Risk factors for revision within 1 year following osteosynthesis of a displaced femoral neck fracture

Anne Marie Nyholm[1], Henrik Palm[2], Håkon Sandholdt[1], Anders Troelsen[1], Kirill Gromov[1] and DFDB Collaborators
[1]Department of Orthopaedic Surgery, Copenhagen University Hospital Hvidovre, Copenhagen, Denmark
[2]Department of Orthopaedic Surgery, Copenhagen University Hospital Bispebjerg, Copenhagen, Denmark

Introduction

The current guideline advice for osteosynthesis of displaced femoral neck fractures (dFNF) in patients younger than 70 years of age.
Primary arthroplasty has been proposed due to high failure rates following osteosynthesis.

The **study purposes** were to

a) estimate the incidence of revision within 12 months for dFNF treated with osteosynthesis in Denmark.

b) evaluate the effect of the age, the degree of displacement and bone quality on 1-year risk of revision.

Material and Methods

654 consecutive osteosyntheses for a dFNF with parallel implants and available x-rays were collected from the Danish Fracture Database. Data included age, gender, ASA score and surgical delay.

X-rays were evaluated for

- Fracture displacement and quality of reduction (displacement and angulation)
- Angulation of implants
- Protrusion of implants into the joint (POI)
- Cortical Thickness Index (CTI).

Fractures were divided into "Mildly displaced" (Garden II >20° posterior tilt or Garden III) and "Much displaced" (Garden IV).

Data of any relevant revision (reosteosynthesis, arthroplasty replacement or femoral head removal) or death were collected from the Civil Registration system. Follow up was 1 year.

Cortical thickness Index – Thickness of the cortici (white line minus black line) in relation to the diameter of the bone (white line) 10 cm below the tip of the trochanter minor (grey vertical line).

$$CTI = \frac{\text{White line} - \text{black line}}{\text{white line}}$$

Demographic data on included cases

	Revision	Death*	Total
Number of surgeries	124 (19%)	117 (18%)	654
Age			
≤50	5 (9%)	1 (2%)	54
>50-≤60	17 (16%)	10 (9%)	109
>60-≤70	65 (29%)	25 (11%)	227
>70-≤80	13 (13%)	15 (15%)	97
>80-≤90	18 (17%)	30 (29%)	104
>90	6 (10%)	36 (58%)	63
CTI			
<0.3	2 (13%)	7 (46%)	15
0.3-0.4	15 (19%)	22 (28%)	78
0.4-0.5	45 (19%)	53 (22%)	238
0.5-0.6	45 (17%)	28 (11%)	263
>0.6	11 (25%)	4 (9%)	44
Fracture displacement			
Mildly displaced	43 (12%)	67 (19%)	356
Much displaced	81 (27%)	50 (17%)	298
Quality of reduction			
Non-displaced, <10°PT	33 (13%)	38 (16%)	245
Displaced	73 (23%)	62 (19%)	322
Non-displaced, >=10°PT	18 (21%)	16 (19%)	85

*Some may have beeen revised prior to death. PT = posterior tilt

Results

Mean age was 69 years. 59% were female.

Adjusted cox-regression analysis demonstrated that

- Female gender (HR 1.71, CI 1.15 - 2.63)
- Surgical delay between 12-24h vs <12h (HR 1.66, CI 1.05 - 2.63)
- "Much displaced" fracture (HR 3.00, CI 1.99 - 4.67)
- Insufficient reduction (HR 1.70, CI 1.06 - 2.50)
- POI (HR 2.32, CI 1.03 ; 5.45)

were significantly associated with increased risk of revision.

Patient age and the angulation of implants were not associated with revision risk.

CTI was not associated with risk of revision, but was inversely associated to risk of death (HR 0.038, CI (0.0044 - 0.33)).

Conclusion

19% underwent revision within 1 year.

Risk of revision was linked mainly to displacement and reduction of the fracture, with no apparent association to the age of the patient or the quality of the bone estimated by CTI.

We suggest considering primary arthroplasty in all highly displaced fractures.

Contact: rienyholm@gmail.com