Spinal Cord (2006) 44, 445–448

www.nature.com/sc

Original Article

Review of spinal cord injuries in Ireland

RJ O'Connor*,[1] and PC Murray[2]

[1]*Academic Department of Rehabilitation Medicine, University of Leeds, Leeds, UK;* [2]*National Rehabilitation Hospital, Dun Laoghaire, Co. Dublin, Ireland*

Study Design: Prospective data collection on all patients with spinal cord injury (SCI) admitted for a comprehensive management programme.
Objectives: To examine the epidemiology of SCI in Ireland over 1 year.
Setting: Ireland's National Spinal Cord Injury Centre.
Methods: Systematic data collection on all patients admitted with SCI for management.
Results: A total of 46 patients (40 males) were admitted from January to December 2000; median age was 37 years (range 6–82 years). In all, 23 of the patients presented with cervical injuries, 19 patients had thoracic injuries. In all, 18 patients had complete injuries (American spinal injuries association (ASIA)). Motor vehicle collisions were the cause of 50% of SCI.
Conclusions: The incidence of SCI in Ireland is 13.1 per million population. Demographic data from this study can go towards improving care for patients with SCI and also in the prevention of SCI.
Spinal Cord (2006) **44,** 445–448. doi:10.1038/sj.sc.3101856; published online 22 November 2005

Keywords: epidemiology; trauma; Ireland

Introduction

Spinal cord injury (SCI) is a life threatening condition that requires a coordinated multidisciplinary approach to manage the injury itself and the potential secondary complications satisfactorily.[1] To enable health services establish the correct level of support for acute management, rehabilitation and ongoing care in the community, accurate figures for the incidence of SCI are needed, as well as a detailed analysis of injury levels and care requirements.

Increasingly, rehabilitation professionals are adding their voices to the call for better prevention of accidents leading to SCI.[2–4] By knowing the causes of SCI in their communities they can contribute to the debate on implementing safety measures. In Ireland, motor vehicle collisions are the principal cause of trauma resulting in serious morbidity, including SCI.[5] Ireland has the third highest rate of motor vehicle collisions in the European Union, with 69% occurring on rural roads.[5] In 1999, the population of Ireland was 3.5 million people, with 2.1 million people living in rural areas.

Drivers of motor vehicles comprise the greatest number of patients involved in collisions in Ireland (38%), followed by cyclists (20%) and motorcyclists (19%);[6] however, injuries sustained by motorcyclists tend to be more severe. Of those involved in trauma in Ireland 74% are under 40 years of age, and the majority of all patients are male (67%).[7]

Ireland has had an organised system of SCI management, coordinated through the National Rehabilitation Hospital (NRH), since the early 1960s.[8] The model of care was based on Sir Ludwig Guttmann's spinal injury unit at Stoke-Mandeville Hospital in the UK. The objective of this study was to develop an Irish database of patients admitted for management of acute SCI to facilitate planning of service provision based on patient requirements.

Methods

All patients admitted to the NRH during the year 2000, for management following SCI, were prospectively included in the database. The NRH offers a multidisciplinary team approach to SCI that includes rehabilitation physicians, rehabilitation nurses, physiotherapists, occupational therapists, social workers, psychologists and rehabilitation engineers as required. The hospital offers acute rehabilitation services as well as life-long review with particular regard to long-term urological management.

The NRH also provides a medical team with specialised equipment, including a stretcher with traction facility and a ventilator, for helicopter transfers of patients from outlying hospitals to Dublin. A 24-h

*Correspondence: RJ O'Connor, Academic Department of Rehabilitation Medicine, University of Leeds, Leeds LS2 9NZ, UK

telephone consultation service is available to medical teams managing patients prior to admission. Early consultation with and referral to a spinal cord injury centre has been shown to reduce the incidence of complications following SCI.[9] Initial management of patients with SCI occurs in the local hospital, where patients are stabilised, before transfer to a neurosurgical centre in Dublin or Cork, or the orthopaedic unit of the Mater Hospital in Dublin. Here, patients receive operative intervention if necessary before transfer for further management and rehabilitation to the NRH.

