

MORTALITY AFTER HIP FRACTURES

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A survey was made of 1592 patients, over the age of 50 years, who had sustained a fracture of the hip.

The mean age was found to be 77 years, and 76.9 per cent (1224/1592) of the patients were women. Trochanteric fractures accounted for 52.5 per cent (836/1592) of the cases and these patients had a higher mean age than those with femoral neck fractures.

The average hospitalization time was 24 days and the mortality during the hospital stay was 8.6 per cent (137/1592). Statistical analysis revealed that the hospital mortality rate was related exclusively to the age and the sex.

The mortality after 3 months was 17 per cent and that after 6 months 21.5 per cent. The survival rates paralleled the expected rate after 1.6 years but were found to be higher than expected after 2.8 years. The mortality after 1 year was 27 per cent, after 3 years 43 per cent and after 5 years 56 per cent.

Key words: fractures, mortality; femoral neck fractures mortality

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A considerable number of studies on the mortality after hip fracture were published in the middle of the 1960's (Alffram 1964, Clark & Wainwright 1966, Cleveland et al. 1951, Fitts et al. 1959, Manpel et al. 1961, McGoey & Evans 1960, Mikkelsen & Langholm 1964, Reno & Burlington 1958, Schenk et al. 1956, Sweet et al. 1967, Weeden et al. 1957). These studies however were based on case materials including a large number of patients treated non-operatively. Furthermore, operative fracture fixation was generally followed by late mobilization of the patients.

During the past 15 years the incidence of hip fractures has increased mainly due to an increase in the number of persons in the older age groups. Today most orthopaedic surgeons consider operation with early weight-bearing

mobilization to be the treatment of choice (Abrami & Stevens 1964, Ainsworth 1971, Graham 1968, Häggquist 1969, Lindholm et al. 1971, Parker & Reitman 1976). We have examined whether this change in treatment has affected the mortality after hip fracture.

PATIENTS AND METHODS

The present series consists of 1592 patients, over 50 years of age, with hip fractures. The patients were admitted during the period April 1st 1971 to March 31st 1977.

The age distribution and the type of fracture are shown in Figure 1; 76.9 per cent were females (1224/1592) with a mean age of 78 years (range 51-99), whereas the mean age for males was 74

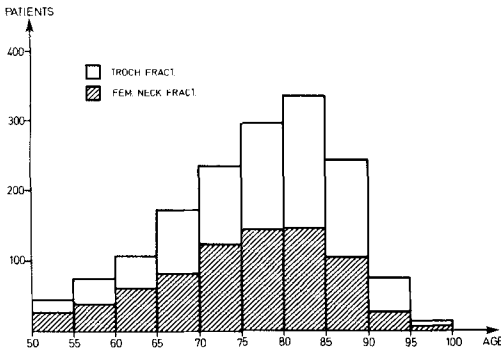


Figure 1. Age distribution of 1592 patients with hip fractures.

years (range 51–98). The age and sex distribution related to fracture type are shown in Table 1.

Trochanteric fractures were internally fixed using the Jewett, McLaughlin or sliding screw-plate apparatus in 95.6 per cent (799/836) of cases while non-operative treatment was applied in the remainder. In femoral neck fractures, 44.0 per cent (333/756) of the cases were treated by primary hemiarthroplasty and 29.2 per cent (221/756) by internal fixation with a sliding nail. The remaining 26.7 per cent (202/756) were treated non-operatively with early weight-bearing mobilization because these fractures were considered to be impacted.

The records of the patients were examined retrospectively considering the following information: the date of admission, the duration of hospitalization, the occurrence of severe somatic

complications (i.e. mainly cardiopulmonary and cerebrovascular diseases or deep infections) and whether the patient died during hospitalization.

All Danish citizens are registered at the Central Bureau of Personal Registration and have an identification number. By means of this central computing system the patients who had died before February 1st 1978 were identified and the survival time calculated. From these data, life tables were calculated by decrement analysis and compared using Gehan's modified Wilcoxon test.

Survival rates for a comparable number of patients with a similar age and sex distribution were calculated from data obtained from the Danish Central Bureau of Statistics.

