

ORIGINAL ARTICLE

Functional outcome and discharge destination in elderly patients with spinal cord injuries

A Gulati¹, CJ Yeo², AD Cooney², AN McLean², MH Fraser² and DB Allan²

¹Department of Trauma and Orthopaedics, University Hospitals of Leicester NHS Trust, Leicester Royal Infirmary, Leicester, UK and

²Queen Elizabeth National Spinal Injuries Unit, Southern General Hospital, Glasgow, UK

Study design: Retrospective cohort study.

Objective: To describe functional outcome and discharge destination of elderly patients with traumatic spinal cord injuries.

Setting: National Spinal Injuries Unit, Glasgow, UK.

Methods: We collected data for 5 years on all patients >65 years old with a traumatic spinal cord injury treated at the National Spinal Injuries Unit.

Results: We identified 39 patients. Of these, nine patients died during admission; all had cervical spine injuries. The mean age of the 30 survivors was 73 years (range 65–88). The most common cause of injury was a fall: 26 patients (87%). In addition, 21 (70%) sustained injury to cervical cord, 3 (10%) had thoracic and 6 (20%) had lumbar spine fractures. In all, 23 patients (77%) were treated by orthosis and 7 (23%) underwent surgical intervention. Twelve (40%) patients showed an improvement in American Spinal Injury Association impairment scale. The median hospital stay was 136 days. Thus, 11 patients (37%), all with incomplete injuries, were discharged home, 10 (33%) were transferred to nursing homes/community hospitals and 9 patients (30%) were discharged back to the referring hospital, while they were awaiting adjustments at home. Patients who were discharged home had significantly higher Functional Independence Measure scores, both at the onset of rehabilitation and at discharge, than those who were discharged to a nursing home or other hospitals ($P < 0.01$ and < 0.001 , respectively).

Discussion and conclusion: Although the elderly patients may benefit from the services of a dedicated spinal injuries centre, they should be carefully selected. The patient, relatives as well as the referring doctors should be alerted to the likely long-term outcomes early in the course of the injury. Elderly patients with complete lesions of the spinal cord will almost certainly remain institutionalized. Early endeavour should be made to find alternate rehabilitation settings with a lower-intensity treatment.

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Introduction

In the United Kingdom, an increase in life expectancy has led to a rise in the elderly population. This increase, along with age-related changes in the biomechanical characteristics of the vertebral column, has resulted in an increased incidence of spinal cord injuries in this age group.^{1–4}

An injury in an elderly patient is associated with a higher mortality and an increased frequency of life-threatening complications, and this is particularly true for spinal cord injuries.^{1,2,5–8} Injuries are compounded by coexisting morbidities, reduced independence and poor tolerance of immobilization.^{9–12} These problems can complicate the rehabilitation of elderly patients and health-care systems

are facing challenges in effectively and efficiently treating the injuries of these patients.^{1,2,7,13}

We had noted an increasing number of elderly patients with spinal injury and had found difficulties in their rehabilitation and safe discharge because of the problems described above. The aim of this study was to describe the outcomes of spinal cord injury in an older population within a National Spinal Injuries Unit.

Materials and methods

The Queen Elizabeth National Spinal Injuries Unit in Glasgow is situated in a Scottish university teaching hospital. The unit accepts referrals for patients with spinal cord injuries in Scotland (population 5.1 million). It also infrequently receives patients with non-traumatic spinal cord damage such as cord ischaemia, abscess and so on. Most of

Correspondence: Dr A Gulati, Department of Trauma and Orthopaedics, University Hospitals of Leicester NHS Trust, Leicester Royal Infirmary, Leicester, LE1 5WW, UK.

E-mail: gulatiaashish@doctors.org.uk

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the patients are transferred to rehabilitation ward from the High Dependency Unit after their acute injury and medical problems have been treated, but some are admitted directly for rehabilitation after initial management at other hospitals. Hence, patients starting their rehabilitation are at variable times from the time of injury.

The study covered the period from January 2000 to September 2005. We searched the Unit's database for all patients >65 years of age who had sustained a spinal cord injury after trauma. The notes of all those identified were retrieved and analysed. We only included patients with neurological deficit. Exclusion criteria were patients with incomplete notes and patients with non-traumatic spinal cord injuries (for example, those because of abscesses or non-traumatic ischaemia).

We collected demographic data, cause of injury, level of injury, type of cord injury, associated injuries, discharge outcome and hospital stay. We recorded American Spinal Injury Association¹⁴ (ASIA) impairment scale (AIS) and ASIA motor scores at the time of injury and before discharge. The Functional Independence Measure Score¹⁵ (FIM) was recorded at acute admission, beginning of rehabilitation and discharge. A higher ASIA motor score indicates increasing motor power and a higher FIM score denotes a greater level of independence. The FIM scores were analysed separately for patients with complete and incomplete injuries.

For the outcome measures, two-tailed Student's *t*-test was used to compare differences in data between the groups. The α -level of significance was defined as 5%. SPSS 12.0.1 for Windows (SPSS Inc., Chicago, IL, USA) software was used for statistical analysis of the data.

