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Predicting post-electrical injury autonomic dysfunction symptom occurrence by a simple test



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ABSTRACT

Background: Sensory, motor, and autonomic neuropathy has been reported after electrical injury. Besides subclinical involvement of the sympathetic nervous system during the 1st year post injury, late clinical manifestations of this involvement have been reported sporadically. This study was designed to investigate how the clinical and electrodiagnostic manifestations of sympathetic involvement would change with time in electricity victims. **Methods and materials:** Sixty electrically burnt patients were followed for 22 months with sympathetic skin response (SSR) and autonomic system derangement symptom surveillance.

Results: Thirty-one patients reported autonomic derangement symptoms during the 2nd year post injury. SSR latency prolongation showed direct negative correlation with time; but SSR amplitude was decreased in all cases irrespective of the time laps. Symptomatic patients showed significantly lower SSR amplitudes compared to asymptomatic ones. This was true for the pre-symptom SSR test results too.

Conclusion: SSR amplitude can be used as a predictive test for the symptoms of autonomic derangement to occur post electrical injury.

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1. Introduction

In Shiraz burn hospital, south of Iran, electrical injury is responsible for 4.73% of referrals [1]. Neurological (81.6%) and psychological (71%) symptoms have been mentioned as the most common sequel of electrical burn injury. In one study the neurological symptoms occurred at 5.3 months post-burn [2]. Compressive peripheral neuropathy is one of the systemic effects of low voltage electrical burn [3]. Electrophysiologic studies have detected peripheral polyneuropathy as early as 1 week post burn. Some scientists

believe that this is due to acute phase reactants released in response to burn, since it subsides with time [4]. But long-term involvement of the motor nervous system has been shown in another study [5].

Following a case report indicating sympathetic nervous system involvement in electrical burn [6], Ashraf et al. showed subclinical involvement of the sympathetic nervous system up to 1-year post electrical injury [7]. We wondered how the electrodiagnostic features of autonomic derangement would change with time and how it might be related to clinical manifestations of this derangement. The present study was designed in response to such concerns.

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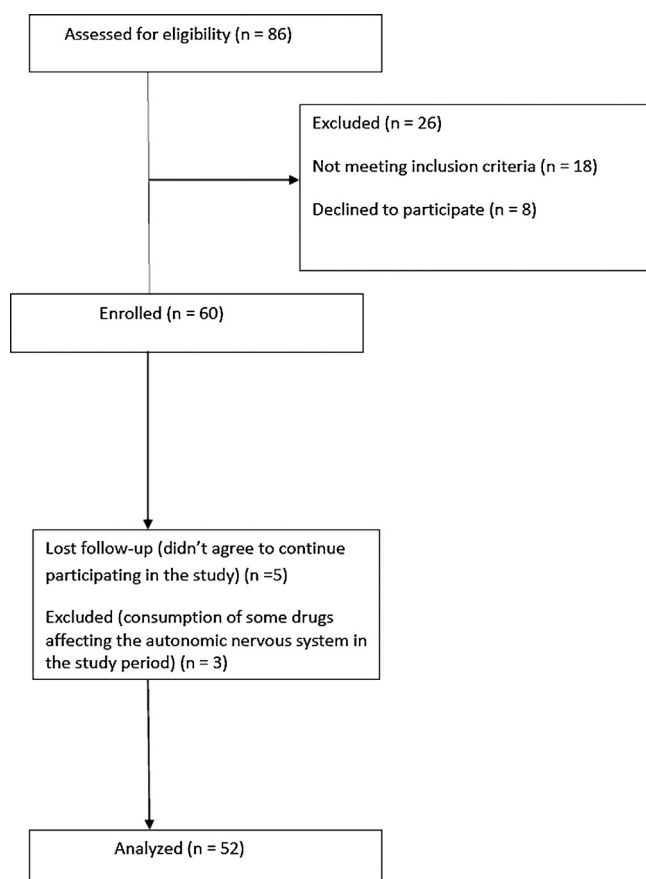


Fig. 1 – CONSORT diagram of the study flow.

2. Methods and materials

Among the 86 registered electrical burn patients in Shiraz burn center (Ghotbedin Hospital), 60 that agreed to participate in the study and had none of the exclusion criteria (known peripheral neuropathic disease, Diabetes mellitus, or consumption of any drug affecting autonomic nervous system) were followed for 22 months. The CONSORT diagram for the patient flow through the study is displayed in Fig. 1. We got the approval of Shiraz University of medical sciences (International branch). After filling in the informed consent, subjects went under

2.1. SSR test

This test was taken by a Synergy multilinker EMG machine in a quiet room, having the patient in the supine position. The patients were invited to keep the eyes open, so that the quiescence of the environment would not make them asleep, and avoid laughing, sighing, coughing, or breathing deeply. By these measures we tried to prohibit any confounding factor from affecting SSR parameters. The room and skin temperatures were kept at 24 °C and 32 °C respectively. For the upper extremities we put the active electrode on the palm and the reference one on the dorsum of each hand to record the SSR to

the median nerve stimulation at the wrist. And for lower extremities, we put the active and reference electrodes on the sole and dorsum of each foot respectively to record the response to tibial nerve stimulation at the ankle. We used a band pass of 0.5–2 KHz, amplification of 100–200 mV/div and a base time of 500 ms/div. Thirteen stimuli of 20–45 mA and 0.3 ms duration were administered at random intervals of more than 30 s [7–10].

Peak to peak amplitude and onset latency of the SSR were the measured parameters. Since we had already established the normal values of SSR latency and amplitude of our lab, we used these norms, (Tables 1 and 2) instead of taking a control group.

A questionnaire to detect any symptom of autonomic derangement was also filled for each patient. In this questionnaire ‘normal’ (no symptom) was indicative of never or almost never experiencing the symptom, ‘mild’ was indicative of experiencing the symptom several times a month, ‘moderate’ was indicative of experiencing the symptom several times a week, and ‘severe’ was representative of experiencing the symptom daily. SSR test and filling in the same questionnaire were repeated at 5, 10, 15 and 22 months after electrical exposure. In statistical analysis of the data, the repeated measure test was used to analyze the changes of amplitude and latency of the SSR with time, and t-test was used for comparison of these two parameters between the symptomatic and asymptomatic groups, and between the electrical burn patients and normal values.

3. Results

At the beginning of the study the time laps between the electrical exposure of the subjects and the study was 2–5 months. We lost the follow up of 5 patients. And 3 patients were excluded due to consumption of some drugs affecting the autonomic nervous system in the study period. One of these received Pregabalin and Neurotriptiline for the management of severe aching pain in the right hand (which was also the entry site of electricity). The pain began 14 months post injury and lasted for 2 months. The 2 SSRs taken from this patient showed very low amplitude responses recorded from right hand (40% of the left hand response amplitude and 30% and 36% of the mean amplitude taken from the other patients’ right hands in the first and 2nd SSR tests respectively).

Table 1 – Reference values of the sympathetic skin response amplitude.

	RP amp	LP amp	RS amp	LS amp
Mean	527	518	515	514
Std. deviation	92	78	92	90
Minimum	280	305	280	54
Maximum	785	745	760	765
Percentiles				
25	475	475	460	460
50	530	520	517	515
75	580	565	570	565

RP: right palm; amp: amplitude; LP: left palm; RS: right sole; LS: left sole

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