Catecholamines and Troponin in Simulated Arrest Scenarios

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Introduction

TASER X26

The mechanisms of death in many arrest-related deaths are unclear. Unexplained arrest-related deaths have occurred after the use of electronic control devices. The primary concern has been direct cardiac arrhythmias.

Some authors have opined that deaths may be related to an acute stress cardiomyopathy induced by high circulating catecholamines, rather than an immediate electrically-induced arrhythmia. In this study, we compared the stress response during several simulated use of force encounters.

Methods

This was a prospective study of human subjects. The subjects were a convenience sample of law enforcements officers receiving a training exposure. Subjects were randomized to one of five groups:

1) a 150 meter sprint, simulating flight,
2) 45 seconds of hitting and kicking a heavy bag, simulating physical combat,
3) a 10-second TASER X26 exposure,
4) a K-9 training exercise of approximately 30 seconds, and
5) an oleoresin capsicum (O.C.) exposure to the face.

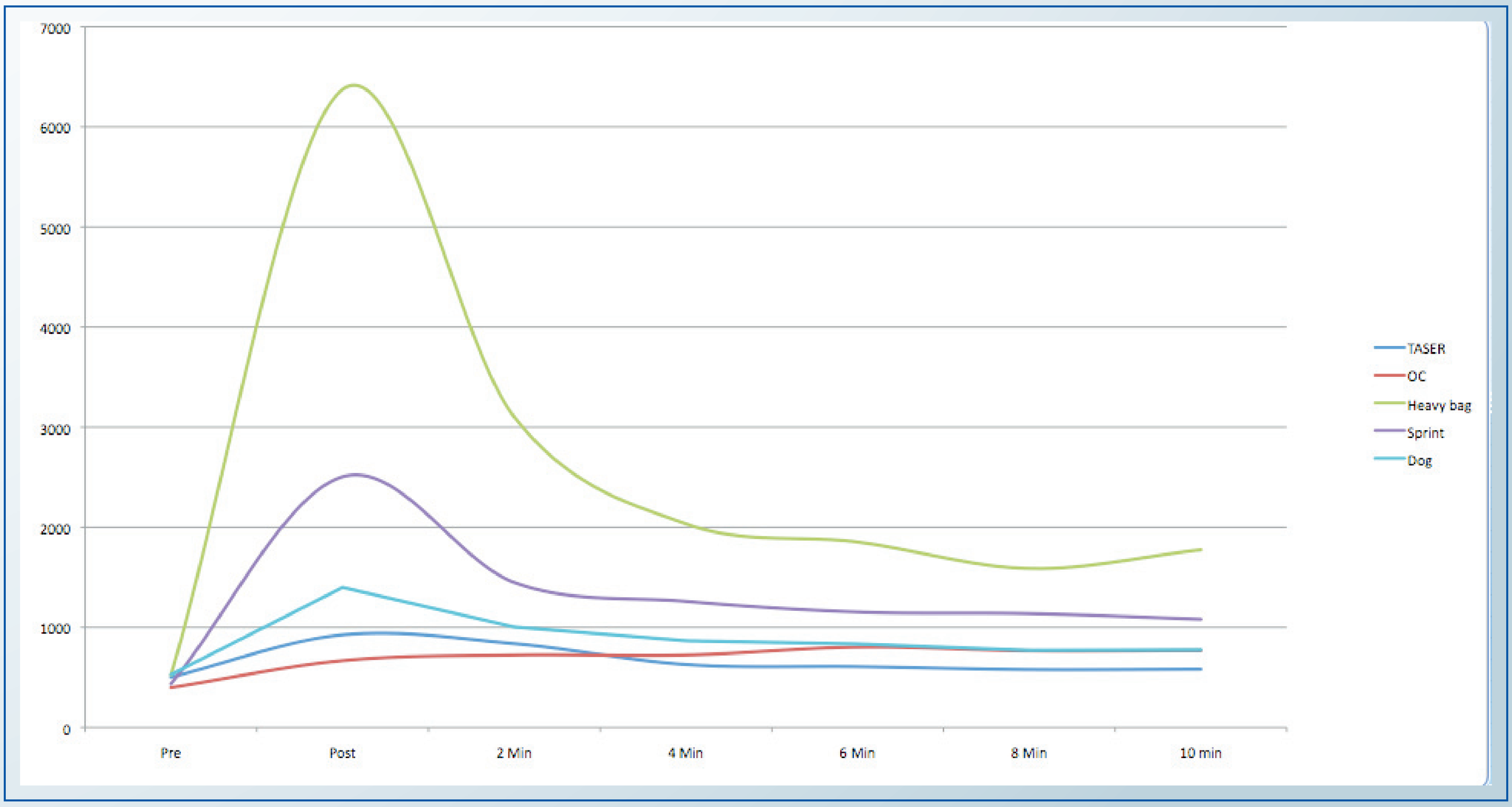
Subjects had an intravenous catheter placed by a physician or paramedic prior to the test. Baseline catecholamines were drawn at that time. Subjects then participated in their assigned task. Catecholamines were drawn immediately after the task and every two minutes for 10 minutes. Troponin was also drawn before and at 24 hours after the task.

Results

60 subjects completed the testing. The median age was 35 (range 19 to 67), 85% were male, and the median body mass index was 27.8. For total catecholamines, there was no difference between the groups at baseline and the median pre-task was 474 (range 241 to 1348, IQR 296 to 824).

Immediately after the task, the highest median was the heavy bag group at 3621 (range 1359 to 11669, IQR 3177 to 4891). The next highest was the sprint group at 2070 (range 1466 to 3606, IQR 1794 to 2518). The K-9 group was next at 1503 (range 803 to 2001, IQR 1299 to 1642). The TASER group and O.C. groups were last at 1038 (range 653 to 1363, IQR 955 to 1089) and 1032 (range 545 to 1233, IQR 736 to 1085).

These differences persisted for all time points. There were no changes in troponin at 24 hours.



Collective Catecholamine Average

Conclusions

The comparison of use of force encounters demonstrated that the simulated combat was one of the most activating of catecholamines.