RESULTS

The average hospitalization time for the present series was 24 days, ranging from 20 to 28 days for each year of the entire period. There was no significant difference in hospitalization time for trochanteric and femoral neck fractures.

The overall mortality during hospitalization was found to be 8.6 per cent (137/1592). The hospital mortality after trochanteric fractures was 9.8 per cent (82/836), whereas it was 7.3 per cent (55/756) following femoral neck fracture. This difference is significant ($P < 0.05$) applying the χ^2 -test. These mortality rates were however related to the

Table 1. Age and sex distribution related to fracture type in 1592 patients with hip fractures

	Trochanteric fractures	Femoral neck fractures
Total series		
Number	836/1592 (52.3 %)	756/1592 (47.5 %)
Age { mean	78 years	76 years
range	51–98	51–99
Females		
Number	631/836 (75.5 %)	593/756 (78.4 %)
Age { mean	79 years	76 years
Range	52–98	51–97
Males		
Number	205/836 (24.5 %)	163/756 (21.6 %)
Age { mean	73 years	75 years
range	51–95	51–99

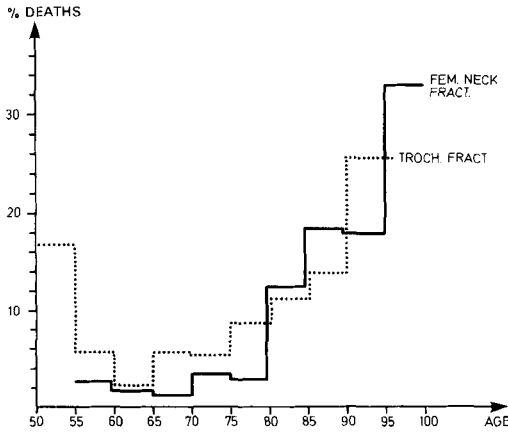


Figure 2. Hospital mortality after hip fracture in 1592 patients related to fracture type and age of the patients.

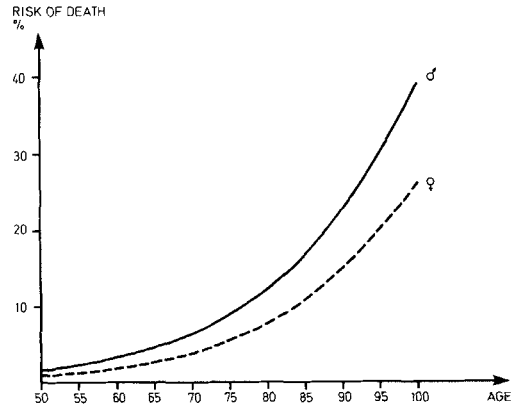


Figure 4. The estimated probability of death, during hospitalization after hip fracture, related to age.

age and the fracture type as shown in Figure 2. A multivariate logistic analysis was applied, revealing that age alone was responsible for the difference ($P < 0.02$), the fracture type being of minor importance. In relation to age and sex (Figure 3) the mortality was demonstrated to be higher for

males in the younger age groups; comparable figures for females were encountered beyond the age of 85 years. The probability of death after hip fracture could be estimated according to age and sex by means of a multivariate logistic analysis. Figure 4 shows that the probability of death increases exponentially with increasing age. In any age group the risk is higher for males. A male at the age of 88 years is thus running a risk of death during hospitalization of 20 per cent, while a female with an equivalent risk is 94 years of age.

It was also investigated to what extent severe *somatic complications* affected the mortality rates in the various age groups. Figure 5 demonstrates that the oldest age groups are particularly vulnerable to somatic complications such as cardiopulmonary or cerebrovascular diseases. The overall hospital mortality in patients with severe somatic complications was 62.9 per cent (122/194).

The *short term survival* curves in Figure 6 illustrate that there is an initial high mortality rate within the first 3–4 weeks after the fracture. After this the mortality rate decreases slowly with a small temporary increase however between the fourth and the fifth month following the fracture.

