Changing epidemiology of tibial shaft fractures

513 cases compared between 1971–1975 and 1986–1990

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We studied the epidemiological features of tibial shaft fractures during two 5-year periods, 1971–75 and 1986–90, in the county of Uppsala, Sweden. The incidence was higher in men than in women during both periods. In men aged 10–19 years, the fracture incidence was lower during the second period, with a reduction of fractures sustained in road traffic accidents. In women above 80 years, the fracture incidence was higher during the second period.

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Submitted 96-04-27. Accepted 96-09-17

The incidence of tibial shaft fractures in Sweden has been reported as unchanged during recent decades (Bengnér et al. 1990). However, in clinical practice our impression during the more recent years has been a smaller number of tibial shaft fractures and especially fractures caused by severe trauma.

We have therefore in this retrospective study defined the age and sex-specific incidence, the external cause, and fracture site distribution of tibial shaft fractures during two 5-year periods in a well defined population.

Patients and methods

The population of Uppsala County was on average 138,000 and 162,000 during the periods 1971–1975 and 1986–1990, respectively (Table 1). The population was mainly urban.

All patients with tibial shaft fractures were treated at Uppsala University Hospital, which was the only trauma hospital in the county. We examined all medical records of patients with a diagnosis of tibial fracture, who had been admitted to the Departments of Orthopedics, Pediatric Surgery, General Surgery, and the Department of Diagnostic Radiology during the two periods. Tibial shaft fractures were defined as all fractures between the 5 most proximal and 5 most distal centimeters of the tibia. The sex and age of the patients were recorded as well as the fracture site (upper, middle and lower third). The severity of trauma was classified according to Edwards (1965) into two groups where severe trauma included all fractures caused by traffic accidents, from falling more than 3 meters, or from blows of heavy objects. All other types of trauma were defined as moderate. The external cause of fracture was noted. In the statistical evaluation, we used the binomial test, Poisson log-linear regression, the chi-square test and Fisher's exact tests.

Results

During the two 5-year periods, 1971–1975 and 1986–1990, the total number of tibial shaft fractures were 258 and 255. The overall annual incidence decreased insignificantly from 37 to 31 per 100,000, respectively (Figure 1). The incidence was higher in men during both periods ($p = 0.0002$). In men, the overall incidence was higher during the first period ($p = 0.007$; Table 2), while there was no such difference among women. The reduced incidence in men during the second period was mainly due to a halved incidence in men below 20 years of age ($p = 0.005$). No significant change in incidence was seen in men aged 20 years and above. In women over 80 years of age the fracture incidence was higher during the second period ($p = 0.001$). In all other age groups in women, there was no significant difference in incidence between periods.

Fractures caused by severe or moderate trauma were equally common during the first period when assessing both genders as one group. During the second period, the incidence of fractures caused by severe trauma was lower ($p < 0.0001$), due to a reduction among men ($p = 0.003$). There were 3 main causes of injury: road traffic accidents, falls, and sporting injuries. The annual incidence per 100,000 inhabitants was for road traffic-related fractures in men 25 during the first and 12 during the second period, while in women this incidence was about 7 in both periods (Figure 1). During the first period 21/41 fractures in men aged 10–19 years occurred in motorcyclists

Table 1. General data

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Men														
0–9	10598	10925	11	19	4	14	7	5	21	35	7.5	25.6	13	9.1
10–19	8758	10317	41	24	14	15	27	9	94	47	32	29.1	62	17.4
20–29	12711	13037	38	27	19	18	19	9	60	41	30	27.6	30	13.8
30–39	10826	13364	28	30	14	21	14	9	52	45	26	31.4	26	13.5
40–49	6923	11997	17	21	9	13	8	8	49	35	26	21.7	23	13.3
50–59	6756	6777	15	10	10	5	5	5	44	30	30	14.8	15	14.8
60–69	5802	6070	15	11	6	8	9	3	52	36	21	26.4	31	9.9
70–79	3595	4414	9	7	4	5	5	2	51	32	22	22.7	28	9
80–89	1201	18710	0	2	0	0	0	2	0	23	0	0	0	23.4
90+	90	152	0	0	0	0	0	0	0	0	0	0	0	0
All men	67260	78763	174	151	80	99	94	52	52	38	24	25.1	28	13.2
Women														
0–9	10183	10563	4	8	2	3	2	5	7.8	15	3.9	5.7	3.9	9.4
10–19	8565	10058	12	12	7	7	5	5	28	23	16	13.9	12	9.9
20–29	13609	13841	14	10	9	6	5	4	21	14	13	8.6	7.3	5.7
30–39	10353	13294	9	15	6	12	3	3	17	23	12	18	5.8	4.5
40–49	6825	11863	2	15	2	8	0	7	5.8	25	5.8	13.5	0	11.8
50–59	7357	7140	14	7	10	6	4	1	38	20	27	16.8	11	2.8
60–69	6822	7105	12	8	9	5	3	3	35	23	26	14.1	8.8	8.4
70–79	5020	6043	8	9	4	8	4	1	32	30	16	26.5	16	3.3
80–89	2116	3176	8	15	6	10	2	5	76	95	57	63	19	31.5
90+	206	495	1	5	1	5	0	0	97	202	97	202	0	0
All women	71056	83578	83	99	55	65	28	34	24	25	16	16.8	7.9	8.1
All patients	138316	162341	258	255	136	169	122	86	37	31	20	20.8	18	10.6

