Closed pelvic fractures: characteristics and outcomes in older patients admitted to medical and geriatric wards

Robert O Morris, Adeniyi Sonibare, Desmond J Green, Tahir Masud

Abstract

Objective—To investigate the characteristics and outcomes of older patients with pelvic fracture admitted to medical and geriatric wards.

Methods—All patients admitted to medical and geriatric wards with a pelvic fracture over a four year period were identified using the hospital clinical coding database. Data were collected from casenotes, hospital and Family Health Services Authority databases. Where available, pelvic radiographs were graded according to the Singh index.

Results—The casenotes of 148 patients (126 women) were studied; 83% (n=123) of patients suffered a pelvic fracture in low energy trauma. Mean (SD) length of hospital stay was 21.3 (17.6) days. Single breaks of the pubic rami accounted for 47.2% (n=68) of all fractures. Inpatient mortality was 7.6% and at one year was 27%. There was a marked adverse effect on the mobility of survivors with all patients using at least a walking stick at discharge and 51.1% (n=70) needing assistance for mobility. Although 70.9% (n=83) of patients admitted from home (or warden aided accommodation) were able to return there, 84.3% (n=70) of them required extra community support. Rates of institutionalisation rose from 20.9% (n=31) at admission to 35.8% (49/137) of survivors at discharge. Altogether 93% (n=107) of 115 patients, in whom adequate quality pelvic radiographs were available, were assigned a Singh index grade of 4 or less indicating the presence of osteoporosis.

Conclusions—Pelvic fractures are often the result of low energy trauma. They are associated with appreciable inpatient and considerable one year mortality. They also have marked negative effects on mobility in the short term. They result in increased levels of dependency in terms of higher levels of community support and rates of institutionalisation. On the evidence of Singh index grading, pelvic fractures are associated with low bone density.

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Pelvic fractures account for between 3% and 8% of all traumatic skeletal injuries.^{1,2} Population studies have shown these fractures to have an overall incidence of 37/100 000 patient

years.³ The highest frequency is seen in women over the age of 85 years (450/100 000 patient years). The majority of research in this area has focused on injuries associated with high energy trauma largely occurring in younger people. Few data exist regarding the characteristics and outcomes of older patients with pelvic fractures. Although hip fractures are seen three times more commonly, fractures of the pelvis are associated with a similar 2.0 to 2.5-fold increase in mortality.⁴ However, much of this excess mortality has been attributed to underlying conditions not directly related to hip and pelvic fractures.^{4,5} Hip fractures have a well documented effect on long term morbidity,^{6,7} but similar information regarding elderly patients suffering a pelvic fracture is not available.

There is also little direct evidence to support the opinion that fractures of the pelvis sustained in low energy trauma are associated with osteoporosis. The Singh index⁸ utilises the trabecular pattern at the femoral neck as a means of estimating bone mass.⁹ This method has been validated against cadaveric specimens¹⁰ and dual energy x ray absorptiometry.¹¹ The Singh index has been shown to be a useful epidemiological tool capable of detecting differences in bone density between and within populations.^{11,12}

The aim of this descriptive study was to identify features associated with older patients suffering a pelvic fracture admitted to general medical and geriatric wards and outcomes in terms of mortality, morbidity, and institutionalisation. We also sought to provide further evidence that these fractures are associated with osteoporosis using the Singh index.

Methods

The study was conducted at the City Hospital, Nottingham and the hospital clinical coding database was used to identify all patients over 65 years of age admitted, either directly or from the accident and emergency department, to medical and geriatric teams with any type of pelvic fracture over a four year period. A trained researcher studied the casenotes of these patients and data including general characteristics, fracture site, fall associated factors, medication, mobility, and patient outcomes were collected. Pelvic radiographs were graded by an experienced radiologist according to their trabecular pattern (Singh index) as a measure of bone mass.⁸ A Singh index atlas derived was used to minimise bias. This atlas is a series of radiographs demonstrating the six Singh index trabecular pattern grades derived from the illustrations in the original

Department of Health
Care for the Elderly,
City Hospital,
Nottingham, UK
R O Morris
T Masud

Department of
Medicine, Queens
Medical Centre,
Nottingham, UK
A Sonibare

Department of
Radiology, City
Hospital, Nottingham,
UK
D J Green

Correspondence to:
Dr R O Morris,
285 Trowell Road,
Nottingham NG8 2FE, UK

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Figure 1 Age and sex distribution of patients with pelvic fractures.

