# Incidence of femoral and tibial shaft fractures

## Epidemiology 1950–1983 in Malmö, Sweden

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**We studied 362 fractures of the femur that had occurred during the years 1950–57 and 1973–83, and 849 fractures of the tibia that occurred during the the years 1950–55 and 1980–83. There was an increase in age-specific incidence over aged 60 years. The risk of low-energy femoral shaft fractures also had increased in elderly women. Both fracture types shifted their age- and sex-specific incidence in the direction of a fragility pattern. There was no increase in the incidence of tibial shaft fractures. Fracture type, site, and degree of displacement of the tibial fractures remained unchanged during the 30 years, i.e, they were predominantly distal, longitudinal fractures with moderate displacement.**

Fractures of the shafts of the femur and the tibia are considered to be mainly high-energy injuries without preponderance for subjects with bone fragility. We examined possible changes in the age- and sex-specific incidences of fracture of the femur and the tibia during 30 years.

## Patients

In the city of Malmö, with approximately 230,000 inhabitants, all the radiographs have been saved at the Department of Diagnostic Radiology—thus, since 1950, all the fractures have been recorded according to anatomy. Because diaphyseal fracture of the femur and tibia hardly ever escape detection and are always treated in the hospital, the collection in Malmö is complete. Moreover, fractures that are sustained by Malmö residents outside the city are recorded after the patients have been transferred. All the films were available and reviewed to certify the fracture and the fracture site.

Included were fractures of the femur that had been sustained by residents of Malmö during the years 1950–57 and 1979–83. Fractures of the upper end of the femur (cervical, trochanteric, and subtrochanteric) were not included, nor were fractures of the distal end, except supracondylar fractures. The shaft fractures were also subdivided into transverse (fracture angle > 45°) and longitudinal fractures.

The tibial fractures occurred during 1950–55 and 1980–83, and were classified according to Edwards (1965) with regard to site (upper, middle, or lower third), fracture anatomy (transverse, longitudinal, comminuted), and degree of displacement (none, moderate, marked).

We investigated some additional years as regards femoral fractures to obtain sufficient numbers for comparison.

The population at risk was obtained from the city files and was calculated for the early and late collection periods separately (Table 1); the population remained fairly constant, whereas the proportion of

Table 1. Population at risk (thousands) in Malmö, Sweden per year in the 1950s and 1980s

| | Women | | Men | |
|---|---|---|---|---|
| 0–9 | 15 | 11 | 16 | 11 |
| 10–19 | 13 | 13 | 13 | 13 |
| 20–29 | 14 | 17 | 13 | 17 |
| 30–39 | 17 | 15 | 16 | 16 |
| 40–49 | 17 | 13 | 15 | 13 |
| 50–59 | 13 | 16 | 11 | 15 |
| 60–69 | 9.6 | 16 | 7.5 | 13 |
| > 70 | 7.3 | 19 | 5.2 | 10 |

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Table 2. Fracture of the femoral shaft during 1950–57 and 1979–83 in relation to age and sex. Total number and age-specific annual incidence per 10,000 inhabitants in Malmö, Sweden

| | Women | | | | Men | | | |
|---|---|---|---|---|---|---|---|---|
| | 1950s | | 1980s | | 1950s | | 1980s | |
| Age | No. | Incidence | No. | Incidence | No. | Incidence | No. | Incidence |
| 0–9 | 14 | 1.15 | 5 | 1.29 | 36 | 2.81 | 20 | 3.2 |
| 10–19 | 4 | 0.39 | 3 | 0.47 | 15 | 1.45 | 8 | 1.47 |
| 20–29 | 3 | 0.25 | 1 | 0.12 | 17 | 1.59 | 7 | 0.92 |
| 30–39 | 4 | 0.28 | 4 | 0.52 | 8 | 0.61 | 2 | 0.24 |
| 40–49 | 4 | 0.29 | 4 | 0.60 | 9 | 0.73 | 3 | 0.46 |
| 50–59 | 4 | 0.38 | 6 | 0.80 | 8 | 0.89 | 2 | 0.27 |
| 60–69 | 4 | 0.52 | 6 | 0.72 | 8 | 1.33 | 7 | 1.02 |
| > 70 | 9 | 1.53 | 28 | 2.96 | 7 | 1.67 | 6 | 1.12 |

