A comparison of presenting characteristics of patients with intracapsular and extracapsular proximal femoral fractures

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Summary

The presenting characteristics of 1423 consecutive admissions with proximal femoral fractures were prospectively studied, to determine any differences that may exist between patients, dependent on the radiological site of the fracture.

Patients with intracapsular fractures were of a lower average age, more mobile, less likely to use walking aids or live in residential accommodation, they also had a considerably shorter length of hospital stay than for those patients with extracapsular fractures. Comparison against previous series shows that the average age of hip fracture patients and the proportion of trochanteric fractures is increasing.

Introduction

'Proximal femoral fractures' or 'fracture of the neck of femur' are omnibus terms which incorrectly lead to a belief that the aetiology and presenting characteristics are similar in all patients. Radiologically we are able to categorize patients according to the site of the fracture, mainly dependent on whether the fracture is intra or extra capsular. These two groups of patients have been suggested to have different characteristics[1,2], however a later paper[3] failed to confirm these findings. The aim of this study is to elucidate this question by using a considerably larger group of patients.

Patients and methods

Details of a consecutive series of 1423 patients admitted to two centres (Peterborough District Hospital and Birmingham Accident Hospital) were prospectively collected. Information recorded included the patient's age, sex and normal residence. For those patients who were admitted from their own home it was noted if they required any social services support, this included home help, district nurse, bath attendant or meals on wheels. Details of walking aids normally used, mobility and a composite mobility score (Table 1) were recorded at the time of admission. Mental state was assessed by asking the patient a series of 10 questions of cognitive function[4]. Physical state was assessed by recording the ASA grade of the patient as described by the American Society of Anaesthesiologists[5]. This grades patients from grade 1 (completely fit and healthy) to grade 5 (moribund). In addition, the proportion of patients who were unfit for surgery or in whom surgery had to be delayed whilst they were made fitter for surgery was recorded.

The results of relevant laboratory investigations performed were noted. Preoperative X-rays were examined to determine the type of fracture and when the quality of the X-rays permitted, the Singh grade[6], as a measure of osteoporosis. Subcapital and transcervical fractures were grouped together as intracapsular fractures. Basal, pertrochanteric, trochanteric and subtrochanteric fractures were described as extracapsular.

Table 1. Calculation of mobility score

(A) Is the patient able to get about the house?	
(B) Is the patient able to get out of the house?	
(C) Can the patient do their own shopping?	
Able to without difficulty	Score 3
On their own, but with an aid	Score 2
Only with someone else's help	Score 1
Not at all, ie bed, chair or housebound	Score 0

For all patients in whom one year had elapsed from injury the length of stay on the orthopaedic ward was recorded. For those patients transferred to another ward or hospital the length of stay there was determined either by reference to the notes or using the hospitals' patient administration computer records. This enabled the total hospital stay to be determined for each patient. Patients who sustained the fracture whilst a hospital inpatient were classified as 'hospital resident' if they had been in hospital prior to the fracture for more than 28 days. The length of stay for these patients was until they were discharged back to the original hospital. For all the other patients the length of stay was until the time they died or were discharged from hospital to the community. The proportion of time spent on the orthopaedic ward was noted. Patients not discharged at one year from injury had a length of stay recorded as 365 days.

Statistical evaluation between patients with intracapsular and extracapsular fractures was by the *t*-test for the variables of age, length of hospital stay and laboratory indices. For the mental test and mobility scores, the Mann-Whitney *U* test was used. The remaining factors were binary and therefore evaluated with the chi-squared test. A P value of >0.05 was considered as being non significant (NS).

Results

The number of patients in each group, age, sex and details of the type of residence at the time of admission of the patients are as shown in Table 2.

The figures for those requiring social services support only applies to those patients who live within their own homes or warden-controlled accommodation. The remainder of patients either lived in residential accommodation or were classified as a 'hospital resident'.

