Psychiatric Outcome Over a Decade After Electrical Injury: Depression as a Predictor of Long-Term Adjustment

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Electrical injury (EI) produces a variety of physical, cognitive, and emotional consequences. Psychiatric and neurocognitive symptoms may complicate survivors' psychosocial adjustment and ability to return to work. However, due to a paucity of longitudinal research, the long-term course of EI remains poorly understood. The purpose of this study was to investigate psychiatric and functional status in EI patients over a decade after injury. Fourteen EI patients who originally underwent baseline neuropsychological evaluation participated in this long-term follow-up. Participants completed a telephone survey of functional status, neuropsychological symptom checklist, and the Psychosocial Adjustment to Illness Scale Self-Report. Participants were grouped according to baseline Beck Depression Inventory (BDI) scores. After an average of 12.36 years postinjury, participants with elevated baseline BDI scores experienced difficulty across multiple domains of psychosocial adjustment at follow-up. This group was also less likely to return to work and exhibited a significant increase in psychological distress. EI results in significant chronic psychiatric complaints for many survivors. In the current sample, psychiatric sequelae of EI continue to persist over a decade after injury. Moreover, elevated baseline BDI scores predicted worse outcomes for vocational and psychosocial adjustment. Findings underscore the impact of emotional symptoms on recovery and need for specialized psychiatric intervention immediately following injury. (J Burn Care Res 2015;36:509–512)

Electrical injury (EI) is associated with a broad range of complaints including cognitive impairment, changes in mood, and somatic difficulties. Neuropsychological studies have documented deficits in attention and concentration, memory, and verbal learning following EI,[1–9] and emotional distress has been widely reported.[10–12] However, the extant literature describing outcomes following EI has largely relied on cross-sectional designs,[2,4,8] case studies,[1,5,6] and archival data.[7,11,13] These studies seem to suggest that EI is associated with ongoing, long-term consequences.

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There is a paucity of literature exploring the long-term outcomes of EI. Among the few studies on outcome of EI, one used a longitudinal design to examine the psychiatric outcome for EI survivors beyond the first year postinjury.[3] The authors found persistent impairment in areas of memory, concentration, and judgment in addition to severe levels of depression in a sample of 16 EI survivors. Pliskin and colleagues[14] also found that the more chronic EI survivors presented with persisting emotional complaints. In a follow-up study by Aase and colleagues,[15] the authors found higher levels of psychiatric sequelae correlate with poor cognitive performance among EI survivors. Another follow-up study was conducted by Fink and colleagues, who contacted 30 EI subjects by telephone an average of 3.9 years following injury. Using several psychosocial measures, they found elevated psychiatric distress that was predicted by the presence of depression at initial evaluation and later onset of symptomatology.[16] These studies indicate that EI has long-term psychiatric consequences, but the relative

lack of longitudinal research limits our understanding of the recovery trajectory following EI and specifically how psychiatric sequelae influence EI recovery. The current study used a follow-up evaluation to investigate psychiatric and functioning status in a sample of EI patients an average of 12 years following their injury.

METHODS

Participants

IRB approval for this study was obtained through the University of Illinoisat Chicago. A consent form was completed by each patient prior to participation in the study. Participants were 14 EI patients who sustained an EI and had archival baseline neuropsychological data. Each participant was contacted to complete a follow-up interview via telephone. Demographic characteristics of the sample are reported in Table 1. Of the 14 participants, 2 did not complete the Beck Depression Inventory (BDI)[17] at baseline and were excluded only from analyses involving the BDI.

Measures

Baseline neuropsychological evaluations were conducted in person, whereas follow-up interviews were conducted via telephone. Two measures administered during the baseline neuropsychological evaluation were used in the current analysis: the BDI[17] and Wechsler Adult Intelligence Scale-Revised.[18] The follow-up interview included a brief survey of employment and litigation status, a neuropsychological symptom checklist (NSC) consisting of 18 common somatic, cognitive, and emotional symptoms,[8] and the Psychosocial Adjustment to Illness Scale Self-Report (PAIS-SR).[19] The PAIS-SR consists of 46 multiple-choice items assessing a subject's psychosocial functioning subsequent to medical problems. Norms are available for several medical populations including burn, cancer, multiple sclerosis, and cardiomyopathy. The measure has been shown to demonstrate adequate reliability (0.63–0.80).[20] Raw scores were converted to T-scores using the measure's normative group of burn patients, which most closely resembles the EI patient population.

Table 1. Demographic characteristics

Participant Characteristic	Mean (SD, Range) or %
Gender	
Female	7%
Male	93%
Ethnicity	
White	100%
Handedness	
Right	93%
Left	7%
Age at baseline (in years)	37.21 (9.18, 25–52)
Years of education	12.7 (1.44, 11–16)
Marital Status	
Single	14%
Married	79%
Divorced	7%
Years since injury (baseline)	1.21 (1.31, 0–4)
Years since injury (follow-up)	12.36 (5.46, 3–21)
Baseline Wechsler Adult Intelligence Scale-Revised Full Scale IQ	100.50 (12.75, 79–120)
Injury Voltage < 1000 V	50%*
Experienced Loss of Consciousness during injury?	21%
Active Litigation at follow-up	14%

*Three subjects did not respond to this item.

Data Analysis

Descriptive statistics were used to describe the nature of the sample and the follow-up intervals. Bivariate correlations were used to determine if baseline cognitive variables (ie, Wechsler Adult Intelligence Scale-Revised Full Scale IQ, Verbal IQ [VIQ], Performance IQ) were associated with follow-up PAIS-SR scores. Independent samples *t*-tests were used to make adjustment outcome comparisons between participants who scored above the clinical threshold (>13) on the BDI to those who scored below the clinical threshold at baseline. We also used independent samples *t*-tests to determine if there were baseline differences between individuals who had returned to work at follow-up and those who had not returned to work.