One of the authors (ROC) completed the dataset as recommended by the British Association of Spinal Cord Injury Specialists on all patients on admission. This includes age, sex, date of injury, level of injury, mechanism of injury, place of residence and management. This data was collated in a Microsoft Excel spreadsheet and statistical analysis was performed by SPSS version 11.[10]

Results

Over the 1-year of the study, 46 patients were admitted to the NRH following SCI due to trauma. The incidence rate for SCI in Ireland for this year was 13.1 per million population per year. Of those admitted, 40 patients (87%) were male. The median age of patients was 37 years (range 6–82 years). There was a bimodal distribution of ages with the largest number occurring in the 20–30 year age range, and a second increase in the 50–60 year age range (Figure 1).

Motor vehicle collisions accounted for 50% of injuries (Table 1). In all, 11 patients (24%) were car drivers, five (11%) were car passengers, four (9%) were motorbike drivers, two were cyclists and there was one motorcycle passenger and one pedestrian. The median age of patients involved in motor vehicle collisions was 25 years (range 6–82 years). Falls were the second most common cause of injury with 17 patients (37%) affected. Falls from an elevated height, such as stairs, ladders and roofs, were responsible for the injuries of 13 patients. Six of these patients were injured in the course of their work. One fall was associated with an attempt at self-harm. Falls on same level, for example slips or trips, occurred in four cases. The median age of patients who were injured in a fall was 53 years (range 28–79 years). Four patients (9%) were injured during sports or recreational activities. Two patients were thrown from horses; one was injured skiing and one diving into shallow water. One patient sustained an injury during a clinical procedure. There were no injuries caused by assaults or gunshot wounds.

In all, 23 patients (50%) presented with cervical injuries; 19 patients (41%) had thoracic injuries and four (9%) had lumbar injuries. Most injuries (16) were at the C4/C5 level, with a second peak in the mid-thoracic region (Figure 2). All patients had some degree of neurological compromise at the time of admission. A total of 18 patients (39%) presented with motor and sensory complete injuries (ASIA Impairment Scale A). Eight patients had sensory incomplete and the rest had motor incomplete injuries (Table 2).

A total of 17 patients sustained other injuries in association with an SCI. Of all, 13 were patients who were injured in motor vehicle collisions, and four were involved in falls. Chest injuries were the most common extra-spinal injury (nine patients) followed by limb fractures (eight patients). Four patients had associated head injuries and three patients had pelvic fractures.

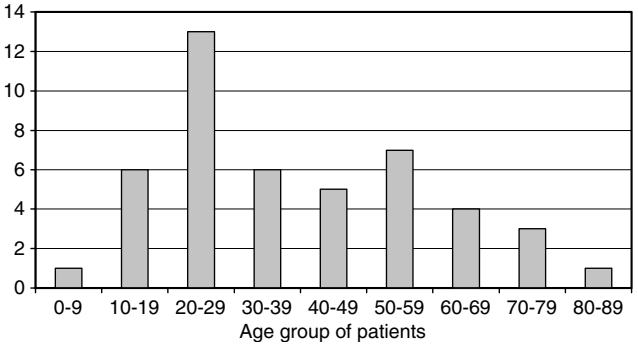

Figure 1 Age groups of patients.

Table 1 Aetiology of SCI

Aetiology	*Number of patients (%)*
Motor vehicle collision	23 (50)
Fall	17 (37)
Work-related falls	6 (13)
Self-harm	1 (2)
Other work-related	1 (2)
Sport	4 (9)
Iatrogenic	1 (2)

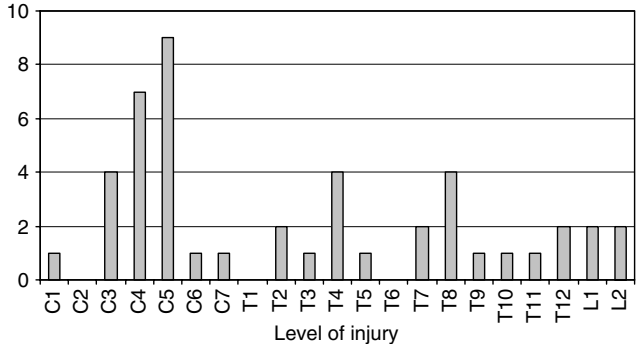

Figure 2 Distribution of SCI by level of lesion.

Table 2 Neurological impairment of patients

ASIA Impairment Scale	*Number of patients*
A	18
B	8
C	5
D	15
E	0

A total of 20 patients had operative intervention comprising decompression and instrumentation. Seven patients had a decompressive operation and three patients had instrumentation alone. A total of 16 patients had no operative intervention for their SCI. Eight patients (17%) required ventilatory support after their injuries. Six were patients with high cervical injuries, and two patients had thoracic level injuries but associated chest injuries.