Table 3. Supracondylar femoral fractures during 1950–57 and 1979–83 in relation to age and sex. Total number and age-specific annual incidence per 10,000 inhabitants in Malmö, Sweden

| | Women | | | | Men | | | |
|---|---|---|---|---|---|---|---|---|
| | 1950s | | 1980s | | 1950s | | 1980s | |
| Age | No. | Incidence | No. | Incidence | No. | Incidence | No. | Incidence |
| 0–9 | 10 | 0.82 | 3 | 0.55 | 4 | 0.31 | 2 | 0.35 |
| 10–19 | 0 | 0 | 1 | 0.14 | 6 | 0.58 | 4 | 0.58 |
| 20–29 | 2 | 0.17 | 0 | 0 | 2 | 0.18 | 1 | 0.12 |
| 30–39 | 1 | 0.07 | 0 | 0 | 2 | 0.15 | 0 | 0 |
| 40–49 | 0 | 0 | 0 | 0 | 1 | 0.08 | 2 | 0.31 |
| 50–59 | 5 | 0.48 | 3 | 0.36 | 3 | 0.33 | 2 | 0.27 |
| 60–69 | 4 | 0.52 | 8 | 0.95 | 1 | 0.17 | 3 | 0.44 |
| > 70 | 4 | 0.67 | 16 | 1.70 | 0 | 0 | 6 | 1.12 |

Table 4. Fracture of the tibia shaft during 1950–55 and 1980–83 in relation to age and sex. Total number and age-specific annual incidence per 10,000 inhabitants in Malmö, Sweden

| | Women | | | | Men | | | |
|---|---|---|---|---|---|---|---|---|
| | 1950s | | 1980s | | 1950s | | 1980s | |
| Age | No. | Incidence | No. | Incidence | No. | Incidence | No. | Incidence |
| 0–9 | 60 | 6.6 | 31 | 7.2 | 97 | 10.1 | 65 | 14.3 |
| 10–19 | 29 | 3.8 | 26 | 4.9 | 55 | 7.1 | 58 | 10.7 |
| 20–29 | 11 | 1.2 | 6 | 0.9 | 40 | 4.9 | 41 | 5.9 |
| 30–39 | 19 | 1.8 | 10 | 1.6 | 34 | 3.5 | 26 | 4.0 |
| 40–49 | 16 | 1.6 | 16 | 3.0 | 29 | 3.2 | 20 | 3.8 |
| 50–59 | 11 | 1.4 | 10 | 1.5 | 22 | 3.3 | 26 | 4.4 |
| 60–69 | 10 | 1.7 | 17 | 2.5 | 8 | 1.7 | 12 | 2.2 |
| > 70 | 10 | 2.2 | 22 | 2.9 | 4 | 1.3 | 8 | 1.8 |

elderly doubled (Johnell et al. 1984). In the incidence presentations, this change was accounted for.

The chi-square test was used for comparison between early and late fracture collection periods.

## Results

### *Femoral fractures*

During 1950–57, 154 femoral shaft fractures and 45 supracondylar femoral fractures were recorded. Dur-

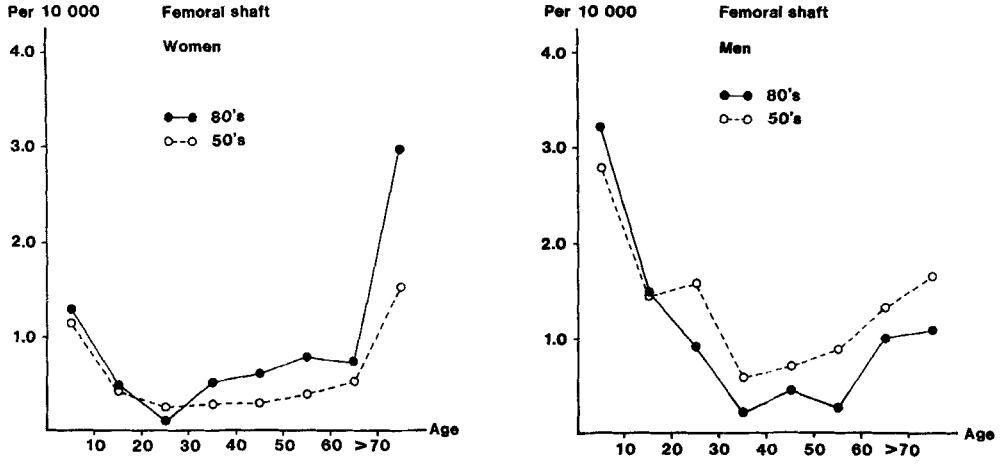


Figure 1. Age-specific annual incidence of femoral shaft fractures per 10,000 inhabitants in 1950–57 and 1979–83.

