

Original Article

Pain following spinal cord injury: the impact on community reintegration

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Study design: Prospective, correlational.

Objectives: (1) Describe how pain changes over recovery from admission to spinal cord injury (SCI) rehabilitation, discharge and after 6 months of community living and (2) examine the relationship between pain and community integration at 6 months of community living.

Setting: Tertiary rehabilitation centre, SCI unit, Vancouver, Canada.

Methods: Subjects from 66 consecutive admissions to the SCI Program of a tertiary rehabilitation centre for the treatment of a traumatic SCI during the years 2000–2002 were followed using data from the National Rehabilitation Reporting System (NRS). Information was obtained from NRRS standardized assessments performed on admission, discharge and 6 months of community living. Early community living was defined as 6 months postdischarge. Community reintegration was assessed by the Reintegration to Normal Living Index (RNL). Pain presence, pain impact and pain intensity were assessed using single item Likert-type scales.

Results: In all, 86% of individuals with a SCI reported pain at 6 months postdischarge, with 27% of these individuals reporting pain that impacted on many or most activities. Pain impact and pain intensity were related to the community reintegration ($r = -0.39$ and -0.55 , $P < 0.001$), with pain intensity accounting for 25% of the variance in RNL scores.

Conclusions: Pain is a major consequence of a SCI, impacting on an individual's activities and perception of how well they are integrated into the community. The results of this study highlight the need to address pain during both the rehabilitation phase of treatment and the early transition into the community.

Spinal Cord (2005) 43, 278–282. doi:10.1038/sj.sc.3101702; Published online 30 November 2004

Keywords: spinal cord injury; pain; community reintegration

Introduction

Individuals with a spinal cord injury (SCI) have described pain as the most difficult medical condition to deal with, more so than the loss of motor or sensory function.¹ Pain has been found to be prevalent following a SCI, with rates ranging from 63 to 91% at 1-year postinjury.^{2–4} Of those individuals reporting pain in the first year, up to 71% have reported that pain interfered with daily activities. Rose *et al*⁵ reported that 18% of individuals did not return to work following a SCI because of pain.

Many of the studies examining pain after SCI have been performed on individuals with long-term injuries.^{5–7} However, it would be useful to understand pain during the individual's early transition to the community, as this represents a critical adjustment time. A handful of

longitudinal studies have found that pain is commonly found in individuals with SCI during the first 6–12 months postinjury;^{2–4,8} however, none have examined the impact of pain on community integration during this early transition. From a clinical perspective, an understanding of the early influences of pain is extremely important in providing the most efficacious treatment to ensure a successful re-entry to the community.

Community integration has been described as the ultimate goal in the rehabilitation of individuals following an injury or disability.⁹ The measurement of community integration is varied, with some studies focusing on a single question while others use a multidimensional measure such as the Reintegration to Normal Living (RNL)¹⁰ or the Craig Handicap Assessment and Reporting Technique (CHART).¹¹ No other study has explored the relationship between pain and early reintegration after the first 6 months of community

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living. Therefore, this study examined the impact of pain on a multidimensional community-integration measure (RNL) assessed after 6 months of community living.

The purpose of this study was to (1) describe how pain changes over recovery from a SCI from admission to rehabilitation, discharge and after 6 months of community living and (2) determine the relationship between pain and community integration (RNL) at 6 months of community living.

Methods

The study's research design was a prospective, cross-sectional study using admission, discharge and follow-up data collected from 66 consecutive admissions to the SCI Program of GF Strong Rehab Centre during the years 2000–2002. Data collection was part of the National Rehabilitation Reporting System (NRS) from the Canadian Information and Health Information (CIHI) database and was standardized with regular audits and clinician training to ensure high-quality data.

Inclusion criteria were admissions which involved individuals who (1) sustained a traumatic SCI, (2) were admitted for inpatient rehabilitation at an adult tertiary rehabilitation centre and (3) were over the age of 18. Criteria for rehabilitation admission included the ability to tolerate a full daily activity programme, which included at least 2 h of physical therapy and occupational therapy, in addition to activities with other disciplines as needed (eg, speech, psychology, recreation and social work). Time of discharge was decided by the rehabilitation team and was considered when individuals reached their functional goals.

Measures

For this study, early community living was defined as 6 months postdischarge and refers to data collected at the NRS 6-month follow-up time frame. Physicians, occupational therapists, physical therapists and nursing staff on the SCI Program performed all admission and discharge assessments according to NRS standards. Follow-up assessments were completed in adherence to NRS standards by telephone by a registered physical therapist at 6 months postdischarge.

The study was approved by the local university and hospital clinical research ethics board. Demographic variables collected were age, gender and time since injury.

