Spinal Cord Injury Identified with Violence: Community Reintegration in Urban Areas

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The data from a two-part study comparing outcomes related to firearm injuries versus injuries caused by motor vehicle crashes are reanalyzed from the perspective of an operational definition of antisocial behavior. One hundred sixty-four men with spinal cord injury (77 motor vehicle injuries and 87 firearm injuries) who were at least 2 years post injury completed an in-person interview. The interview included the Beck Depression Inventory (BDI), the civilian version of the Mississippi Scale of Posttraumatic Stress Disorder (M-PTSD), and the Craig Handicap Assessment and Reporting Technique (CHART) as outcome measures. The CHART was used as a measure of community reintegration. The data were categorized into three groups based on combinations of gang involvement and incarceration history. Unlike the findings associated with etiology, groups categorized by indicators of antisocial behavior were shown to be significantly different on all three outcome measures. In addition, correlation patterns between the three outcome measures were different for the three groups. Thus, treatment decisions and outcome expectations based on the superficial category of etiology should be avoided. Impairment, disability, education, employment history, and history of antisocial behavior are the most important factors associated with community reintegration. Key words: *community reintegration, spinal cord injury, violence*

HISTORICALLY, the leading cause of spinal cord injury (SCI) has been motor vehicle crashes. However, in recent years, the proportion of persons who have sustained SCI as a result of causes associated with violence has risen markedly. Within the National Spinal Cord Injury Model System Database, during the period from 1973 through 1978, causes identified with violence accounted for 13.3% of cases entered into the database; from 1979 through 1982, 15.1%; from 1983 through 1986, 17.2%; from 1987 through 1990, 20.8%; and from 1991 through 1994, 30.4%.[1]

Although violence seems pervasive in American society, SCI resulting from etiologies connected with violence is more prominent in facilities with primarily urban, as opposed to rural, catchment areas. In facilities with urban catchment areas, SCIs

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linked to violent causes ranged from 21.1% to 50.0%; in those with rural catchment areas, the range was 6.6% to 21.2%.[2]

Violence comes in many forms. For example, we know of motor vehicle–pedestrian injuries that were inflicted intentionally. Nevertheless, one usually associates SCI owing to violence with gunshot wounds, and perhaps rightly so. Eighty-eight percent of the injuries identified with violence and documented in the National Spinal Cord Injury Model System Database were caused by firearms.[1] Of course, it is unlikely that all documented gunshot wound injuries were inflicted intentionally, especially in rural areas, just as it is unlikely that all injuries associated with falls are due to carelessness. In this regard, if violence is defined as an intentional act to cause harm, the available data are not perfectly reliable.

Nevertheless, despite the rising incidence of SCI associated with violence, information concerning differences between individuals who have sustained SCIs as a result of causes identified with violence and those who have sustained SCIs as a result of causes not identified with violence has been limited primarily to demographics. Published information pertaining to rehabilitation outcome differences, especially community reintegration, is almost nonexistent. In this article, we will review the few reports available dealing with SCI and violence that do not have a medical/surgical bent. We will look at data not previously reported and will analyze it in a manner we believe is more productive from a clinical and community reintegration perspective than categorization by etiology. In closing, we will offer some observations and opinions based on our experiences with persons who have sustained an SCI as a result of violence.

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Demographics

Demographically, those injured by causes traditionally associated with violence are significantly younger than those injured by causes not associated with violence.[1–3] In addition, although SCIs are sustained predominantly by males, for those injuries identified with violence, the gender gap is greater. For example, of 2,324 individuals injured from 1980 through 1996 and rehabilitated within the Regional Spinal Cord Injury Care System of Southern California, 86% were males. Of those injured by violence, 92% were males. However, the most prominent demographic difference between individuals with SCI resulting from violent causes and those with SCI resulting from other causes is in the ethnic distribution of those injured. Within the National Spinal Cord Injury Database, 71.8% of those who sustained an SCI by firearm injury were ethnic minorities.[2] Of the firearm injuries recorded in the Southern California database, 94.9% occurred in ethnic minority groups, predominantly Hispanics (56.3%) and blacks (34.8%).