Results

We found 39 patients, of which nine died in the unit after a median of 44 days (3–268 days). Of these nine patients, five patients died because of respiratory complications, two as a result of gastrointestinal causes, one from myocardial infarction and one patient died of septicaemia. Patients dying of bronchopneumonia developed this complication at different times after the admission (4–160 days). One patient died because of respiratory failure 44 days after the accident and another patient had sudden-onset unexplained gastrointestinal bleeding 168 days after the injury. They did not have any predisposing comorbidities. The patient who developed myocardial infarction died 44 days after the injury. All patients who died had sustained cervical spine injuries, of which seven had a complete lesion (AIS A) of the spinal cord and two were incomplete, with AIS B. None of the patients who died underwent surgical fixation. The mean age of the 30 remaining patients was 73 years (range 65–88 years) and this cohort of patients was used for statistical analysis.

Duration between the injury and admission

The median duration between the injury and admission to the unit was 7.5 days (mean 14.8 days, range 1–127 days).

Cause of injury

The most common cause of injury was a fall in 26 patients (87%); 15 patients (50%) fell from a height of <1 m and 11 patients fell down the stairs (37%). The remaining four patients (13%) were involved in automobile accidents as occupants or pedestrians.

Level of injury

The majority of patients (70%) sustained an injury to the cervical spine. Three patients (10%) had thoracic spine injuries and six patients (20%) had lumbar spine injuries. The most common cervical injury was at the level of C5.

Mode of treatment

Of the total, 23 patients (77%) were treated conservatively with a collar, brace or halo jacket, and 7 patients (23%) underwent surgical intervention.

ASIA impairment scale and motor scores

A total of 24 patients (80%) sustained an incomplete spinal cord injury and the remainder had a complete lesion (AIS A). Thus, 12 (40%) showed an improvement in their AIS on discharge: 2 patients (33%) improved from AIS A to C, 2 patients (100%) improved from AIS B to D, 7 (77%) improved from AIS C to D and 1 patient (8%) improved from AIS D to E. No patient suffered deterioration (Table 1). The mean ASIA motor score improved from 67.9 to 87.6 in patients with incomplete neurological deficit and from 23.3 to 32.5 in those with complete cord lesions (Table 2).

Hospital stay

The median hospital stay for patients was 136 days. The patients with complete neurological deficits stayed for a median of 172 days and the patients with incomplete spinal cord injuries were hospitalized for a median of 84 days.

Table 1 ASIA impairment scale at admission and discharge

ASIA impairment scale	At admission		At discharge
	Deceased patients	Surviving patients	
A	7	6	4
B	2	2	0
C		9	4
D		13	21
E		0	1

Abbreviation: ASIA, American Spinal Injury Association.

Table 2 Mean ASIA scores throughout admission by level of completeness

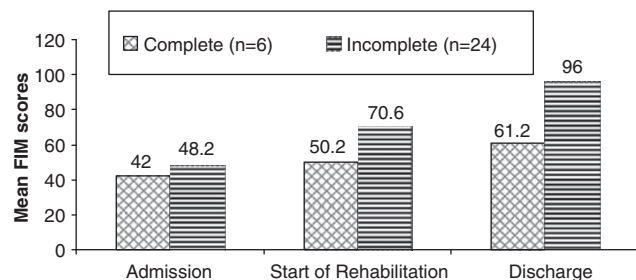
Type of injury	Mean ASIA score	
	Admission	Discharge
Complete (<i>n</i> = 6)	23.3	32.5
Incomplete (<i>n</i> = 24)	67.9	87.6

Abbreviation: ASIA, American Spinal Injury Association.

Table 3 FIM scores throughout admission by level of completeness

	Mean FIM score		
	Admission	Start of rehabilitation	Discharge
Type of injury			
Complete (n=6)	42.0	50.2	61.2
Incomplete (n=24)	48.2	70.6	96.0

Abbreviation: FIM, Functional Independence Measure.

**Figure 1** FIM scores throughout admission by level of completeness.

FIM outcome

The FIM scores were recorded at the time of admission, on commencing rehabilitation and immediately before discharge (Table 3 and Figure 1).

Residence after discharge

In all, 11 patients (37%), all with incomplete injuries, were discharged home and they had significantly higher FIM scores at the onset of rehabilitation and discharge than for those discharged to a nursing home or other hospital ($P < 0.01$ and $P < 0.0001$, respectively). Those discharged home also had a significant ($P < 0.005$) improvement in their FIM score from the onset of rehabilitation to discharge (Table 4 and Figure 2). No patient with a complete cord lesion could be discharged home from the Unit.

