



F19 The Verdict Is In: Can Dental Characteristics Be Quantified?

L. Thomas Johnson, DDS, Milwaukee County Medical Examiner's Office, 933 West Highland Avenue, Milwaukee, WI 53233; Thomas S. Wirtz, MSW, and Thomas W. Radmer, DDS*, Marquette University School of Dentistry, Post Office Box 1881, Milwaukee, WI 53201-1881; and David Cadle, 10414 West Congress Street, Wauwatosa, WI 53225*

Those attending this presentation will leave with an appreciation for the fact that dental characteristics occur in a myriad of combinations that can produce patterns reflecting variations in size, shape, position, angles of rotation, presence of supernumerary teeth, anomalous teeth, accidental damage, displacement, and a pattern of missing teeth.

When specific tooth characteristics are distinctly reflected in a human bite mark, it should be possible to statistically calculate the probability of any two individuals having the same dental pattern based on a database of the frequency distribution of dental characteristics.

The comparative forensic sciences have for several years been challenged to provide a scientific basis for the expression of probability. Critics have referred to bite mark analysis as "junk science." The U.S. Supreme Court trilogy, *Daubert*, *General Electric*, and *Kumho Tire* decisions, developed guidelines for courts on the admissibility of scientific and technical testimony. These guidelines have produced considerable confusion and uneven application. It should be pointed out that there are at least two types of science: exact or Newtonian sciences and the comparative sciences which involve scientific methods, but have a subjective or human element as to the interpretation of the evidentiary value of the objective observations.

In answer to the criticism, a two year pilot research project has developed the early stages of a database which should eventually enable the odontologist to quantify specific dental characteristics observed in both the human dentition and in clearly registered bite mark patterns. Initiated in 2005 with seed money from the American Society of Forensic Odontology, the California Forensic Dental Association and the American Board of Forensic Odontology, it was substantially funded by two research grants from the U.S. Department of Justice via the Midwest Forensic Research Center, Ames Laboratory, Iowa State University.

Using two computer imaging programs, the anonymous imprints of the upper and lower teeth of 419 individuals, representing the general population of Caucasian, Asian, Native American, Black and Hispanic, were studied for the frequency distribution of six dental characteristics: arch width, tooth width, angles of rotation, diastemata, and missing or supernumerary teeth. Inter-observer and intra-observer consistency, another of the challenges, were also studied. A seventh tooth characteristic, measurement of the displacement from the native curvature of the dental arch, is still under investigation.

A consulting imaging specialist from the Wisconsin Department of Justice Crime Laboratory assured that the protocol followed the guidelines of the Scientific Working Group on Imaging Technology (SWGIT) and a "Professor of Evidence" served as a consultant on admissibility issues concerning digital evidence.

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