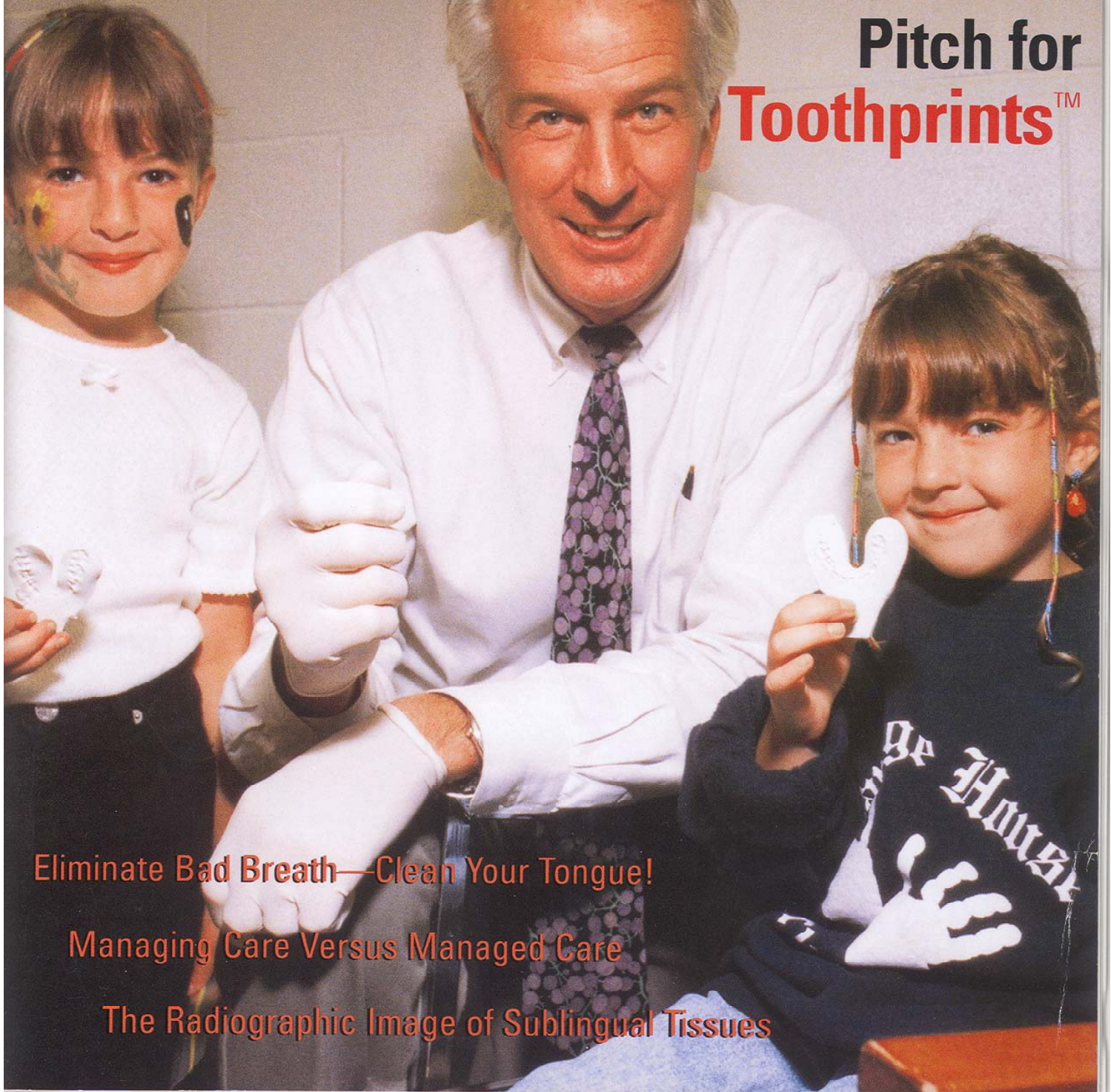


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Dentistry's Role in Identification of Missing and Unknown Children: Update on the Dental Bite Impression Technique

DAVID A. TESINI, DMD, MS

DAVID B. HARTE, DMD

KATE CROWLEY, DDS

The dental professional is encouraged to participate in comprehensive community programs in an effort to increase awareness regarding child identification, a very serious national problem.