Injury classification

Severity of injury was measured using the ASIA total motor index, a sum of the scores for 10 select muscles on each side of the body. Each muscle is rated on a 6-point score from 0 to 5 (muscle activity is absent = 0, normal = 5), with a total score ranging from 0 to 100. The ASIA motor score is a widely used measure of motor impairment in SCI¹² and has been found to be both reliable and valid.¹³ Participants were also

categorized by the level of their injury. Those having sustained a cervical lesion were designated as having tetraplegia. All other participants were referred to as having paraplegia. Using the ASIA classification system, participants were also classified as incomplete *versus* complete. ASIA A was considered complete, while ASIA B, C, D were considered incomplete.

Pain measures

Pain measures included the presence of pain (yes/no), pain intensity and pain impact. Participants were asked to rate their pain intensity as mild, moderate or severe on a single-item Likert-type 3-point scale. Pain impact was also rated as pain impacting on no activities, a few activities, some and most activities, using a Likert-type 4-point scale. Categorical pain ratings are widely used in the spinal cord literature and have been found to be a reliable and valid method to assess pain.^{14,15}

Functional independence measure

The motor subscale of the Functional Independence Measure (FIM) was used to measure an individual's level of function. The FIM motor subscale examines an individual's degree of independence on a 7-point scale for 13 activities of daily living (ADL), including self-care, bowel and bladder management, transfers and mobility. Scores range from 13 (totally dependent) to 91 (totally independent). The reliability and validity of the FIM in a SCI population has been well documented.^{16,17} At the time of 6-month community living, the FIM motor score was assessed verbally over the phone with the individual and the caregiver. Strong correlations ($r > 0.80$) have been reported between the FIM motor scores of self-report and observational ratings in individuals with spinal cord injury.¹⁸

Reintegration to normal living index

The RNL index was used to evaluate the perceived degree of reintegration to community living achieved by participants. The RNL Index is a self-report measure that asks individuals to rate their satisfaction on 11 items regarding their perceived physical functioning (eg, 'I move around my community as I feel is necessary'), emotional lives (eg, 'I feel that I can deal with life events as they happen') and social lives (eg, 'I participate in social activities with my family, friends and/or business acquaintances as is necessary or desirable to me'). A 3-point scale was used where a value of 1 was assigned to 'does not describe my situation', 2 to 'partially describes my situation' and 3 to 'fully describes my situation'. Scores range from 11 to 33, with higher scores indicating a greater degree of perceived integration to community living. The RNL has been demonstrated to be a reliable, valid and responsive measure in individuals with musculoskeletal and neurological conditions.¹⁰

Statistical analysis

Descriptive statistics were performed for all variables measured. Owing to the ordinal nature of the data the Spearman's rho was used to assess relationships between pain measures and the RNL. The strength of the correlations was described using correlational descriptors (good to excellent >0.75 , moderate to good $=0.50-0.75$ and fair $=0.25-0.50$).¹⁹ To further examine the relationships between pain and RNL, a linear regression model was constructed to determine the variables assessed at 6 months community living (pain intensity, pain impact, age, FIM motor, time since injury) that were associated with community integration (dependent variable: RNL). Variables were entered in the model at a significance level of $P < 0.05$ and removed from it at $P > 0.1$. Normal probability plots were visually inspected to ensure that assumptions of linear regressions were met. An alpha level of 0.05 was used to identify statistical significance. Statistical analysis was performed with SPSS 11.0.

Results

Participant characteristics are presented in Table 1.

Pain frequency, intensity and impact

On admission, 92% of individuals reported pain, 85% reported pain at discharge and 86% of individuals reported pain at 6 months of community living. Of those individuals that reported pain, 34, 18 and 19%, reported severe pain at admission, discharge and 6 months of community living, respectively. Similarly 53, 25 and 27%, reported pain that interfered on many or most activities at admission, discharge and 6 months of community living, respectively (Tables 2 and 3). The median pain intensity reported at 6 months of community living was 2.0 out of a possible 3.0 and the median pain impact was 2.0 out of a possible 4.0.

Relationship among pain variables

Pain intensity and pain impact at 6 months of community living demonstrated a fair to moderate correlation with the RNL, with r values of -0.39 and -0.55 , respectively ($P < 0.001$) (ie increasing pain related to poorer reintegration). A forward multiple regression analysis found that pain intensity, FIM motor scores and pain impact at 6 months of community living accounted for 37% of the variance in RNL scores. Pain intensity alone accounted for 25% of the variance in RNL scores, with FIM motor scores accounting for an additional 7% of the variance and pain impact accounting for a further 5% of the variance in RNL scores. Age and time since injury were excluded from the

Table 2 Pain intensity at admission, discharge and 6 months of community living (% reporting)

	Mild	Moderate	Severe
Admission ($n = 61$)	11.9	54.2	33.9
Discharge ($n = 56$)	49.0	32.7	18.4
6 months of community living ($n = 57$)	35.1	45.6	19.3

