A8 Patterning of Projectile Trauma Associated With a Historic World War II Battlefield Site

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Learning Overview: After attending this presentation, attendees will have a better understanding of projectile skeletal trauma patterns associated with historic military contexts.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by highlighting the pattern and extent of projectile trauma associated with historic battlefield deaths.

Since World War II (WWII), it is estimated that approximately 70% of battlefield wounds are due to explosive munitions, whereas gunshot injuries are more common during "theatre entry operations" in the early phases of a conflict. Clinical literature demonstrates most battlefield injuries affect the extremities, with the extent of the injury determined by the amount of energy transferred, which is dictated by the type of tissue being penetrated and the surface area of the projectile. Although literature is available for current-day military operations, data sources for injuries patterns of WWII cases are not as readily available. A study of the trauma documented by the Defense POW/MIA Accounting Agency's (DPAA) scientists during their analyses to identify unaccounted-for service members from the Battle of Tarawa provides a unique opportunity to understand injury patterns associated with an amphibious landing assault during WWII and how it compares to modern-day battlefield contexts.

This study utilized a sample of 33 WWII-era causalities where the historic documentation noted the cause of death as gunshot wound(s) and the skeletal material was available for review. All individuals in this sample were associated with the same unit and were killed during a single offensive during the Battle of Tarawa. Some preservation issues prevented a definitive assessment of projectile trauma of the thorax, but nearly all other trauma was readily discernable for these cases. All trauma was documented in accordance with the DPAA-Laboratory's standard operating procedures, including applicable photography. The type and extent of trauma was tabulated by general body region to produce descriptive statistics of elements effected and to provide an overall pattern of skeletal defects observed. Extreme perimortem and postmortem fragmentation of several elements complicated efforts to assess if a given injury was the result of ballistic or another high-energy projectile; however, the high degree of fragmentation (20+ fragments) was overcome in most cases through reconstruction of the defect to allow for more accurate documentation and interpretation of the projectile trauma.

Over 90% of individuals in the sample display at least one traumatic lesion on the skeleton. Approximately 70% of individuals exhibit some form of trauma to the skull or neck, several exhibiting multiple defects, with approximately 55% of individuals having sustained at least one traumatic lesion consistent with projectile trauma. Almost 40% of cases have at least one projectile or possible projectile defect located on the upper appendages, while only 12% of cases have at least one defect on the lower appendages that is clearly related to projectile trauma. Trauma to the thorax, including ribs, thoracic and lumbar vertebrae, scapulae and claviculae, was observed in almost 30% of cases, with the majority of these (~27% of total cases) exhibiting at least one projectile or possible projectile defect. Traumatic lesions were least frequently observed on elements comprising the pelvis, with only 6% of the sample showing at least one defect from possible projectile trauma. The projectile trauma that was readily discernable had a presentation consistent with the prevailing literature for cranial and tubular bone, which allowed for further interpretation on impact trajectory. For the cranium and long bones, 35 distinct defects were identified, with directionality able to be estimated in ~80% of cases.

The overall pattern of trauma, with more injuries to the head and neck as opposed to the extremities, is discordant with modern day clinical data indicating a high percentage of wounds to the extremities in battlefield injuries. Of note, there is a larger percentage of clear gunshot wounds to the skeletons in this sample, which corresponds with expectations in theatre entry operations for current-day military operations. Exploring these similarities and differences, such as demonstrated here, has the potential to improve forensic practitioners' abilities to interpret trauma from historic battlefield contexts.

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