Examining the issue from a different perspective, among all Hispanics sustaining an SCI from 1980 through 1996 and treated

within the Southern California System, 52.1% were injured by firearms. Among blacks treated within the system during the same period, 63.4% were injured by firearms, compared with only 9.5% of all non-Hispanic whites. Cases reported to the National Spinal Cord Injury Database between 1990 and 1993 show similar trends, with 45.7% of SCIs in blacks, 52.4% of SCIs in Hispanics, and only 8.5% of SCIs in non-Hispanic whites caused by violence.[2] In a community-based sample, Rintala et al. also found similar ethnic distributions, with 67% of blacks, 35% of Hispanics, and 14% of whites in their sample being injured by violence.[4]

Zafonte and DeSantis[5] retrospectively examined differences in demographics and medical complications at 1 year post injury in two groups comprising 48 individuals each. The two groups were matched for level and completeness of injury and for age. The members of one group had SCIs resulting from violence-associated causes; members of the other group had SCIs resulting from other causes. The association of ethnicity and violence was also supported in this study: 69% of those with nonviolent injuries were white; 85% of those with injuries stemming from violence were black. The only other reported preinjury difference between the groups was in employment at time of injury. Of those with nonviolent injuries, 67% were employed at the time of injury; whereas only 28% of those with violent injuries were employed at the time of injury. At follow-up, greater percentages of contractures and spasticity were noted for those with injuries related to violence; and the rehospitalization rate within the first year of injury was nearly double for these patients. The authors concluded that socioeconomic status, premorbid personality, and access to health care were the primary causes of follow-up differences.

Rintala et al[4] reported the results of a telephone survey of community-based persons with paraplegia resulting from violent or nonviolent injuries. Patients with injuries related to violence were more likely to have problems with pain, to smoke, to have incomes under $10,000, to have poorer support systems, to not live with a spouse or significant other, and to not be involved in any productive activity. They also found those with violent injuries were less well educated and spent more time in bed.

Waters and Adkins[6] examined a sample of 164 men who were between 18 and 35 at the time of injury. Motor vehicle crashes accounted for 77 (47%) of injuries and firearms for the remaining 87 (53%). Ethnically, 23% were white, 28% were black, and 49% were Hispanic. However, no whites were injured by firearms, compared with 89% of blacks. Of the Hispanics in the sample, 57.5% had been injured by firearms, and 42.5% by motor vehicle crashes.

The study by Waters and Adkins[6] emphasized outcomes at discharge from rehabilitation and factors that might influence the rehabilitation process and outcomes. Analyzed from one perspective, significant differences between etiologic and ethnic groups were found. Those injured by firearms were found to have lower levels of preinjury employment, higher levels of antisocial behavior (arrests, imprisonment, and gang involvement), lower impairment, fewer associated injuries, fewer spine surgeries, greater scores on the Functional Independence Measure (FIM)[7] at admission and discharge from rehabilitation, and shorter lengths of stay for

rehabilitation and total hospitalization. Because of the disproportionate distribution of ethnicity across etiology as described above, the best comparison of etiologic groups was among Hispanics, and the trends noted earlier were generally supported. Also because of this disproportionate distribution, with all firearm injuries being sustained by ethnic minorities, ethnic differences tended to follow the same pattern as differences between firearm and motor vehicle injuries.

There was one interesting aspect of the findings of Waters and Adkins,[6] however, that might have some bearing on community reintegration. Although those injured by firearms had slightly fewer years of education than those injured by motor vehicles, the difference was not significant. This was due to the fact that the blacks, who were overrepresented in the group injured by firearms, actually had the highest mean years of education (26% had education beyond the high school level). Nevertheless, 75% of blacks with education beyond the high school level had been injured by firearms. In addition, although blacks had the highest mean number of years of education and Hispanics the lowest, blacks had the lowest rate of preinjury employment and Hispanics the highest.

