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It was not a hip fracture – you were lucky this time – or perhaps not! A prospective study of clinical outcomes in patients with low-energy pelvic fractures and hip contusions

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ABSTRACT

Introduction: Prehospital and hospital emergency care guidelines have been developed for patients with suspected hip fracture. Initial radiography can identify a number of patients with other injuries, generally pelvic fractures and hip contusions. Little is known about the prognosis for these patients.
The aim of this study is twofold: i) to investigate the injury pattern of patients assessed in prehospital emergency care as suffering from a suspected hip fracture and ii) to compare clinical outcomes between patients with verified hip fracture (HF) and those with other hip injuries (OHI).
Method: The study design was prospective. Older patients with suspected HF after low-energy trauma were identified in prehospital emergency care. Injury type was determined by radiological imaging. Comparisons of length of stay, adverse events, repeated prehospital emergency care and mortality were made between verified HF and OHI cases.
Results: 449 patients were included, 400 in the HF and 149 in the OHI group (86 hip contusions, 46 pelvic fractures and 17 other injuries/diseases). The HF group had a significantly longer hospital stay (9.5 days vs. 6.3 for the OHI group; $p < 0.001$) and more adverse events while in hospital (34% vs. 19%; $p < 0.001$). We found no evidence that the groups differed with regard to other outcomes: mortality during hospital stay (4% vs. 2%, $p = 0.42$), at 4 (16% vs. 13%; $p = 0.35$) and 12 months (21 vs. 23%; $p = 0.64$), the proportion that experienced an adverse event (24% vs. 22%; $p = 0.65$) and the proportion that required another ambulance transport within 6 months after discharge (40% vs. 34%; $p = 0.16$). The results were not strongly affected by adjustments for possible confounders.
Conclusion: Older patients who suffer a low-energy pelvic fracture or a hip contusion are common in prehospital and hospital emergency care. These patients need attention as they have poor outcomes in terms of adverse events, mortality and recurrent need for ambulance transport after discharge from hospital. While individualized multidisciplinary care is recommended for hip fracture patients, it might also be suitable for other geriatric hip injuries.

Introduction

Hip fractures (HF) are considered a typical manifestation of frailty and ageing with an abundance of scientific literature and guidelines on the subject. However, other similar injuries due to falls in combination with frailty receive little attention.

Injuries caused by falls account for the highest number of deaths and hospital admissions among older patients. Due to the growing proportion of older people in the population, the problem is expected to increase over the coming decades and to constitute a major economic burden to society [1,2]. A fall affecting the hip can result in HF, hip contusion or pelvic fracture. If a HF occurs, the patient is in the majority of cases hospitalized and undergoes surgery. According to the literature, one-year mortality is 8–36% [3–5]. Retrospective studies on older people with a low-energy pelvic fracture report a mean one-year mortality of 16% [6–9].

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Similar data are not published for patients with hip contusions. Available studies describe a gender distribution similar to HF cohorts [10,11]. Prehospital and hospital emergency care guidelines have been developed for patients with suspected HF [12]. In Sweden patients often receive prehospital fast track care (PFTC), where preoperative procedures are initiated in the ambulance and patients are transported directly to the radiology department, thus by-passing the Accident and Emergency Care (A&E) department [13–15]. Initial radiography identifies a number of patients with other hip injuries (OHI), the most common of which are pelvic fractures and hip contusions. However, the prognosis for those who are not diagnosed with a HF is mainly unknown.

The aim of this study is twofold: i) to investigate the injury pattern of patients assessed in prehospital emergency care as suffering from a suspected hip fracture and ii) to compare clinical outcomes between patients with verified hip fracture (HF) and those with other hip injuries (OHI).

Methods

Study design, setting and patients

A prehospital randomized controlled trial was conducted between July 2012 and May 2014 to compare PFTC with traditional transport to the A&E for patients with a verified HF [15].

The present study is a secondary analysis of the original study data and the sample includes all patients with a suspected HF who were randomized prehospital. The patients who received PFTC and those transported to the A&E were divided into two groups; patients with a verified HF or OHI.

The study was performed in the Region of Halland, Sweden, which has eight ambulance stations that provide a population of 124, 000 people aged 50 years and over with prehospital emergency care and transport to two emergency hospitals.