RESULTS

Baseline neuropsychological evaluations occurred an average of 1.21 years following the injury (SD = 1.31, range 0–4 years), and follow-up interviews occurred an average of 12.36 years (SD = 5.46, range 3–21 years) after the injury (Table 1). The mean time between the baseline evaluation and follow-up interview was therefore 11.14 years (SD = 6.07, range 2–19 years). Participants who scored above clinical threshold on the BDI did not significantly differ from those who scored below clinical threshold on time since injury at baseline or the follow-up assessment. Similarly, there were no differences in time since injury at either time point between those participants who had returned to work and those who had not returned to work at the follow-up.

Baseline Full Scale IQ and Performance IQ were not significantly associated with any of the PAIS-SR scores. VIQ was significantly and negatively correlated with follow-up T-scores in the domain of Sexual Relationships ($r = -.55$, $P = .05$). Otherwise, baseline VIQ was not significantly associated with any other adjustment outcomes.

Table 2 shows outcomes when comparing groups based on baseline BDI scores. On most measures of the PAIS-SR, there were no significant group differences, with the exception of the Psychological Distress domain. Participants with clinically elevated BDI scores at baseline reported higher levels of psychological distress compared with those who did not have clinically elevated BDI scores at baseline ($P = .038$). While there were not many statistically significant differences between groups, Table 2 shows that group with elevated baseline BDI scores had elevated PAIS-SR scores in the domains of Healthcare Orientation, Domestic Environment, Sexual Relationships, Extended Family Relationships, Social Environment, and Psychological Distress. The group without elevated baseline BDI scores only reported elevated PAIS-SR scores for Sexual Relationships. There was also a marginally significant trend suggesting higher scores on the follow-up NSC for individuals with elevated baseline BDI scores.

Groups were also created based on whether participants had returned to work ($n = 8$) or not ($n = 6$) at the follow-up interview. There were no significant differences between the two groups on any of the PAIS-SR subscales or the NSC. However, individuals who had not returned to work at the follow-up had reported significantly higher baseline BDI scores ($M = 25.8$, SD = 12.19) compared with those who had returned to work ($M = 8.43$, SD = 6.55), $t(10) = 3.213$, $P = .009$.

DISCUSSION

The current study presents the psychiatric and functional profile of a select subset of EI survivors an average of 12 years following injury. Participants whose initial BDI scores fell below clinical level (<13) were more likely to have returned to work at the time of the follow-up. Conversely, long-term neuropsychological complaints and psychological distress were found to be more prevalent for those with elevated initial BDI scores. These findings suggest that psychiatric sequelae of EI become a chronic concern for a significant subset of survivors. This group is less likely to successfully return to work and they experience a great number of persistent neuropsychological symptoms. Thus, it is imperative that EI survivors receive psychiatric intervention at the onset of emotional symptomatology.

Results indicate that 57.1% of our participants were eventually able to return to work after sustaining EI. This employment rate is higher than those reported by other EI studies[14,21] with shorter follow-up intervals. One such study found that 32.5% of EI participants successfully returned to work following injury.[21] However, return to work data were retrieved 3 to 4 months postinjury, whereas the current study's results suggest that some EI survivors may return to work several years after injury.

Limitations of this study include the small number of self-selected patients who sought out specialized intervention subsequent to injury. It is possible that the sample of EI survivors accessible to participate represents patients with poorer adjustment to injury. These aspects of our convenience sample restrict generalizability of current findings across all EI victims. The effects of time and intervening life events could also contribute to the psychosocial functioning of participants. Despite the limitations, our

Table 2. Mean scores on PAIS-SR and NSC outcomes by BDI group

T-Score (PAIS-SR) or Raw Score (NSC)	Mean (SD) for Nonelevated BDI Group ($n = 6$)	Mean (SD) for Elevated BDI Group ($n = 6$)	Sig.
PAIS-SR Total Score	64.67 (15.13)	72.50 (6.77)	ns
Health Care Orientation	63.33 (8.12)	69.67 (5.28)	ns
Vocational Environment	55.50 (10.54)	60.00 (14.78)	ns
Domestic Environment	64.00 (17.83)	74.33 (4.23)	ns
Sexual Relationships	66.67 (10.09)	70.33 (10.95)	ns
Extended Family Relationships	60.33 (12.58)	65.33 (13.05)	ns
Social Environment	60.00 (10.24)	69.00 (5.93)	ns
Psychological Distress	56.50 (10.64)	68.83 (6.88)	$P = .038$
NSC	8.83 (7.17)	16.00 (1.79)	$P = .058$*

BDI = Beck Depression Inventory; *NSC* = Neuropsychological Symptom Checklist; *PAIS-SR* = Psychosocial Adjustment to Illness Scale Self-Report; ns, not significant.
*Due to a violation of Levene's test for the Equality of Error Variances, degrees of freedom were adjusted and findings changed from significant ($P = .039$) to a nonsignificant trend.

sample contained individuals reporting psychological difficulties and psychosocial maladjustment over a decade following EI. Additional research should explore long-term effects of EI across all areas of functioning as well as identifying factors that contribute to postinjury maladjustment.

Although there are several limitations to the generalizability of the current study, it presents the longest follow-up interval known in EI literature. Evidence for psychiatric sequelae among EI survivors is consistently cited throughout extant research, and this study reveals the chronic nature of such sequelae over a decade after injury. Moreover, acute presentation of psychiatric symptomatology postinjury has a significant impact on the course of recovery, suggesting that early psychiatric intervention is paramount to recovery for EI survivors.

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