A Age group
Population (average/year)
B 1971–1975
C 1986–1990
Number of patients
D 1971–1975
E 1986–1990

Number of patients with moderate trauma
F 1971–1975
G 1986–1990
Number of patients with severe trauma
H 1971–1975
I 1986–1990
Annual incidence/10^5
J 1971–1975
K 1986–1990

Annual incidence with moderate trauma /10^5
L 1971–1975
M 1986–1990
Annual incidence with severe trauma /10^5
N 1971–1975
O 1986–1990

Table 2. The relative risk for tibial shaft fracture in Uppsala, Sweden during 1971–1975 (period 1) and 1986–1990 (period 2) when analyzed using Poisson log-linear regression

Age, grade and sex with stratification vis-a-vis period							*Age, grade and period with stratification vis-a-vis sex*					
	Period 1			Period 2			Women			Men		
Factor	RR	95%CI	P-value	RR	95%CI	P-value	RR	95%CI	P-value	RR	95%CI	P-value
Age												
0–9	0.4	0.2–0.8	0.004	0.7	0.5–1.2	0.2	0.6	0.3–1.1	0.1	0.6	0.4–0.9	0.01
10–19	1.8	1.2–2.7	0.008	1.0	0.7–1.6	0.9	1.6	0.7–2.2	0.4	1.4	1.0–2.0	0.05
20–29	1.2	0.8–1.8	0.5	0.8	0.5–1.3	0.4	0.9	0.5–1.5	0.6	1.1	0.7–1.5	0.8
30–39	1.0	reference		1.0	reference		1.0	reference		1.0	reference	
40–49	0.8	0.5–1.4	0.4	0.9	0.6–1.4	0.6	0.9	0.5–1.7	0.7	0.9	0.6–1.3	0.5
50–59	1.2	0.7–2.0	0.5	0.7	0.4–1.3	0.3	1.4	0.8–2.6	0.2	0.8	0.5–1.2	0.3
60–69	1.3	0.8–2.1	0.3	0.9	0.5–1.5	0.6	1.4	0.8–2.6	0.3	0.9	0.6–1.4	0.7
70–79	1.2	0.7–2.2	0.5	0.9	0.5–1.7	0.8	1.5	0.8–2.8	0.2	0.8	0.5–1.4	0.5
80–89	1.6	0.7–3.3	0.3	2.2	1.3–3.9	0.005	4.3	2.4–7.6	<0.0001	0.3	0.1–1.2	0.08
90+	2.3	0.3–16.6	0.4	5.2	2.1–13.2	0.0005	8.4	3.4–20.6	<0.0001	0.1	0.0–>100	0.8
Grade												
moderate	1.0	reference		1.0	reference		1.0	reference		1.0	reference	
severe	0.9	0.7–1.1	0.4	0.5	0.4–0.7	<0.0001	0.5	1.3–2.3	<0.0001	0.8	0.7–1.0	0.7
Sex												
female	1.0	reference		1.0	reference							
male	2.2	1.7–2.9	<0.0001	1.6	1.2–2.1	0.0002						
Period												
1971–1975							1.0	reference		1.0	reference	
1986–1990							1.0	0.8–1.4	0.9	0.7	0.6–0.9	0.007