The mean length of time from injury to admission to the NRH was 34 days (SD 38; range 5–211 days). Four patients had lengths of time from injury to admission greater than 70 days. When these four patients were excluded from the analysis of the mean length of time to admission, the mean time was 23 days. Two of these patients received their initial rehabilitation in other facilities before transfer to the NRH; the other two patients required prolonged periods of treatment for their associated injuries before transfer.

With respect to the timing of SCI it was noted that September, May and March had the highest incidences for injury (Table 3). On a week-to-week basis, Saturday and Sunday were the days on which nearly 40% of injuries occurred (Table 4).

Patients were referred from all over Ireland, mainly from outside the major urban centres. There were patients from 22 of the 26 counties of Ireland during the study period. The capital is situated in Dublin where one-third of the population lives but this county represented only 17% of all admissions to the hospital.

Table 3 Month of injury

Month	*Number of patients*
January	2
February	3
March	8
April	2
May	7
June	1
July	1
August	4
September	9
October	5
November	4
December	0

Table 4 Day of injury

Day of week	*Number of patients*
Monday	5
Tuesday	4
Wednesday	4
Thursday	7
Friday	7
Saturday	9
Sunday	9

Discussion

A detailed understanding of the epidemiological, demographic and pathological features of SCI within a national system of care is vital to directing further system development, determining the priorities for funding and resource management, and identifying the greatest potential for injury prevention. We performed such an analysis on all SCI referred for rehabilitation over a 1-year period. Our database set out to explore the epidemiology of SCI in Ireland. No figures have previously been available for the incidence or severity of SCI in Ireland, or its causes.

This study has a number of limitations. Firstly, the small number of patients precludes comprehensive statistical interpretation of the results. This is due to the limited geographical area covered and data collection over only 1 year. This is the most likely explanation for the relatively small number of female patients in this study. Secondly, we have no information on patients who died before being referred to the NRH or who sustained only spinal column injuries and were managed by local units. As the NRH is the only SCI rehabilitation centre in Ireland, the results of this study reflect patients who sustained moderate to severe injuries associated with neurological deficits. As such, the true incidence of SCI in Ireland is likely to be higher.

In common with studies in other countries, SCI predominately affects younger males. Motor vehicle collisions, followed by falls, are the main causes of SCI in developed countries. The results of this study are in keeping with registers from other SCI centres in Europe, North America, Australia and New Zealand.[11–16] Higher incidence rates are seen in less developed countries with lower levels of road safety and a more agricultural economy.[17,18] Nevertheless, in a study of work-related injuries in Australia, O'Connor found that 13% of injuries were due to incidents in the work-place.[19] And work related injuries comprised 15% of injuries in this series from Ireland. That there were no penetrating injuries due to gunshot wounds or stabbings reflects the strict weapon control laws in Ireland. Other studies have revealed rates of SCI due to penetrating gunshot wounds as high as 17% of all admissions.[20] Sport is frequently mentioned in respect to SCI. Again, the incidence of sport-related SCI is similar to that seen in other countries.[21] Relatively greater numbers of patients were injured in rural areas. This is a reflection of all trauma-related injuries in Ireland, and is also seen in other countries with rural populations.[22]

One interesting point that emerged during the study was that the Christmas and holiday period surrounding Easter-time have low incidences of SCI compared to the rest of the year. It is possible that increased police surveillance during these festive periods encourages more responsible driving habits. However, the higher incidence at weekends is not as surprising. Factors that influence this may include the use of alcohol and other substances that impair judgment leading to motor

vehicle collisions and falls. Information on these agents was not collected during the study.

The results of this study have important implications for the prevention of SCI and other serious injuries. More resources are required in road safety education and law enforcement to prevent motor vehicle collisions. The findings of this study have been discussed with the Department of Health in Ireland, and have been included in a number of road safety publications. Furthermore, employers should be aware of the potential of work-related SCI amongst employees who work at a height, and appropriate safety equipment should be provided. Setting up the database of patients required considerable time on the part of the authors to collect and collate the information. This is a problem encountered by all spinal injury units and needs to be addressed with adequate funding and dedicated personnel.[23] The database in the NRH is undergoing constant updating and will form part of the larger information network shared by SCI centres in the UK and Ireland.