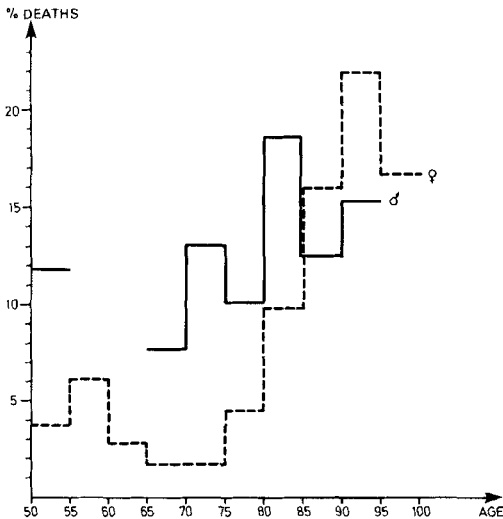


Figure 3. Hospital mortality after hip fracture in 1592 patients related to age and sex. The hospital mortality was 8.6 per cent (137/1592).

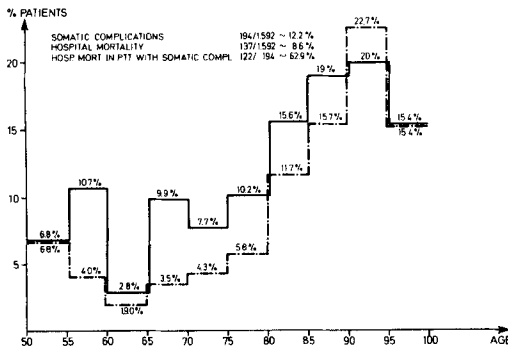


Figure 5. Somatic complications in patients with hip fracture related to age. The continuous line illustrates the percentage of patients suffering from somatic complications, 12.2 per cent (194/1592). The dotted line illustrates the percentage of patients dying, 8.6 per cent (137/1592). The hospital mortality in patients with somatic complications was 62.9 per cent (122/194).

During the whole period the mortality rate is considerably higher for males than for females. At 3 months after the hip fracture the mortality rate is 21.5 per cent for males and 15.2 per cent for females with a mean mortality rate of 17.0 per cent. At 6 months after the fracture 25.0 per cent of the males have died, compared with 20.0 per cent of the females. The mean mortality rate after 6 months was 21.5 per cent.

The long term survival after hip fracture is shown in the life tables in Figure 7. The uppermost three curves demonstrate the expected survival rates for populations of the same age as the present series determined from data obtained from the Danish Central Bureau of Statistics. As the male patients in the present series were younger than the females their survival rate was slightly higher. The lowermost three curves were calculated from the data from the present series.

It was thus found that there was a higher mortality among male patients with hip fractures than for females during the whole period. The survival rate for males was considerably lower than expected for men of the same age group. The curves for males become parallel 1.8 years after the fracture with an increment of 23.2 per cent, and 3.6 years after the fracture male patients have a slightly higher survival rate than expected. In comparison, female patients obtain the expected survival rate 1.6 years after the fracture with an increment between the curves of 16.5 per cent. After 2.6 years the survival rate after hip fracture in females becomes higher than expected and is considerably higher for the rest of the observation period. The mean survival curve for this series parallels that of the population with the same age and sex distribution after 1.6 years with an increment of 18.0 per cent and converges after 2.8 years. In this series the mortality rate 1 year after the hip fracture can thus be calculated to be 26.8 per cent compared with an expected mortality rate of 9.0 per cent, while the mortality rate after 3 years is 43.0 per cent (expected 26.5 per cent) and 56.0 per cent after 5 years (expected 43.0 per cent).

