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Neuromuscular junction dysfunction in paraquat

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Objective: Paraquat is a non-selective, highly effective contact herbicide that has been widely used in many countries during the last 50 years. It has a very good safety profile if used properly. There are evidences that oxidative stress can cause neuromuscular dysfunction. Since the main pathology behind paraquat toxicity is oxidative stress, the study aimed to find out whether there is any evidence to support NMJ dysfunction with acute paraquat poisoning.

Methods: A cohort study was conducted with matched controls. Consecutive patients admitted with self poisoning of paraquat to a tertiary care hospital in the Southern province of Sri Lanka were recruited. NMJ function was assessed by supramaximal slow repetitive stimulation (RNS) of the median nerve administering 10 stimulations at a rate of 3Hz at the wrist, at rest (A), immediately after 30 seconds maximal isometric exercise of the thumb (B), and two minutes after the exercise (C). The assessment was done at one and six weeks after the exposure. The decrement response was calculated to the second, fourth and fifth stimuli at A, B and C. Post exercise facilitation was assessed by calculating the ratio of the amplitude of the first action potential in B to the amplitude of the first action potential at A (B1/A1) and post exercise exhaustion by calculating the ratio of the amplitude of the first action potential in C to the amplitude of the first action potential at A (C1/A1). Mann-Whitney U test and Wilcoxon Signed Ranks test were used for the analysis.

Results: There were 28 (males 21) paraquat survivors and 56 controls. The mean age of cases and controls were 29±12 and 31±11 years. The decrement response was significantly high in the test group at one week from exposure after augmentation (B) compared to the controls. Significantly high decrement response was persisted at six weeks after the exposure at fourth and the fifth stimuli in B. No significant decrement was found at A and C. No post exercise facilitation and exhaustion.

Conclusion: NMJ dysfunction was demonstrated by slow RNS after augmentation in patients with self-ingestion of paraquat compared to the controls.