

Posterior Angulation in Trochanteric Fractures Detected with Roentgen Stereophotogrammetry

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ABSTRACT

Roentgen stereophotogrammetric analysis has been carried out in 8 patients with trochanteric fracture after fixation with a sliding screw-plate. In 6 of the 8 cases the proximal fragment angulated posteriorly after the operation. Posterior angulation may be an important mode of failure of trochanteric fractures.

INTRODUCTION

Postoperative fracture stability is of vital importance for enabling early mobilization and full painfree weight-bearing in trochanteric fractures (2, 3). Roentgen stereophotogrammetric analysis (RSA), using tantalum bone markers, makes it possible to detect movements between body segments with a high degree of accuracy (8). We studied the angulation and the impaction of trochanteric fractures after fixation with a sliding screw-plate.

MATERIAL AND METHODS

Eight patients (2 men and 6 females; age 72-97 years) with trochanteric fractures (2 stable and 6 unstable according to Evans) were operated with a sliding screw device (BioMet, Warsaw, Indiana) comprising a femoral plate and a lag-screw. Osteosynthesis was performed after reduction of the fracture on a traction table using an image intensifier. At operation, 3-5 tantalum balls, 0.8 mm in diameter, were implanted on both sides of the fracture in the proximal femur (Figure 1).

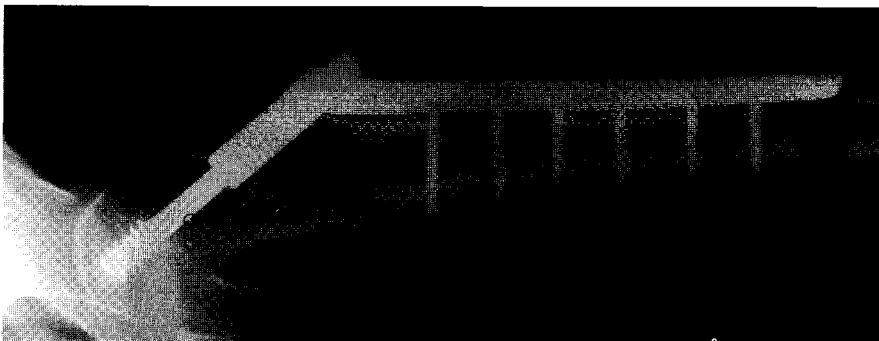


Figure 1. An operated trochanteric fracture with tantalum balls (○) in the femoral head and neck, and in the femoral shaft.

RSA (8) was performed within 6 hours postoperatively (before weight-bearing), after 1 week, 2-3 months, and after 1 year. All patients were able to bear full weight on their legs within the first week. The stereophotogrammetric exposures were made with the hip relaxed and with the patient supine. Angulation and displacement of the femoral head around/along the longitudinal axis of the femur were recorded. Angulation or displacement less than 2° or 0.5 mm, respectively, was not considered significant.

Two patients died during the observation period: one (no 2) from cardiac failure 2 weeks after the operation, and one (no 6) from an acute myocardial infarction 4 months after the operation.

RESULTS

In 7 of the 8 hips fracture impaction occurred, and in one hip (no 5) the impaction had caused screw penetration through the femoral head one year after the operation. In 6 of the 8 hips the proximal fragment angulated along the longitudinal axis mainly in the early period of weight-bearing, and in all the 6 cases the femoral head angulated posteriorly in relation to the femoral shaft (Table 1).

Table 1. Angulation and displacement of the femoral head postoperatively

patient	fracture type	Posterior angulation (degrees) / distal displacement (mm) of the femoral head after:		
		7 days	2-3 months	1 year
1	stable	0 / 0.0	0 / 0.0	0 / 0.0
2	stable	4 / 3.5	†	
3	unstable	0 / 3.7		4 / 7.9
4	unstable	0 / 6.7	5 / 21.3	7 / 21.6
5	unstable	3 / 3.6		7 / 18.5
6	unstable	5 / 3.9	10 / 6.8	†
7	unstable	6 / 1.1	8 / 1.8	17 / 2.5
8	unstable	26 / 8.8		28 / 11.5

DISCUSSION

Fracture fixation in trochanteric fractures with a sliding screw-plate is a successful treatment; more than 90 per cent heal without major complications (4). Fracture complications such as screw penetration and varus deformation are more common in unstable fractures. The sliding screw-plate is designed to allow concentric fracture impaction and stability (1, 9). However, the intended stability might not be achieved if the proximal fragment is displaced posteriorly and thus causing an insufficient bone contact area in the fracture.

Posterior angulation of the proximal fragment has been ignored in many studies on hip fractures; most investigations have been confined to the frontal plane. However, a considerable posteriorly directed force acts on the femoral head at heel-strike and in flexion, which may cause posterior angulation of the proximal fragment. In 3/4 of our cases the proximal fragment angulated posteriorly in the early period of weight-bearing (Table 1).

In conclusion, like in hip prostheses (5, 6) and femoral neck fractures (7), posterior angulation is probably an important mode of failure in trochanteric fractures, and the posteriorly directed stress deserves attention in biomechanical testing models of fracture fixation devices for the hip.

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