G88 Utilizing Ultrasonography for Interpretation of Wounds From 40mm Less Lethal Impact Munitions

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The goal of this presentation is to demonstrate the validation of current ballistic testing models to evaluate less lethal impact weapons and how that testing can be applied to predict wound profiling in humans.

This presentation will impact the forensic science community by applying testing models in order to predict wound profling when the less lethal weapons are applied.

Less lethal impact munitions are law enforcement weapons used to subdue aggressive individuals as an alternative to lethal force. They are also deployed during civil disturbances or other critical events to target specific individuals, such as rioters. The projectiles fired from specialized weapons are intended to deliver blunt trauma similar to a police baton strike, but from a distance. The flight and impact characteristics of some of these projectiles were studied as a result of some negative outcomes from police incidents. It was learned that some manufacturers of these projectiles gather little data as to the effect they may have when striking a human target. When these weapons are deployed in the field, the extent of the wounds they can inflict are generally unknown.

As less lethal projectiles are constructed with a variety of materials, predicting the wound profile they impart can be problematic. Ballistic testing models utilizing calibrated 10% ordnance gelatin and Maki ballistic media have been successfully used to estimate the energy density, impact profile, and potential penetration between a variety of types of less lethal options. The energy transfer into the gelatin can be captured on high-speed video and measured by calculating movement of the gelatin block and velocity loss of the projectile. These measurements are used in conjunction with Maki ballistic media to measure volume displacement of the impact site, similar to “backface signature.” Combining the testing data from the media allows comparison between types and models, but it was unclear how the data obtained equates to trauma on living subjects.

During a demonstration of a new 40mm less lethal impact projectile round, police officers volunteered to be exposed to its effects. The lateral mid-thigh was the target area selected for the seven subjects. The subjects also agreed to diagnostic ultrasound scanning of the area before and after impact. Ultrasonography is an imaging modality that has the capability to detect and graph tissue motion and blood flow. Three sets of sonographic images were collected from each test subject and evaluated. When compared to the pre-insult control, the tissue disruption from the less lethal impact was apparent and measurable. The response to the blunt trauma released fluids from the normal spacing within the subcutaneous spaces that were readily detectible. The scope, depth, and size of the insult was measured and captured. In addition, repeat ultrasound scans were performed at 60 days post event to document the healing process. When the scans were compared to the data retrieved from the testing model, the results were consistent, establishing validity of the previous testing methods to predict wounding inflicted from a less lethal deployment.

Less Lethal, Wounds, Ultrasound

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