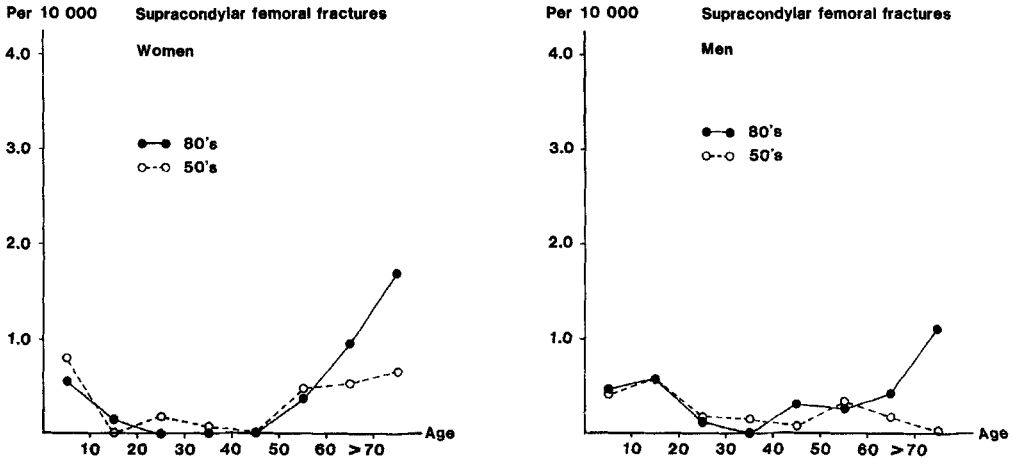


Figure 2. Age-specific annual incidence of supracondylar femoral fractures per 10,000 inhabitants in 1950–57 and 1979–83.

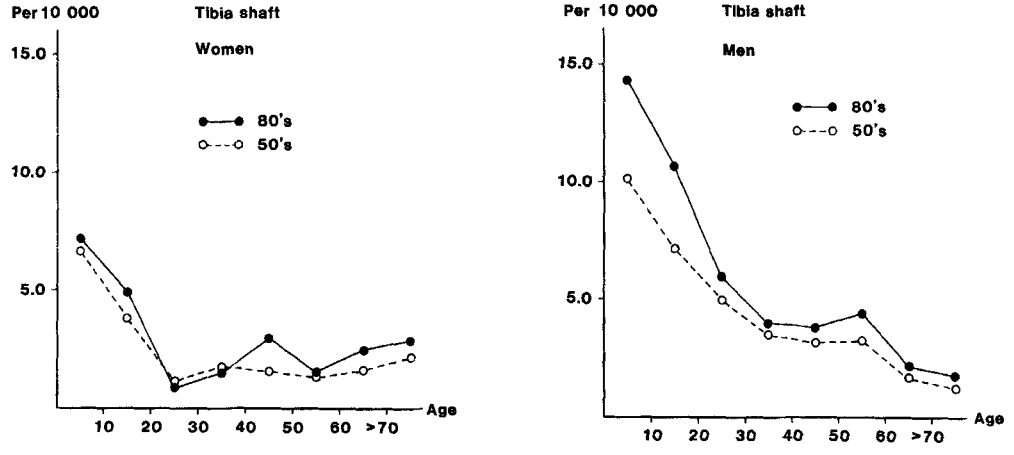


Figure 3. Age-specific annual incidence of tibial shaft fractures per 10,000 inhabitants in 1950–55 and 1980–83.

ing the 5 years in the 1980s, the corresponding numbers were 112 and 51, respectively (Tables 2 and 3). In women over aged 35 years, the age-specific incidence of shaft fractures had increased during 30 years (Figure 1) to become significant over aged 50 years ($P < 0.05$). In men the outcome was reversed: shaft fractures had become less common. This difference was significant only when all the men were included. Thus, there was a shift towards more longitudinal fractures in women during the 1980s ($P < 0.05$), indicating that the additional fractures in this group were mainly caused by low-energy trauma.

The risk of supracondylar femoral fractures also increased in men ($P < 0.05$), as well as in women ($P < 0.05$) over aged 60 years.

### *Tibial fractures*

During 1950-55, 455 tibial shaft fractures occurred, and in 1980–83, 394 fractures (Table 4). There was no change during the 30 years in fracture incidence. The fracture anatomy, site, and degree of displacement of the fractures remained unchanged. The most common fracture was a longitudinal, moderately displaced fracture through the distal third of the tibia.

## Discussion

In the 1950s, femoral shaft fractures were twice as common in men as in women. Today, however, the risk in men and women has become similar due to a slight decrease in the male population, but also to an increase in female residents. Femoral shaft fractures have been regarded as being the result of high-energy trauma. However, the pattern in old women now indicates that femoral shaft fractures are also partly due to aging, with its increased bone fragility. An age influence on the rate of femoral shaft fractures was demonstrated as early as in the 1950s (Knowelden et al. 1964). Additional support to the concept of femoral shaft fracture as partially a fragility fracture is that the increase in women was mainly due to low-energy trauma.

Kolmert and Wulff (1982) found a high rate of fractures in the distal end of the femur in older women. In the present study, supracondylar femoral fractures have increased in both men and women; the age- and sex-specific pattern is now more compatible with fragility fractures than it was in the 1950s.

In tibial shaft fractures there was a very slight, not significant increase in elderly women. The incidences found in this study agree with those found by Knowelden et al. (1964) in Dundee and Oxford. The tibial shaft fractures are, it seems, more resistant to the background factors that increase the fracture risk in the elderly, but these factors, whatever they are, seem to have an influence also on fractures that have not usually been regarded as being due to fragility, such as a fracture of the shaft of the femur.

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