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OBJECTIVE:

Conducted Electrical Weapon (CEW) use by law enforcement is increasing. There are concerns about CEW safety and its possible ability to cause cardiac tachyarrhythmia. Previous human CEW research analyzing before and after electrocardiograms in both resting and exhausted populations does not support this.^{1,2}

EKG tracings cannot be obtained during CEW exposure due to artifact interference between the CEW and the skin electrodes. This study examines real-time cardiac rate measurement using cardiac ultrasound technology during CEW application on an exercising population.

METHODS:

This was a prospective, non-blinded study. Adult human volunteers underwent limited echocardiography before and after an anaerobic exertion regimen which was immediately followed by a 15 second CEW application with pre-placed thoracic electrodes.

Real-time limited echocardiography was also performed during the CEW application. Ultrasound images were analyzed using M-mode for evidence of tachyarrhythmia by a trained, proficient ultrasonographic emergency physician.

The heart rate and the presence of sinus rhythm were determined using these images. Data were analyzed using descriptive statistics.



DISCUSSION:

Recent animal studies have raised the question of whether CEW application can capture underlying heart rates or induce arrhythmias.^{3,4}

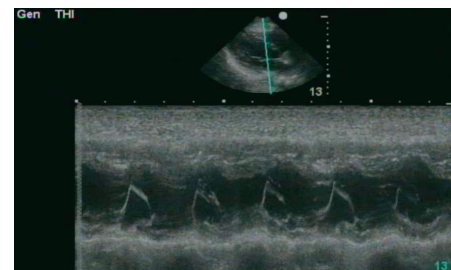
The limitations of these animal model studies are significant and include size limits, probe placement limits, use of deep sedation/anesthesia and other factors that may make their methodology unrealistic. Our use of adult humans in an exhausted state is believed to be a better model in which to study this question.

RESULTS:

A total of 37 subjects were enrolled. There were no adverse events reported. The mean HR prior to starting the event was 86 (± 2.88) and increased to 153 (± 3.00) immediately following exercise.

During the CEW exposure, the mean HR was 140 (± 2.64) and dropped to 115 (± 2.76) at 1 minute after CEW exposure. Sinus rhythm was clearly demonstrated in 18 subjects during CEW exposure (mean heart rate 121 ± 1.46).

Sinus rhythm was not clearly demonstrated in 19 subjects due to movement artifact but rate was never greater than 156 in any of these subjects (mean heart rate 111.1 ± 2.2).



CONCLUSIONS:

A 15 second CEW application on exercised volunteers did not demonstrate any evidence of induced tachyarrhythmia. It is unlikely that CEW exposure induces cardiac rate capture or tachyarrhythmia in humans.

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