A103 The Use of Geographic Information Systems (GIS) to Identify Relationships Between Victim Dispersal Patterns and Skeletal Trauma After a Blast Event

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After attending this presentation, attendees will better understand the utility of GIS methods at a post-blast scene and the benefits to anthropological trauma analysis of blast victims.

This presentation will impact the forensic science community by providing the first data out of a series of controlled post-blast trauma experiments from an area with a scant amount of anthropological research to date. This study emphasizes the need for standardization of evidence collection at the scene so anthropological analyses of blast trauma can be effective.

Anthropological study benefits from the inclusion of geographic analysis by connecting observations to specific locations. Forensic anthropologists have recognized the importance of documenting the location of evidence by mapping victim remains found at scenes. The increase of blast-related incidents in areas of conflict worldwide as well as attacks on civilian populations in industrialized regions has necessitated research that simulates blast events to aid in the interpretation of blast trauma. Mapping post-blast evidence is a way to increase base knowledge of what is typical of post-blast scenes and to aid in identifying human remains onsite. As such, there is an immediate need for controlled experiments that test the accuracy of evidence collection methods at blast events and the relationships between victim trauma and geographic location at the post-blast scene. The current study uses GIS as a tool to understand the nature and scope of victim (and associated remains) displacement from their original location after a blast event.

Seventeen non-military grade, outdoor blast events with two porcine proxy victims (*Sus scrofa*) each (N=32) were used to test for the existence of commonality in victim dispersal patterns, fracture type and location on the skeleton, and accuracy of GIS post-blast scene mapping methods. Proxy victims were placed 1.5 meters away from, and facing, each device. Victims were positioned upright to simulate a standing human. After detonation, a Global Navigation Satellite System (GNSS) Receiver was paired with a Bluetooth® connection to a collector app to document all evidence, including victim remains. The GNSS Receiver was paired with a Satellite-Based Augmentation System (SBAS) to compensate for possible inaccuracies due to obstruction, data integrity, point anomalies, and signal availability. Evidence was also mapped using an azimuth board, a hand-mapping technique. Victim remains were decomposed at an outdoor facility, macerated, and analyzed for blast trauma to the skeleton. Seven blunt force trauma fracture types were identified and their frequencies were overlaid on GIS maps developed from scene data.

The remains of all 32 victims were dispersed in a cone-shaped pattern from the seat of the 17 blasts. Remains traveled as far as 57 meters, but the highest concentration of evidence was contained within a 30-meter radius of each blast. Anatomical portion (e.g., lower limb) and fracture type were significantly associated (p=0.036) with distance from the seat of the blast. When assessing accuracy of scene mapping, data points collected using this GIS procedure were not significantly different within 30 centimeters (p=0.081) of the same point collected using the hand-mapping method. Further, the use of the collector app allowed for photographic documentation simultaneously with the collection of geographic location.

The results of this study highlight the importance of collaboration between anthropologists and crime scene investigators at a post-blast scene. Mapping spatial data provides an additional analytical tool for the anthropologist during trauma analysis and scene recreation by investigators. Moreover, digital maps of this nature are often more easily interpreted by the public (i.e., juries) than charts or numerical data tables.

Post-Blast, GIS, Blunt Force Trauma

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