Total $n = 66$. Those not included reported no presence of pain

Table 3 Pain impact on activities at admission, discharge and 6 months of community living (% reporting)

	No impact	Some activities	Many activities	Most activities
Admission ($n = 61$)	17.2	29.7	39.1	14.1
Discharge ($n = 56$)	31.6	43.9	19.3	5.3
6 months of community living ($n = 57$)	40.9	31.8	18.2	9.1

Total $n = 66$. Those not included reported no presence of pain

Table 1 Participant characteristics

Variable	Number of	Mean	SD	Range
Gender (M/F)	49/17			
Paraplegia/tetraplegia	36/30			
Incomplete/complete	30/36			
Age (years)		43.1	14.9	19-75
Time since injury (days)		383	217.5	209-1604
Time since discharge (days)		183	24.0	143-324
ASIA motor score admission		45.6	25.3	0-91
ASIA motor score discharge		51.9	27.8	0-98
FIM motor admission		34.6	18.2	13-78
FIM motor discharge		63.1	25.1	13-91
FIM motor at 6 months community living		65.1	25.0	13-91
Pain presence at 6 months (y/n) community living	57/9			
Pain intensity at 6 months community living ^a		2.0	1.0	1-3
Pain impact at 6 months community living ^a		2.0	1.0	1-4
RNL at 6 months community living		26.9	4.39	15-33

^aMedian and interquartile range presented

Table 4 Linear regression model of RNL (all variables assessed at 6 months of community living)

Variable	Model	Predictor	Beta	Adjusted r ²	r change
RNL	1	Pain intensity	-0.517	0.252	0.267
		Pain intensity	-0.496		
	3	FIM motor	0.282	0.368	0.060
		Pain intensity	-0.335		
		FIM motor	0.253		
		Pain impact	-0.296		

predictor equation and did not account for any additional variance (Table 4).

Discussion

Although reports of pain, pain intensity and pain impact decreased slightly from admission to discharge, a large proportion (86%) of individuals with SCI reported living with pain after 6 months of community living. New *et al*⁴ reported a similar decrease in pain intensity from admission to discharge, although they reported an increase in pain intensity at 12 months postinjury while our study found that the pain at discharge was similar to pain experienced at 6 months of community living. The large proportion of individuals with continuing pain highlights the need to ensure that supports are in place to address pain issues that arise after discharge. Such supports could include out-patient support groups, telephone interviews or early community follow-up assessments.

Although no studies have reported RNL scores for individuals with SCI at 6 months of community living, our findings are comparable to those reported with individuals with long-term SCI living in the community.^{20,21}

Relationship among pain variables and community reintegration

Our results suggest pain impact and pain intensity are both key factors that relate to one's ability to reintegrate to the community, with pain intensity accounting for 25% of the variability, while the addition of the FIM and pain impact accounted for a total of 37% of the variance in RNL scores. This is a worthy finding given that a myriad of factors can potentially influence one's adjustment to the community, including motivation, education, family support, ethnicity and the availability of appropriate resources.^{20,21}

One study that has examined pain and community reintegration reported that individuals with long term SCI (mean length of injury = approx. 7.4 years) who had extreme pain interference reported lower scores on the CHART mobility, social integration, economic self-sufficiency subscales compared to individuals who reported no pain interference.²² The results of our study suggest that pain also has an influence on community

integration during the early transition from rehabilitation to the community.

The fact that pain has been found to play a role in both early and long-term community integration is not surprising. Pain has been found to negatively impact the physical and emotional health and quality of life of individuals with a SCI.²²⁻²⁴ Although there are many definitions of community integration, each includes the idea of participation and involvement in one's roles and activities.²⁵ Therefore, it may be this direct influence of pain on the physical and emotional dimensions of an individual that are indirectly influencing an individual's ability to fully integrate into their community.

One limitation of this study is that participants were from only one rehabilitation programme, which may limit the ability to generalize. Also, this study did not examine types of pain or pain location. In the future, it would be useful to collect data on the type and location of pain so that a detailed examination of pain experiences could be undertaken, although at this time there is no gold-standard for the assessment of pain in individuals with SCI.²⁶

Conclusion

Pain is a major consequence of a SCI, impacting on an individual's activities and perception of how well they are integrated into the community. The results of this study reinforce the need to address pain during both the rehabilitation phase of treatment and the early transition into the community.

Acknowledgements

We would like to acknowledge the grant support of the BC Neurotrauma Fund, salary support award to J Eng from the Canadian Institute of Health Research and Michael Smith Health Research Foundation and clinical input from Karen Anzai and Jenny Young from the Spinal Cord Injury Program from the GF Strong Rehab Centre.

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