H57 The Long and Short of It: A Skeletal Trauma Analysis of a Gunshot Wound Suicide From a .22 Caliber Long Rifle Round Shot Through a Handgun

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The goals of this presentation are to provide attendees with: (1) information concerning the diagnostic characteristics related to gunshot wound trauma to the head; (2)the order of operations implemented when law enforcement, forensic pathologists, and forensic anthropologists work on a case; and, (3) the logical and objective reasoning used to determine the manner of death.

This presentation will impact the forensic science community by filling a gap in the literature related to rifle ammunition that is shot from a handgun in cases of suicide.

This presentation discusses the analysis of trauma resulting from a suicidal gunshot wound to the skull. This study draws attention to the process of differentiating low-velocity projectile trauma from blunt force injuries while reinforcing how cooperation between the medical examiner, skeletal analysts, and law enforcement investigators leads to case resolution.

In 2015, the severely decomposed remains of a European (White) male were discovered within a wooded area in Venice, FL. A handgun was found at the scene. The forensic autopsy was conducted and the preliminary finding was a gunshot wound of the head; however, because of the extensive fracturing of the skull, the co-occurrence of blunt force trauma to the decedent's head could not be excluded. In addition, the positive identification needed to be established using an antemortem radiographic comparison. With these analysis needs in mind, forensic anthropological analysis was conducted at the request of the medical examiner.

Following best practices outlined by the Scientific Working Group for Forensic Anthropology (SWGANTH), the remains were macroscopically examined, photographed, and radiographed prior to rendering. After the maceration process, the fracture margins were evaluated using a 300X dissecting microscope; the skull was reconstructed using a quick-drying glue; the skull was radiographed and photographed post-reconstruction; the fracture lines were mapped onto anatomical figures. The examination revealed one entrance wound to the right temporal squama as evidenced by internal beveling while the exit wound with external beveling perforated the left temporal squama. Based upon the location of these entrance and exit defects, the projectile moved from right to left with a slight anterior to posterior trajectory. Multiple radiating fractures marked both defects and ran across the orbital plates, maxilla, and basilar portion of the cranium. Radiographic analysis revealed evidence of bullet wipe within the entrance and exit wounds as well as within the anterior cranial fossa.

Further information from law enforcement regarding the caliber of the gun and ammunition revealed that a Ruger® 22/45 (Model P512) was recovered near the body. Low-velocity projectiles are associated with a variety of handguns as well as 0.22 caliber rimfire rifles with muzzle velocities ranging from 650 to 1,400 feet per second. The 0.22 caliber Long Rifle (LR) round is the most powerful of the 0.22 short and long caliber ammunition. The injuries associated with these types of low velocity projectiles occur within the tissues and organs directly in the path of the projectile; although, 0.22 LR cartridges usually produce secondary fractures within the hard tissues — especially when the projectile impacts the head from a contact position. The pattern of low-velocity projectile injury contrasts

markedly to the injury patterns that typify military ammunition or high-velocity (≥2,000 feet per second) center fire rounds (≥0.17 caliber) where tissue and organ damage can occur outside the projectile's path.

Although both gunshot and blunt force injuries create radiating and concentric fractures, they differ fundamentally in their direction, magnitude, and rate at which force is applied. For example, the rate of blunt force trauma is slow loading, allowing the bone to fail (or bend) over time, thereby creating plastic deformation, delamination, and sometimes tool marks. In this case, the radiating fractures, lack of delamination, fracture propagation, and the presence of beveling allowed us to rule out blunt-force traumato be ruled out. Therefore, the extensive fractures to the cranial vault, maxilla, and basilar portion of the skull were consistent with 0.22 caliber LR ammunition. The 0.22 caliber LR ammunition has a much longer cartridge and, as such, produces more gas at the time of discharge. The discharge of the firearm in combination with the expansion of the gases confined within the cranial vault produces extensive fractures in a contact wound suicide.

Upon further communication with law enforcement and due to the evidence provided by the District 12 Office of the Medical Examiner, the decedent's skeletal remains were identified and it was confirmed that the skeletal trauma associated with a peri-mortem gunshot wound was consistent with a 0.22 caliber LR projectile.

Gunshot Wound, Suicide, .22 Caliber Long Rifle