The location and identification of missing and unknown children have received much attention in the national and local media. Dentists have historically helped law enforcement agencies by providing dental information when requested, but more recently, dentists are participating in community-sponsored child identification programs. Because of the uniqueness of the human dentition, bite impressions provide a reliable method for identification purposes.

This article addresses child identification issues and dentistry's response to this social tragedy. It is updated from the article "Development of the Bite Impression Technique for Use in Identification of Missing and Unknown Children," which appeared in the Spring 1985 issue of the *Journal of the Massachusetts Dental Society*.

Dentistry's role in identifying missing children

Over the last two decades, dentistry's primary role in the identification of missing and unknown persons has been that of responding to law enforcement agencies in their appeal for help. When that appeal involves the location and identification of missing or unknown children,

it becomes particularly disturbing. Because of this national concern, the Missing Children Act was signed into law on October 2, 1982. The law created a national clearinghouse of any dental and physical information that could help identify and compare the records of missing persons with the unidentified living and dead. Today, this is part of the National Crime Information Center (NCIC), also responsible for the computerization of available information.

The extent of the problem is difficult to define. Media hype, misquoted statistics, and inaccurate reporting have been questioned as contributing to exaggerated and misinterpreted facts. Agencies and organizations have developed their own terminology; thus, no universal language has been adopted when reporting information (see Table 1).

Since 1983, children identification programs have been designed to include a dental component. Initially, dental chartings were advocated by Child Keepers, Inc., a nonprofit organization in Florida. In addition to vital statistics, photographs, and fingerprinting, the record information data (RID) systems needed a dental component.² In this regard, the American Dental Association adopted a resolution in 1985 that stated,

"The ADA encourages dental societies, related dental organizations, and the membership to participate in efforts designed to assist in identifying missing and/or deceased individuals through dental records and other appropriate mechanisms."

Since the incidence of dental caries has significantly declined, there have been fewer restorations, which had originally been helpful in dental identification systems. Other techniques were, therefore, advocated. John Walsh, whose son Adam was abducted and murdered in 1981, gave an emotional speech in 1985 at the American Academy of Pediatric Dentistry Meeting in Washington, DC, attesting to the importance of dental identification.

Mucosal tattooing, microdisk dental identification systems, radiograph and oral photographs, bite pattern registration, and Toothprints™ bite impressions have been advocated by the profession since the mid-1980s.²⁻⁵

The credibility of the use of bite mark methodology is based on the individuality of the human dentition. Previous investigations have reported significant differences even between identical twins.⁶⁻⁸ Court cases have legally upheld the uniqueness concept.^{9,10}

Dr. Tesini is an associate clinical professor at Tufts University School of Dental Medicine. He has a private pediatric practice in Natick, Massachusetts. Dr. Harte is past chair of the MDS Council on Dental Health and Health Planning. He has a private general dentistry practice in Milton, Massachusetts. Dr. Crowley is the Massachusetts State Forensic Dentist.

