

BRIEF COMMUNICATION

In this issue we introduce a new category of published work, the Brief Communication. This category is designed for the communication of results (generally of an experimental nature) in a short format. These communications will be reviewed in the normal manner, but are shorter than a typical Technical Note. We believe that the availability of this category meets a need for our journal, and helps us to better serve both our authors and our readers. As noted editorially in the January, 1993, issue, the availability of this format will eliminate the presentation of experimental results in Letters to the Editor, and thereby enhance our quality assurance.

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Identification of Gunpowder in Healed Wounds

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ABSTRACT: A woman received a contact gunshot wound to the abdomen from a .22 caliber revolver. She recovered only to succumb to another gunshot wound six months later. The initial wound was dissected and multiple intact granules of round flake gunpowder were recovered. Cross sections of granules were clearly identifiable in histologic slides. Recovery of intact powder in remote wounds has not been previously described and may help classify the ammunition and weapon used to produce the injury.

Under the layman's broad concept of the misnomer "powder burns" and all that it portends to the expert, is the principle that heavy particulate matter composed of burned and unburned powder granules will penetrate and be retained by the epidermis and dermis. In the acutely inflicted wound this finding is useful in determining range of fire, type of gunpowder used and to some extent the type of weapon. The forensic literature is replete with descriptions of this acute phenomenon, but relatively devoid of the histologic characteristics of remotely retained gunshot residue. Identifying intact granules in healed wounds means the evidentiary value of exploring the wound remains high well beyond the acute injury.

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Report

A woman sustained a contact gunshot wound of the abdomen from a .22 caliber revolver. Six months later she received a fatal gunshot wound to the head with a .25 automatic. Examination of the healed wound revealed a scarified periphery with a central eschar. The wound was excised and showed readily visible intact powder granules in the subcutaneous scar tissue. Figure 1 shows three intact granules of round flake gunpowder recovered from the wound track. When touched with a red-hot needle, the granules burned with a bright yellow flash, typical of gunpowder [1]. Figure 2 shows the histologic appearance of the granules embedded in scar tissue. Cross sections of the powder granules are readily defined from their fibrous outline, the adherent carbon and the nearly trans-

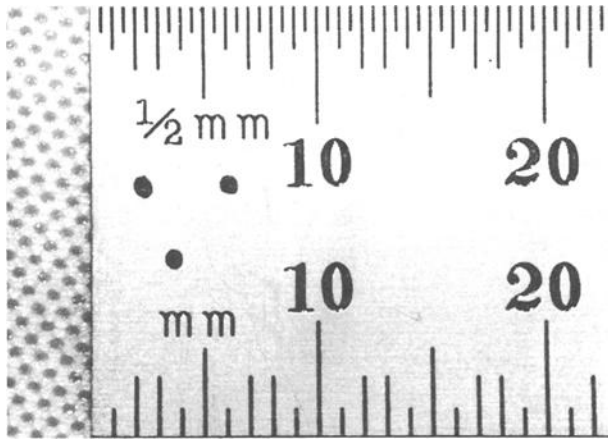


FIG. 1—Photograph showing round flake granules of gunpowder removed from the scar tissue of the healing gunshot wound. Individual granules were readily identifiable, encased in a fibrous capsule and easily recovered.

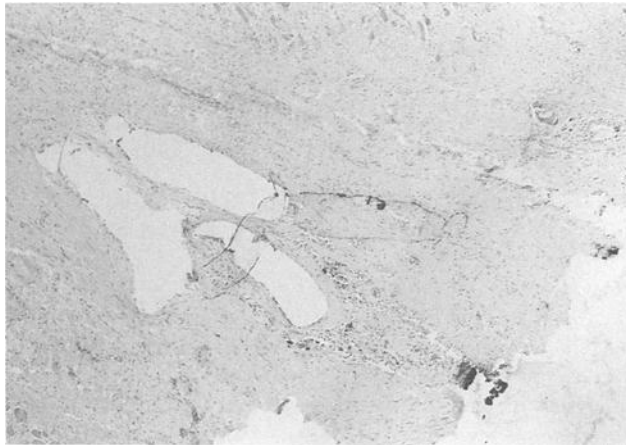


FIG. 2—Photomicrograph of a portion of the scarified gunshot wound showing entrapped, intact granules of gunpowder. Thin sections of the nitrocellulose base are displaced by sectioning onto adjacent tissues. The outline of the granule is preserved and peripherally highlighted by carbonaceous material. The inflammatory reaction consists of maturing granulation tissue without foreign body or granulomatous reactions adjacent to the granule.

parent nitrocellulose itself. A foreign-body type granulomatous reaction producing dissolution or loss due to macrophage activity is not seen involving the granules.

Discussion

Gunshot residue detection by naked eye [2] or histologic examination [2,3], is used in interpreting gunshot wounds. Character, density, dispersion, and penetration are adjuncts in estimating range of fire [4,5]. Finding unburned powder granules helps identify the munitions used through the type of powder loaded in the cartridge [6,7]. The type of powder may also point to the class of weapon. Ball and flattened ball powders are frequently loaded in magnum handgun cartridges, but tubular powders are generally loaded in rifles and only recently seen in pistol cartridges [8]. The above findings from the current literature describe acutely inflicted gunshot wounds; some articles have identified anthracotic residues in wounds undergoing repair, but not intact granules [9]. In patient's who survive, healing entry sites may retain the carbonaceous debris or dark granules of powder in the dermis, leaving the skin with a permanent (explosive adventitious) tattoo [1,10]

This case indicates that gunpowder is stable, at least for six months. Resorptive changes similar to retained suture material were expected but not seen. Macrophage and occasional giant cell activity is present but not adjacent to the granule; there is neither breakup of the granule, nor ingrowth of granulation tissues. The granules are easily recovered and retain their original shape. The material still reacts to a red-hot probe by giving the characteristic flash of gunpowder.

The practical advantage is the ability to obtain evidence and state with confidence the nature of such remote injuries. Identification of gunpowder is as valid in the healed wound as it is in the acute one. Large amounts of powder reflect a contact to near wound, but intact particles of powder may be carried into the wound depths by a bullet fired from a distance [11].

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