



H165 Radiodense Bullet Wipe (RBW) Around Skeletal Entrance Gunshot Wounds: The Frequency of Detection and Evaluation of Decedent, Wound, and Ammunition Characteristics

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Learning Overview: After attending this presentation, attendees will appreciate the prevalence of RBW around skeletal entrance gunshot wounds and the possible significance of bullet caliber, presence of jacket, and range of fire.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by documenting information that may be helpful for the postmortem evaluation of skeletal gunshot wounds.

“Bullet wipe” is the material deposited by a bullet on any surface with which it comes into contact after it is fired. Bullet wipe may contain debris from the gun barrel, including particles of primer and metal fragments from previously fired bullets. X-ray analysis is a non-destructive method by which traces of metallic elements can be visually detected. The analysis of bony defects for RBW is an important technique for assisting in the determination of the presence or absence of perforating gunshot wounds, especially in fragmented, skeletonized remains.

The aim of this current study was to determine the frequency of RBW around entrance firearms injuries that perforated bone. This study prospectively analyzed entrance gunshot wounds for RBW over a three-year period using digital X-ray analysis (KaVo NOMAD™ Pro with DEXIS™ software). The primary rate limiting step was the ability to maneuver the skeletal element for radiography. A total of 59 cases were able to be successfully radiographed. The autopsy reports from these cases were retrospectively reviewed to determine the frequency of RBW by biologic sex, reported ancestry, age-at-death, location of wound, manner of death, range of fire, bullet caliber, and presence of bullet jacket. Data were analyzed by Fisher’s exact test or Chi-square test (GraphPad Prism 8.1.2) with significance levels accepted at $p < 0.05$.

RBW was present in 66% ($n=39$ of 59) of examined cases. Decedent biological characteristics did not significantly alter RBW, including biologic sex ($p=0.75$), reported ancestry ($p=0.49$), and age-at-death ($p=0.43$) when examined by ten-year ranges. Additionally, the location of the bony entrance gunshot wound did not significantly affect RBW detection, including the frontal bone, right parietal bone, left parietal bone, right temporal bone, occipital bone, maxillae (hard palate bones), sternum, and mandible. RBW was not detected from the left temporal bone ($n=1$) nor the rib ($n=1$).

Manner of death did not significantly affect RBW detection, as RBW was found in 67% of homicides ($n=18$) and 72% of suicides ($n=21$). No RBW was detected from cases where the manner of death was classified as accident ($n=2$) or undetermined ($n=1$). Range of fire did not significantly affect RBW detection, as RBW was recovered from 65% of contact range wounds ($n=22$), 69% of intermediate range wounds ($n=9$), and 67% of indeterminate range wounds ($n=8$).

When information was available regarding handgun cartridge caliber ($n=49$), RBW was recovered from 100% of cases involving .22 caliber cartridges ($n=3$), 50% of cases involving .25 caliber cartridges ($n=1$), 64% of cases involving .380 caliber cartridges ($n=7$), 56% of cases involving 9mm caliber cartridges ($n=9$), 75% of cases involving .40 caliber cartridges ($n=9$), 50% of cases involving .357 caliber cartridges ($n=1$), and 33% of cases involving .45 caliber cartridges ($n=1$). In 42 cases, the handgun cartridge was jacketed and RBW was detected in 67% of these cases ($n=28$). All cases involving non-jacketed rounds ($n=5$) showed RBW ($p=0.30$).

Per research, this study is the first to report the frequency of RBW detection from skeletal entrance gunshot wounds.

Radiodense Bullet Wipe, Skeletal Gunshot Wound, Postmortem Radiology