Eligible patients with suspected HF after a low-energy trauma were consecutively included by an ambulance nurse and randomized using a closed, opaque envelope either to PFTC or to traditional transport to the A&E.

All patients in the study were treated in accordance with the ambulance organization's guidelines, receiving pain treatment, oxygen therapy and intravenous liquid substitution.

Inclusion and exclusion criteria

Only patients triaged by the Rapid Emergency Triage and Treatment System (RETTS) as yellow or green (i.e. not in a life-threatening condition) were considered for inclusion [16]. Exclusion criteria were age <50 years old, head injury, symptoms of myocardial infarction, other fractures or previous surgery on the affected hip.

Prehospital fast track care (PFTC)

The patients randomized to PFTC were transported directly to the radiology department. If the x-ray verified a hip fracture, the patient was transported to the orthopaedic ward for preoperative care. In cases where no hip fracture was found, she/he was transported to the A&E for further assessment and a decision about treatment.

Accident and emergency (A&E) care

Patients randomized to the A&E were transported there for examination by an orthopaedic surgeon before transport to the radiology department. After radiographic examination the patient was moved back to the A&E, where she/he was placed in an examination room or a corridor to await the treatment decision. The patients with a verified HF or OHI requiring hospital care were transported to the orthopaedic ward.

Data collection

Data for all study participants were collected from various systems. Data on the need for an ambulance within six months of discharge from hospital were collected from the ambulance patient care records. The hospital medical record system provided data on the length of hospital stay (days), postoperative complications, in-hospital mortality, presence of dementia and type of residence. The occurrence of adverse events six months after discharge from hospital and with renewed care were classified according to the ICD-10 coding system. Adverse events with a plausible relationship to the hip injury were chosen.

The American Society of Anesthesiologists (ASA) classification [17] for non-surgery patients was performed by a designated anaesthesiologist. The Swedish National Registry of hip fracture patient care (2015) provided data on ASA classification for patients with verified HF. Information on mortality after four and 12 months was collected from the Swedish population registry.

Statistical analysis

Outcome data for the HF and OHI groups are summarized by descriptive statistics. Fisher's exact test was used for group comparisons (HF/OHI, OHI/discharged immediately or admitted to a ward and type of injury) of characteristic binary/categorical variables (gender, ASA, dementia, type of residence and injury, dementia and admission to the orthopaedic ward) and for outcome variables; mortality, adverse events in hospital and within 6 months and the need for an ambulance. The *t*-test was employed for comparison of the continuous characteristic variable age and the outcome variable length of hospital stay. A multivariate logistic regression analysis was applied to adjust for potential confounding factors on binary outcomes between the HF and the OHI group. The factors used were; gender, age, ASA, dementia and type of residence. P-values < 0.05 were regarded as significant. IBM SPSS 24.0.0 was employed for the statistical analyses.

Ethics

This study was approved by the Regional Ethical Review Board in Lund, Sweden.
(Dnr. 2011/467).

Results

Of 571 patients assessed in prehospital emergency care due to a suspected hip fracture, 22 (4%) were excluded due to being below 50 years of age, other fractures, previous surgery on the affected hip and transport to other hospitals where it was not possible to follow them up. Four-hundred patients (70%) had a verified HF (HF group), while 149 (26%) had OHI (OHI group) (Fig. 1). Forty-six of the patients in the OHI group had a pelvic fracture (mostly fractures of the pelvic rami) and 86 had a hip contusion. 17 patients in this group had other injuries/diseases and were excluded from further analysis (Table 1).

The OHI and HF groups differed regarding prevalence of dementia and life circumstances, with fewer patients who were institutionalized and suffered from dementia in the latter group. No significant differences between the groups were observed for gender, age and ASA (Table 1).

The HF group had a significantly longer duration of hospital stay, 9.5 days compared to 6.3 for the OHI group. After adjustments