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Table 2. Age, sex and residence of patients [95% confidence limits]

	Intracapsular	*Extracapsular*	*All patients*	*P value**
Number of patients	729 (51%)	694 (49%)	1423 (100%)	
Mean age (years)	78 [77.2-78.8]	80 [79.2-80.8]	79 [78.4-79.6]	<0.001
Percentage male	17% [14-20]	19% [16-22]	18% [16-20]	NS
Percentage from own home	76% [73-79]	71% [68-74]	74% [72-76]	0.02
Percentage requiring social services	38% [32-44]	48% [42-54]	43% [39-47]	0.03

*The *P* value is for the comparison of extracapsular versus intracapsular fractures

Table 3. Mobility of the patients prior to the fracture [95% confidence limits]

	Intracapsular	*Extracapsular*	*All patients*	*P value**
Mean mobility score	5.5 [5.3-5.7]	4.9 [4.7-5.1]	5.3 [5.2-5.4]	<0.001
'Homebound'	43% [39-47]	50% [46-54]	46% [43-49]	0.009
Able to do their own shopping	39% [35-43]	32% [28-36]	35% [32-38]	0.006
Using a walking aid in their residence	47% [43-51]	53% [49-57]	50% [57-53]	0.02
Normally walking with a Zimmer frame	7% [14-21]	25% [22-28]	21% [19-23]	0.002

*The *P* value is for the comparison of extracapsular versus intracapsular fractures

The mobility of the patients immediately prior to the injury was assessed at the time of admission. Results are as shown in Table 3.

The mobility score is calculated from the answers to the questions shown in Table 1. The maximum score is 9 and the minimum 0. A homebound patient is one who cannot leave their place of residence without the help of another person. Walking aids included sticks, tripod or Zimmer frame. The group of patients who normally use a Zimmer frame includes some patients who are mainly wheelchair or bed bound, but can walk with a frame and the assistance of one or two people.

Table 4 gives results of the mental test score which has a maximum score of 10 and the proportion of patients with an ASA grade of 1 or 2 (ie those who are completely fit or have an asymptomatic illness). Sixteen per cent of patients were initially considered unfit for surgery. After a variety of preoperative measures such as transfusion, rehydration, correction of electrolyte imbalance and treatment of cardiac failure and respiratory complaints surgery was undertaken in 82% of these patients.

Results of the laboratory investigations performed at the time of admission were recorded whenever possible. Those with significant differences ($P<0.05$) are detailed in Table 5. There was no significant difference for the white cell count, packed cell volume, serum potassium, sodium and blood group.

The average Singh grade for intracapsular fractures was 3.9 and 4.0 for extracapsular fractures. Twenty-seven (2.1%) of fractures were pathological, 16 of these were subtrochanteric fractures. Eighty per cent of these were from carcinoma, mainly secondaries from the breast and 20% were associated with Paget's disease. 9.9% of patients had previously sustained a fracture of the contralateral hip.

The length of hospital stay for the different types of fracture are shown in Table 6.

Table 4. Mental test score, ASA grade and patients initially considered unfit for surgery [95% confidence limits]

	Intracapsular	*Extracapsular*	*All patients*	*P value**
Average mental test score	7.1 [6.8-7.4]	6.7 [6.4-7.0]	6.9 [6.7-7.1]	NS
ASA of grade 1 or 2	48% [1.7-3.3]	44% [1.8-3.4]	46% [2.0-3.0]	NS
Unfit for surgery	13% [10-16]	19% [15-23]	16% [14-18]	0.01

*The *P* value is for the comparison of extracapsular versus intracapsular fractures

Table 5. Laboratory indices recorded [95% confidence limits]

	Intracapsular	*Extracapsular*	*All patients*	*P value**
Haemoglobin (g/dl)	12.9 [11.7-12.1]	11.9 [12.7-13.1]	12.4 [12.3-12.5]	<0.001
Lymphocyte count	1.3 [1.2-1.4]	1.5 [1.4-1.6]	1.4 [1.3-1.5]	0.002
Serum urea (mmol/l)	7.6 [7.1-8.1]	8.5 [8.0-9.0]	8.0 [7.6-8.4]	0.007
Serum albumin (g/l)	37.2 [36.3-38.1]	35.2 [34.2-36.0]	36.1 [35.5-36.7]	<0.001

*The *P* value is for the comparison of extracapsular versus intracapsular fractures

Table 6. Mean length of orthopaedic ward stay and total hospital say in days [95% confidence limits]

