TECHNICAL NOTE

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Cyanoacrylate Adhesive Technique in Wound Edge Approximation

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ABSTRACT: Cyanoacrylate, the adhesive component of many commercially available strong-binding glues, has been used by the medical profession for various purposes, including tissue adhesion and repair, embolization, sclerotherapy, and hemostasis. Mortuary science professionals rely on cyanoacrylate's adhesive property to aid in body restoration techniques following embalming. Forensic applications include the use of cyanoacrylate fumes for latent fingerprint detection. An additional application for this sticky chemical is currently unrecognized by many within the forensic community. Specifically, cyanoacrylate's adhesive property makes possible the relatively simple, efficient, and rapid approximation of disrupted skin and tissue when warranted during a forensic autopsy. The final result is aesthetically pleasing and lends itself to subsequent photographic documentation especially when patterned injuries are encountered. We discuss the technique, benefits, and limitations of the cyanoacrylate adhesive method in this setting and present several cases wherein the technique has produced satisfying results.

KEYWORDS: forensic science, cyanoacrylate ester, wound edge approximation, photographic documentation

The disruption of skin and other tissue is frequently encountered in individuals requiring a forensic autopsy. Reconstruction and approximation of wound edges are often indicated for photographic documentation, especially when patterned injuries are encountered. Manual approximation of wound edges, while probably the fastest method available, may cause unnecessary distractions in medicolegal photographs. Transparent adhesive tape may be used to adjoin edges of stab or incised wounds [*1*], but the tape is often unintentionally blemished by blood and/or powder. The use of staples can obscure certain injuries, and the time required to suture wound edges together can be laborious. Another form of tissue reconstruction involves the use of hot melt adhesives and electric glue guns for bone reconstruction [*2*]. Instead of time-consuming suturing or potentially nonphotogenic manual or tape methods, we routinely use a rapid, efficient, and aesthetically pleasing method involving cyanoacrylate ester adhesive.

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Material and Methods

Cyanoacrylate adhesive, more commonly known as Super Glue, is commercially available at most department, drug, and hardware stores. Several proprietary names with various chemical composition are manufactured; however, we routinely use "Aron Alpha" (Borden, Inc., HPPG, Columbus, OH), which is a low viscosity, ultra-quick setting compound. The actual technique for tissue reconstruction is quite simple (Fig. 1). Following initial photography, the tissue is gently washed and blotted dry before applying the adhesive. A small amount of glue is applied to the tissue surfaces to be joined. When attaching disrupted skin, a thin stream of adhesive is applied subjacent to the epidermis along the wound edge. Adherence of wound edges follows careful application of firm pressure for 10 to 15 seconds. Gentle release of pressure leaves the reconstructed tissue intact and ready for photographic documentation. Experimentation with variations on this technique may be required depending on the tissue reconstructed. It is important to keep the tissues as dry as possible, as the glue does not bind well to extremely wet or bloody surfaces. Care must be taken to avoid using excessive amounts of adhesive to prevent "spillover" onto skin or other surfaces.

Results and Discussion

Cyanoacrylate ester is by no means new to the medical or forensic professions. Various forms of the chemical have been used for intraoperative tissue adhesion and repair [*3–6*], arteriovenous malformation embolization [*7–9*], sclerotherapy [*10*], hemostasis [*11,12*], gastrointestinal ulcer topical application [*13,14*], fallopian tube obstruction [*15*], and drug carrier/delivery systems [*16,17*]. Cyanoacrylate ester has aided dermatologists

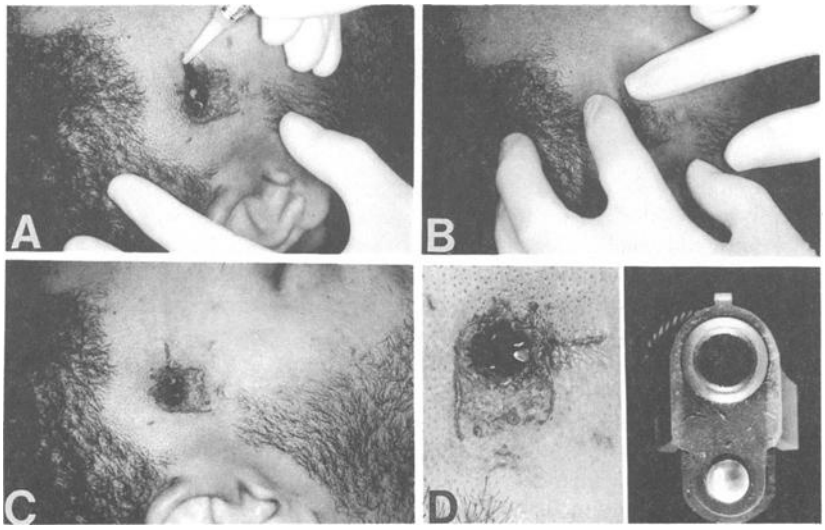

FIG. 1—*A thin stream of cyanoacrylate ester is applied to the dried wound edge* (A). *Following gentle pressure* (B), *the wound edges are approximated and adherent* (C). *Imprint abrasion and muzzle of decedent's 9mm Taurus* (D).

