

TECHNICAL NOTE

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Radiographic Interpretation of Contrast-Media-Enhanced Bite Marks

Radiography has been a diagnostic and interpretive instrument of the scientific community for many years [1]. The forensic science applications are numerous and varied, with a primary focus on identification problems [2]. Forensic odontologists rely heavily on dental radiography to match or exclude antemortem and postmortem films for identification [3]. Medical examiners have often been aided in their identifications by radiographic discoveries of broken bones, implants, and other foreign objects [4]. Recent work has expanded the experimental use of radiography to include the examination of fingerprints on skin [2, pp. 123-135] and the accurate mapping of incisal contours for comparisons [5]. Current opinion discounts any radiographic application in interpreting the tissue change caused by bites [6, p. 81].

Bite marks are routinely studied by various photographic techniques [7, pp. 150-151] and impressions [6, pp. 121-126] with supplemental tests such as saliva washings [7, pp. 151-152].

This paper describes a technique for interpreting bite marks through soft tissue radiography.

Methods and Materials

A series of bite marks was produced up to 15 h postmortem on the lower right quadrant of the abdomen of 25- to 35-year-old white and black male cadavers. Typodont³ was used with the aid of a C-clamp⁴ to develop a consistent and reproducible bite mark.

Immediately after the bite marks were produced, a silicone impression⁵ was taken as a reference and the skin was sutured to a plastic ring 8.9 cm in diameter.⁶ Approximately 1-cm-thick skin was then dissected from the body and placed in a 2.5% formalin solution to await the radiographic procedures.

The radiographic procedures depend on contrast enhancement of the bite marks. A 0.25-mm-thick layer of 60% iodine solution⁷ was used as a radiopaque medium to cover

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³Typodont #SS61, Columbia Dentoform Corp., New York.

⁴Stanley Tool Co. H155, 64 by 64 mm (2½ by 2½ in.), Hartford, Conn.

⁵Elasticon syringe and tray material, Kerr Sybron Corp., Romulus, Mich.

⁶Polyvinyl chloride 89-mm (3½-in.) plastic pipe.

⁷Conray® (meglumine iothalamate) injection, U.S. Pharmacopeia, 60%, Mallinckrodt, Inc., St. Louis, Mo.

the bite mark. Standard radiographic techniques were then employed for soft tissue visualization. A General Electric hospital diagnostic X-ray machine was used to produce xeroradiographs of the specimen placed 79 cm from the X-ray source. The operating conditions were 200 mA, 44 kV, and 1 s as a starting point for exposures; exposures were then bracketed by changing the voltage in increments of ± 4 kV. The xeroradiographs were processed in the negative and positive mode for comparison.

An image-intensifying cassette⁸ was used with a dental X-ray unit⁹ and Type F¹⁰ film to provide similar results. The initial settings were 15 mA and 50 kV at 0.4 s with a distance of 76 cm.

Silicone impressions were repeated 36 h after production of the bite marks to determine the amount of distortion produced with preservation.

Results and Discussion

Figure 1 demonstrates the bite-marked tissue specimen sutured to a plastic retaining ring. The photographic depiction of the bite mark is of typical high contrast quality and demonstrates the impressions made by individual teeth.

Figure 2 shows the xeroradiograph in the positive mode. The xeroradiographic enhancement of the incisal edges is apparent. The impressions left by the incisal edges can be accurately compared to the original model producing the bite.

Figure 3 is a standard photographic print¹¹ of a radiograph taken with dental X-ray equipment. There is less contrast than in the xeroradiograph, but the impressions produced

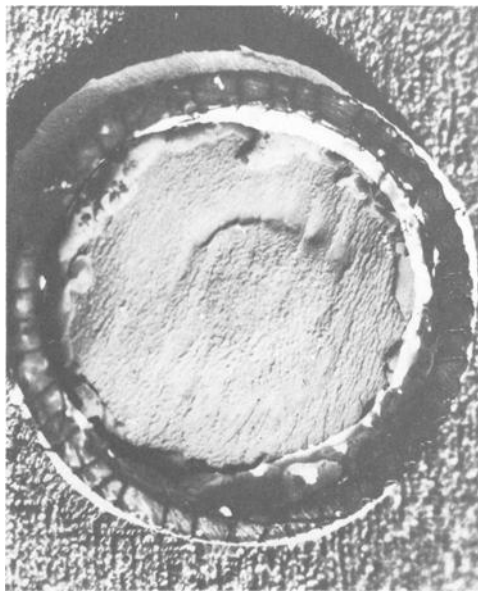


FIG. 1—Standard high-contrast photograph of tissue with a bite mark sutured to a plastic retaining ring.

⁸ Panorex cassette, Eastman Kodak Co., Rochester, N.Y.

⁹ General Electric Model 90X.

¹⁰ Kodak Type F SB Panoramic dental X-ray film.

¹¹ Ilford resin-coated photographic paper, 127 by 305 mm (5 by 12 in.).

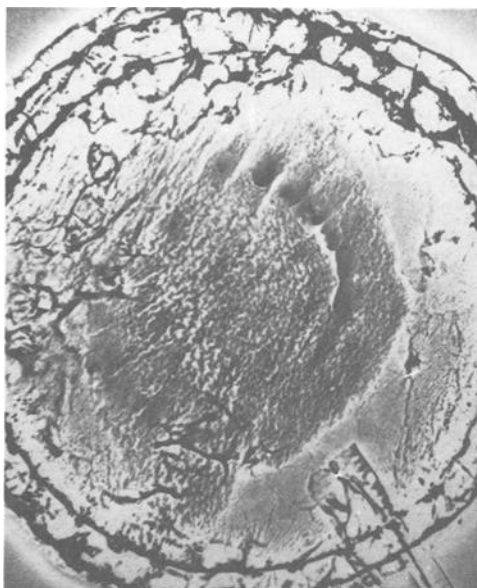


FIG. 2—Xeroradiograph of tissue with a bite mark.



FIG. 3—Standard photographic print of a radiograph of tissue with a bite mark.

by the incisal edges are distinct and accurately match the biting model through the use of overlays or direct comparison.

A comparison of the silicone impressions taken before dissection of the skin and after 36 h of preservation in 2.5% formalin shows a shrinkage of less than 1 mm in 30 mm. The small amount of shrinkage would indicate that a reevaluation of bite mark examina-

tion procedures may be in order. The dissection and examination of certain bite marks may be proper in some situations.

Conclusions

Contrast-enhanced radiography of bite marks is a technique that allows more thorough study and understanding of the bite mark. While this technique is not intended to replace standard photographic techniques in recording bite mark evidence, it can add valuable information and should therefore be considered as an adjunct. Radiography has the advantage of penetrating the tissue, thereby revealing damage that might not be observed in the photographic approach.

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