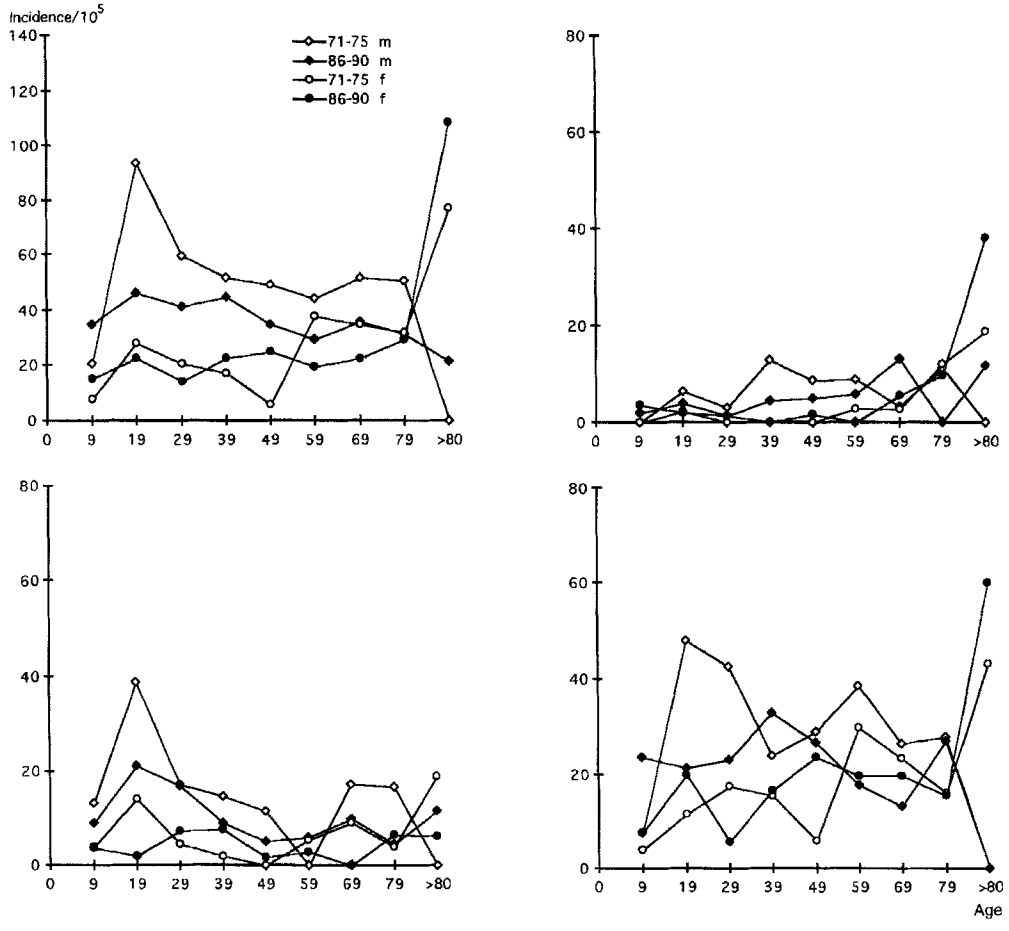

Figure 1. Annual incidence of tibial shaft fractures per 100,000 inhabitants (Y-axis) during 1971–1975 and 1986–1990 in relation to age (X-axis), with respect to sex (upper left), fracture site (proximal third—upper right, middle third—lower left, and distal third—lower right).

while in the second period the ratio was 4/24 ($p = 0.005$). The fall-related fracture incidence was unchanged, with 16 in men and 12 in women during each period. Sport-related tibial shaft fractures were commoner ($p < 0.0001$) in men during both periods, with an annual incidence of 11 in men and 5 in women during each period (Figure 1). The incidences of tibial shaft fractures sustained at work were 2 and 1 per 100,000, respectively, for the two periods, i.e., considerably lower than the number of fractures caused by traffic accidents and falls.

Of all fractures, about 60% were in the distal third of the tibia, 25% in the middle and 10% in the proximal part. 3% of the fractures were segmental. There was no statistically significant change in the fracture site distribution between these periods in all patients and ages (Figure 1).

The tibial shaft fractures occurred as the only injury in about 80% during both periods (Table 3).

Table 3. Additional injuries. In 1971–75, 48 patients had 71 associated injuries while in 1986–90, 51 patients had 82 associated injuries

	1971–1975	1986–1990
Head	14	14
Thorax	11	3
Pelvis	1	8
Shoulder, arm	16	11
Femur	12	16
Knee, ankle, foot	15	28
Spine	2	2
Total	71	82

All but 15 patients during the first period and 7 patients during the second period were treated as inpatients. The mean length of the total hospitalization time during the treatment period, including primary treatment as well as additional admissions for adjust-