Despite the differences noted above, when analyzed using multiple regression techniques, the outcomes studied were shown not to be primarily related to etiology or ethnicity, but to impairment, associated injuries, and respective treatments. Similarly, education, work ethic (as indicated by employment history), and antisocial behavior did not affect outcome at discharge from rehabilitation.[6]

In the second report using the same sample studied by Waters and Adkins,[6] the relationships of selected injury and preinjury factors with specific outcomes following rehabilitation were assessed.[8] Injury and preinjury factors included impairment, FIM score at discharge from rehabilitation, evidence of brain injury, chronic pain, duration of injury, education, employment, gang activity, arrests, self-reported alcohol and drug abuse, available support, etiology, and ethnicity. The outcomes examined were mean numbers of documented complications, pressure sore episodes, nonroutine clinic visits, and days hospitalized per year after discharge from rehabilitation, and total score on the Craig Handicap Assessment and Reporting Technique (CHART)[9] at follow-up. The five outcomes were assessed in multiple regression models using the factors above as independent variables. Complications and pressure ulcers were treated as and added to the independent variables for the regression models for clinic visits and hospitalization; complications, pressure ulcers, clinic visits, and hospitalization were treated as and added to the independent variables for the regression model for CHART. Although CHART is regarded a measure of handicap, it has been used as a measure of community integration[10] and discussed in the same context as the Community Integration Questionnaire.[11] Presumably the less the handicap, the greater the degree of community integration.

The results of these analyses demonstrate that complication rates were significantly associated with discharge FIM scores and self-reported alcohol use/abuse only; pressure ulcer episodes were significantly associated with injury completeness and drug abuse after injury; the rate of nonroutine clinic visits was also associated with injury

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completeness, as well as duration of injury, complications, and pressure ulcer episodes; and the only significant correlate of hospitalization was pressure ulcer episodes. With regard to CHART scores, discharge FIM scores, chronic pain, and injury completeness were the primary correlates, accounting for 22.6% of the variance. Preinjury education was also a significant correlate of CHART, accounting for 9.8% of the variance; other significant correlates were length of continuous employment, mean numbers of nonroutine clinic visits, and hospitalization.

Again, as in the first report examining data from this sample,[6] impairment and resulting disability, as measured by FIM score, demonstrated the strongest associations with both medical and social outcomes. In addition, alcohol and postinjury drug abuse were correlated with medical problems, which in turn were associated with handicap. Preinjury education was negatively correlated with handicap. In sum, although etiology and ethnicity may mask other important factors (eg, injury completeness and antisocial behavior influencing outcomes) because of strong associations with those factors, when taken alone, they are not important correlates of outcome.

Issues related to community reintegration are likely to be affected by minority status, and the large proportion of ethnic minorities injured by violence may influence the perception of outcome trends. In addition, it is common to stereotype those injured by violent means as possessing certain attributes that might cause them to respond less successfully to rehabilitation than those injured by other means. It is not uncommon for those injured by violent causes to be perceived as being more at fault or somehow more accountable for their injury, and therefore perhaps less deserving of the benefits of rehabilitation, than those injured by nonviolent causes. In general, those injured by violence tend to be perceived as being associated with antisocial behavior. In reality, a proportion of those injured by violent causes have no history of antisocial behavior; whereas a proportion of those injured by nonviolent causes may have strong histories of such behavior.

Methods

Based on the supposition that behavioral characteristics influence community reintegration to a greater extent than etiology, we operationally defined antisocial behavior and recategorized the participants from the sample discussed above[6,8] into three defined groups: Group 1 included individuals who reported no gang affiliation and had never been incarcerated; Group 2 included those who either reported gang affiliation (past or present) or had been incarcerated, but not both; and Group 3 included those who reported gang affiliation and had been incarcerated.

Participants

Participants were drawn from a volunteer convenience sample of 164 men who were between 18 and 35 at the time of injury, and who were injured by firearms or motor ve-

hicle crashes between January 1, 1980, and December 31, 1989. All participants had completed rehabilitation at Rancho Los Amigos Medical Center and were white, black, or Hispanic. Participants included only those who could be contacted by mail and telephone and who were willing to participate. The sample comprised 26% of the potential candidates; however, differential follow-up rates were highly consistent with the distribution of primary characteristics within the population of potential candidates. A more detailed description of the sampling methods has been presented elsewhere.[6]

Procedures

A survey, including an interview and medical record review for each participant, was conducted. The interviews were performed in person by trained individuals who had either completed or were in the process of completing a master's degree in social work. The interview included self-report items regarding personal history, family characteristics, and the injury event, as well as a number of standardized instruments, including the CHART, the Beck Depression Inventory (BDI), and the civilian version of the Mississippi Scale of Posttraumatic Stress Disorder (M-PTSD).[12] Each interview averaged approximately 2 hours. Each participant was paid $50 to cover costs associated with their participation.

