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CASE REPORT

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Significance of the Recent Extraction to the Postmortem Dental Identification: A Case Study

ABSTRACT: This case report illustrates the significance of the partially healed extraction site to the postmortem dental identification process. It presents the remains of two individuals with documented extractions—one, 6 ½ months prior to death, the second, only three weeks prior to death. These photographs, compiled with others, can be used as a guideline for the forensic scientist who seldom has the opportunity to study skeletonized remains.

KEYWORDS: forensic science, forensic odontology, forensic dentistry, extraction sites, bone remodeling

Identification of dental remains is commonly based on a comparison of the postmortem findings with antemortem radiographs or written records. In the absence of radiographs, every detail of the written record is essential to the development of the antemortem dental profile. Documentation of a recent extraction not only contributes to the pattern of restored and missing teeth, it also provides a chronological component to the profile. This can be very important to the identification if the decedent received minimal dental treatment, if there are limited available records, or if there are limited remains. Two cases are presented that illustrate progressive bone remodeling and the significance of the recent extraction in the identification process.

Case Reports

Case One

Following a 1993 unilateral turnover from North Korea, the commingled remains of an indeterminable number of individuals were accessioned to the U.S. Army Central Identification Laboratory, Hawaii (CILHI). A list of associated names was also provided, and a comparison with the Computer Assisted Postmortem Identification Database (CAPMI) revealed that one of the associated individuals had antemortem records consistent with a portion of the remains. Dental records of the decedent document extraction of the mandibular left second molar (tooth No. 18) on 16 May 1950. The individual, a soldier in the 7th Infantry Division, was reported as Missing-In-Action (later presumed Killed-In-Action) on 30 November 1950, a casualty of the first Chinese offensive of the Korean War. Considering the fact that the remains were obtained by unilateral turnover and commingled prior to repatriation, it was deemed necessary to attempt mitochondrial DNA (mtDNA) testing. The mandibular right third molar of this particular assemblage was sampled, and the resulting sequence was consistent with one provided by a maternal relative of the individual suggested by the CAPMI. Figure 1 illustrates the osseous remodeling that occurred during the 6 ½ months prior to death.

Case Two

In August 1942, elements of Company A and Company B, 2nd Marine Raider Battalion assaulted the Japanese garrison on Makin Island (now Butaritari). Following the battle, the Raiders reported 30 men unaccounted-for: 18 Killed-In-Action (Body Not Recovered) and 12 Missing-In-Action. In 1999, a CILHI team deployed to the island and recovered the remains of 20 individuals from a mass grave, the purported burial site of the Marine Raider casualties. The excavation yielded uniform remnants, weapons (small arms), and personal effects. Twenty-two metal identification tags were recovered, associating 11 individuals, by name, with the site. These 11 were among the 18 Marines documented as Killed-In-Action during the 1942 raid. Further evaluation revealed that a total of 19 assemblages were Caucasoid and could be tentatively associated with the Marine Raider casualties. The last assemblage recovered was determined to be mongoloid. This finding was consistent with a history given by island residents, who stated that natives prepared the mass grave and buried one islander with the Marines. The 19 Caucasoid assemblages were compared to the available antemortem dental records of the 30 unaccounted-for individuals, with a high degree of suspicion focused on the 18 Marines originally documented as Killed-In-Action. Eventually, the remains of 19 Marine Raiders were identified by a combination of circumstantial evidence (historical background and material evidence), anthropological consistencies, dental comparisons, and when necessary, mtDNA testing. The 19 consisted of the 18 Marines originally listed as Killed-In-Action and one Marine originally listed as Missing-In-Action.

One set of remains included a relatively complete, unrestored dentition that was missing four teeth: three mandibular incisors and the maxillary left first molar (tooth No. 14). The alveolar socket of

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the molar was clearly evident, and fracture of the maxilla through the socket suggested the tooth may have been lost perimortem or postmortem (Fig. 2). The curious aspect of this finding was the presence of an alveolar socket but no evidence of the smooth cortical bone that normally lines this area. It was reasonable to assume that some remnant of the cortical bone would be obvious, as was the case with the three mandibular incisors. These teeth, missing postmortem, were represented by alveolar sockets lined by intact, well-defined cortical bone. The contrast in appearance raised the question of whether tooth No. 14 was actually lost postmortem or extracted shortly before death. Senior Staff Anthropologist Robert Mann was consulted on this issue, and after studying the remains, he affirmed that the original cortical bone was indeed present but had undergone remodeling sufficient to alter the surface texture of the socket wall.