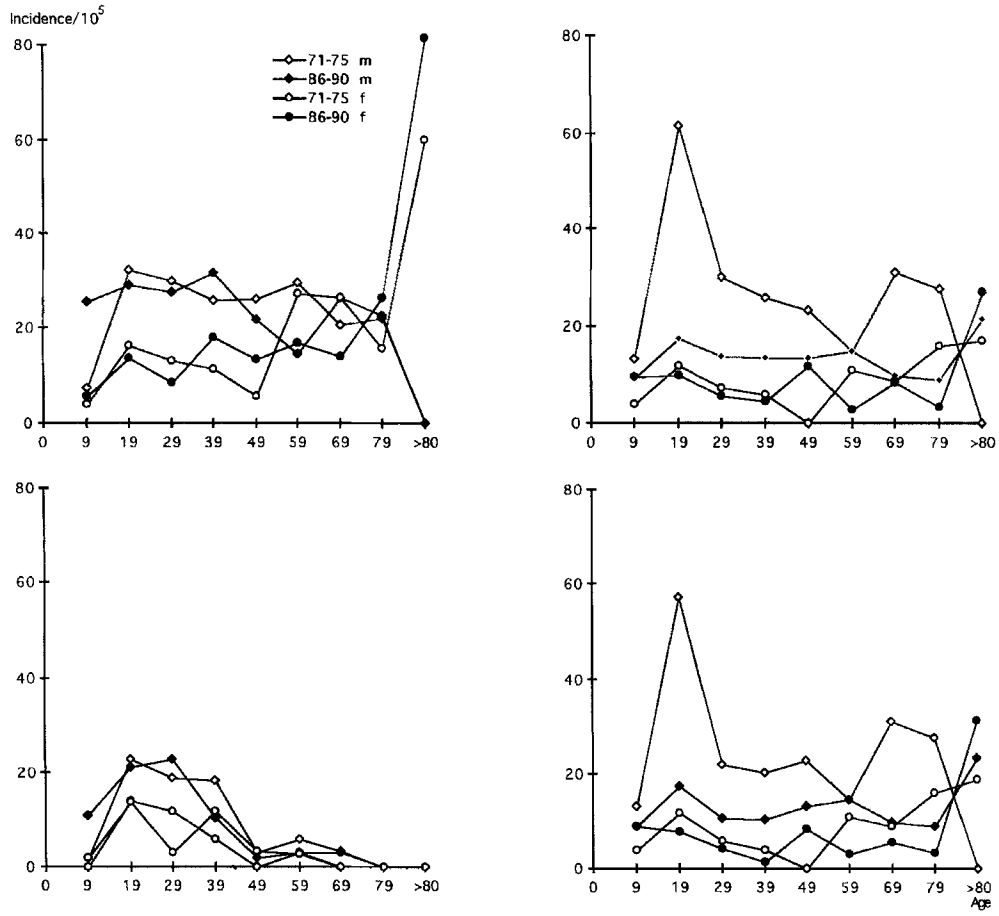

Figure 1. Continued. Annual incidence of tibial shaft fractures per 100,000 inhabitants (Y-axis) during 1971–1975 and 1986–1990 in relation to age (X-axis), with respect to trauma severity (moderate trauma—upper left and severe trauma—upper right), and cause of fracture (sports-related—lower left and traffic accident-related—lower right).

ment and extraction of fixation devices, was 10 days in 1971–1975 and 14 days in 1986–1990 (median 9 and 11 days, respectively).

Discussion

The reduction in tibial shaft fracture incidence in men during the second period could be attributed almost entirely to a decline in the number of fractures seen in younger motorcyclists. According to information from the Swedish National Central Bureau of Statistics (SCB), the number of motorcycles in Uppsala County was approximately the same during the two periods studied. According to the same statistics, the total number of patients who sustained a severe injury in a traffic accident, all injuries and not only tibial fractures included, was considerably lower during the second compared to the first period. This implies that the observed reduction in tibial fractures in motorcyclists was due to changes in the traffic behavior and environment.

The increase in fracture incidence in elderly women during the second period may have been caused by a reduction in bone strength due to osteoporosis rather than to a change in the external causes. Most fractures in this elderly group of women were caused by a moderate trauma, usually by falling indoors on the same level, which was interpreted as an indication that the fractures occurred because of reduced bone strength, as seen in hip and other fragility fractures.

The low incidence of work-related injuries was probably due to the structure of the county, white-collar jobs being common with only a few heavy industries in the area.

The incidence in the two age groups up to 19 years of age was lower in our study than in the southern part of Sweden during the beginning of the 1980s as re-

ported by Landin (1983) and Bengnér et al. (1990). There is no obvious reason for the discrepancy between studies covering approximately the same period in urban populations in the same country. The incidence in the age group 0–9 years in the present study was about 1/4, and in the age group 10–19 years slightly less than half of the incidence in the same age groups in the study by Bengnér et al. (1990). We cannot explain the lower fracture incidence seen in our study in the two youngest age groups. Wong (1967) reported from Singapore an annual tibial fracture incidence in children during 1962–63 below 1/10,000, which is even lower than the incidence seen in our series. All sources used for sampling and analysis of data in our study have been re-checked for potential errors and we consider our data to give a true description of the incidence of tibial fractures in our population during the years of the study.

The increase in hospital stay was mainly due to a more extensive use of external fixation during the second period which, in several cases, obviated secondary adjustments of alignment (Emami et al. 1995). In many cases where intramedullary fixation has been used, the stay in hospital is shorter (Court-Brown et al. 1990, Hooper et al. 1991).

Acknowledgment

Jonas Ranstam, PhD, for the statistical analysis.

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