Table 1 Mobility status of patients before and after pelvic fracture; values are number (%)

Mobility status	On admission (n=148)	At discharge (n=137)
Walking unaided	79 (53.4)	0
Walking with an aid	58 (39.2)	67 (48.9)
Walking or transferring with assistance	11 (7.5)	70 (51.1)

publication.⁸ Patients with severe injuries requiring surgical and/or orthopaedic intervention were excluded. Long term follow up information was gathered from casenotes, general

Figure 3 Kaplan-Meier survival function (censored cases marked x) for patients with pelvic fracture.

practitioner and local Family Health Services Authority records.

Results

DESCRIPTIVE FEATURES

The age sex distribution of the study population (126 women and 22 men, mean age 83, mode 87, median 84 years) is shown in fig 1, which demonstrates the preponderance of older women. The majority (83%, n=123) of patients had suffered low energy trauma in the form of a fall from standing height, while walking or transferring; 16% (n=24) of patients did not remember falling and one patient was injured in a road traffic accident. At the time of admission 45.3% (n=67) of patients were taking antihypertensive drugs (21 patients were using antihypertensive drugs and 59 diuretics, 13 were using both drug classes). Altogether 21% (n=31) had been prescribed psychotropic drugs (22 were using sedatives, 14 antidepressants, five neuroleptics, one patient was using

Figure 2 Histograms showing outcomes in pelvic fracture patients according to their place of residence at admission (see text).

Figure 4 Age and sex scatter diagram showing the results of Singh index grading in 115 patients with pelvic fracture.

all three, and 11 patients two of the three drug types). The mean (SD) length of hospital stay was 21.3 (17.3) days (range 2–113). The anatomical site of pelvic fracture was recorded. Single breaks of the superior or inferior pubic ramus accounted for 47.2% (n=68) of all fractures. A further 47.9% (n=69) were found to have sustained multiple fractures. Lone fractures of the acetabulum and ilium were rare (3.5% and 1.4% respectively).

OUTCOME

Mobility status before admission and at discharge is shown in table 1.

The majority (117/148, 79.1%) of patients were admitted either from their own home (n=87, 58.8%) or warden aided flat (n=30, 20.3%) and of these 67.5% (79/117) were living alone. Altogether 20.9% (31/148) of patients were living in either a residential home (n=20, 13.5%) or a nursing home (n=11, 7.4%). The four histograms shown in fig 2 detail discharge outcomes of pelvic fracture patients according to their place of residence before admission.

MORTALITY AND LONG TERM FOLLOW UP

Inpatient mortality in this series was 7.6%. The mean length of long term follow up was 52.3 months (28.6–75.4). Mortality at one year was 27% and there was an approximate annual mortality of 10% thereafter such that survival at three years was around 50%. Figure 3 displays these mortality data in the form of a Kaplan-Meier survival curve. Mean (SD) age at death was 87.4 years (7.03). The mean age of the 53 surviving patients was 86.1 (6.77) years and their mean survival from the time of fracture 48.6 (12.95) months. Of these 53 survivors, 58.5% were living in their own home (n=23) or warden aided flat (n=8) at the end of the follow up period and 41.5% (n=22) were living in either a rest home (n=8) or a nursing home (n=14).

SINGH INDEX

Figure 4 displays the results of Singh index grading in 97 female (84.3%) and 18 male patients in whom adequate quality radiographs were available. One hundred and seven (93.0%) of these patients received a Singh index of 4 or less indicating osteoporosis. Singh index data collected from older (≥ 65 years) control subjects examined in previous studies of hip^{13,14} and spinal⁹ fractures are displayed graphically in fig 5.