Medical records were thoroughly reviewed for associated injuries sustained at the time of SCI and any subsequent complications during inpatient acute care and rehabilitation. The FIM, which assesses self-care, sphincter control, transfers, locomotion, communication, and social cognition, was used to provide a measure of disability and to indicate the degree of skill in activities of daily living at discharge from rehabilitation. However, because the FIM did not exist when the individuals included in this study were discharged from rehabilitation, estimated scores were generated from medical record review. To ensure data reliability, FIM scores were established independently by two raters (one occupational therapist and one physical therapist) and then were compared. The rating activities of the two individuals took place approximately 1 year apart. Overall the FIM ratings were shown to be highly reliable for admission ($r = .95$), for discharge ($r = .89$) and for change scores ($r = .86$); all were significant ($P < .001$).

Data analysis

Primary data analyses for the current assessment consisted of multivariate and univariate analysis of variance and covariance, with appropriate post hoc comparisons to assess differences among the three groups categorized by the operationally defined variable of antisocial behavior. In addition, scores on the CHART, BDI, and M-PTSD were assessed by Pearson Product-Moment correlation both across and within the three groups.

Results

When categorized according to antisocial behavior, the majority of the firearm injuries fell in Group 2 and the majority of the motor vehicle injuries fell in Group 1. Nevertheless, 21% of the firearm injuries occurred in Group 1 and 9% of the motor vehicle injuries in Group 3 (Table 1). Although some ethnic bias remained, the distribution was broader

Table 1. Etiology by antisocial behavior category

	Group 1	Group 2	Group 3	Total
Motor vehicle crashes	41 (53.2%)	29 (37.7%)	7 (9.1%)	77 (47%)
Firearm injuries	18 (20.7%)	49 (56.3%)	20 (23.0%)	87 (53%)
Total	59 (36.0%)	78 (47.6%)	27 (16.5%)	164 (100%)

$\chi^2 = 19.82$; $P < .001$.

than that seen when the sample was categorized by etiology (Table 2).

Multivariate analysis of variance, with scores on the CHART, BDI, and M-PTSD as dependent variables, demonstrated a highly significant aggregate difference among the three groups ($P < .001$). Univariate analyses of variance for each of the dependent variables demonstrated overall group differences in each instance. Analyses of covariance, controlling for impairment, produced a stronger effect for the CHART. However, controlling for impairment produced slightly weaker but still significant effects for the BDI and M-PTSD. The relevant means are presented in Table 3. Post hoc analyses (Tukey HSD) indicated significant differences ($P < .05$) between Groups 1 and 2 on the CHART and between Groups 1 and 2 and Groups 1 and 3 on the BDI and the M-PTSD.

For the entire sample, correlations among the three dependent variables were all highly significant ($P < .001$). The CHART was negatively correlated with both the BDI and the M-PTSD, with a stronger correlation with the BDI. The strongest correlation was between the BDI and the M-PTSD and was positive. The correlations were of different magnitudes for the three groups. Group 1, the members of which had not been involved with gangs or been incarcerated, demonstrated the strongest negative correlations between the CHART and the BDI, and between the CHART and the M-PTSD; and the weakest positive correlation between the BDI and the M-PTSD. Group 3, the members of which had been both involved with gangs and incarcerated, demonstrated the lowest correlation between the CHART and the BDI. In addition, this group showed a nonsignificant correlation between the CHART and the M-PTSD but had the highest positive

Table 2. Ethnicity by antisocial behavior category

	Group 1	Group 2	Group 3	Total
White	20 (52.6%)	17 (44.7%)	1 (2.6%)	38 (23.2%)
Black	11 (23.9%)	29 (63.0%)	6 (13.0%)	46 (28.0%)
Hispanic	28 (35.0%)	32 (40.0%)	20 (25.0%)	80 (48.8%)
Total	59 (36.0%)	78 (47.6%)	27 (16.5%)	164 (100%)

$\chi^2 = 16.44$; $P < .0025$.

Table 3. Means ± standard deviations

	Group 1	Group 2	Group 3	*P*
CHART	402.2 ± 81.4	364.1 ± 88.9	370.9 ± 71.4	<.007
BDI	25.4 ± 6.3	28.7 ± 8.0	29.9 ± 9.0	<.014
M-PTSD	71.4 ± 14.3	83.7 ± 19.5	90.3 ± 23.6	<.001

correlation between the BDI and the M-PTSD. All three correlations for Group 2 were significant; however, the magnitudes were more similar to Group 3 than to Group 1. The relevant *r* values are presented in Table 4.

