E99 The Comparison of Entry Bullet Holes in Glass, Metal, and Wood With a Variance in Caliber, Distance, and Grain Weight

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Learning Overview: After attending this presentation, attendees will have a better understanding of the differences in entry bullet holes in glass, metal, and wood substrates created by variables often encountered in shooting incidents: (1) different caliber ammunitions, (2) different grain weights, and (3) shooting distances.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by improving the understanding of entry bullet holes and validating expert testimony regarding the origin and relationships of these in the reconstruction of shooting incidents.

This study hypothesized that a larger caliber bullet with a heavier grain weight would make a larger entry bullet hole, compared to a smaller caliber bullet with a lighter grain weight. It also hypothesized that a bullet fired at a closer distance would make a larger entry bullet hole than being fired at a further distance and one could expect significant differences in entry bullet holes depending on the nature of the target substrate. These possibilities were tested at an outdoor shooting range.

The following studies were conducted on three different surfaces (laminate glass, sheet metal, and plywood). The first study was conducted using a laminate glass as the target to simulate a vehicle windshield (24"x24" and 7mm thick). The second study was conducted using sheet metal as the target to simulate a metal vehicle quarter panel (24"x24" and 20 gauge). The third study was conducted using a plywood target (24"x24" and ½") to simulate a covering of an outdoor structure. There were three different shooting distances: near (4"), intermediate (24"), and distant range (48"). The shooting distances were measured from the muzzle of the handgun to the target surface. Six shots were fired for each caliber and grain weight: six shots for the distances of the metal and wood targets and only four shots for the glass target, due to the fragility of the glass. The entry holes were photographed with a Canon® EOS 70D camera and an American Board of Forensic Odontology (ABFO) metric scale. Camera settings were set manually according to the lighting at the time of shooting. The diameters of the entry holes were measured with a digital caliper and the date analyzed for statistical significance using the One-Way Analysis of Variance (ANOVA) statistical test and a p value of <0.05 to indicate significance.

The findings indicated that there was no statistical significance difference in the diameter of the entry hole in the targets, handgun caliber, grain weight, and firing distances used in this investigation. This research may dispel the often-held myths related to the tested variables and will provide crucial information for establishing the truth by supporting or refuting eyewitness or suspect testimony in the courtroom.

Shooting Distance, Bullet Entry Hole, Bullet Grain-Caliber