Discussion

The majority (83%) of pelvic fractures in this series of older patients were the result of low energy trauma and involved either single breaks of the pubic rami or fractures at multiple pelvic sites. It has been suggested that patients sustaining such injuries form part of a group in common with hip fracture.¹⁵ Data from this study highlight some of the similarities and distinctive features of patients suffering these common injuries. Previous research has shown that the majority of hip fractures are the result of a fall from standing height or less.^{16–20} Falls, defined as any incident in which the patient

Figure 5 Histograms showing the results of Singh index grading in control populations used in hip and spinal fracture studies and similar results in patients with pelvic fracture.

unintentionally ends up on the floor,²¹ become more common with increasing age.²² Low energy trauma in this sense implies that the forces applied to bony structures in the process of injury are those arising only from the dissipation of potential energy in the change of position from standing height or less to ground level. In the community, 30% of persons over the age of 65 will fall each year.²²⁻²³ This rate rises to 40% of those over 80.²³ Between 10% and 25% of falls result in serious injury and up to 6% culminate in a fracture.²⁴⁻²⁵

Recurrent falls are associated with increased mortality, increased rates of hospitalisation, curtailment of daily activities, increased fear of falling, loss of confidence, and higher rates of institutionalisation.²³⁻²⁶ The length of hospital stay in this study was similar to that observed in hip fracture patients (21.4 days and 25.1 days respectively).²⁷ Inpatient mortality, however, was half that in a study of hip fractures (7.6% *v* 15.2%).⁷ Figures from the same study show that mortality rates at one year appear comparable (27% in pelvic fractures and 33% in hip fractures). Longer term follow up of this pelvic fracture group shows that cumulative mortality from all causes is around 50% at three years from the date of fracture. Laxton and colleagues clearly demonstrated the adverse effect of hip fracture on functional ability with fewer than one third of survivors returning to prefracture levels within 90 days.⁶ Before pelvic fracture, 53.4% of patients were walking unaided and 39.2% were using a simple walking aid (stick or frame). Only a small proportion of patients (7.5%) required the assistance of another person. However, at discharge all patients were using at least a walking stick to aid mobility and 51.1% required assistance. Of 117 patients admitted either from their own home or warden aided flat (fig 2), the majority (70.9%) were able to return there but most patients (84.3%) required extra social services support at home. This increased dependence after pelvic fracture is also in evidence through increased rates of institutionalisation, the remaining 29.1% of this group requiring residential care at discharge. Furthermore, 25% of patients admitted from rest homes had been rendered more dependent by their injury and required nursing home placement at discharge. Overall, the numbers of patients in institutional care rose from 20.9% at admission to 35.8% of survivors at discharge.

The majority (93.0%) of patients with pelvic fracture in whom adequate quality radiographs were available were assigned Singh index grades indicative of osteoporosis (grade ≤ 4). When compared with similar grading in non-fracture control populations of similar age (fig 5) it would appear that pelvic fractures are associated with decreased bone density as estimated by this method.

This study has a number of limitations. Firstly, it is not an epidemiological study entirely representative of the general population. It is likely that some selection has occurred. Studies of hip fracture may be regarded as "epidemiological" in that virtually

Learning points

- Most pelvic fractures in older people are the result of falls from standing height or less
- There are marked increases in dependency and rates of institutionalisation after a pelvic fracture
- Inpatient mortality is 7.6% and one year mortality is 27%
- On the evidence of Singh index grading, pelvic fractures are associated with osteoporosis

nobody who breaks their hip escapes hospital admission, whereas some pelvic fractures may not be diagnosed or are perhaps managed without recourse to hospital admission. Secondly, the usefulness of knowing the status of mobility at discharge is limited. Leaving hospital is an arbitrary end point and in this study the length of inpatient stay ranged from two to 113 days. It would be preferable to have information relating to mobility status at a fixed time after fracture, such as six months. The retrospective casenote study design did not, however, allow for the determination of outcomes at such fixed points. Thirdly, the Singh index method of assessing bone density is crude and the radiologist was not blinded to pelvic fractures, although a Singh index atlas was used to minimise bias. Furthermore, the retrospective design precluded the use of more accurate methods of bone density measurement, such as dual energy x ray absorptiometry. This study did not address whether any of the patients had been diagnosed as osteoporotic prior to admission and data regarding previous antiosteoporotic treatment or any therapy at discharge were not recorded.

Despite these limitations, the study is of clinical interest as the study population is familiar to many physicians responsible for admitting older subjects. The results show that there is an important change in type of residence and mobility as well as an association with mortality. The Singh index data shows that there may be a high prevalence of osteoporosis and suggest that these patients need to be considered for further investigations for osteoporosis and appropriate management. The latter issue requires further study.

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