

TECHNICAL NOTE

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Resin Dental Casts As an Aid in Bite Mark Identification

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ABSTRACT: Two techniques are presented for the fabrication of resin dental casts to aid in bite mark analysis. The first technique produces visible light cured dental casts of the suspected biter's dentition. These casts can be compared to the victim's bite marks or photographs of the bite marks. The technique is rapid and casts of the suspected biter's dentition can be made in less than thirty minutes, which is advantageous when the elimination of possible suspects must be accomplished in a timely fashion. The second technique involves the fabrication of crystal clear epoxy resin dental casts of the suspected biter's dentition. The dental casts are translucent and permit visualization through the teeth when comparisons are made to the bite marks or to tracings or photographs of the bite marks. The casts can also serve as an educational tool for a jury or juries in trials involving bite mark evidence. The resin dental casts are less brittle than dental stone casts permitting storage without concern for breakage for periods of years.

KEYWORDS: odontology, bite mark identification

A bite mark is a mark made by the teeth either alone or in combination with other mouth parts [1]. The bite mark may be considered a mirror image of the arrangement and characteristics of the dentition. Epidermal bite mark evidence has led to the indictment, trial and conviction of suspects in crimes associated with child abuse, sexual assaults, and homicides [2]. In bite mark analysis, dental casts are traditionally fabricated in dental stone [3]. Dental stone is brittle and opaque in comparison with resin materials.

The purpose of this article is to present two techniques of producing clear resin casts for bite mark analysis. The first technique involves the production of clear resin models that can be quickly used to compare a suspected biter's dentition to that of the bite marks on the victim. The second technique involves the production of clear resin casts that can allow by virtue of their translucency, visualization through the casts for comparison of the biter's dentition to that of the actual bite marks or to tracings or photographs of the bite marks. This latter technique also preserves the casts

for indefinite periods and serves as an educational tool for the jury to study.

Materials

Visible Light Cured Resin

TRIAD (Dentsply International, Inc, York, PA) material is similar to light cured composite resin but has an organic rather than an inorganic filler [4]. The material is composed of a matrix of urethane dimethacrylate plus small amounts of microfine silica to control the rheology [4]. The filler consists of acrylic resin beads of varying sizes that become part of an interpenetrating polymer network when cured. Polymerization of high molecular weight acrylic resin monomers contained within the matrix is initiated with a camphoroquinones amine photoinitiator. The material is available in tubes containing 22 grams of material. Polymerization of the material can be accomplished using a portable visible light curing unit. Any visible curing light that emits light in the 400 to 500 nanometers (nm) wavelength range will successfully cure the material to a depth of 5 to 6 mm [4]. This material has been found to be more dimensionally stable than conventional acrylic resins [5].

Crystal Clear Epoxy Casting Resin

Marglass 658 (Acme Chemicals and Insulation Co., New Haven, CT) is a room temperature cured crystal clear epoxy resin. It is characterized by a low exotherm and by the ability to render water clear small castings at room temperature. The resin will cure even under conditions of high humidity and moisture. The resin is usually mixed with its hardener Marglass 558 in a ratio of 2:1 by weight. The resin normally cures at room temperature in 24 hours. The resin is available in 2 kilogram containers.

Technique

TRIAD Resin Cast

An impression of the suspected biter's upper and lower teeth is made using disposable plastic dental trays and vinyl polysiloxane impression material (Baysilex, Henry Schein Inc., Port Washington, NY) according to accepted dental techniques. A bite registration record is also made according to standard techniques. The impressions are rinsed with water and dried thoroughly using an air syringe. TRIAD clear resin gel is squeezed from the tube into

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the impression for each tooth (Fig. 1). The material is extended to a height approximately 3 mm beyond the cervical area of each tooth. The TRIAD gel material is then cured using a standard visible light curing unit that emits light in the 400 to 500 nm wavelength range (Dolan-Jenner Model 170D, Dolan Jenner Industries Inc., Woburn, MA) (Fig. 2). This forms a horseshoe-like cast of the suspected biter's dentition (Fig. 3). These casts can then be used to compare, to the bite marks on the victim, or a properly made photograph of the bite marks. The TRIAD clear gel material does not cure clear enough to permit actual visualization of the photographs or tracings of the bite marks through the resin teeth. In this regard the use of an epoxy resin model is recommended. The time involved to make impressions of the suspected biter's teeth and to generate a TRIAD resin model is less than 30 minutes, which can be useful in the elimination of suspects when time is of the essence.

