TECHNICAL NOTE

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A Photographic Technique for the Restoration of Damaged Radiographs

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ABSTRACT: Occasionally during identification efforts, the forensic science team will encounter radiographs needed for comparisons that are damaged and seemingly useless. The simplified darkroom technique presented will facilitate the recovery of useful information from such compromised radiographs on film.

KEYWORDS: odontology, X-ray analysis, human identification, radiographs

With the steady increase in the number of identification cases involving severely fragmented, dismembered, or skeletonized remains, forensic science teams are finding that successful resolution may often depend upon radiographic comparisons involving small amounts of postmortem material. All too frequently, the quality of the antemortem radiographs, against which a comparison must be made, is compromised. This may be due to the use of poor (that is, less than archival) quality radiographic film, with the resultant breakdown of the material with age; poor developing, fixing, or some additional technique failure during the initial processing of the radiograph; improper storage with subsequent damage from mold, mildew, heat, or other sequelae of environmental disturbances; or combinations of these, to varying degrees.

While various disciplines of forensic science may frequently use radiographic comparison, the vast majority of forensic science cases involving such comparisons are handled by the forensic odontologists. Therefore, it is not uncommon, from among the practitioners of this speciality, to hear the lament: "If only we had better radiographs to work with." The forensic odontology section at the U.S. Army Central Identification Laboratory, Hawaii (CILHI), is no exception in this regard.

Part of the mission of the CILHI is the identification of remains from World War II, the Korean War, and the Vietnam War. The last U.S. serviceman listed as missing during the Vietnam War was lost in 1975. Therefore, the most current radiographs available to the CILHI forensic odontologist are twelve years old, and many radiographs used for comparison date back to the late 1950s. It is to be expected then that the CILHI forensic science team

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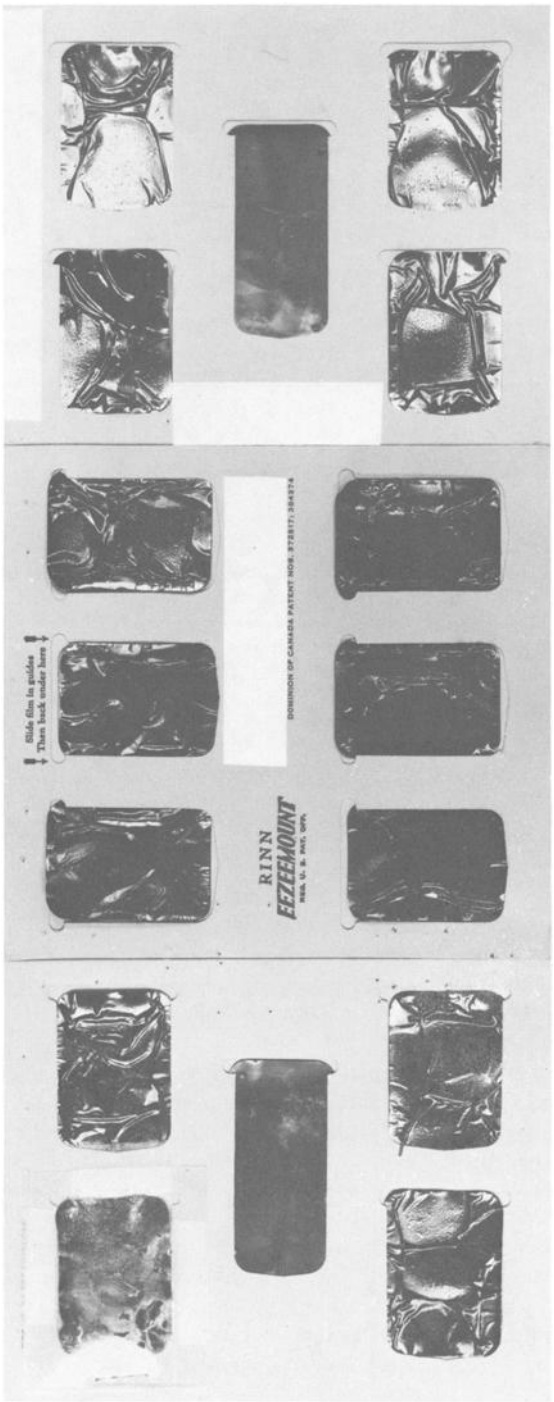

