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## Femoral fractures and orthopaedic surgery: a 4-year survey in Italy

Received: 15 September 2005  
Accepted: 26 November 2005

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**Abstract** Femoral fractures are associated with a high rate of mortality, especially in the elderly, and high social and economic burdens. The impact of femoral fractures is of particular importance in countries like Italy with a progressively ageing population. Therefore, to quantify the real impact of femoral fractures, we studied national hospitalisation records. In a previous report we described the incidence and costs of hip fractures, while here we report our findings on the numbers and types of surgical interventions. We evaluated national records for operations of hip replacement and femoral fracture reduction in adults  $\geq 45$  years of age. Over 120 000 surgical hip interventions were performed in 2002; of these, more than 72 000 were directly attributable to femoral

fractures. Between 1999 and 2002, the number of operations for femoral fractures increased by 7.1%, and in each year we observed a predominance of women and elderly, in line with the increased prevalence of osteoporosis in these populations. Together with our findings on an increased number of hospitalisations, these data indicate that in Italy the prevalence of hip fractures is increasing, and that women and elderly are the most affected. Primary prevention programmes to sensitise the population to the risks of osteoporotic fractures and to reduce the incidence, especially in high-risk subjects, are urgently needed.

**Key words** Femoral fractures • Osteosynthesis • Hip replacement • Elderly • Italy

### Introduction

Femoral fractures are associated with a high rate of mortality, especially in the elderly [1, 2]. The costs of femoral fractures, both to society and to national public health systems, are high and exceed those of pathologies like myocardial infarction that are considered more prevalent and costly [3–5]. The average length of hospitalisation for osteoporotic femoral fractures is longer than that of any other acute pathology [6]. In Western countries, annual mortality due to femoral fracture has surpassed that of gastric and pancreatic tumours; the lifetime risk of

femoral fracture is greater than that for mammary, endometrial and ovarian cancers combined in women and prostatic cancer in men [7]. Femoral fracture has a risk of death similar to that of breast cancer, with an estimated mortality of 5% in the acute phase and 15–25% within 1 year [8, 9]. Motor disability after femoral fracture is permanent in 20% of cases and only 30–40% of patients regain a level of autonomy compatible with pre-injury activities of daily living [10].

In Italy, high life expectancy combined with low natality has increased the elderly population, such that this country represents an interesting case study for ageing-related diseases. The Epidemiology Study on the

Prevalence of Osteoporosis (ESOP) [11] recently documented that 40% of Italian women 60 years of age and older (almost 4 million women) have osteoporosis and therefore an increased risk of femoral fracture. According to estimates from the Italian Senate's Commission on Hygiene and Health, 18 000 persons each year become permanently disabled as a result of femoral fractures [10]. However, the real impact of femoral fracture in Italy has not been sufficiently evaluated, and is probably underestimated [10]. This led us to study the incidence and associated costs of femoral fractures in Italian adults ( $\geq 45$  years), using data from the national hospitalisation database *Schede di Dimissione Ospedaliera*; this database permitted us to obtain real incidence data and costs rather than just estimates.

The first report of our national study [12] documented that in 2002 femoral fractures led to 86 719 hospitalisations, with an increase of 10.0% over 4 years. When we stratified data by age into 3 classes (45–64, 65–74 and  $\geq 75$  years), we observed a strong age effect: 92.7% of patients hospitalised for hip fracture were  $\geq 65$  years of age. When we stratified data by gender, we observed a clear predominance of women: 77% of all patients were female, and the incidence per 10 000 inhabitants was >2-fold higher for women than for men in both elderly age classes (65–74 and  $\geq 75$  years). The fact that almost 80% of hip fractures in women occurred after the age of 75 years indicated a clear relationship with the prevalence of osteoporosis, known to be higher in this age class [11]. These data document the dramatic impact of femoral fractures, even though their perceived impact, among both the public and physicians, remains low compared to that for pathologies generally considered severe (e.g. acute myocardial infarction).

In continuation of our national study on the impact of femoral fractures in Italy, we report here our findings regarding the number and types of surgical interventions, in particular reduction of femoral fractures (osteosynthesis) and hip replacement.