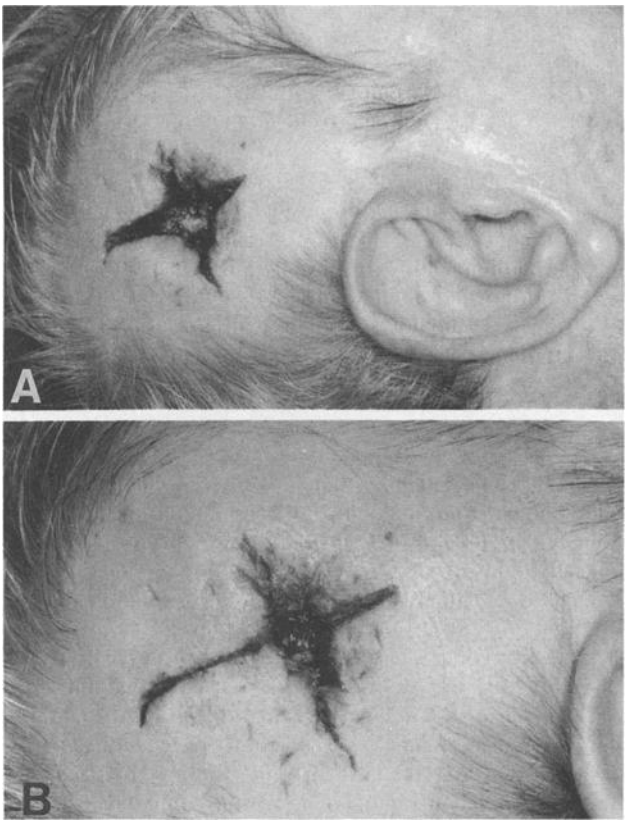

FIG. 2—*Suicidal gunshot wound of the head* (A) *and approximated wound edges* (B).

and pathologists in the examination of the epidermal stratum corneum [*18*]. Mortuary science professionals have used cyanoacrylate restoration techniques since at least 1975 [*19*]. Finally, the use of cyanoacrylate fumes for latent fingerprint detection is well-known within the forensic science community [*20–23*].

While this chemical has received widespread acclaim from many of our professional colleagues, we have found cyanoacrylate to be invaluable to our forensic autopsy service. The rapid, practical, and inexpensive cyanoacrylate wound approximation technique has proven itself in a variety of forensic autopsy situations.

Some of the most satisfying results have occurred in the reconstruction of contact, cranial gunshot wounds (Fig. 2). Markedly disrupted wounds can be restored revealing readily recognizable entrance wounds with associated muzzle imprint abrasions that can be compared with the alleged weapon (Fig. 3). This method can be valuable in correcting surgical artifacts that create interpretation difficulties. Figure 4 depicts an abdominal gunshot wound that was incorporated into an emergency laparotomy incision. The gunshot wound is nearly imperceptible, even though the incision has been partially closed with surgical sutures. After wound edge approximation using cyanoacrylate adhesive, the entrance wound is easily recognizable. Adjoining of wound edges in stabbing victims can produce gratifying results (Fig. 5).

Although excellent results are often attained with this procedure, it does have its limitations. As mentioned previously, the adhesive does not adhere well to excessively

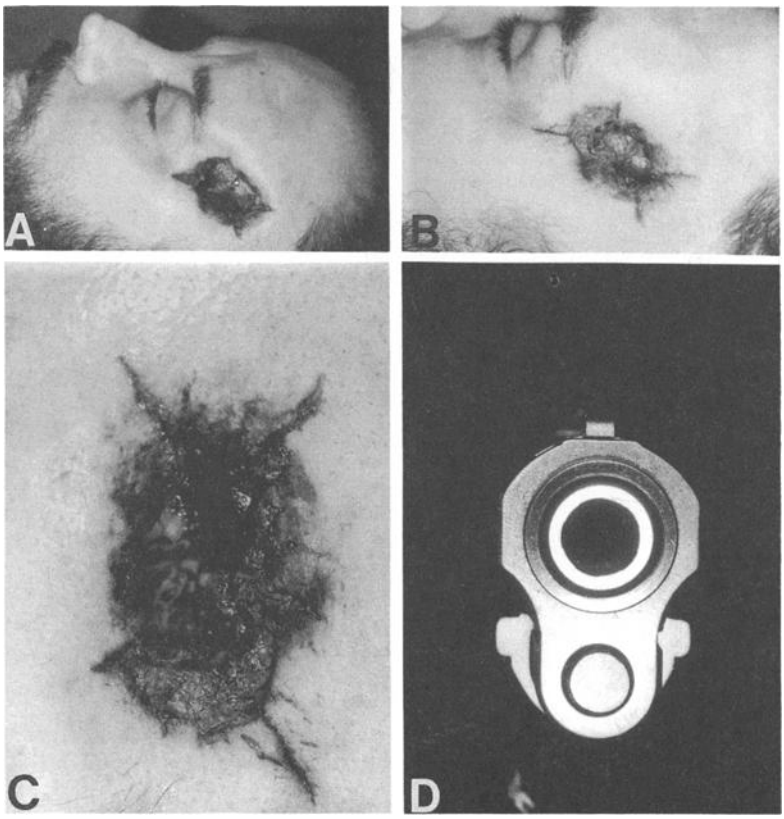

FIG. 3—*Disrupted gunshot wound of the head* (A) *and wound following cyanoacrylate ester adhesion* (B). *Imprint abrasion* (C) *and muzzle from 9mm S&W 5904* (D).