FIG. 1—*The damaged radiographs. Reflected light is used to demonstrate the "crinkled" surface that is peeling loose from the back of the films.*

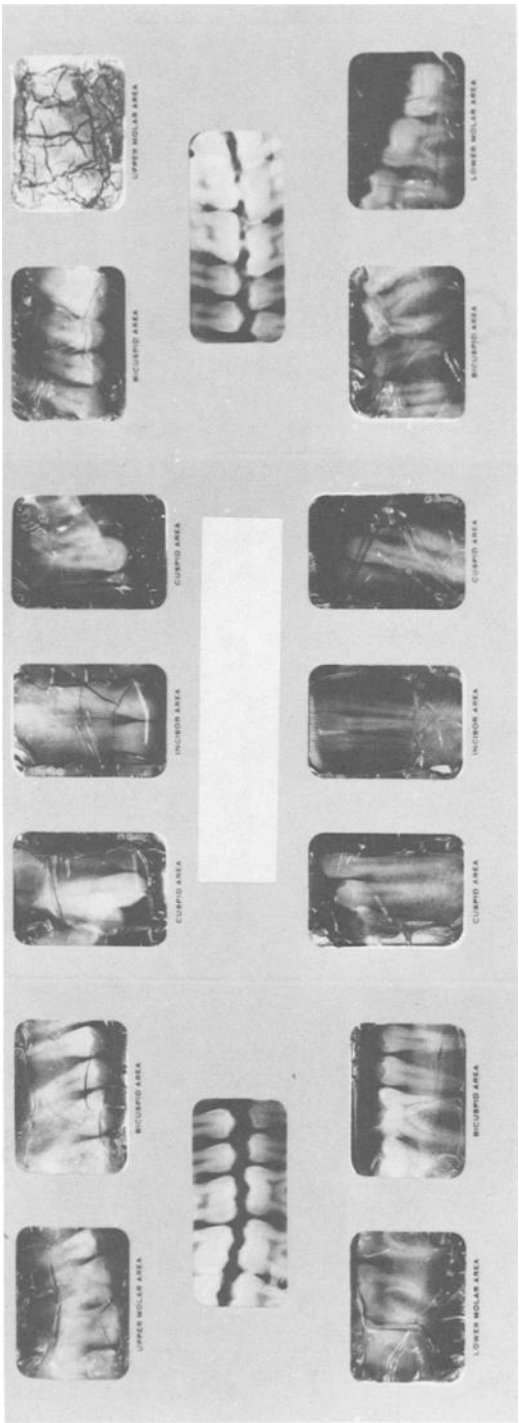

FIG. 2—*The radiographs as viewed on a view box under reduced room light.*

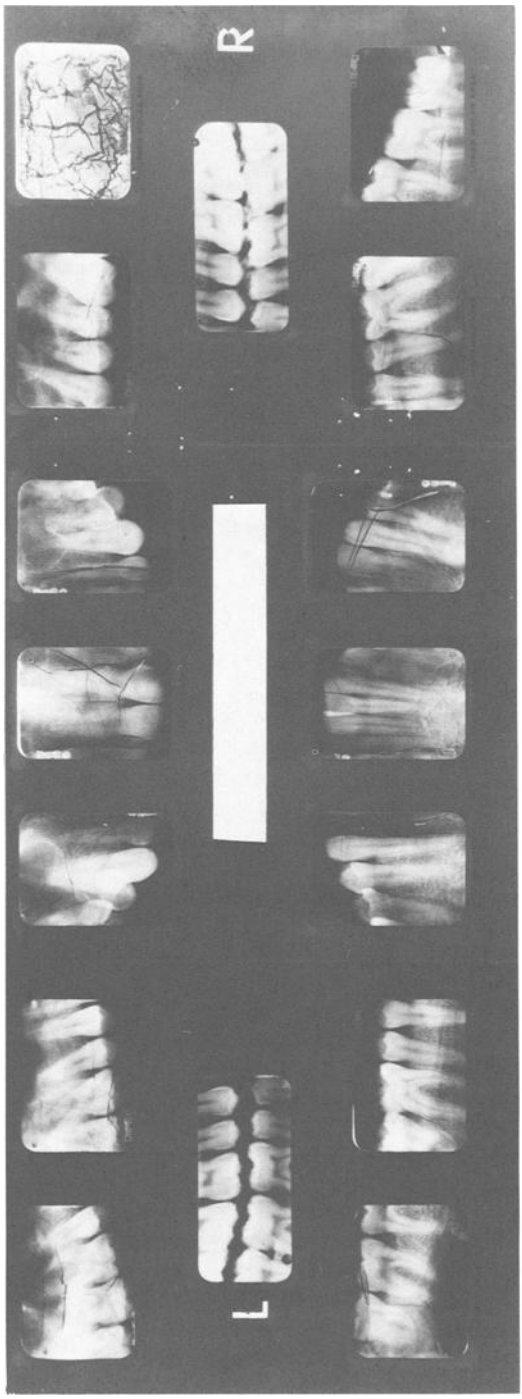

FIG. 3—*The photographic restoration of the information still available from the damaged radiographs using the technique discussed in this paper.*

would encounter radiographs of compromised quality with greater frequency than other forensic science units, and, by necessity, must use some innovative techniques to glean the maximum amount of available information from poor quality radiographs. One such technique is a simple photographic procedure carried out in the darkroom.

Method

During a recent identification effort, it became apparent that a radiographic comparison would be necessary between the postmortem radiographs and a full series of antemortem periapical radiographs in extremely poor condition. As can be seen in Fig. 1, the surface lamination of the individual radiographic films were in various stages of peeling and severely "crinkled." When placed on an X-ray view box and viewed with reduced room light, as in Fig. 2, the clarity was extremely poor. Consequently, the films were of no diagnostic value. These radiographs were placed on a view box in the darkroom and all uncovered areas that allowed extraneous light to pass through were masked. The radiographs, as viewed in the totally darkened room, yielded sufficient information to allow a successful antemortem-postmortem radiographic comparison to be made.