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## Materials and methods

We studied the number and types of surgical interventions for femoral fractures in the Italian population aged 45 years and older in the 4-year period 1999–2002. Population data were obtained from the National Institute for Statistics (ISTAT) [13]: in 2002 there were 25 055 775 adults  $\geq 45$  years of age. Clinical data regarding in-hospital interventions were obtained from *Schede di Dimissione Ospedaliera* (SDO), the national hospitalisation database maintained by the Italian Ministry of Health; we assumed that hip fractures were not treated in day-hospital regime.

Hip fractures were defined by the following ICD-9CM codes: 820.0–820.1 (femoral head fractures); 820.2–820.3 (inter-trochanteric femoral fractures); and 820.8–820.9 and 821.1 (other femoral fractures). Data were stratified by gender and analysed for all adults ( $\geq 45$  years) and for elderly persons  $\geq 60$  years for 1999 and  $\geq 65$  years for 2000–2002 (for these years, data could not be extracted specifically for the age class 60–64 years).

To classify surgical interventions, we used the following ICD-9CM codes: 7905 (closed reduction of femoral fracture without internal fixation), 7915 (closed reduction of femoral fracture with internal fixation), 7925 (open reduction of femoral fracture without internal fixation), 7935 (open reduction of femoral fracture with internal fixation), 8151 (total hip replacement) and 8152 (partial hip replacement). As femoral fracture is not the only indication for hip replacement, we estimated the percentage of these surgical procedures attributable to fracture. This analysis, performed for us by the Department for Studies and Documentation of the Ministry of Health on a subgroup of patients residing in Lazio, a region with 5.3 million inhabitants, suggested that 30% of hip replacements, both total and partial, are performed for femoral fracture while the remainder are indicated for osteoarthritis and other hip pathologies.

Descriptive statistical analyses were performed using Stata (StataCorp, College Station, USA) and Excel (Microsoft, Redmond, USA) software programmes.

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## Results

The total number of surgical interventions in the hip, in Italian adults aged  $\geq 45$  years, increased by 9.5% over 4 years, from 110 862 in 1999 to 121 397 in 2002 (Table 1). In each year analysed, osteosynthesis (reduction of femoral fracture) represented 43–44% of these interventions; total hip replacements comprised 38–40% while partial hip replacements represented the remaining 17–18% of all interventions. As femoral fracture is the indication for hip replacement in only about 30% of cases, these numbers overestimated the surgical burden of hip fracture. Therefore, we estimated that the number of operations performed annually for hip fracture was 67 696 in 1999 and increased by 7.1% over 4 years to 72 495.

Analysis of the gender and age profile of patients undergoing reduction of femoral fracture (Table 2) revealed a predominance of both women (within the range 68.2–71.6%) and elderly (77.1–80.0%); these percentages remained reasonably stable over the 4 years of investigation and no temporal trend was observed.

A predominance of elderly women was also observed among patients undergoing hip replacement (Table 3). Although fewer partial than total hip replacements were performed, partial arthroplasties were performed almost exclusively in elderly patients (95.3–96.8%).

**Table 1** Surgical interventions associated with femoral fractures in Italian adults ( $\geq 45$  years), 1999–2002. Values are absolute numbers recorded in the national hospitalisation database and, for partial and total hip replacements, estimates of the numbers of operations actually required for femoral fractures

	1999	2000	2001	2002
Fracture reduction	49 195	47 106	50 902	51 538
Partial hip replacement	19 175	20 263	20 643	21 328
For femoral fractures <sup>a</sup>	5 753	6 079	6 193	6 398
Total hip replacement	42 492	44 001	45 431	48 531
For femoral fractures <sup>a</sup>	12 478	13 200	13 629	14 559
Total interventions	110 862	111 370	116 976	121 397
For femoral fractures <sup>a</sup>	67 696	66 385	70 724	72 495

<sup>a</sup>Estimate values assume 30% of hip replacement operations were due to femoral fractures

**Table 2** Gender and age profile of patients undergoing femoral fracture reduction in Italy, 1999–2002

	1999	2000	2001	2002
Total, n	49 195	47 106	50 902	51 538
Women, n (%)	33 541 (68.2)	33 721 (71.6)	35 163 (69.1)	35 737 (69.3)
Elderly, n (%) <sup>a</sup>	37 921 (77.1)	37 660 (80.0)	39 506 (77.6)	40 601 (78.8)
Women, n (%) <sup>b</sup>	29 778 (78.5)	29 722 (78.9)	31 215 (79.0)	32 091 (79.0)