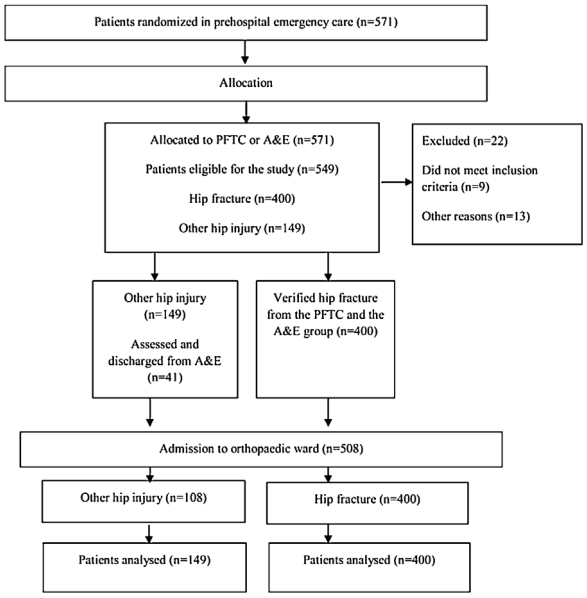

Fig. 1. Flow of patients in the study.

Table 1
Characteristics of patients with other hip injury (OHI) and hip fracture (HF).

	Other hip injury (n = 149)	Hip fracture (n = 400)	*p* value
Men (n)	52 (35%)	133 (33%)	0.76[1]
Women (n)	97 (65%)	267 (67%)	
Age			
Mean (year)	82.6	82.2	0.66[2]
Median	84	84	
Min-max	57–103	50-103	
ASA[3] (n)			
1-2	77 (52%)	228 (57%)	0.29[1]
3-4	72 (48%)	172 (43%)	
Dementia (n)	39 (26%)	73 (18%)	0.04[1]
Residence (n)			
Own home	93 (62 %)	300 (75 %)	<0.001[1]
Institutionalized	56 (38 %)	100 (25 %)	
Injury (n)			
Femoral neck		207	
Trochanteric		157	
Sub trochanteric		36	
Pelvic fracture	46		
Hip contusion	86		
Trochanteric avulsion	6		
Hip infection	4		
Dislocation of arthroplasty	4		
Lumbago	3		

[1]Fisher's exact test, [2]*t*-test, [3] Estimated by anaesthesiologist for non-surgically treated patients as well.

to binary outcomes with logistic regression analysis, the HF group had more adverse events while hospitalized; 34% compared to 19%. Mortality while hospitalized as well as at 4 and 12 months was similar for both groups; 4% vs. 2%, 16% vs 13% and 21 vs 23% respectively. The groups suffered adverse events within 6 months of discharge to the same extent; 24% in the OHI and 22% in the HF group. They had a similar need of further ambulance transport within 6 months of discharge; 40% and 34% respectively, thus there was no significant difference (Table 2).

Not all OHI patients were admitted to a hospital ward; 41 (27%) out of 149 were discharged from the A&E directly. Table 3 compares these 41 patients with OHI patients who required in-patient care. Out-patients more often had hip contusions (83% compared with 48% for those who required in-patient care), a lower ASA classification and were more frequently institutionalized. Nevertheless, their outcomes were similar.

All data employed in the comparisons between the two OHI subgroups are presented in the supplementary table. The proportion of women in the contusion subgroup was 58%, while women constituted 80% of the pelvic fracture subgroup. Twice as many in the contusion subgroup were institutionalized before their injury. Otherwise, these groups were similar in terms of age, ASA class and prevalence of dementia. 91% of the pelvic fracture patients were admitted to a ward, compared to 60% in the contusion subgroup. The latter had a shorter hospital stay and fewer adverse events while hospitalized. In the first six months after discharge, the occurrence of adverse events and need for an ambulance were similar in the two groups. Mortality at one year was 24% after pelvic fracture and 25% after hip contusion (Supplementary Table).

Discussion

This study shows that several patients with suspected hip fracture actually had pelvic fractures or hip contusions. Nevertheless, these patients have poor outcomes after discharge from hospital in terms of adverse events and mortality as the HF patients. Moreover, the need for subsequent ambulance transportation was equally common.

Injury patterns

Almost one in every four patients was diagnosed with a pelvic fracture or hip contusion, where hip contusion occurred twice as often as pelvic fracture. Although no surgery was required, the majority of the patients were admitted to an orthopaedic ward for medical care and mobilization. However, some were considered for discharge from the A&E.

The need for knowledge of injury patterns in older patients in order to improve outcomes has previously been described by Aschkenasy and Rothenhaus [18]. Our findings contribute new knowledge on patients treated for suspected HF in prehospital emergency care and the relationship of actual HF.

