

Absence Of Electrocardiographic Change

Following Prolonged Application of a Conducted Electrical Weapon in Physically Exhausted Adults

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BACKGROUND:

Conducted electrical weapons (CEWs) are used by police for control of subjects by causing pain and neuromuscular incapacitation. There has been scrutiny of CEWs and their potential role in the sudden death of subjects in custody. While there are numerous cases every year of custodial deaths when no CEW is used, criticism of this device has led to a hypothesized causal relationship.

One theory is that CEWs may cause death from cardiac dysrhythmia. Previous work has shown that CEW application for 5 seconds does not induce dysrhythmias in resting humans.^{1,2}

We sought to determine if prolonged exposure to a CEW in an exerted human sample population caused detectable change in the 12-lead electrocardiogram (ECG).

METHODS:

25 human volunteers were studied after receiving Institutional review board approval. All subjects had a baseline ECG obtained and were then put through a regimen of timed push-ups and a sprint on a treadmill at 8.5 degrees of elevation until subjective exhaustion. This was to simulate the physical exertion often seen in subjects prior to CEW application in the field by police.

The volunteers then received a continuous 15-second application from a TASER® X26 CEW (TASER Intl., Scottsdale, AZ). Volunteers received random positions of the CEW electrodes on their thoraces, either both electrodes in front or both in back. Electrode positions involved at least a 12 inch spread and always encompassed the normal anatomic position of the heart.

An ECG was obtained following CEW exposure. All ECGs were interpreted by a blinded cardiologist.

DISCUSSION:

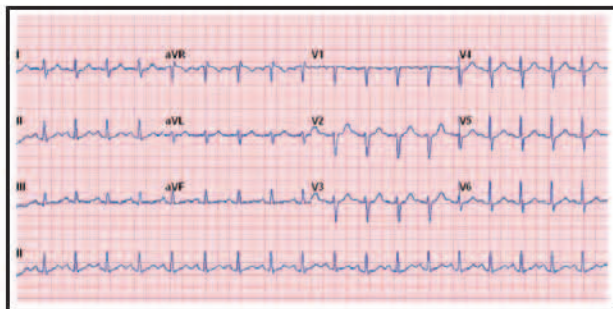
There are currently unfounded beliefs that CEWs are causative devices in sudden death phenomena. One of the theories is that application of a CEW for a prolonged period of time on physically exhausted persons may be dangerous.

Sudden cardiopulmonary arrest in subjects after struggling with law enforcement has been documented and is associated with profound acidosis, presumably from anaerobic exhaustion.³

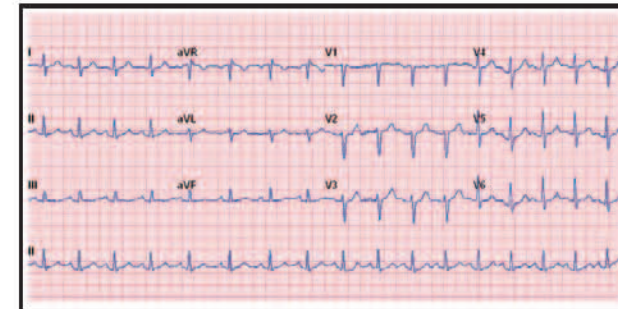
There is no published human study examining this relationship. This study took volunteers to the point of subjective, anaerobic exhaustion and then exposed them to a prolonged CEW application while looking for changes from their baseline ECG.

No arrhythmia or dangerous pattern was uncovered. The data from this study is consistent with prior findings on a rested population.¹

This data represents the first known human data to examine this relationship.



ECG Immediately Prior to TASER® X26 Application



ECG Immediately Following TASER® X26 Application

RESULTS:

At baseline, 24/25 ECGs were normal. One baseline ECG was abnormal due to several monomorphic premature ventricular complexes.

After CEW exposure, all 25 ECGs were interpreted as normal.

CONCLUSIONS:

Prolonged 15 second CEW application in a physically exhausted adult human sample did not cause a detectable change in their 12-lead ECGs.

Theories of exhaustion associated CEW induced dysrhythmias are not supported by our findings.

LIMITATIONS:

- * Small Sample Size
- * No Drug Intoxication Present

1. Ho JD, Miner JR, Lakireddy DR, Bultman LL, and WG Heegaard. Cardiovascular and physiologic effects of conducted electrical weapon discharge in resting adults. *Acad Emerg Med*, 2006;13:589-595.
2. Levine SD, Sloane C, Chan T, Vilke G, and J Dunford. Cardiac Monitoring of subjects exposed to the TASER. *Acad Emerg Med*, 2005;12(supplement 1):71.
3. Hick JL, SW Smith and MT Lynch. Metabolic acidosis in restraint-associated cardiac arrest: a case series. *Acad Emerg Med*, 1999;6:239-43