assess and compare other variables that may have influenced the place of death, such as the availability of carers for the study and control populations. For purposes of comparison, those patients cared for in ‘continuing care’ were grouped with those living in nursing and residential accommodation, as control data obtained from the ONS did not distinguish between different types of care facility.

Key points

- Patients with IPD most frequently die in hospital. They are more likely to die in a care home and less likely to die at home or in a hospice than the general elderly population.
- Further research is required to explore PD patients’ choice and experiences of care at the end of life.

Conflicts of interest

None.

References


Survival and functional outcome in patients 90 years of age or older after hip fracture

SIR—Epidemiological studies have widely demonstrated that in industrialised countries, the population is increasingly ageing. Since elderly people can be frail, disabled or dependent [1, 2], this phenomenon will result in significant social and financial burden. Thirty-five per cent of individuals aged over 65 years fall each year, and up to 10% of falls result in hip fracture [3]. Furthermore, in the elderly, falls and hip fracture are the most common causes of acute hospitalisation producing severe disability [3, 4]. These dramatic events are associated with morbidity, mortality, as well as poor quality of life [5, 6]. A growing number of people over 90 years of age will suffer from traumatic events and hip fractures that will need care and rehabilitation treatment, yet this advanced age is associated with increased mortality and poorer functional recovery [7–9]. Several reports [9–16] in the literature concern the recovery of the ‘oldest old’ [17] after hip fracture. However, few studies investigated elderly people aged 90 years or older [11–16] and only one followed the patients for >1 year [15]. Surgery and rehabilitation can be questionable in many of these very elderly [12, 18] who at the least may require a different approach as well as an inpatient setting for services [19, 20]. The purpose of the present study was to evaluate functional recovery in nonagenarian patients with hip fractures. The study focused on (i) functional outcome and recovery of gait after intensive rehabilitation treatment; (ii) rate of survival and (iii) maintenance of walking and functional ability in patients followed for almost 2 years.
Subjects and methods

After the local Ethics Committee and written informed consent approval, consecutive patients aged 90 years or older with hip fractures and admitted to an intensive rehabilitation setting in our Rehabilitation Medicine ward were enrolled. Patients with a history of a previous hip fracture, pathological or multiple fractures, dementia or a terminal disease with a life expectancy of <3–6 months were excluded. Assessment of pre-injury ambulation ability was obtained by all patients. Clinical evaluation and comorbidity were ascertained in all patients (see Appendix 1 in the supplementary data available at Age and Ageing online). The Mini-Mental State Examination (MMSE) was used to evaluate cognitive status. Functional ability was assessed by means of the Barthel scale performed at admission, discharge and follow-up (26.3 ± 8.8 months). The Barthel scale quantifies global functional recovery and dependence in some of the basic activities of self-care [21, 22] (see Appendix 1). A limitation of this scale lies in the definition of functional modification in ambulation. To offset this inadequacy, gait was independently classified into four functional levels graded from 0 to 3: grade 0, no gait or bedridden; grade 1, uses a wheelchair; grade 2, uses a double support or walker; and grade 3, unaided walking or uses a cane [15].

Low-molecular weight heparin was administrated to all patients to prevent thrombotic and/or pulmonary embolic events in the month after surgery. An interdisciplinary approach was adopted that included geriatric medical care review and orthopedic and neurological consultation. All patients received rehabilitation treatment for almost 2 h a day (6 day/week) in accordance with their clinical condition (Appendix 1).

Statistical analyses involved the ANOVA test for repetitive measures over time and the Mann–Whitney U test or unpaired two-tailed Student’s t-test for comparisons at each time point.