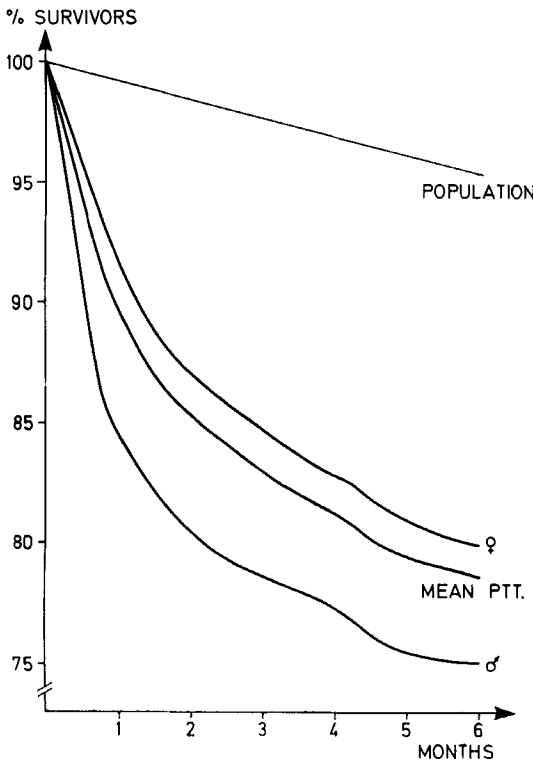


Figure 6. Short term life tables for 1592 patients with hip fractures.

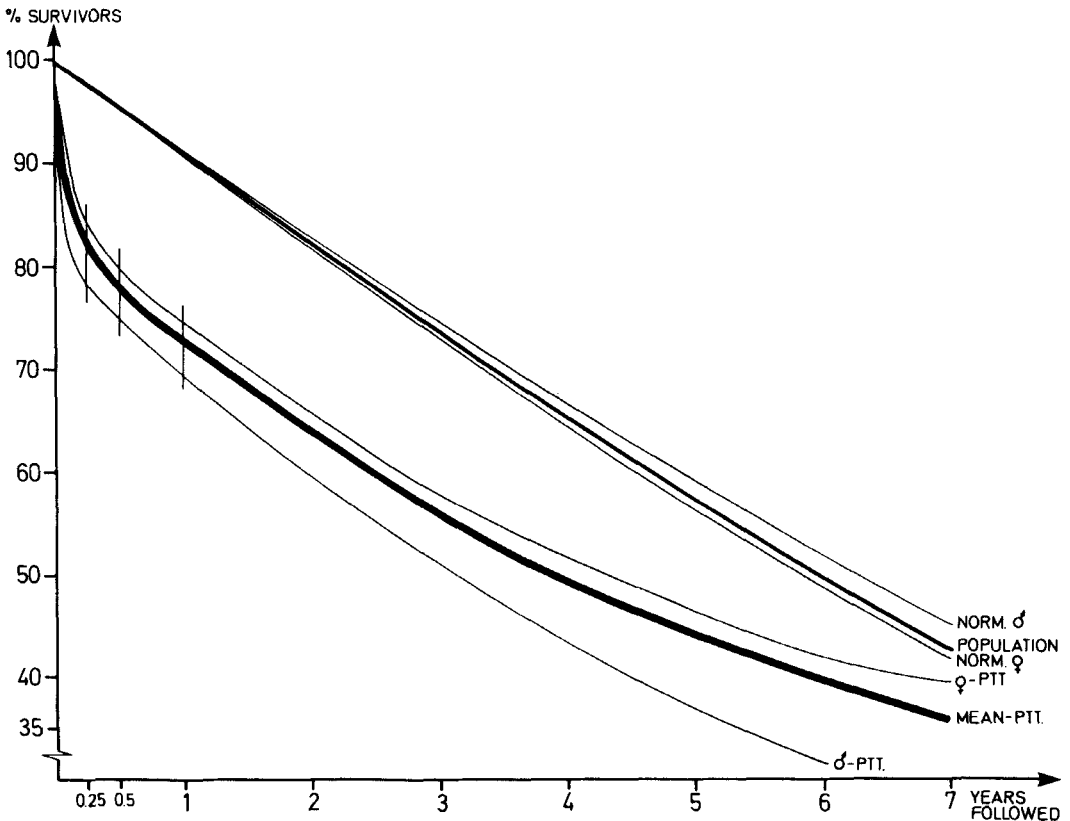


Figure 7. Life tables for 1592 patients with hip fractures.

