2	

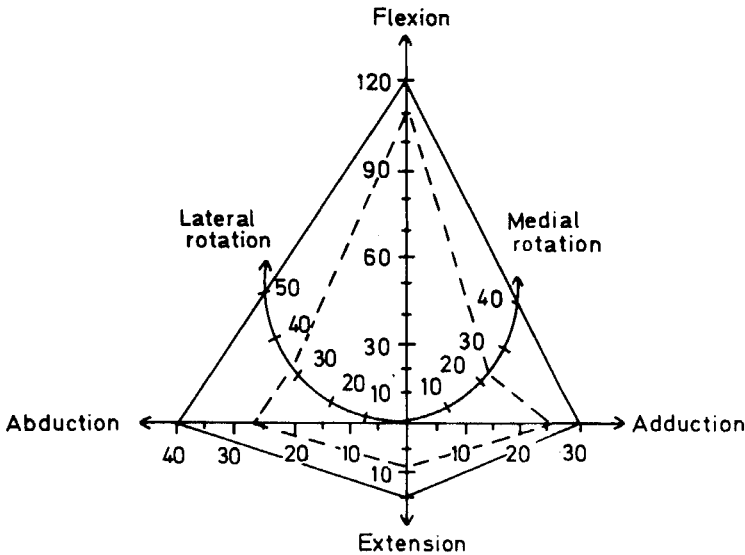


Figure 3. Range of movement in the operated hips according to Spangfort's scheme (left hip turned).

One more patient had screw movement and fracture dislocation before the follow-up examination and is waiting for prosthetic replacement. During the follow-up examination one further patient presented with dislocation of the femoral head due to screw movement, but reoperation is not indicated due to the present general condition of the patient. Thus, during the first year 10 mechanical failures were recorded giving a failure rate of 20 per cent. One patient had necrosis of the femoral head at the time of the follow-up examination.

*Analysis of the material*

The material was analysed to determine the factors which might have influenced the failure rate. Table 4 shows

the parameters analysed. The mechanical failures have then been compared to the rest of the material, in the following called "healed" fractures, and the results are given in Table 4. The Chi-square test was used for the statistical analysis. Due to the small number of patients in the different groups, a redistribution, as shown in Table 4, has been made to allow the statistical analysis to be performed.

The fracture types found (Garden's classification) seem to be similarly distributed in the "healed" group and in the "failure" group. However, the number of patients are small and a larger series may be necessary to confirm this distribution.

The results of the peroperative reposi-

Table 4. Analysis of the clinical material.

		Healed fractures		Failures		Statistical analysis (P values)
Classification of fractures (Garden)	2	6		0		Probably not significant
	3	9		2		
	4	24 *		8		
Reposition	Good	27	>	2	>	P = 0.05
	Acceptable	10		5	7	
	Poor			3		
Position of caput	Valgus	24	>	2	>	P < 0.05
	Neutral	12		0	2	
	Varus			4		
Screw position	Good	15	>	8	>	P < 0.01
	Acceptable	1		1	9	
	Poor			24		

\* Original X-rays are lacking for one patient.

tion procedures show that the reposition in the "healed" group is significantly better than in the "failure" group. Similarly, the "healed" group shows a more favourable varus/valgus position of the caput fragment compared with the "failure" group.

The screw position has also been analysed on the basis of the criteria recommended by von Bahr (von Bahr et al. 1974). The "healed" group shows a significantly better screw position than the "failure" group.

## DISCUSSION

Analysis of our material indicates that the primary grade of displacement was not important as a factor causing mechanical failure, whereas the operative reduction, especially the valgus/varus position of the femoral head were of significant importance. Similarly, the analysis indicates that poor screw position gives a higher failure rate.

von Bahr has reported screw movement in 9.5 per cent of his patients.

Pseudarthrosis was also found in 9.5 per cent of his patients but he has not indicated whether this group of patients is the same as the group with screw movement. The explanation for the high failure rate (20 per cent) in our material compared with the probable low failure rate in von Bahr's series is not quite clear. In our material the patients were allowed weight-bearing from the first postoperative day, whereas von Bahr seems to have been more restrictive as regards weight-bearing. Furthermore, von Bahr seems not to have excluded impacted fractures (Garden type 1) from his study as we have done. On the other hand, the results of the reposition procedure and the operative fixation (screw position) seem to be better in his material. These factors may explain the differences in failure rates.

The high incidence of mechanical failure is unacceptable. If either reduction or screw position is unsatisfactory based on the peroperative fluoroscopic view, it seems justified to advocate either a re-reposition and a new osteosynthesis or a primary prosthetic replacement. An

earlier retrospective report from this department (Søreide et al. 1975) indicates that primary prosthetic replacement therapy in the elderly carries the same low mortality and morbidity rates as the internal fixation reported in this paper.

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#### REFERENCES

- von Bahr, V., Syk, B. & Walheim, G. (1974) Osteosynthesis of femoral neck fractures using screws. *Acta chir. scand.* **140**, 277-282.
- Øhmann, U., Bjørkegren, N.-A. & Fahlstrøm, G. (1969) Fracture of the femoral neck. A five year follow-up. *Acta chir. scand.* **135**, 27-42.
- Søreide, O., Lerner, A. P. & Thunold, J. (1975) Primary prosthetic replacement in acute femoral neck fractures. *Injury* **6**, 286-293.
- Stinchfield, F. E., Cooperman, B. & Shea, C. E. (1957) Replacement of the femoral head by Judet or Austin Moore prosthesis. *J. Bone Jt Surg.* **39-A**, 1043.

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