Missing children statistics

1. In 1997, 980,712 individuals (adults and juveniles) were reported missing to the police and entered into the records of the FBI's National Crime Information Center (NCIC).^a
2. The FBI estimates that 85 to 90 percent of missing persons are juveniles. In approximately 850,000 cases (or 2,300 per day), the disappearance of a child was serious enough that a parent called the police and a report was filed with the NCIC.^a
3. In 1990, Congress passed the National Child Search Assistance Act, mandating an immediate police report and NCIC entry in every case. Since 1990, NCIC missing persons reports have increased 47.7 percent.^a
4. The NCIC sorts missing children reports into the following categories:
Juvenile: Police enter most missing child cases under this category, including some nonfamily abductions where there is no evidence of foul play. About 801,652 cases have been reported, up 1.8 percent since 1996.
Endangered: This category is defined as "missing and in the company of another person under circumstances indicating that his/her physical safety is in danger." About 106,332 cases (adults and juveniles) have been reported, an increase of 7.8 percent since 1996.
Involuntary: This category is defined as "missing under circumstances indicating that the disappearance was not voluntary, i.e., abduction or kidnapping." About 33,908 cases (adults and juveniles) have been reported, an increase of 8.4 percent since 1996.^a
5. In May 1990, the U.S. Department of Justice reported the following annual statistics:
 - 114,600 attempted abductions of children by nonfamily members
 - 4,600 reported abductions by nonfamily members reported to police
 - 300 abductions by nonfamily members where a child was gone for a long period of time and/or murdered
 - 354,000 children abducted by family members
 - 450,700 runaway children
 - 127,100 "thrown away" children
 - 438,200 children who were lost, injured, or otherwise missing^b
6. Unidentified persons range according to location: 795 in California, 357 in Florida, 23 in Massachusetts, and 1 each in Maine and South Dakota.^c
7. Missing Children's Help Center reports that over a nine-month period (January through September 1998), 528 cases were registered and 314 located. Since 1982, 9,050 were registered and 5,590 located.^d
8. More than 4,000 missing children are reported in the state of Florida at any given time.^e

Sources: a.) FBI National Crime Information Center (NCIC), Missing Persons File; b.) United States Department of Justice; c.) Unidentified Persons Report, National Center for Missing & Exploited Children; d.) Missing Children Help Center; e.) Missing Children Center, Inc.

Table 1. Recent available data from five respected and often-quoted sources.

Interaction with law enforcement and childfind agencies

Dentists play a significant role in assisting in the identification of unidentified and missing persons. A case in New Jersey from the late 1980s describes one such incident. An unidentified white female, estimated between the ages of 17 and 25, was found in a rural area. A facial reconstruction along with a dental charting was distributed by the state police.

Dental records were obtained and positive identification could occur.¹¹ In addition, as of January 25, 1999, the California Department of Justice's Missing/Unidentified Persons (MUPS) has identified seven persons by dental identification using the Computer Assisted Post Mortem (CAPM) Identification System.²³

Potential points of correspondence to secure a positive ID are almost limitless. Forensic odontologists can analyze existing dental restorations and material used. Attention is directed toward identifying teeth where specialized care had been delivered. Other areas of comparison include missing teeth, spaces between teeth, arch alignment, incisal and occlusal groove distinction, and carious lesion pattern. Radiographically, areas of correspondence can include root, pulp, and osseous topographies.

A permanent record is often established unknowingly when a family member can produce a photograph that clearly depicts characteristics such as tooth discoloration, carious lesions, tooth fractures, and tooth alignment. Alginate-generated models and wafer bite impressions allow further analysis of occlusal grooves and patterns of

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Dental identification methods used in child identification programs

Method	Comments
Dental Chartings	Must be thorough and accurate, making them somewhat time-consuming. Limitations in caries-free individuals. Inexpensive, yet needs updating.
Mucosal Tattoo	Low public acceptance. Not comfortable, and not easily done in young or uncooperative children. Expensive.
Dental Radiographs (Bitewings or Panorex)	Radiographic exposure makes it difficult to justify to parents. Also difficult comparing caries-free individuals. Expensive and needs updating.
Intraoral Photographs	Special equipment necessary. Difficult to obtain oriented photographs on young or uncooperative children. Can be helpful adjunct to other ID methods. Can be expensive and needs updating.
Bite Impressions (Toothprints™, Thermoplastic)	Good definition and quality. Inexpensive and quick. Can easily be done as part of a "safety day" children's program. Storage is parent's responsibility. Needs updating.
(Toothprints™, Laminated Wax)	Prone to distortion if not stored properly.
Micro Disks*	Must be preordered. Permanence is dependent on bond success. Public acceptance varies. Expensive. National micro disk registry never developed by ADA. Disk can be customized to contain specific information.
Bite Pattern Registration (Child Keepers™)**	Two-dimensional registration (cusp tip markings).
(Identibite Corp)***	Not legally tested and not scientifically based for reproducibility.

