

Prevalence of vertebral fractures in 85-year-olds

Radiographic examination of 462 subjects

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Radiographic examinations for the presence of vertebral fracture between Th4-L5 were performed in a random sample of 85-year-old women (n 304) and men (n 158) who participated in a longitudinal population study. A moderate vertebral fracture was defined as an anterior/posterior vertebral height ratio of 0.66 or less. A severe vertebral fracture was defined as a compression of vertebral height of more than 33 percent both at the anterior and posterior

edges compared to the posterior edge of the adjacent vertebral body. The prevalence of vertebral fractures was 25 percent in women and 13 percent in men. The ratio between moderate and severe grades of vertebral fracture was 1.5 for women and 2.1 for men. The most common site for vertebral fracture was L1 in women and Th12 in men. Women with vertebral fracture at 85 years of age had more back pain.

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We report the prevalence of vertebral fracture in a community-based population of 85-year-olds.

Subjects and methods

Our study was based on a longitudinal population investigation of natural ageing started 1971/72 with a systematic sampling of 30 percent of the 70-year-old population in Gothenburg. 520 men and 628 women participated, with a non-response rate of 15 percent (Rinder et al. 1975, Svanborg 1977). These participants were reexamined at the ages of 75 and 85; at the age of 85 one third of the participants had been examined earlier in the longitudinal study. In 1986/87 a cross-sectional study was performed where all the 85-year-old residents living in the city of Gothenburg were invited to participate; 684 women (64 percent) and 299 men (68 percent) responded.

The radiographic study

The radiographic study was performed only in the cross-sectional study of 85-year-olds in a consecutive subsample of every second participant (304 women and 158 men); some of the subjects living in institutions could not be examined.

The radiologist assessed radiographs of the spine from Th4 to L5 for vertebral fracture. Anteroposterior

and lateral views of the thoracic and lumbar spine were obtained at a standard target-to-film distance of 105 cm. Moderate vertebral fracture was defined as an anterior/posterior (A/P) vertebral height ratio of 0.66 or less. Severe vertebral fracture was defined as a loss of vertebral height of more than 33 percent both at the anterior and posterior edges, compared to the posterior edge of the adjacent vertebral body. This method has been thought to reduce overdiagnosis of vertebral fractures among the elderly. Melton et al. (1989) showed that the vertebral-specific A/P ratio was the best criterion of vertebral fracture, and that a clinical estimation of vertebral fracture was a more relevant finding than an A/P ratio of 0.85.

Table 1. Vertebral fractures among 304 women and 158 men

| Women | | Number of vertebral fractures | Men | |
|---------|----|-------------------------------|---------|----|
| Percent | n | | Percent | n |
| 9.9 | 30 | 1 | 3.8 | 6 |
| 5.3 | 16 | 2 | 2.5 | 4 |
| 4.3 | 13 | 3 | 3.8 | 6 |
| 2.3 | 7 | 4 | 1.9 | 3 |
| 1.0 | 3 | 5 | 0.6 | 1 |
| 1.6 | 5 | 6 | 0 | 0 |
| 0 | 0 | 7 | 0 | 0 |
| 0.3 | 1 | 8 | 0 | 0 |
| 0.3 | 1 | 9 | 0 | 0 |
| 25 | 76 | Total | 13 | 20 |

Table 2. Percent of total vertebral fractures (moderate and severe grades) in thoracic and lumbar spine among 304 women and 158 men

| | Th4 | Th5 | Th6 | Th7 | Th8 | Th9 | Th10 | Th11 | Th12 | L1 | L2 | L3 | L4 | L5 |
|--------------|-----|-----|-----|-----|-----|-----|------|------|-------|-------|------|------|-----|-----|
| Women | 0.3 | 2.0 | 3.0 | 4.9 | 4.9 | 3.0 | 4.3 | 6.6 | 10.2 | 10.9 | 5.3 | 4.6 | 2.3 | 0.7 |
| ^a | 1/0 | 5/1 | 6/3 | 9/6 | 6/9 | 5/4 | 7/6 | 12/8 | 15/16 | 23/10 | 11/5 | 10/4 | 4/3 | 1/1 |
| Men | 0 | 0 | 0.6 | 1.3 | 1.9 | 0.6 | 1.9 | 3.2 | 7.6 | 5.7 | 5.1 | 2.5 | 0.6 | 0 |
| ^a | 0/0 | 0/0 | 1/0 | 1/1 | 2/1 | 1/0 | 2/1 | 4/0 | 8/4 | 5/4 | 6/2 | 3/1 | 0/1 | 0/0 |

^a Number of moderate/severe grades of vertebral fractures

Statistics

Fischer's two-sided permutation test was used to test differences between groups (Odén and Wedel 1975).

Results

The prevalence of vertebral fracture in women was 25 percent and in men 13 percent ($P < 0.01$, Table 1); the prevalence of severe fracture was 13 and 3 percent, respectively. The mean number of vertebral fractures was 2.5 in both sexes, in subjects with vertebral fractures, and the ratio of moderate/severe fractures was 1.5 in women and 2.1 in men. Vertebral fractures were most common in L1 in women and Th12 in men (Table 2).

Daily back-pain was correlated with vertebral fracture both in women (34 percent vs 22 percent in controls, $P < 0.05$) and in men (20 percent vs 14 percent, $P < 0.05$). There were no differences between moderate and severe vertebral fractures in their correlation to back-pain.

Discussion

Radiographic identification of severe vertebral crush fracture is not difficult, but moderate vertebral fractures can be overestimated. A more strict analysis is therefore necessary to define each vertebral body (Smith et al. 1987). Most studies of vertebral fracture have used the same definition for all vertebrae with an A/P height ratio of 0.80-0.85 (Melton et al. 1989). This will obviously overestimate the prevalence because the normal A/P height ratio in the mid-thoracic vertebrae is about 0.80-0.85; we therefore used the ratio of 0.66. Of the 462 participants in our study, only 5 percent of the men and 8 percent of the women

were living in hospitals and geriatric nursing homes; it was not possible to investigate all participants because of other severe diseases. This means that our study has probably missed a number of participants with vertebral fracture, so that our figures represent a minimum prevalence. There are few community-based epidemiological studies of vertebral fracture and they have been performed in different ways. However, there appears to be a difference in the prevalence of fracture in people living in the northern countries, notably northern Europe (Jensen et al. 1982, Johnell et al. 1984, Falch et al. 1985, Härmä et al. 1986, Santavirta et al. 1992), and among caucasians in the U.S.A. (Riggs 1987, Melton et al. 1989) compared with Mexican-Americans (Bauer and Deyo 1987) and non-caucasians (Modawer et al. 1965). The same tendency is found in other parts of the world, with a higher prevalence of fracture in developed countries, such as Japan (Fujiwara et al. 1987) and New Zealand (Stott and Gray 1980). The results from our urban study confirm investigations in Sweden (Bengnéér et al. 1988) and in U.S.A. (Melton et al. 1989). Eastell et al. (1991) showed in an age-stratified random sample of women aged 47-94 that 21 percent had vertebral fracture (mean, 2 per person).

Most vertebral fractures that occur during the first 15-20 years after the menopause often cause severe pain, while vertebral fracture diagnosed after 75 years are often painless (Riggs 1987); half of the vertebral fractures are asymptomatic (Gershon-Cohen et al. 1953).

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