As an identification is only as good as the supporting documentation, it was necessary to produce a high quality representation of what was observed in the darkroom. Simple duplication of the original radiographs using a Rinn model 72-1200 X-ray duplicator and Kodak X OMAT duplicating film processed with GBX chemicals, resulted in the duplication of most flaws. The following photographic steps produced the superior result seen in Fig. 3.

In the darkroom the frame of radiographs is mounted on the view box, masked, and this whole setup is placed lying horizontal on the base of a copy stand. A Polaroid MP 4 format camera (4-by 5-in. negative) and Kodak Royal Pan (4141) film are used in this technique at CILHI. The lens is stopped down to f-16 and an exposure of one second is made. These exposure settings may vary with other equipment so spot metering is recommended as well as bracketing the exposure when first utilizing this technique. Normal Kodak suggested processing of the exposed film is carried out in producing the negative as well as the print. A No. 4 contrast filter was used in making the final print, Fig. 3, on Kodak Polycontrast Rapid II RCF paper.

Discussion

A simple and easily duplicated technique for obtaining high quality diagnostic photographic images from damaged and seemingly useless radiographs has been presented. The procedures discussed in this paper are intended as a guideline only. The choice of photographic equipment, film, and exposure settings are limited only by the imagination of those who would use this technique. The results will prove that the effort is well worth the minimal amount of time and expense required.

Sooner or later every forensic scientist who relies on radiographs of some type will open a radiographic envelope with great expectations, only to be severely disappointed by the contents. With this photographic technique, identifications will be made that would might not have been possible otherwise.

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