Results

Sixty patients aged 90 years and older (50 F, 10 M; mean age 93.2 ± 2.4 years) were evaluated. Of these, 18 (12 F, 6 M) did not meet inclusion criteria, leaving 42 subjects (38 F, 4 M; mean age 92.6 ± 3.5 years, range 90–101) for the final enrolment. Clinical characteristics of these nonagenarian patients are reported in Table 1. Thirty patients suffered an intertrochanteric hip fracture, and 12 patients suffered a femoral neck fracture. In 24 patients, the surgical intervention consisted in hip prosthesis and in 18 patients, a dynamic compression hip screw with a plate. The mean number of concomitant diseases was 2.62 ± 1.53. Two (4.7%) patients died of heart failure during the in-hospital stay. At admission, discharge and follow-up, respectively, the mean Barthel score was 51.6 ± 7.8, 82.7 ± 18.2 and 81.4 ± 19.1 (P < 0.001). At discharge, 32 (80%) patients had a good score (Barthel 90.9 ± 6.6). After rehabilitation, 8 (20%) patients achieved ambulation without aid and were independent, 28 (70%) walked with assistance (12 and 16 with a cane or a walker, respectively) and 4 (10%) subjects were bedridden (Table 2). Globally, 18 (45%) subjects had a good recovery of gait. Eighteen (45%) patients regained ambulation at a lower functional level than before the injury. Of the 34 patients at follow-up, 14 (41.1%) had an independent gait, 8 (23.5%) needed support to walk (6 and 2 with a cane and a walker, respectively), 2 (5.8%) used a wheelchair and 10 (29.4%) subjects were bedridden. The patients with the poor outcome did not have significantly higher disease comorbidity (3.6 ± 2.3 vs 2.2 ± 1.1, P = ns) than subjects with good recovery. The mean length of hospital stay was 45.6 ± 14.6 days. After 12 months, 2 patients had died, and at follow-up, 34 (80.9%) were still living. Thirty-four patients were discharged to their home and 6 (14.2%) subjects to skilled nursing facilities. At follow-up,

Table 1. Demographic characteristics and disease comorbidity of very elderly patients with hip fractures

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
<th>Hip fracture</th>
<th>Type of surgery</th>
<th>Prosthesis</th>
<th>Internal fixation</th>
<th>Disease comorbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>92.6 ± 3.5</td>
<td>38 (89.4)</td>
<td>4 (10.5)</td>
<td>30</td>
<td>12</td>
<td>24</td>
<td>18</td>
<td>2.62 ± 1.53</td>
</tr>
</tbody>
</table>

Table 2. Functional status at admission, discharge and follow-up of patients 90 years of age or older with hip fractures

<table>
<thead>
<tr>
<th>Admission</th>
<th>Discharge</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>42</td>
<td>40</td>
</tr>
<tr>
<td>MMSE</td>
<td>23.4 ± 2.2</td>
<td>22.8 ± 3.6</td>
</tr>
<tr>
<td>Barthel</td>
<td>51.6 ± 7.8</td>
<td>82.7 ± 18.2*</td>
</tr>
<tr>
<td>Gait ability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 3</td>
<td>0</td>
<td>20 (50)</td>
</tr>
<tr>
<td>Grade 2</td>
<td>20</td>
<td>16 (40)</td>
</tr>
<tr>
<td>Grade 1</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Grade 0</td>
<td>12</td>
<td>4 (10)</td>
</tr>
<tr>
<td>Deceased</td>
<td>–</td>
<td>2 (4.7)</td>
</tr>
<tr>
<td>Living at home</td>
<td>40 (95.2)</td>
<td>34 (85)</td>
</tr>
<tr>
<td>Nursing facilities</td>
<td>2 (4.7)</td>
<td>6 (15)</td>
</tr>
</tbody>
</table>

MMSE (Mini-Mental State Examination), *P < 0.0001, Barthel mean score at discharge and follow-up compared to admission. Percentage is reported in brackets. Gait ability scoring system: grade 0, no gait or bedridden; grade 1, uses a wheelchair, grade 2, uses a double support or walker, grade 3, unaided walking or uses a cane.
26 of the surviving patients (76.4%) still lived at home and 8 (23.5%) at nursing facilities (details in Appendix 1).

Discussion

Nonagenarian patients suffering from hip fractures and treated in an intensive rehabilitation setting achieved a good functional outcome, but only 41% regained and maintained independent ambulation. Many studies have focused on the factors that affect the recovery of elderly patients after hip fracture [23–28], but enrolled predominantly elderly people with a mean age not older than 85 years.

