

## CASE REPORT

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### External Beveling of Cranial Gunshot Entrance Wounds

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**REFERENCE:** Peterson, B. L., "External Beveling of Cranial Gunshot Entrance Wounds," *Journal of Forensic Sciences*, JFSCA, Vol. 36, No. 5, Sept. 1991, pp. 1592-1595.

**ABSTRACT:** Entrance gunshot wounds of the skull generally have internal beveling. External beveling has been previously described in association with internal beveling (keyhole defect) and with wounds from handgun projectiles. An accidental shooting is described in which a 22-year-old male sustained a perforating gunshot wound of the head at distant range from a 5.56-mm (.223-caliber) fully jacketed rifle round. Although the entrance wound had symmetrical external beveling, misinterpretation of this particular entrance wound as an exit wound would have been difficult.

**KEYWORDS:** pathology and biology, wound ballistics, beveling, gunshot wounds, skulls

External beveling is a feature generally associated with skull gunshot wounds of exit; the usual entrance wound has internal beveling. An accepted mechanism has the projectile pushing a plug or disk of cortical bone through the cancellous layer, creating a larger "blowout" type of defect on the opposite side [1]. External beveling of entrance wounds is uncommon and has been previously described in two types of wounds: tangential gunshot wounds and certain handgun wounds. Tangential or graze wounds may produce "keyhole" bony defects that have both external and internal beveling [2]. The keyhole pattern is not exclusive to entrance wounds and exit defects of similar appearance have been described [3].

The literature concerning external beveling of other than tangential entrance wounds is sparse. Spitz mentions the phenomenon in passing and ascribes the effect to "chipping of the outer layer of the bone around the defect by the forceful return of gases through the bullet hole or by the twisting force of the rotating bullet" [4]. Coe's discussion [5] concerns wounds produced by handguns (.22, .38, and .32 caliber) and cautions against

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misinterpreting such entrance wounds as exits. Di Maio [6] notes that:

Chips of bone can flake off the edge of an entrance defect, producing an effect resembling beveling. Such chipping of the edge of the wound of entrance is very superficial and usually does not lead to confusion with an exit hole, because it is not nearly as marked as the beveled surface. Rare exceptions do occur.

Other references describe either “standard” beveling [1,7,8] or neglect to discuss the phenomenon [9]. The following case illustrates a pattern of external beveling associated with a perforating high-velocity gunshot wound.

### Case Report

A 22-year-old male sustained a perforating gunshot wound of the head while standing guard duty at a military range. The shooting occurred as a second guard aimed and fired his M16A2 at the victim, not realizing a round was chambered. The ammunition was a standard fully jacketed 5.56-mm (.223-caliber) “military ball” of the new M8-85 (62 grain) type. A single shot was fired from a distance of 4 ft; the victim was transported to an emergency room and pronounced dead within 45 min of the shooting.

At autopsy, the sole injury was the gunshot wound of the head. A 7.6-cm scalp laceration corresponding to the bony entrance wound was found 11.2 cm above the right external auditory meatus and 6.1 cm anterior to the coronal midline. Neither fouling nor stippling were found around the laceration. The calvarium and skull base were extensively comminuted; examination of the entrance and exit defects was facilitated by reconstruction of the skull using a drill and stainless steel wire. The entrance defect (Fig. 1) was 5.5 mm in diameter, surrounded by a symmetrical 2.0-mm margin of external beveling (Fig. 2). Internal beveling was on the inner table deep in the wound. The right frontal, temporal, parietal, and occipital lobes were extensively lacerated. The exit defect, comminuted and with missing bone fragments, was in the midline and measured 5.1 cm in width by 3.6 cm in height (Fig. 3). External beveling was particularly prominent on the left margin of this defect. An overlying stellate scalp laceration measured 17.8 cm in height by 9.0 cm in width. The bullet was not recovered either from the body or at the scene.

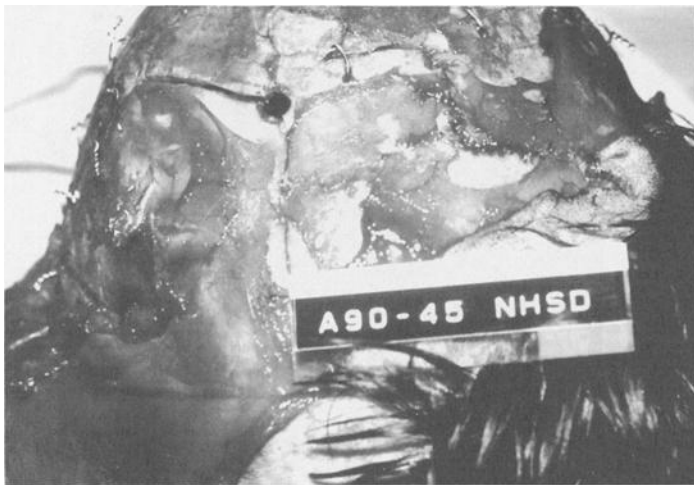


FIG. 1—Right parietal entrance wound.



FIG. 2—Close-up of the entrance wound. Note the symmetrical external beveling.

**Discussion**

Gunshot wounds of the skull may generally be interpreted using a set of simple principles. The entrance defect usually is circular and has internal beveling; the exit defect usually is larger than the entrance and externally beveled. Fortunately for the field of forensic pathology, these principles have exceptions. Entrance wounds often differ in shape and may have internal, external, or both types of beveling. Exit wounds may be



FIG. 3—Occipital exit wound.

similarly confusing. In the present case, an investigation indicated that this rifle wound was inflicted at a distance of 4 ft, and the impact was essentially perpendicular to the head. Given the clear history and nature of the head wounds, differentiation of the entrance from the exit wound was not difficult. The fact that external beveling was symmetrically distributed around the entrance wound is not so easy to explain. Mechanisms have been proposed for such an artifact, including the return of gases through the entrance hole and bullet rotation [4]. The former explanation may prove sufficient in cases of contact range firing, but such logic does not extend well to firing from a distant range. The theory of bullet rotation is not convincing because of the minimal rotation that would occur during skull perforation. Blowback from pressure associated with temporary cavity formation would appear to be the most likely explanation for this artifact; such a mechanism has been invoked to explain the often stellate appearance of distant high-velocity gunshot wounds of the head [6]. In any case, this artifact should be considered in the interpretation of any gunshot wound of the head, particularly in cases where soft tissue is absent or only bony fragments are available for examination.

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