	Intracapsular	*Extracapsular*	*All patients*	*P value**
Orthopaedic ward stay	16.4 [14.7-18.1]	19.0 [17.6-20.4]	17.7 [16.6-18.8]	0.028
Total hospital stay	32.6 [28.5-36.7]	46.1 [40.5-51.7]	39.1 [35.7-42.5]	<0.001
Patients not discharged at one year from injury	1.1% [0.3-1.9]	2.2% [1.0-3.4]	1.7% [1.0-2.4]	NS

*The *P* value is for the comparison of extracapsular versus intracapsular fractures

Discussion

The main aim of this study was to provide data on the current characteristics of patients presenting with proximal femoral fractures. We were able to demonstrate clear differences in the level of mobility and degree of independent living dependent on the site of the fracture. This confirms the findings of Lawton[2], who stated that patients with trochanteric fractures are slightly physiologically and chronologically older when compared with patients with intracapsular fractures. We found it more difficult to demonstrate significant differences in the general medical state of the patients. The ASA has been shown to be of value in predicting early mortality from hip fracture[7], however it is probably not sensitive enough to detect differences between our two groups of patients. We tried but were unable to use other parameters of health such as the presence of cardiovascular disease but found too much inter-observer variation.

Sir Astley Cooper in 1824[8] stated that trochanteric fractures occurred mainly in the adults under 50 years of age, whilst intracapsular fractures were more predominant in the elderly. Clearly this is no longer the case with the higher average age in our series for those patients with a trochanteric fracture. Zain[9] showed a change over a 15-year period in a Swedish population in the ratio of trochanteric to intracapsular fractures from 1 : 1.8 to 1 : 1.1. The ratio in our series is 1 : 1.2 supporting the evidence that the proportion of trochanteric fractures is increasing. The average age of patients in our series was 79 years. This confirms that the average age of patients with hip fractures is progressively increasing over the years. In 1944 Linton[10] quoted 67 years, in 1957 Murray and Young[11] quoted 71 years and in 1964 Alffram[1] cited 72 years.

Figures quoted for length of hospital stay depend on the method of collection of the data and may have only quoted the length of stay on the orthopaedic ward, and thereby ignored the considerable time these patients may spend on other wards particularly geriatric. By using the hospital patient administration computer we are able to determine the length of hospital stay on the orthopaedic ward and then for any additional time on other wards. In our study 1.7% of patients had not been discharged at one year from injury, these patients will probably remain as long stay hospital inpatients. The length of hospital stay whilst reflecting effectiveness of treatment and rehabilitation will also be affected by the availability of community resources and nursing homes.

Although we have demonstrated some differences within the different patient populations, we are unable to explain why patients fracture at different sites. Watson-Jones[12] stated that osteoporosis predisposes to trochanteric fractures in preference to intracapsular fractures, and a later study[13] supported this. Using the Singh grade as a measure of osteoporosis we have not been able to confirm these findings. An alternative theory is suggested by Ferris[14] that relates the site of the fracture to the length of the femoral neck.

Our conclusions are that significant differences exist within the different groups of hip fracture patients as classified by the anatomical site of the fracture. The average age of hip fracture patients is progressively increasing as is the proportion of trochanteric fractures.

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Forthcoming events

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Reproductive Toxicology
28 April 1992, Scientific Societies Lecture Theatre, London
Further details from: Pauline A Sim, Secretariat, Gascoigne Secretarial Services, 24 Southfield Drive, Hazlemere, High Wycombe HP15 7HB (Tel: 0494 713664; Fax: 0494 714516)

Minimally Invasive Surgery
29-30 April 1992, RCOG, London
Further details from: (see entry for 17-18 March 1992)

Modeling Modified Drug Release: Practical, Time-Saving Techniques
29-30 April 1992, Oakbrook, Ill
Further details from: (see entry for 24-25 March 1992)

International Conference on the Molecular and Clinical Genetics, Epidemiology and Clinical Characteristics of Childhood Renal Tumors
14-16 May 1992, Albuquerque, New Mexico
Further details from: University of New Mexico, Office of Continuing Medical Education, HSSB, Room 140, Box 713, Albuquerque, NM 87131-5126, USA