This study has demonstrated the incidence of SCI resulting in neurological disability in a geographically defined population. Those at highest risk of injury are males in their 20s. Motor vehicle collisions and falls are the most common causes for SCI in Ireland. More resources are required to reduce the incidence of this devastating injury and ameliorate its impact in patients at the most productive time of their life.

References

1 Inman C. Effectiveness of spinal cord injury rehabilitation. *Clin Rehabil* 1999; **13**(Suppl 1)**:** 25–31.
2 Bedbrook GM. Update on spinal cord paralysis. A preventable injury, a surgical challenge? *Aust N Z J Surg* 1991; **61:** 478–481.
3 Miller TR, Luchter S, Brinkman CP. Crash costs and safety investment. *Accid Anal Prev* 1989; **21:** 303–315.
4 Okonkwo CA. Spinal cord injuries in Enugu, Nigeria – preventable accidents. *Paraplegia* 1988; **26:** 12–18.
5 Street JT, Winter D, Buckley S, Nicholson P, Twomey A. Trauma on rural roads: the role of a peripheral hospital. *Injury* 1999; **30:** 337–340.
6 Cunningham C, Howard D, Walsh J, Coakley D, O'Neill D. The effects of age on accident severity and outcome in Irish road traffic accident patients. *Ir Med J* 2001; **94:** 169–171.
7 Eguare E, Tierney S, Barry MC, Grace PA. Management of head injury in a regional hospital. *Ir J Med Sci* 2000; **169:** 103–106.
8 Gregg TM. Organisation of a Spinal Injury Unit within a Rehabilitation Centre. *Paraplegia* 1967; **5:** 163–166.
9 Aung TS, el Masry WS. Audit of a British Centre for spinal injury. *Spinal Cord* 1997; **35:** 147–150.
10 SPSS. *SPSS for Windows* Release 11.0 ed. New Jersey: SPSS 2002.
11 van Asbeck FW, Post MW, Pangalila RF. An epidemiological description of spinal cord injuries in The Netherlands in 1994. *Spinal Cord* 2000; **38:** 420–424.
12 Prasad VS, Schwartz A, Bhutani R, Sharkey PW, Schwartz ML. Characteristics of injuries to the cervical spine and spinal cord in polytrauma patient population: experience from a regional trauma unit. *Spinal Cord* 1999; **37:** 560–568.
13 Burke DA, Linden RD, Zhang YP, Maiste AC, Shields CB. Incidence rates and populations at risk for spinal cord injury: a regional study. *Spinal Cord* 2001; **39:** 274–278.
14 Dixon GS, Danesh JN, Caradoc-Davies TH. Epidemiology of spinal cord injury in New Zealand. *Neuroepidemiology* 1993; **12:** 88–95.
15 Biering-Sorensen E, Pedersen V, Clausen S. Epidemiology of spinal cord lesions in Denmark. *Paraplegia* 1990; **28:** 105–118.
16 Gjone R, Nordlie L. Incidence of traumatic paraplegia and tetraplegia in Norway: a statistical survey of the years 1974 and 1975. *Paraplegia* 1978; **16:** 88–93.
17 Solagberu BA. Spinal cord injuries in Ilorin, Nigeria. *West Africa J Med* 2002; **21:** 230–232.
18 Maharaj JC. Epidemiology of spinal cord paralysis in Fiji: 1985–1994. *Spinal Cord* 1996; **34:** 549–559.
19 O'Connor P. Work related spinal cord injury, Australia 1986–97. *Inj Prev* 2001; **7:** 29–34.
20 Farmer JC, Vaccaro AR, Balderston RA, Albert TJ, Cotler J. The changing nature of admissions to a spinal cord injury center: violence on the rise. *J Spinal Disord* 1998; **11:** 400–403.
21 Katoh S, Shingu H, Ikata T, Iwatsubo E. Sports-related spinal cord injury in Japan (from the nationwide spinal cord injury registry between 1990 and 1992). *Spinal Cord* 1996; **34:** 416–421.
22 Dryden DM *et al*. The epidemiology of traumatic spinal cord injury in Alberta, Canada. *Can J Neurol Sci* 2003; **30:** 113–121.
23 O'Connor PJ. Development and utilisation of the Australian spinal cord injury register. *Spinal Cord* 2000; **38:** 597–603.