<sup>a</sup> Patients  $\geq 60$  years for 1999 but  $\geq 65$  years for 2000–2002; <sup>b</sup> Percentage of all elderly patients

**Table 3** Gender and age profile of patients undergoing partial or total hip replacement in Italy, 1999–2002. Only 30% of these surgeries are attributable to femoral fracture

	1999	2000	2001	2002
Partial hip replacement				
All patients, n	19 175	20 263	20 643	21 328
Women, n (%)	15 063 (78.6)	15 697 (77.5)	16 075 (77.9)	16 688 (78.2)
Elderly, n (%) <sup>a</sup>	18 556 (96.8)	19 302 (95.3)	19 843 (96.1)	20 555 (96.4)
Women, n (%) <sup>b</sup>	14 695 (79.2)	15 133 (78.4)	15 577 (78.5)	16 193 (78.8)
Total hip replacement				
All patients	42 492	44 001	45 431	48 531
Women, n (%)	27 178 (64.0)	28 099 (63.9)	28 944 (63.7)	30 947 (63.8)
Elderly, n (%) <sup>a</sup>	33 407 (78.6)	30 197 (68.6)	31 611 (69.6)	34 010 (70.1)
Women n (%) <sup>b</sup>	22 139 (66.3)	20 280 (67.2)	21 267 (67.3)	22 867 (67.2)

<sup>a</sup> Patients  $\geq 60$  years for 1999 but  $\geq 65$  years for 2000–2002; <sup>b</sup> Percentage of all elderly patients

## Discussion

This study documented, on the basis of national hospital records, that over 120 000 surgical hip interventions were performed in Italy in 2002. The estimated number of interventions due to fractures of the femur, correcting for those indicated for osteoarthritis and other hip pathologies,

increased by 7.1% over 4 years (1999–2002) and exceeded 72 000 in 2002. For each of the 3 main classes of surgery (fracture reduction, partial and total hip replacement), a predominance of elderly women was observed. Similar numbers of fracture reductions and total hip replacements were performed and, in each year, partial hip replacement represented only a minority (<20%) of all procedures per-

formed due to hip fractures. These data agree with and extend our observations on the incidence and costs of hip fractures in Italy [12]: in particular, in 2002 we recorded 86 719 hospitalisations for hip fractures (compared to 72 495 operations) and a 10.0% increase in hospitalisations over 4 years (*vs.* a 7.1% increase in operations). Together, these data indicate that the prevalence and impact of hip fractures are increasing, and that women and the elderly are the most affected. The predominance of women and elderly among hip fracture patients corresponds with the known higher prevalence of osteoporosis in these populations [11] and the increased risk of falling.

The strength of our analysis lies in the fact that we accessed national hospital records, which permitted us to calculate real values rather than just estimates. Limitations in our calculations were the need to estimate the number of hip replacements indicated for femoral fractures, excluding procedures due to other hip pathologies, and the inability to access data for the age class 60–64 years for 1999. Nonetheless, the good agreement between number of operations and number of hospitalisations for hip fracture demonstrates the validity of this analysis.

This study reveals the need for extensive primary prevention programmes to sensitise the population to the problem of osteoporosis and to reduce, in particular, the inci-

dence of femoral fractures. These fractures have a considerable impact on the elderly and their family members, in terms of health, productivity and quality of life; they also have a major impact on the National Healthcare Service in terms of resources and finances. In consideration of the societal impact of osteoporosis and of the increasing age of the population, we advocate a global preventive approach that eliminates common risk factors (e.g. vitamin D deficiency and sedentary lifestyles), promotes initiatives to prevent falls (e.g. improving the home environment of elderly persons) and identifies subjects at high risk for osteoporotic fractures (who may benefit from pharmacological treatment). Further studies should evaluate the benefits of extending preventive pharmacological and non-pharmacological treatments to the large number of persons with vertebral fractures and other conditions that are considered risks factors for femoral fractures in the elderly.

**Acknowledgements** We extend sincere thanks to Drs L. Lispi and D. Del Gigante (Direzione Generale della Programmazione, Italian Ministry of Health) for help in accessing the national hospitalisation database. Special thanks go to Senator L. Compagna (Commissione Parlamentare Istruzione, Università e Ricerca Scientifica; XII Commissione Permanente Igiene e Sanità). This study has been entirely supported by the Department of Orthopaedics and Traumatology, Second University of Naples, Italy.

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