Cardiac Monitoring of Subjects Exposed to the Taser®

Saul Levine MD, Christian Sloane MD, Theodore Chan MD
Gary Vilke MD, James Dunford MD

University of California San Diego Emergency Medicine

Background

The Taser® is a "less lethal" weapon now in use by nearly one third of U.S. law enforcement agencies. Though regarded as safe, there are reports of sudden death in association with its use, and there are no prospective human safety studies. We sought to determine whether ECG disturbances developed when the Taser® was deployed on healthy volunteers.

Taser X-26®

Researcher physician enjoying Taser ® with police training staff

Methods

This prospective, interventional pilot study was performed on police officers who volunteered to experience deployment of the Taser X26® during training sessions. Volunteers had continuous ECG monitoring before, during and after shock delivery (50,000V, 2.1 mA, 19 pulses/sec) via alligator clips applied to the trunk or extremities.

Primary endpoints included changes in rate, rhythm, ECG morphology and interval duration. Investigators independently analyzed tracings. Descriptive statistics & paired student t test were employed to evaluate the results.

Results

Of 58 subjects, 9 were excluded due to ECG lead displacement. In the remaining 49 subjects, mean shock duration was 2.3 sec (1.2– 5.0).

Subjects demonstrated baseline tachycardia, and heart rate increased 20 bpm after shock (Figure 1).

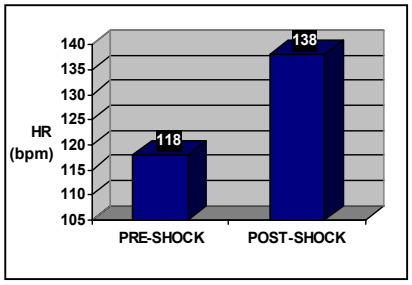


Figure 1: Change in Heart Rate

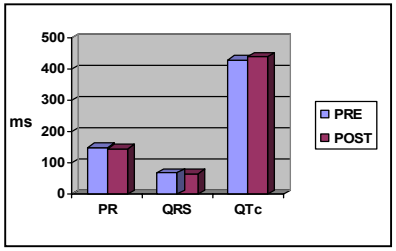


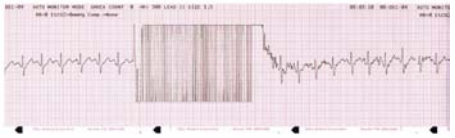
Figure 2: Effect of shock on ECG

There were no significant changes in PR, QRS and QTc intervals post Taser® (Figure 2, Table 1a/b). Sinus tachycardia was common; one subject had rare unifocal PVC's pre and post Taser®. Artifact obscured rhythm during shock (Figure 3)

	pre-HR (bpm)	post-HR (bpm)	pre-PR (ms)	post-PR (ms)	pre-QRS (ms)	post-QRS (ms)	pre-QTc (ms)	post-QTc (ms)
Mean	118	138	149	146	69	67	431	441
95% C.I.	112-125	134-144	142-157	136-155	63-74	62-74	415-447	424-458
Range	66-160	94-190	100-210	100-240	40-120	50-120	350-620	283-580

	Δ HR (bpm)	Δ PR (ms)	Δ QRS (ms)	Δ QTc (ms)
P-value	<0.0001	0.22	0.35	0.19
95% C.I.	-24.6 to -14.5	-2.25 to 9.47	-1.7 to 4.7	-26.4 to 5.5
Range	-1 to 72	-60 to 40	-30 to 20	-110 to 145

Table 1a/b: Effect of Taser ® on ECG



Limitations

Limitations of this study include: (1) healthy volunteers may not reflect physiology of subjects for whom this device is intended (2) single brief durations of shock were employed (3) post-shock recording intervals were limited to 30 seconds and could miss late asymptomatic ECG events (4) artifact during shock obscures true ECG (5) shock was applied with alligator clips rather than barbed darts and may not mimic physiology during law enforcement deployment.

Conclusions

Subjects undergoing voluntary shock by Taser® had baseline sinus tachycardia. Aside from a further increase in heart rate, no cardiac dysrhythmia, conduction or morphology disturbances were observed. The clinical implications of these findings for the population of individuals for whom this device is intended is unknown.

Disclosures

This study was accomplished without outside funding

Acknowledgements

Special thanks goes to the San Diego Police Department for allowing this study to be performed during scheduled officer training and to the San Diego Fire Rescue Department for providing ECG monitoring equipment