H134 Survival Intervals Following Fatal Single Gunshot Wounds of the Head

Michelle S. Clark, MS, Farmington, CT ; Deland Weyrauch, MD, Yale School of Medicine, New Haven, CT 06515; James R. Gill, MD, Office of the Chief Medical Examiner, Farmington, CT 06032*

Learning Overview: The goal of this presentation is to elucidate factors associated with a survival interval following an ultimately fatal gunshot wound of the head.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating that not all fatal gunshot wounds of the head are immediately fatal and by delineating the factors associated with survival.

Forensic pathologists are commonly asked to opine, based on autopsy findings, about the amount of physical activity or length of survival following gunshot wounds. Standard forensic pathology teaching is that gunshot wounds of the central nervous system are immediately incapacitating/fatal while other injuries, even a perforating gunshot wound of the heart, may not be. These opinions may help corroborate or contradict witness statements or help explain scene findings.

The Connecticut Office of the Chief Medical Examiner is a single-facility, centralized, state-wide medical examiner system serving a population of approximately 3.6 million people with 29,000–31,000 deaths per year during the span of this study. It receives all reports of jurisdictional deaths, including all gunshot wound fatalities. There were 3,081 fatal gunshot wound deaths over this 20-year review, of which gunshot wounds of the head were involved in 1,769. Of these, there were 62 deaths due to a single gunshot wound of the head in which the person survived from 6 to 336 hours (14 days). The mean survival interval in these cases was 57 hours. The manners included 35 suicides, 24 homicides, 1 accident, and 2 undetermined. Fifty-six decedents were male (90%) and the ages ranged from 13–90 years (mean: 36 years). The firearms included: 33 handguns, 3 rifles, and 26 unknown. The bullet exited in 26 instances. The wound involved both cerebral lobes in 43, and involved the brain stem in two. Penetration/perforation of only one cerebral lobe occurred in 15, and 3 wounds were midline. Skull fractures were described in 37 (60%). Range of fire was: 33 contact, 12 close, and 16 undetermined. Projectiles included: 10 small caliber (3 rifles with .22), 15 medium caliber (.32, .38, 9mm), and 4 large caliber (.40 and .45). Eight decedents had expanding hematomas (subdural and/or epidural) described. Three patients, all with self-inflicted wounds, were reported to be fully conscious when discovered. The first had an entrance wound under the chin and an exit wound inferior to the eye (the projectile did not enter the skull). Death was caused by aspiration of blood from the gunshot wound complicated by metastatic lung cancer. The second involved the superficial parietal lobes. The third had a facial entrance wound with perforations of the left frontal and right parietal lobes and an expanding subdural hematoma. All these patients were speaking when discovered; only the first remained fully conscious on arrival to the hospital (two projectiles were deformed, jacketed bullets, and one was a jacketed .25 bullet).

Opinions of forensic pathologists regarding these survival intervals must distinguish between incapacitation and death. A single gunshot wound of the head normally causes immediate incapacitation, but rarely there may be a period of consciousness and even a prolonged survival interval, particularly with prompt medical intervention. This may occur with gunshot wounds that involve both cerebral lobes and in the context of a variety of calibers and ranges of fire. The mechanism of death due to gunshots wounds of the head typically involves disruption of the central nervous system and may include hemorrhage and expanding intracranial hematomas. The neurological trauma almost always results in immediate cessation of brain function, but cardiopulmonary function may persist or return with resuscitation attempts. Rarely, a period of brief consciousness may occur even when a projectile penetrates the brain. When offering these opinions, it is best to interpret the autopsy findings in context of the circumstances.

Forensic Pathology, Gunshot Wounds, Survival Intervals

*Presenting Author