DISCUSSION

The present series confirms some obvious changes in the pattern of hip fractures during the recent years. The mean age, 77 years, for patients with hip fracture has thus increased by about 3 to 5 years compared with figures given in earlier papers (Alffram 1964, Fitts et al. 1959, Sweet et al. 1967, Öhman et al. 1968), but it is consistent with figures in recently published records (Beals 1972, Gordon 1972, Riska 1970). The percentage of female patients, however, is largely unchanged, approximately 75 per cent (Alffram 1964, Gordon 1972, Manpel et al. 1961, McNeill 1975, Weeden et al. 1957). The mean age of the patients with trochanteric fractures is

higher than those with femoral neck fractures and the female patients have a higher mean age than males as mentioned before (Alffram 1964, Beals 1972, Gordon 1972).

The hospital mortality after hip fracture has often been studied and a great variety of mortality rates have been claimed, ranging from 4 per cent (Häggquist 1968, Mikkelsen & Langholm 1964) to about 30 per cent (Manpel et al. 1961, Reno & Burlington 1958, Schenk et al. 1956). In our opinion, however, it is mandatory to know the length of the hospital stay when dealing with hospital mortality rates. It thus makes no sense to compare hospital mortality rates of 31 per cent (Manpel et al. 1961) and 36.7 per cent (Schenk et al. 1956) where the period of

hospitalization was 40 and 62 days, respectively, with the hospital mortality of 8.6 per cent in this series where the hospitalization period was 24 days. In two papers taking into account this factor the mortality rate during hospitalization was 7.6 per cent after 16 days (McCown & Miller 1976) and 18.5 per cent after 30 days (Riska 1970).

It has been claimed that the mortality rate is higher in trochanteric fractures than in femoral neck fractures (Colbert & O'Muircheartaigh 1976, Cleveland et al. 1951, Dolk & Westerborn 1977, McGoey & Evans 1960, Mikkelsen & Langholm 1964, Riska 1970, Weeden et al. 1957). The present series, in accordance with others (Alffram 1964, Menpel et al. 1961), proves however that it bears no relationship to the fracture type as such. The age and the sex of the patients exclusively determine the hospital mortality rates (Alffram 1964, Beals 1972, Clark & Wainwright 1966, Eddy 1972, Fitts et al. 1959, Gordon 1972, Manpel et al. 1961, Mikkelsen & Langholm 1964, Reno & Burlington 1958, Schenk et al. 1956). Severe somatic complications postoperatively lead to a higher mortality within the age groups, which has been established previously (Reno & Burlington 1958). In the present series, however, 63 per cent of the patients sustaining somatic complications died, whereas Schenk et al. (1956) stated 85 per cent.

The short term survival in this series, as in most others, was determined by a high initial mortality rate. In our series, however, a delayed increase in mortality rates was observed 3–4 months after discharge from hospital. Beals (1972) noted a similar increase 2 months after discharge from hospital. The causes of this secondary rise can not be explained by either of these studies.

The mortality 3 months after hip fracture amounted in our series to 17.0 per cent and that at 6 months to 21.5 per cent, which is consistent with figures given in other papers (Alffram 1964, Fitts et al. 1959, McCown & Miller 1976, Sweet et al. 1967). These rates have obviously not changed during the past

15 years although the mean age of the patients has increased.

In discussing the long term survival after hip fracture it is of interest to identify the time when the survival rate parallels the expected survival rate. Alffram (1964) found this to occur 3 months after the fracture, while Fitts et al. (1959) and Colbert & O'Muircheartaigh (1976) claimed 6 months. In the present series the survival rate paralleled the expected after 1.6 years, but was found to be higher than expected after 2.8 years. In our series the 1 year mortality rate was 26.8 per cent, in agreement with the rates given by Colbert & O'Muircheartaigh (1976) and Öhman et al. (1968), who also encountered mortality rates of about 43 per cent after 3 years and about 56 per cent after 5 years. Beals (1972), however, stated an 83 per cent mortality rate after 5 years.

In conclusion we found, in comparison with papers from the past 15 years, that the mean age of patients with hip fractures has increased. In spite of this and in spite of a greater emphasis on operative treatment, the hospital mortality seems to be largely unchanged and related exclusively to age and sex. The mortality after 3 months is also unchanged. The survival rate, however, does not parallel the expected rate until 1.6 years after the fracture.

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