Discussion

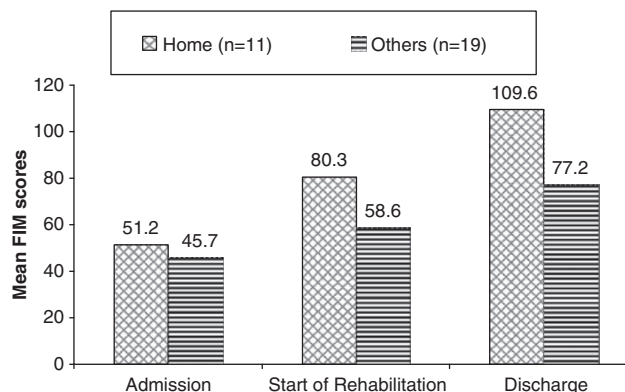
We investigated the outcome of spinal cord injury in patients > 65 years old, because in the United Kingdom there is a reduction in community funding for home care and social benefits for patients above this age. The average age of patients in our study was 73 years, and before this study our clinical impression was that significantly paralyzed older patients are rarely discharged home. This suspicion was confirmed: none of the patients with complete (AIS A) injuries returned home.

Mortality in the present study was high; $> 50\%$ (7 out of 13) of elderly patients with AIS A paralysis died during the initial admission. We speculate that overall national mortality in this group must be higher still. Unpublished review of referrals to our unit shows that elderly patients were referred but not admitted because they were either too unwell or had multiple co-morbidities that precluded any realistic prospect of transfer and rehabilitation in the spinal unit.

Table 4 FIM scores throughout admission by discharge destination

	Mean FIM score		
	Admission	Start of rehabilitation	Discharge
Discharge destination			
Home	51.2	80.3	109.6
Other	45.7	58.6	77.2

Abbreviation: FIM, Functional Independence Measure.

**Figure 2** FIM scores throughout admission by discharge destination.

The main cause of spinal cord injury in this study was falls (87%), and half of these patients fell from a height of < 1 m. Various studies have attributed falls as a cause of spinal cord injury in the elderly in 46–77% patients, but the incidence was slightly higher in our study group.^{1,2,4,6,13} The majority of falls from less than standing height may emphasize the age-related reduced capability of the spine to withstand the mechanical stress^{3,4} or a higher tendency to falls in this group. Injuries as a result of violent acts and automobile accidents (13%) were on the lower side of the reported range for this group^{7,16} of 12–33%.

The majority of patients were treated conservatively with a collar, brace or halo jacket, and 23% patients underwent operative fixation of their spinal injury. The decision to operate on patients with a spinal cord injury was based on a risk-benefit analysis of surgery and whether fixation of a spinal fracture would facilitate earlier rehabilitation. The role of acute decompression in spinal cord injury remains controversial and patients were not selected for surgery in the expectation of neurological improvement. None of the patients suffered a decline in ASIA motor scores (Table 2), but some studies have documented neurological deterioration ranging from 1.8¹⁷ to 4.9%¹⁸ of cases. However, Marshall *et al.*¹⁸ suggested that these changes does not necessarily imply a failure to provide optimal care. Instead, they should be accepted as the inevitable product of an attempt to manage patients with an unstable spinal column and spinal cord injuries.

Our study found that two patients (33%) improved from AIS A to C, two patients (100%) improved from AIS B to D, seven (77%) improved from AIS C to D and one patient (8%) improved from AIS D to E. Although the absolute numbers

are small, we suggest that some older patients with a significant paralysis can expect motor improvement, although not necessarily an increase in function. This rate of improvement was higher than rates reported by Alander *et al.*,⁹ in which none of the patients with complete cord injury improved, and all required extensive care. Fisher *et al.*¹⁹ concluded that the motor recovery does not occur below the zone of injury for patients with complete spinal cord injury, and Marino *et al.*²⁰ suggested that the recovery of neurological deficit after spinal cord injury is dependent on the aetiology and the severity of the injury and so is the improvement in the motor scores.

A total of 37% of patients were discharged home after primary rehabilitation. Initial FIM score and mean improvement in FIM score were considerably higher for patients who were discharged home and this finding was comparable to the findings of other researchers.^{2,13} None of the patients with complete cord lesions were discharged to their original home; we believe this reflects the effect of age and severity of injury on discharge disposition. Further research is needed to clarify the predictive value of severity of an injury towards 'the likelihood of institutionalization' for older spinal patients.² Long-term prospective prognostic studies may help identify patients who would most likely not benefit from admission to a dedicated rehabilitation centre, for example, patients with complete cervical cord injuries. This information may also provide guidance for difficult resuscitation decisions.

We suggest that older patients with a traumatic spinal cord injury can benefit from the services of a dedicated spinal cord rehabilitation centre, but this population does pose acute management and rehabilitation challenges. The initial mortality of patients aged >65 years with complete (AIS A) injuries was very high (>50%), and is likely to be still higher in patients who are too unfit for transfer to the spinal unit. We believe that this study is generally representative of the UK medical and rehabilitation practice, and we suggest that surviving patients with complete lesions of the spinal cord will almost certainly remain institutionalized, as will many of those with incomplete injuries. The patient and relatives, as well as the referring doctors, should be alerted regarding the likely long-term outcomes early in the course of the injury, and we suggest that future care and placement should be arranged with appropriate agencies at the earliest opportunity.

Conflict of interest

The authors declare no conflict of interest.

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