Epoxy Resin Cast

Upper and lower impressions of the suspected biter's teeth are made using disposable plastic trays and vinyl polysiloxane impres-

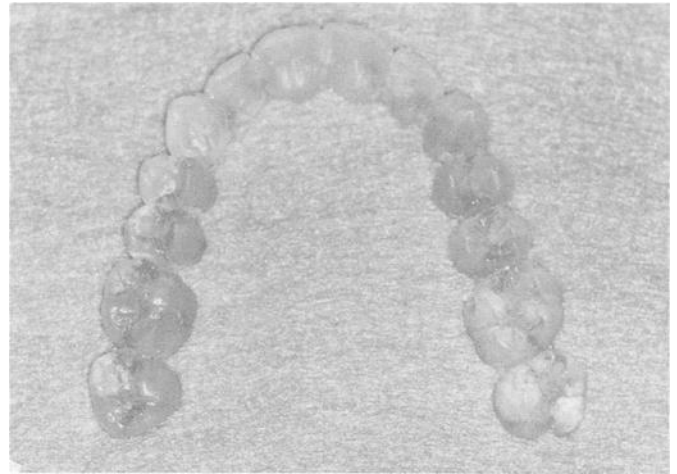


FIG. 3—TRIAD resin (Dentsply International, York, PA) cast of upper arch of suspected biter's dentition.

sion material (Balsilex, Henry Schein Inc, Port Washington, NY) according to accepted dental techniques. A jaw registration record is also made according to standard dental techniques. The impressions are rinsed with water and dried thoroughly with an air syringe. The impressions are boxed using boxing wax that has been wrapped in aluminum foil. The aluminum foil coating of the boxing wax prevents the epoxy resin from acting as a solvent and causing dissolution of the pigments from the boxing wax. If dissolution of the pigments from the boxing wax occurs the final casts will not be clear. The boxed impressions are placed on a flat surface so that the impression trays are oriented in a horizontal and level position. The Marglass 658 is mixed with its corresponding hardener Marglass 558 according to the manufacturer's recommendations and poured into the impressions (Fig. 4). The resin is allowed to cure at room temperature for 24 hours and then the casts are separated from the impressions. The result is crystal clear dental casts which can permit visualization through the resin teeth and thereby allow accurate comparison of the teeth in the cast to the



FIG. 1—TRIAD resin gel (Dentsply International, York, PA) applied to upper impression of suspected biter's dentition.



FIG. 2—TRIAD resin gel (Dentsply International, York, PA) in impression being cured using portable visible light curing unit.



FIG. 4—Upper impression boxed using wax and aluminum foil. Marglass 658 epoxy resin (Acme Chemicals and Insulation Co., New Haven, CT) is poured into the impression and allowed to cure with the impression being maintained in a horizontal and level position.



FIG. 5—Completed epoxy resin dental cast (dental arch) of suspected biter's dentition.

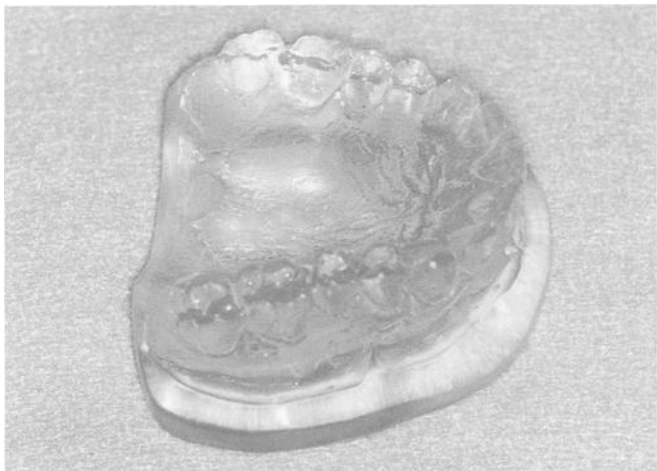


FIG. 6—Completed epoxy resin dental cast (full cast) of suspected biter's dentition for evidence purposes.

bite marks or photographs of the bite marks (Figs. 5 and 6). These crystal clear resin casts also make nice educational models for the jury or juries in criminal trials. The resin casts are less brittle than dental stone casts and thus can be stored for a period of years without concern for breakage.

Conclusions

Resin dental casts offer the advantages of rapid fabrication to aid in eliminating suspects in cases involving bite marks and translucency to allow visualization through the teeth when analyzing bite marks. Two methods of fabricating resin dental casts were described. The first method involved fabricating resin dental casts using a visible light cured resin. The visible light cured resin allows rapid fabrication (30 minutes) of casts for use in bite mark cases. However this resin does not cure clear enough to allow complete visualization through the teeth and therefore epoxy resin dental casts should be relied upon when visualization through the teeth is desired when analyzing the bite marks. The method of fabricating clear resin dental casts involves the use of epoxy resin which is translucent permitting visualization through the teeth. This material is less brittle than dental stone and can be stored for a period of years without concern for breakage. Both techniques of fabricating resin dental casts are simple and require no elaborate or expensive equipment. These techniques can serve as a useful tool in the armamentarium of the forensic dentist involved in bite mark identification.

References

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