Secondary prevention of hip fracture

Many risk factors for diseases are asymptomatic until the pathology is severe enough to result in clinical expression of disease. For example, hypercholesterolaemia with coronary artery disease can be asymptomatic until a myocardial infarction occurs. Likewise hypertension may pre-date stroke. Following treatment of acute clinical events such as myocardial infarction and stroke, protocols are now established for prevention of further organ damage by modification of underlying risk factors, i.e. secondary prevention [1, 2]. Thus, all patients who have had an acute myocardial infarction should have their serum cholesterol measured and, if high, treated with drugs like statins to reduce the risk of future myocardial infarction [1].

Osteoporosis is analogous to these vascular diseases, having a prolonged asymptomatic phase of bone loss and gradual increase in fall risk with age. Although protocols for secondary prevention in myocardial infarction and stroke are being widely followed, appropriate management following an osteoporotic fracture is poor. For example, a recent questionnaire survey of advice given to patients following a hip or vertebral fracture showed that only 41% were aware of osteoporosis and its risks [3]. Appropriate drug therapy is also limited following an osteoporotic fracture as suggested by a study of prescribing by general practitioners which concluded that fractures of the hip are not associated with increased use of drugs for secondary prevention [4]. Similarly, a study based in a Milwaukee nursing home found that of 31 hip fracture survivors in the nursing home, 23 (74%) had sustained a hip fracture before admission to the nursing home and nine (29%) had a history of second fracture. In 26 (84%) there was no mention of osteopenia in the active medical problem list and no intervention plan in place to improve or prevent further bone loss [5].

These findings suggest that an important group of patients is being neglected with respect to secondary prevention of osteoporotic fracture. This is despite the fact that low trauma fractures are a major risk factor for further fractures [6] and that presentation with a low trauma fracture is an indication for assessment and intervention for osteoporosis in most guidelines [7–9].

A significant proportion of osteoporotic fractures occur in individuals whose life expectancy is substantial (e.g. early post-menopausal women), therefore secondary
The incidence of second hip fracture from the studies listed in Table 1 ranges from 2.3% to 10.6%. As there are approximately 60,000 hip fractures per annum in the UK [21], the absolute number of second hip fractures may be between 1400 and 6500 per year. The mean interval between the first and second hip fractures varied between 1 and 7 yr but the majority of second hip fractures occurred within a few years of the first hip fracture [16, 19, 21]. Risk factors for having a second hip fracture at any time were explored in some of these studies. In one study from Hong Kong [18] the presence of concomitant neurological diseases, such as stroke or Parkinsonism, was more likely to be present in those who went on to have a second hip fracture. This study also showed that those who were institution-based at the time of the first hip fracture were more likely to have a second hip fracture [16, 19, 21].

**Table 1. English language studies published since 1980 examining the features of second hip fractures**

<table>
<thead>
<tr>
<th>Authors [Reference]</th>
<th>Setting/country</th>
<th>Study design</th>
<th>No. of second hip fractures/all hip fractures</th>
<th>Mean interval between first and second hip fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dretakis et al. 1981 [14]</td>
<td>Community/Greece (Athens)</td>
<td>Retrospective</td>
<td>24,324</td>
<td>2.5 yr male, 5 yr female</td>
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<tr>
<td></td>
<td></td>
<td>Retrospective</td>
<td>72,1099</td>
<td>2.1 yr male, 54 yr female</td>
</tr>
<tr>
<td>Melton et al. 1982 [15]</td>
<td>Community/USA</td>
<td>Retrospective</td>
<td>106,1145</td>
<td>Not stated but 1% at 1 yr, 8% at 5 yr, 16% at 10 yr, 29% at 20 yr</td>
</tr>
<tr>
<td>Boston 1983 [16]</td>
<td>Hospital/UK</td>
<td>Retrospective</td>
<td>53,500</td>
<td>Not stated but 38% within 1 yr</td>
</tr>
<tr>
<td>Finsen and Benum 1986 [17]</td>
<td>Community/Norway</td>
<td>Retrospective</td>
<td>151,2a</td>
<td>7 yr</td>
</tr>
<tr>
<td>Chiu et al. 1992 [18]</td>
<td>Community/Hong Kong</td>
<td>Prospective</td>
<td>35,1514</td>
<td>2 yr (range 0.1–5)</td>
</tr>
<tr>
<td>Schroder et al. 1993 [19]</td>
<td>Community/Denmark</td>
<td>Retrospective</td>
<td>256,4161</td>
<td>3.3 yr (5 days to 14 yr)</td>
</tr>
<tr>
<td>Wolinsky and Fitzgerald 1994 [20]</td>
<td>Study population/USA</td>
<td>Prospective</td>
<td>27,568</td>
<td>1.7 yr</td>
</tr>
<tr>
<td>Dretakis et al. 1998 [21]</td>
<td>Community/Greece (Crete)</td>
<td>Retrospective</td>
<td>106,1685</td>
<td>13.3 yr (75% within 4 yr)</td>
</tr>
</tbody>
</table>

