H38 Distinguishing Homicides and Suicides in Firearm Fatalities: The Role of Skeletal Trauma Analysis

Jade S. De La Paz, BA, Boston University School of Medicine, 72 E Concord Street, Boston, MA 02118; Jonathan D. Bethard, PhD, Boston Univ School of Medicine, Dept of Anatomy & Neurobiology, 72 E Concord Street, L1004, Boston, MA 02118; Jennifer L. Hammers, DO, Comm of MA OCME, Boston Office, 720 Albany Street, Boston, MA 02118; and Hugh E. Berryman, PhD, Middle TN State University, Dept Sociology & Anthropology, Box 89, Murfreesboro, TN 37132*

After attending this presentation, attendees will understand how skeletal gunshot trauma analysis can provide information for identifying manner of death through consideration of four specific factors: (1) anatomic location of entrance wound; (2) bullet direction; (3) number of shots; and, (4) fracture severity/patterns.

This presentation will impact the forensic science community by identifying new ways in which firearm fatalities and manner of death can be investigated through the use of skeletal trauma analysis. Specifically, it presents new findings that broaden the scope of anthropological research on skeletal gunshot trauma and uniquely represent the important role of the anthropologist in the forensic science community.

Although it is not the anthropologist's responsibility to determine manner of death in a forensic case, an expertise in osteology and the biomechanics of high velocity projectile trauma to bone may contribute to the pathologist's final conclusions about manner of death in firearm fatalities. Previous research looking at variation between homicides and suicides in firearm fatalities has primarily used soft tissue trauma analysis and autopsy reports to identify common characteristics specific to these manners of death.[1-9] They have found that anatomic location of entrance wound, bullet direction, number of shots, and range of fire are important factors in understanding this variation. Anthropological research has not explored how this variation is expressed on the skeleton and knowledge of these differences can better equip anthropologists to report pertinent information that can lead to accurate determinations of manner of death. The current study explores the factors of anatomic location of entrance wound, bullet direction, and number of shots, with additional consideration to fracture severity and fracture patterns, in place of range of fire.

The William M. Bass Donated Skeletal Collection and the Antioquia Modern Skeletal Reference Collection provided a total sample of 15 suicide and 19 homicide cases, totaling 16 suicidal and 35 homicidal gunshot wounds. Each factor observed was analyzed to identify statistically significant differences between homicides and suicides.

This research found that localized entry sites to the front and right sides of the head and to the chest were common in suicides. Entries to the left and front sides of the head and to the posterior side of the head and body were common in homicides. Further analysis of sequence of shots and entry sites revealed that the front of the head, common in both homicides and suicides, was more common in secondary gunshot wounds in homicides. Bullet directions common in suicides were right to left through the sagittal plane, and anterior to posterior through the coronal plane. The left to right direction through the sagittal plane was most common for homicides, whereas the anterior to posterior and posterior to anterior directions through the coronal plane were almost equally represented in homicides. Further analysis of sequence of shots and bullet direction revealed that the anterior to posterior direction was more common in secondary gunshot wounds in homicides. The transverse plane did not show statistically significant differences between homicides and suicides for either the inferior to superior or superior to inferior directions. For number of shots, homicides more commonly expressed multiple gunshot wounds and suicides more commonly expressed single gunshot wounds. Fracture severity analyses revealed that the presence of tertiary fractures (concentric fractures) in entrance wounds was more common in suicides. The presence of secondary fractures (radiating fractures) as the most severe fracture in entrance wounds was more common in homicides. These results suggest that fracture severity is higher in suicides, based on the amount of kinetic energy dispersed at impact, although it is unclear what factor influences these differences (range of fire, type of firearm, caliber of bullet, etc.). There was also a significant difference between homicides and suicides in fracture patterns for both entrance and exit wounds.

These findings are based on a small sample and should be considered with caution, especially for use in a forensic setting. Further research is crucial to better understanding the results of this study. Specifically, sequencing of shots should be further explored for its utility in distinguishing homicides and suicides as well as providing a better understanding of multi-shot cases. Additionally, research should be conducted on fracture severity and fracture patterns with specific consideration to factors that influence the variation seen between homicides and suicides.

References:

 ** Presenting Author*

1. Cina S, Ward M, Hopkins M, Nichols C. Multifactorial analysis of firearm wounds to the head with attention to anatomic location. Am J Forensic Med Pathol 1999;20:109-15.
2. de la Grandmaison GL, Fermanian C, Aegerter P, Durigon M. Influence of ballistic and autopsy parameters on the manner of death in case of long firearms fatalities. Forensic Sci Int 2008;177:207-13.
3. Desinan L, Mazzolo GM. Gunshot fatalities: Suicide, homicide or accident? A series of 48 cases. Forensic Sci Int 2005;147S:S37-S40.
4. DiMaio VJM. Gunshot wounds. Practical aspects of firearms, ballistics, and forensic techniques, 2nd edn. New York, NY: Elsevier, 1999.
5. Druid H. Site of entrance wound and direction of bullet path in firearm fatalities as indicators of homicide versus suicide. Forensic Sci Int 1997;88:147-62.
6. Eisele JW, Reay DT, Cook A. Sites of suicidal gunshot wounds. J Forensic Sci 1981;26:480-85.
7. Karger B, Billeb E, Koops E, Brinkmann B. Autopsy features relevant for discrimination between suicidal and homicidal gunshot injuries. Int J Legal Med 2002;16:273-78.
8. Karlsson T. Multivariate analysis ("forensiometrics") – A new tool in forensic medicine. Differentiation between firearm-related homicides and suicides. Forensic Sci Int 1999;101:131-40.
9. Pennefeather RL. Determination of manner of death based on gunshot wound entry site and bullet trajectory. Master's Thesis. Knoxville, TN: University of Tennessee, 2003.

Skeletal Gunshot Trauma, Manner of Death, Fracture Severity

 ** Presenting Author*