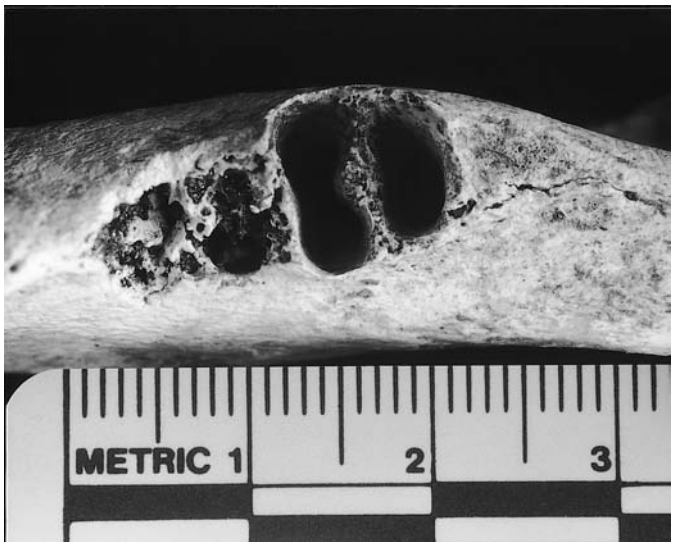

FIG. 1—*Occlusal view of Case One, the 6 ½ month old extraction site of tooth No. 18. Tooth No. 17 was temporarily removed from the mandible in order to view the intact cortical bone normally associated with a postmortem tooth loss.*

FIG. 2—*Occlusal view of Case Two, the three-week-old extraction site of tooth No. 14. Note that the maxilla has been reconstructed.*

Subsequently, antemortem dental records were provided that documented a Marine Raider having his maxillary left first molar extracted on 21 July 1942. Justification for the procedure (the diagnosis) was not recorded, but the remains showed no sign of significant periodontal pathology. The individual tentatively associated with the remains was verified as Killed-In-Action on 18 August 1942. His dental record reflected no treatment other than the extraction; however, the record did document four carious lesions.

Considering the detailed dental record charting available for the majority of the Marines involved in the incident, it was reasonable to assume this particular individual had no restorations, another significant finding consistent with the remains. In contrast, the vast majority of the Raider casualties had documentation of dental treatment more extensive than that observed in this specific assemblage, readily eliminating 24 of the 30 unaccounted-for Marines. Two other casualties were unlikely to be associated with the remains because shortly before the raid these individuals were documented as having "perfect sets" of teeth; whereas, the remains in question exhibited four carious lesions—the same pattern as documented in the dental record of the individual tentatively associated with the remains. There were no dental records for three Raiders, but two of these were identified by mtDNA comparison and other circumstantial evidence. In conclusion, only one individual had dental records that were consistent, in all detail, with the remains, documenting four specific carious lesions and the recent extraction of the left maxillary first molar. Identification tags that match the suspected individual were recovered in close proximity to the remains, and anthropological findings were consistent with medical records. The cumulative evidence was considered sufficient to identify the remains without the need for mtDNA testing.

Discussion

Claflin, utilizing dogs as a model, documented osseous healing of undisturbed extraction sites. He noted, "In an extraction wound 19 days old, the bone [remodeling adjacent to the socket wall] has reached the crest" (1). Amler's findings support this observation by noting that some calcification of the entire socket wall is possible in as little as 21 days, provided the subject is in good general health (2). Simpson, using the Rhesus monkey as his test subject, noted that as bone formation nears the level of the alveolar crest, "the most obvious feature is osteoblastic activity on the surface of the trabeculae approaching the socket mouth. . . . The lamina dura is still distinct and it is only later that osteoclasts begin to attack it to any marked degree" (3). These findings explain the roughened clinical appearance of the alveolar socket discussed in Case Two.

In conclusion, the presence of an extraction site may be of significant value to the forensic scientist. This feature contributes to the antemortem or postmortem dental profile of missing and restored teeth, but more importantly, it provides a chronological marker to a specific treatment procedure. This knowledge may

prove critical in cases involving limited antemortem records or limited available remains. As illustrated in Case Two, the very recent extraction may mimic postmortem loss. For this reason,it is important to appreciate the rapid rate of osteoblastic activity that involves the entire alveolar socket wall shortly after surgery.

It is hoped that this article and others like it (4), illustrating osseous remodeling at known phases, will be of value to forensic scientists, particularly those who have little opportunity to routinely view skeletonized remains.

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