Of great importance is the patient’s status at discharge, after rehabilitation treatment, since some patients never recover the pre-injury functional level and return to living independently. The pre-injury functional level recovery in very old patients with hip fracture has been reported in a percentage of 53% [12] and 69.8% [13].

The present study showed that 80% of patients regained their pre-injury global functional level. This finding might be specific to the therapeutic approach, to referred patients who might be healthier and less dependent pre-injury or type of rehabilitation intervention, a regimen that might have resulted in a better functional outcome at discharge. Similar results have been reported by previous studies using different evaluation systems [9, 10].

The in-hospital mortality rate in patients 90 years of age or older has been reported to vary from 10 to 36.4%, and the 1-year mortality rate is even higher, ranging from 25 to 54% [9–13] (Table 3, Appendix 2). In contrast, we identified an in-hospital and 2-year mortality rate of 4.7% and 20%, respectively. This more positive outcome could also have been a result of our multidisciplinary approach to treating patients. Our staff works in teams to apply management, rehabilitation strategy and a comprehensive geriatric assessment aimed at preventing complications and caring for concomitant diseases. It is also possible that therapists and staff have more than the usual empathy with nonagenarian patients, enabling them to work better with these patients. The benefit of a geriatric interdisciplinary approach is the reduction of complications and hospitalisation in the elderly in general [10, 29], as well as in nonagenarians [12].

We found that 40% of patients regained gait without aid after rehabilitation. This finding is consistent with that of Ishida et al., who reported that 45% of patients were able to walk unaided [15] and of Shah et al. who found that 44.4% of very old patients recovered their pre-fracture level of ambulation [13]. Conversely, a recent large prospective study by Holt et al. reported that only 2% of extremely old patients recovered unaided gait and maintained independent mobility at the 120-day post-fracture [16]. These divergent results could again be due to younger subjects of our sample (mean age of 92.6 vs 96 years, respectively). Almost all of our patients who regained gait without aid remained independent over time and only 14% were found to be bedridden at follow-up. The results of the present study demonstrate that nonagenarians with hip fracture and few concomitant diseases can achieve and maintain good recovery after intensive rehabilitation treatment.

Advanced aged patients more frequently are discharged to skilled nursing facility placement at hospital discharge, but our finding challenges this practice. Indeed, 85% of patients were discharged at home and only 15% at skilled nursing facilities. Of the survivors, 76.4% lived still at home and 23.5% at nursing facilities at the follow-up visit. Differences in social and cultural aspects, policy and Health System services access could explain this finding.

The present study has some limitations including the small number of patients, and the lack of a control group and randomised design. Since demented and/or pre-injury-dependent patients were not enrolled, results cannot be generalised to those. In compensation, however, this study also has some strengths. To our knowledge, it is the first research study conducted in an intensive rehabilitation setting, and the patients were followed for almost 2 years after the fracture. In conclusion, these results indicate that patients 90 years of age or older with hip fracture achieved a surprisingly good outcome and returned home after intensive rehabilitation treatment. About one-half achieved independent gait or the pre-injury functional level of ambulation, and the mortality rate was low, since the majority of nonagenarians were alive at follow-up. Extensive studies with larger numbers of subjects and comparisons of different rehabilitation settings would provide more definitive results.

Key points

- The number of individuals 90 years of age or older with hip fractures is expected to rise significantly in the future.
- In the present study, 80% of patients after intensive rehabilitation treatment achieved their pre-injury global functional level, but only 41% regained and maintained independent ambulation.
- Positive outcome could also have been a result of our multidisciplinary approach and comprehensive geriatric assessment preventing complications.
- Patients 90 years of age or older with hip fracture achieved a surprisingly good outcome and returned home after rehabilitation.
- At 2 years, the mortality rate was low, and most nonagenarians were still living.

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Supplementary data

Supplementary data are available at Age and Ageing online.

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References


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