Length of stay, adverse events and mortality

When compared to those with OHI, the HF patients had more adverse events during their hospital stay and a longer period of hospitalization, which can be explained by the surgical intervention. However, the mortality rate and rate of subsequent adverse events were similar for both groups. Low-energy pelvic fractures are mainly treated non-operatively with pain relief and mobilization [19,20]. The few retrospective studies and the only local register study that have been published report mean one-year mortality as 16% [6–9].

Increased mortality after a pelvic fracture among institutionalized older people has previously been reported [21]. However, these results may be influenced by patient selection. In our prospective material, only patients with the clinical signs of a HF were included, i.e., the OHI group was similar to the HF group. Consequently, we found a one-year mortality of 24% after pelvic fracture. In addition to an equally high mortality, a low-energy pelvic fracture led to the same loss of function as a HF [7,9]. Furthermore, the incidence of pelvic fracture appears to increase among older patients [22].

Table 2
Comparison of patient outcomes during hospitalization and after discharge from hospital.

	Other hip injury (n = 149)	Hip fracture (n = 400)	Mean difference	CI (95%)	*p* value
Length of hospital stay [3]					
Mean (days)	6.3	9.5	−3.204	−4.204, - 2.204	<0.001[1]
Min-max	1-31	1- 40			
Adverse events in hospital [2] (n)	29 (19%)	135 (34%)			<0.001[3]
Pneumonia	9	18			
Infection	5	11			
UVI	13	33			
Pressure ulcers	2	44			
Mortality (n)					
In hospital [3]	3 (2%)	15 (4%)			0.28[3]
After 4 months	19 (13%)	65 (16%)			0.06[3]
After 12 months	34 (23%)	83 (21%)			0.71[3]
Readmission to hospital and adverse events within 6 months of discharge (n)	36 (24%)	89 (22%)			0.74[3]
Ischaemic heart disease	4	4			
Congestive heart disease	6	16			
Arrhythmia	0	4			
Stroke	1	1			
Pneumonia or other infection	5	12			
Thrombo embolic event	1	6			
Renal failure	0	3			
Obstipation or other gastrointestinal diseases	1	7			
Hyperglycaemia	0	1			
Intoxication	0	1			
Urinary tract infection	4	8			
New fracture	7	11			
Hip related complication	3	10			
Other musculoskeletal problems	4	5			
Need of ambulance transport to hospital within the first 6 months of discharge (n)	60 (40%)	135 (34%)			0.30[3]

[1] *t*-test, [2] Refers to 108 patients admitted to a ward (41 were discharged to their home from the A&E), [3]Adjusted for age, gender, ASA, dementia and type of residence by means of multivariate logistic binary regression analysis.

Table 3
Characteristics of patients with no hip fracture and type of discharge.

	Admission to orthopaedic ward (n = 108)	Discharge from A&E (n = 41)	*p* value
Men (n)	37 (34%)	15 (37%)	0.85[1]
Women (n)	71 (66%)	26 (63%)	
Age			
Mean (year)	83.09	81.37	0.33[2]
Median	85	83	
Min-max	57-103	60-93	
Injury (n)			
Pelvic fracture	42 (39%)	4 (10%)	<0.001[1]
Hip contusion	52 (48%)	34 (83%)	<0.001[1]
Other	14 (13%)	3 (7%)	0.40[1]
ASA (n)			
1-2	50 (46%)	27 (66%)	0.04[1]
3-4	58 (54%)	14 (34%)	
Residence (n)			
Own home	77 (71%)	16 (39%)	<0.001[1]
Institutionalized	31(29%)	25 (61%)	
Adverse events within 6 months of discharge from hospital (n)	31 (29%)	5 (12%)	0.05[1]
Ambulance transport to hospital within 6 months of discharge (n)	47 (44%)	13(32%)	0.26[1]
Mortality within 12 months of discharge (n)	29 (27%)	5 (12%)	0.08[1]

[1] Fischer's exact test, [2]*t*-test.

If radiography, including MRI, does not reveal any fracture, the patient is diagnosed with hip contusion. Published data on hip contusion are scarce. A Finnish study found that hip contusions constitute 8% of all fall injuries in institutionalized older people [10], a majority (71–82%) of whom are female [10,11]. Due to the lack of published data we are unable to compare our finding of a 25% one-year mortality after hip contusions with other sources.