Discussion

The distributions shown in Tables 1 and 2 show significant biases: More antisocial behavior is seen among those injured by violence and among ethnic minorities. Nevertheless, the distribution demonstrates that among those injured by violence, not all display antisocial behaviors generally perceived as being coupled with violent etiologies. In this sample, about 20% of those with violent injuries had no gang involvement and had not been convicted of crimes resulting in incarceration. In addition, approximately 9% of those with nonviolent injuries had been both involved in gangs and incarcerated. With regard to ethnicity, although none of the whites in the sample had been injured by violence, approximately 45% had been involved in gangs or been incarcerated. Similarly, whereas 89% of the blacks in the sample had been injured by firearms, nearly one fourth had not been involved with gangs or jailed.

In the previously discussed report by Adkins et al,[8] there were no significant differences in CHART scores between those

Table 4. Correlations

	Total sample (N= 164)		Group 1 (N = 59)		Group 2 (N= 78)		Group 3 (N = 27)	
	BDI	**M-PTSD**	**BDI**	**M-PTSD**	**BDI**	**M-PTSD**	**BDI**	**M-PTSD**
CHART								
r	–.42	–.35	–.52	–.48	–.35	–.28	–.34	–.19
P	<.001	<.001	<.001	<.001	=.001	=.006	=.040	N.S.
BDI								
r		.77		.71		.75		.83
P		<.001		<.001		<.001		<.001

NS = not significant.

injured by firearms and those injured by motor vehicle crashes, even when impairment was included as a covariate. However, the CHART scores of the individuals in the three groups categorized by the operationally defined variable of antisocial behavior were significantly different ($P = .029$), and more so when impairment was included as a covariate ($P = .007$). Neither the BDI nor the M-PTSD scores of individuals in this sample were previously compared by etiologic group (firearm versus motor vehicle crash). However, subsequent analyses demonstrated no differences in this regard. When categorized by our operational definition of antisocial behavior, the differences were shown to be significant.

Although the literature pertaining to rehabilitation and physical disability contains no specific assessment of community integration relative to depression, depression has been shown to be associated with scores on the CHART.[13] In our total sample, the CHART was significantly correlated with depression ($r = -.42$; $P < .001$) and M-PTSD ($r = -.35$; $P < .001$). However, the correlations were much stronger for Group 1 ($r = .52$; $P < .001$ and $r = -.48$; $P < .001$, respectively) and were nonsignificant for Group 3. However, the scores on the BDI and M-PTSD were significantly different for the groups, with mean scores on both measures for Group 3 being higher than those for Group 2, and the scores for Group 2 being higher than those for Group 1. Thus, although those who have stronger histories of antisocial behavior manifest greater depression and posttraumatic stress, their community integration is less associated with depression and posttraumatic stress. These findings tend to support our clinical observations that the "more innocent" victims of violence (ie, those who have not been exposed to violence) are more affected by a violent injury than are those who may have had greater exposure to violence.

Given the above results, we recommend that clinicians and policy makers avoid treatment decisions, other judgments, and outcome expectations related to community reintegration based on the superficial category of etiology. An individual's history of antisocial behavior, level of education, and employment history appear to be the most important factors in community integration, other than actual impairment and disability.

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In conclusion, we offer some additional observations based not on research, but on collective clinical experience:

- One of the dilemmas in fostering community reintegration for those injured by violence is the fact that return to the community means return to the environmental conditions that contributed to the injury in the first place.
- There is a stigma associated with having been injured by violence; however, it appears to affect those who are "innocent" (ie, have had little previous exposure to violence) to a greater extent.
- The younger the gang-involved individual is, the harder the task of community reintegration. Age and maturity play strong roles in successful community integration.
- To foster successful community reintegration, especially among those with a strong history of antisocial behavior,

the clinician must rely on accurate disclosure of information and thus must establish a measure of trust. This process is time consuming. We believe the strong current trend to reduce rehabilitation time will have a greater negative impact on the successful community reintegration of these individuals than on others.

Although none of these conjectures have solid support based on research, all could be fashioned into research hypotheses and ultimately tested; such research is clearly needed.

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