



A13 Blast and Aircraft Crash Trauma: A Selection of World War II (WWII) Cases From the Defense POW/MIA Accounting Agency (DPAA) Laboratory

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Learning Overview: After attending this presentation, attendees will understand differential traumatic patterning in skeletal remains associated with historic wartime aircraft- and blast-related events.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by deconstructing analytical criteria associated with historic aircraft and blast events and providing guidelines to differentiate both types of trauma. These criteria will help anthropologists and pathologists working in mass disaster areas and possibly human rights work around the world.

Trauma assessment is a complicated endeavor that provides insight into the cause of death, peri-mortem interval, and life history of the individual. Because of their work with other forensic experts and in medicolegal situations, forensic anthropologists must demonstrate competency and accuracy in trauma analyses. As other researchers have noted, methods for trauma analyses require validation to ensure quality and scientific rigor of work.

Blast- and aircraft-related incidents are influenced by various extrinsic and intrinsic forces and represent extreme forms of bodily trauma that may result in similar patterns of injury. However, limited research has been completed regarding differentiating between these types of trauma, and no well-defined criteria exist for analysis.

Bodily trauma from propeller-driven aircraft crashes is characterized by extensive blunt-force trauma from deceleration. Anthropological literature categorizes four types of blast trauma, which result from different mechanisms and are associated with different fracture patterns. Bodily trauma from a blast event may result from the blast wave (primary), associated projectiles (secondary), acceleration/deceleration impacts (tertiary), or flash burns (quaternary). The potential injuries are characterized by a mixture of blunt-force and/or projectile trauma, resulting from exposure to explosive ordnance, such as grenades, landmines, mortars, and bombs. Furthermore, a set of remains may display complicated patterns that preclude identification of a single category of blast trauma.

Recently resolved WWII cases with established causes of death relating to blast ($n=11$) or aircraft ($n=24$) events were assessed. The reports were written by various anthropological analysts who performed their analysis in the blind. The causes of death were determined by a medical examiner based on the available historical and anthropological data. The blast cases are from open-environment ground losses, while the aircraft cases involve propeller-driven aircraft.

Among these cases, differences existed in the amount and overall condition of recovered remains, which may affect analytical potential. The majority of aircraft (50%) and blast (90%) cases reported at least 25% element recovery; complete biological profiles were possible for some aircraft (29%) and most blast (90%) cases. Widespread trauma was found predominantly in aircraft cases (66%) and less frequently in blast cases (27%), in which trauma tends to be more localized. Aircraft cases often displayed spiral (33%) and butterfly (20%) fractures, but none were observed in the blast cases. Multiple or indeterminate directionality was evident in all aircraft (100%) and a number of blast (45%) cases, but unidirectionality was observed only in blast cases (55%). Only blunt trauma was observed in the majority of aircraft cases (66%) and a smaller percentage of blast cases (36%), while other blast cases (45%) displayed some evidence of projectile trauma. Indeterminate trauma was observed in some aircraft (29%) and blast (9%) cases.

The results of this study suggest that physical trauma resulting from historic aircraft and blast cases can be differentiated based on the type and pattern of trauma present. Additionally, it may be possible to identify specific blast trauma categories within a set of remains; based on the analysis, blast trauma may be characterized as projectile (secondary) or non-specific.

Although numerous traumatic features may aid interpretations, they should not be used as definitive criteria. These case studies are intended to provide a comparative framework for differential diagnosis and possible points for future research. Similar fracture patterns may result from other causes, and not all criteria may be evident in all cases due to the inherent complexities of traumatic events and the recovery process, which affects the condition of remains present for analysis.

The views herein are those of the authors and do not represent those of the Defense POW/MIA Accounting Agency, Department of Defense, or United States government.

Trauma, Aircraft Deceleration, Blast Injuries