Readmission within six months and adverse events

The outcome after injuries due to frailty can also be described in terms of adverse events. One fifth of the HF patients in the present study were readmitted to hospital within 6 months. This is somewhat lower than in previous studies, where approximately one third were readmitted [23–25]. Furthermore, cardiac diseases and infections were the most common reasons for readmission, followed by orthopaedic events. Similar findings have been reported in previous studies with follow-up periods from 30 days to 12 months [26,27].

Our finding of pneumonia in 3% of both the OHI and the HF group is lower than the 5–16% that has been reported in HF patients [28–32]. The rate of symptomatic thromboembolic events in both groups (1–3%) was similar to other studies on HF cases [30,33]. The fact that HF patients are more often readmitted for medical as opposed to surgery-related reasons has been recently confirmed by a systematic review [34].

Patients who escape a hip fracture and “only” have a pelvic fracture or hip contusion are often left without organized rehabilitation and follow-up. These injuries are considered less serious. Our data reveal that those patients are recruited from the same frail group as HF patients. Accordingly, the same comprehensive geriatric assessment recommended after HF today may also be suitable for improving the care of OHI patients [35]. Kammerlander et al. reviewed the literature and found that integrated care was associated with lower mortality and shorter length-of-stay [36]. A geriatric fracture programme co-managed by a geriatrician and an orthopaedic surgeon in combination with extended physiotherapy at home and cholecalciferol supplementation can reduce the risk of readmission for HF patients [37,38].

Repeated ambulance transport

Within six months of discharge from hospital, one third of the patients called for an ambulance and required unplanned hospital care. Additional ambulance transport among patients over the age of 65 years who had suffered a fall is reported to be 15% within 30 days of discharge and 56% during the first 9 months after discharge [39,40]. Frequent ambulance transport among patients over 65 years might be due to them suffering from a greater number of comorbidities [41]. Accordingly, additional ambulance transport after a fall injury is common among older patients, thus confirming that they constitute a vulnerable population. Fall injuries in older people require comprehensive healthcare resources and the aging population means that healthcare consumption constitutes an increasing economic burden to society. Extensive costs for the treatment and ambulance transport of older patients with a history of fall injuries have previously been described [10]. The health and social care system can be used more effectively to prevent falls. According to guidelines from England [42], individualized multidisciplinary care provided outside hospital is beneficial. A study from England demonstrated that a community based rehabilitation service led to a reduction in falls and ambulance transports [43].

Discharge from the A&E

In 27% of cases where radiography excluded a HF, the patient was discharged from the A&E after a minimum of treatment. In view of the knowledge that frail older patients are at risk of adverse events, loss of function and death irrespective of the type of injury suffered, the need for improved short and long term care is obvious. The A&E department could play a key role in organizing and following up targeted multidisciplinary out-patient care. A randomized study showed a lower rate of hospital admissions and improvements in patients’ mental and physical function when they were referred for comprehensive geriatric assessment after a visit to the A&E [44]. Moreover, information about the patient’s social environment and home situation provided by prehospital emergency care professionals has previously been considered valuable for ensuring a safe return home after discharge from the A&E [18].

Strengths and limitations

By means of prospective recruitment and thorough reading of medical records we have presented outcome data for OHI, both low-energy pelvic fracture and hip contusion, thereby contributing important knowledge. Hip contusion, in particular, has not previously been described in these terms. To the best of our knowledge, no earlier study has followed up outcomes after advanced prehospital and acute care for patients with suspected HF, who were verified as having other injuries. Some limitations should be taken into account. The result is based on a small sample and the occurrence of other injuries such as pelvic fractures and hip contusions might be underestimated, as these injuries occur in older patients with more serious co-existing conditions such as head injuries, myocardial infarction, other fractures or previous surgery on the affected hip, all of which were exclusion criteria in the present study.

Conclusion

Older patients who suffer a low-energy pelvic fracture or a hip contusion due to falls are common both in prehospital and emergency care. These patients need attention as they have poor outcomes in terms of adverse events, mortality and recurrent need for ambulance transport after discharge from hospital. Patients with geriatric hip injuries other than hip fractures should not be considered less serious. Future studies should focus on whether these patients could also benefit from individualized multidisciplinary care as recommended for hip fracture patients.

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Conflict of interest

We confirm that there are no known conflicts of interest associated with this publication. There has been no financial support for this work that could have influenced its outcome. We confirm that this manuscript is original and has not been submitted elsewhere.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.injury.2019.03.021.

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