F31 The Effect of Different Dental Coding Methods on Victim Identification

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After attending this presentation, attendees will explore the effects of different dental coding methods when they are applied to the WinID program. This study compares the resultant ranks generated with detailed dental codes versus ranks generated with very simple dental codes.

This presentation will impact the forensic community by presenting evidence-based research on the effects of different dental coding methods with WinID. These results will be of interest to forensic odontologists working with mass fatality events and victim identification.

The goal of any computerized dental matching software is to rank potential matches between antemortem and postmortem dental data. These rankings greatly assist forensic odontologists in the victim identification process by providing them with a list of the most likely matches. This study examines the effects of different dental coding strategies using WinID.

Dental case data were formatted in two manners: "detailed" and "simple." For the detailed format there were 34 possible codes for each tooth, including / (no Information), V (virgin), X (missing), and 31 possible combinations for surface restorations (MODFL). For the simple format there were only four possible codes per tooth / (no Information), V (virgin), X (missing), or F (filled/restored tooth). In the "detailed" system, all the surfaces with treatment were recorded. In the "simple" format, any restored tooth received a code of "F" regardless of the extent or location of the restoration on the tooth. A multi-surface restoration in the detailed format might be coded as "MODF," while in the simple format it would be coded "F" (note that F in the detailed format stands for "Facial" while in the simple format it stands for "filled/restored." Utilizing existing codes allowed different coding methods to be evaluated by the WinID ranking algorithms).

Two distinct samples of data were utilized. The first set was compiled from two large-scale dental health studies (NHANES and TSCOHS) and was used to test the "ideal" scenario of accurate, up-to- date, perfectly matched dental records. Although this dataset may not be a realistic representation of a true forensic scenario, it does provide a theoretical framework to observe the effect of coding strategies without interference of outside factors such as data entry or coding errors. The second dataset utilized the World Trade Center disaster dental data in order to see if the trends observed with the "ideal" data were also observed with real world "imperfect" data.

In order to simulate different disaster scenarios, the "ideal" data was further divided into different groups. These groups represented situations ranging from a small number of victims with relatively complete bodies to a large number of victims with body fragmentation. Fifty random records were selected as the *postmortem sample*. In order to simulate postmortem fragmentation, three scenarios were created for each "victim": (1) intact body (28 observations), (2) fragmentary body (14 observations), and (3) very fragmentary body (7 observations). *Antemortem samples* were constructed to simulate varying disaster population sizes of 50, 100, 500, 1000, and 10,000 individuals. This system allowed trends to be observed based on varying numbers of observable teeth and differing population sizes.

For the WTC test data, 50 postmortem cases were randomly selected that had 14 or more dental observations present. These records were compared against an antemortem database of 2,464 records. Any record that did not contain dental information was excluded.

Utilizing WinID, rankings were generated for the 50 postmortem cases using both the "detailed" and "simple" code formats. The number of records that were tied with or better than the correct match was noted for each case and each data format. Differences between the "detailed" rank and the "simple" rank represented the effects of the coding format (i.e., better, worse, or no change). Although this method produced higher ranking numbers than an "absolute record number" system it eliminates any bias introduced when multiple cases receive the same ranking in WinID. In addition, sample data showed that "absolute record number" ranks produced similar trends.

Results from the "ideal" data show that for smaller disasters with less fragmentation there is little benefit in utilizing detailed coding. As disaster size and fragmentation increase, ranking degradation occurs when codes are simplified. The results from the WTC data support this overall trend. Based on the large number of WTC victims, the "detailed" coding format generally outperformed the "simple" coding format.

Obviously computer ranking systems, such as WinID, are only tools to provide a starting point for forensic odontologists to make dental comparisons. Simplification of dental codes expedites the data collection process and, based on ideal test data, appears to have minimal impact on computer ranking in small to medium datasets and incidents with few fragmented specimens. The major shortcomings of the simple coding system are the loss of the ability to search for unusual restoration patterns and poor rankings with high fragmentation/large population scenarios. Future studies should explore whether the trends observed in this

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study are also seen with other case data and with other dental ranking programs.

Dental Coding, Victim Identification, WinID

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