wet surfaces; therefore, bloody, edematous, and various decomposed tissues are less suitable for cyanoacrylate adhesion. Blotting and air drying may yield acceptable surfaces to which adhesion may occur. Large, floppy tissue segments may be difficult to glue together due to the weight of the tissue. In such situations, a few strategically placed sutures may provide enough support to create a suitable setting for cyanoacrylate adhesion.

Despite the limitations of this method of wound edge approximation, cyanoacrylate appears to be the best technique available. For medicolegal documentation, it is almost essential that forensic pathologists photograph the decedent's injuries. Besides documenting the wound "as is," it is appropriate to produce photographs which reveal important patterned injuries and points of impact. Tissue reconstruction is often required in these instances. Forensic photographs must be a fair and accurate representation of the victim's injuries with minimal distractions. This is particularly important when autopsy photographs are displayed in court. The use of cyanoacrylate ester allows the simple, quick, and efficient approximation of disrupted tissues when indicated during a forensic autopsy.

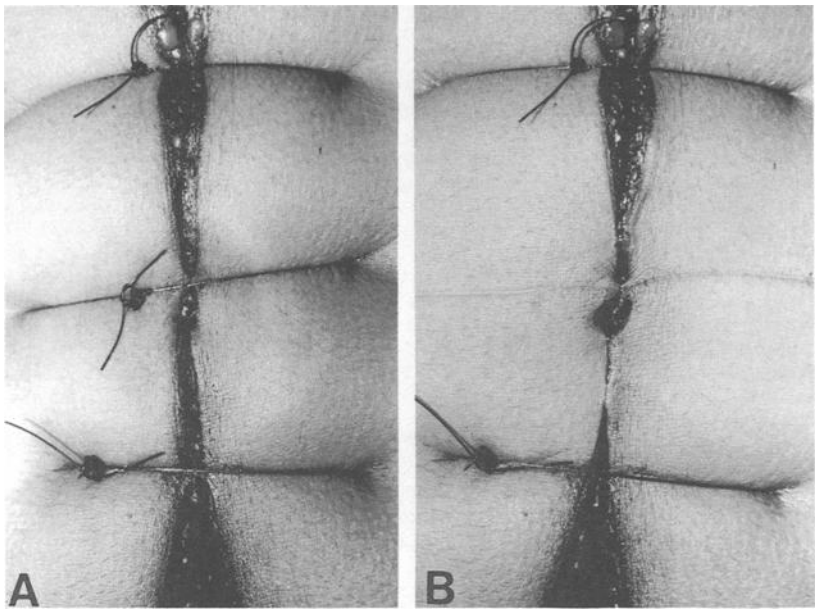

FIG. 4—*Laparotomy incision partially closed by sutures* (A). *Application of cyanoacrylate ester reveals bisected gunshot wound* (B).

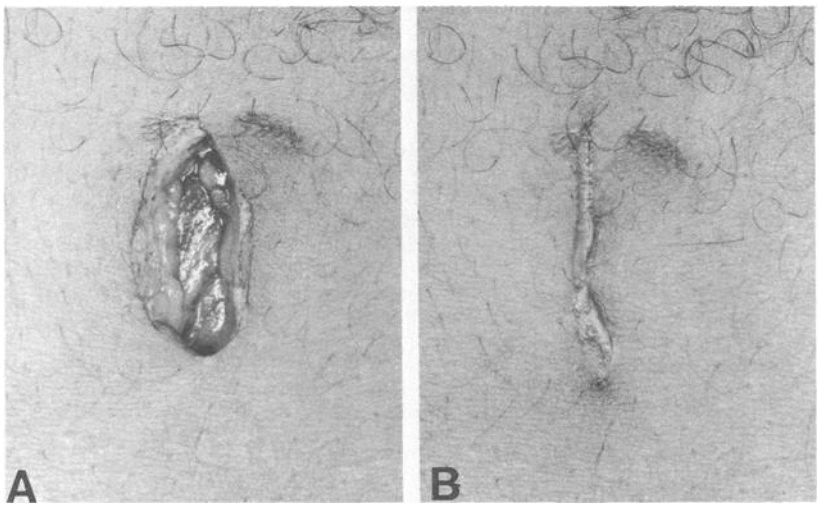

FIG. 5—*Gaping stab wound* (A) *and approximated wound edges* (B).

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