*This study was not designed to examine the frequency of second hip fractures.*
poor perceived health were more likely to have a second fracture [20].

The characteristics of individuals who have had an early second fracture (within 1 yr) compared with late (after 1 yr) may differ, with one study showing that early second hip fractures tend to be more common in older individuals, in women, and in those with biochemical evidence of osteomalacia [18]. However, the finding that women were at higher risk of early second fracture was not supported by a previous study suggesting that men may be at higher risk [19].

Bone mineral density at the time of the first hip fracture was shown in one study not to discriminate between those who will have a second fracture and those who will not [21]. However, the sites measured in this study were the lumbar spine (using dual-energy X-ray absorptiometry) and the calcaneum (broad band ultrasound), so no data are available for the hip site. Bone loss after the first hip fracture may be more important, as a rate of loss of 3–7%/yr in the unfractured hip has been demonstrated [23, 24] which is substantially higher than age-related bone loss of approximately 1%/yr at the hip [25]. This accelerated bone loss in the unfractured hip may be reduced by early mobilization [26].

What conclusions can we reach from these data? Our interpretation is that survivors of a first hip fracture are at substantially increased risk of a second hip fracture and the number of second hip fractures is probably high enough to consider secondary prevention. However, it is difficult to give clear practical guidelines for interventions that could reduce the risk of second hip fracture as the evidence is limited. Currently a reasonable case could be made for early mobilization and encouraging weight-bearing activity for reducing both bone loss in the unfractured hip, as well as complications of immobilization. Repleting patients with vitamin D also seems a simple and practical strategy especially as there is a high prevalence of occult vitamin D in women with acute hip fracture [27]. However, it is unclear as to the best means of delivery of vitamin D (e.g. depot injection or daily tablets) and whether calcium should be added. Currently it may be best to institute doses similar to that for primary prevention of hip fracture in high-risk individuals [28]. Potential dietary measures other than vitamin D include protein supplementation, as this has been shown to increase bone mineral density after hip fracture [29].

In addition there is no reason why other bone active drugs such as oestrogen and bisphosphonates could not be added, although whether all patients would benefit is unclear. The need for bone density measurements prior to initiating drug treatment is also an important consideration. If facilities are available then it may be helpful to assess the severity of osteoporosis. However, given that risk of second hip fracture will be high irrespective of bone density at the hip (by virtue of increased fall risk), measurement may not be essential.

Measuring risk of falls to define those at highest risk of second hip fracture should also be considered as the risk of falls can be assessed rapidly [30]. In those with clear risk of multiple falls, hip protectors could be used, although the major limitation of hip protectors has been that compliance is low after the first few months [31, 32]. Further study is needed in this particular group of patients, as compliance may be better in those who have had a hip fracture, because of the increased perception of risk of future hip fracture.

In summary, although primary prevention of osteoporosis is important, case finding can be difficult. However, individuals who survive a first hip fracture are usually hospitalized and therefore easier to target. Currently the data suggest that there is a significant risk of a second hip fracture and that individuals who have had a hip fracture are neglected with respect to secondary prevention. Early mobilization and vitamin D repletion seem reasonable based on the current evidence. However, further studies are required to determine second hip fracture rates more accurately and define subgroups at highest risk as well as appropriate interventions. What is clear though, is that multiple interventions will be required for periods of years and possibly indefinitely.

G. H. M. George and S. Patel

Department of Rheumatology, Epsom & St Helier NHS Trust, Carshalton, Surrey SM5 1AA and 1Osteoporosis Unit, Department of Rheumatology, St George’s Hospital, London SW17 0QT, UK.

Correspondence to: S. Patel.

References
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