25th Annual Advances and Controversies in Clinical Paediatrics
14-16 May 1992, San Francisco, California
Further details from: Extended Programs in Medical Education, University of California, Room LS-105, San Francisco, CA 94143-0742, USA (Tel: 415 476 4251)

MRCP Part II Courses
1-5 June 1992, Royal Free Hospital, London
Further details from: Dr D Geraint James, Royal Free Hospital, Pond Street, Hampstead, London NW3 2QG (Tel: 071 794 0500, ext 3931)

2nd International Symposium on Perinatal Asphyxia: Current Concepts and Intrapartum Fetal Surveillance
8 June 1992, Vancouver, Canada
Further details from: Mrs Joan Beards, Canadian Medical Protective Association, Education Department, Perinatal Asphyxia Conference, PO Box 8225, Ottowa, Canada K1G 3H7 (Tel: 613 236 2100, ext 238; Fax: 613 236 5588)

Digital Imaging Processing Applied to Orthopaedic and Dental Implants
8-13 June 1992, Portugal
Further details from: M Barbosa, Department of Metallurgy, Faculty of Engineering, University of Porto, Rua dos Bragas, 4099 Porto Codex, Portugal (Tel: 2-2009297; Fax: 2-319280)

13th International Symposium on Computer Assisted Decision Support & Database Management in Anesthesia, Intensive Care and Cardiopulmonary Medicine
10-12 June 1992, Rotterdam, The Netherlands
Further details from: Dr O Prakash, Chief, Thorax Anesthesia Thorax Centre, Dijzigt Hospital, Dr Molewaterplein 50, 3015 GD Rotterdam, The Netherlands (Tel 31-10-463 5230; Fax: 31-10-463 5240)

4th International Course on Health and Disasters Preparedness
July 1992, Brussels
Further details from: Course Co-ordinator, 4th International Course, Centre for Research on the Epidemiology of Disasters, School of Public Health (EPID 30.34), Catholic University of Louvain, 30, Clos Chapelle-aux-Champs, 1200 Brussels, Belgium (Tel: 32-2 764-33-27: Fax: 32-2 764-33-28)

36th Annual Scientific Meeting of the Society for Research into Hydrocephalus and Spina Bifida
15-18 July 1992, Mainz, Germany
Further details from: Dr R Bayston, Hon Secretary, Institute of Child Health, 30 Guilford Street, London WC1N 1EH (Tel: 071 242 9789; Fax: 071 831 0488)

12th Annual Fine Needle Biopsy Course
9-15 August 1992, Mauna Lani, Hawaii
Further details from: (see entry for 2-4 April 1992)

3rd British Lithium Congress
6-10 September 1992, Wolverhampton Polytechnic
Further details from: N J Birch PhD, Biomedical Research Laboratory, School of Health Sciences, Wolverhampton Polytechnic, 62-68 Lichfield Street, Wolverhampton WV1 1DJ (Tel: 0902 28525, ext 1136; Fax: 0902 321161)

Uvitis and Retinal Frontiers
10-13 September 1992, California
Further details from: (see entry for 2-4 April 1992)

XIIth International Conference on the Social Sciences and Medicine
14-18 September 1992, Peebles, UK
Further details from: Dr P J M McEwan, Glengarden, Ballaret, Aberdeenshire AB35 5UB

1st European Symposium on Paediatric Cochlear Implantation
24-27 September 1992, University Hospital, Nottingham
Further details from: University of Nottingham, Office for Professional and Industrial Training, University Park, Nottingham NG7 2RD (Tel: 0602 792841; Fax: 0602 501718

British Association of Oral and Maxillofacial Surgeons: Autumn Meeting
2-3 October 1992, Royal College of Surgeons of England
Further details from: (see entry for 25-26 April 1992)

6th International Conference on Behçet's Disease
30 June-1 July 1993, Paris, France
Further details from: Bertrand Wechsler MD, Pitié-Salpètière Hospital, 47/83 Bd de L'Hopital, 75013 Paris Cedex 13, France (Tel: 45 70 26 67; Fax: 45 70 20 45)