* Of the five companies reported by Wilson in 1986, no company was currently still in business.¹³

** No response from repeated phone calls.

*** No listing found.

incisal wear. Forensic anthropologists recommend the following:

- Rechart all previous dental work on new patients
- Become familiar with and accurately complete NCIC dental form if requested
- Be able to recognize your own work
- Save dental records in perpetuity
- Review your records to compare with cases reported in dental journals

Bite impressions and other dental identification systems

Within the past two decades, numerous methods have been popularized as the "method of choice" for dental identification of missing and unknown persons (see Table 2). The following characteristics might best describe the ideal method:

- Accuracy
- Techniques based on sound scientific principles
- Reliability in caries-free individuals
- Approaching 100 percent certainty that; if necessary, the chosen method will allow for positive identification
- Quickness and comfort
- Inexpensiveness and availability
- Able to be part of high-volume community child identification program

The concept of bite principles in identification arises out of the scientifically based and legally accepted field of forensic bite mark analysis. Current research continues to advance the understanding and predictability, particularly as it is used in criminal investigations. Computer technology enhances the

Table 2. Annotated review of dental identification methods used in child identification programs.

sensitivity and reliability of bite mark analysis.¹³⁻¹⁵

The Toothprints™ bite impression involves an imprint of the child's dentition which is made in a softened, contoured, thermoplastic (previously wax) wafer. The child bites into the wafer in the same manner as a bite registration taken for prosthetics or orthodontics. It records individual tooth characteristics, tooth position within the arch, and the maxillomandibular jaw relationship (see Figure 1).

Kane and Schmidt studied 40 bite impressions of the primary and mixed dentition. Results showed that a contoured wafer provided the 20 to 30 percent greater crown height needed on the anterior region.¹⁶ When done properly, the wax bite impression can serve as a verifiable record of the child's dental characteristics.⁵

The importance of an anterior/posterior taper cannot be emphasized enough. It allows longer anterior crown heights to be recorded and is especially useful in open bite cases. The thinner posterior prevents children from having to "grind" their way through the wafer. Taper and thickness will vary between wax and thermoplastic. The extra wafer area, as a result of the handle, will allow accurate recording of a moderate to severe anterior overjet, and facilitates both the initial softening and final removal.

Bite impressions taken annually are considered ideal, though not necessary or even practical. A recommended "retake schedule" for recording dental characteristics would be as follows: take an initial impression when the child is age 3, or after all primary teeth have erupted; repeat the impression at age 7 or 8, after the maxillary and mandibular incisors and the first permanent

molars have erupted; and finally, repeat the impression at age 12 or 13, once all permanent teeth (excluding third molars) have erupted.

If dental treatment or diagnostic procedures (i.e., restorations, study models, radiographs, or intraoral videos that serve as identifiers) have been provided between any "repeat" periods, repeat bite impressions may not be needed. Parents and dentists would use their own discretion in making this decision.

The role of dentistry in statewide community programs

On March 13, 1985, New England K.I.D.S. announced their support for the use of bite impressions in community child identification programs. Other organizations endorsed the Toothprints™ bite impressions technique, including the Massachusetts Academy of Pediatric Dentistry, the Wilbraham School Committee, and Dr. Stanley Schwartz, then Massachusetts State Forensic Dentist. Over 60,000 children were "tooth-printed" between 1985 and 1987.

In 1996, the Grand Lodge of Masons in Massachusetts instituted the CHIP (Child Identification Program), similar to those in 30 other states. This program consists of fingerprinting children and providing a TV-quality videotape to parents for use in the event a child is lost, missing, or abducted. The child's videotape adds another identification dimension by capturing the child's speech, mannerisms, and expressions. Videotape documentation has actually led to the recovery of a child in New York based on the questions an interviewer asked the child during the session.¹⁷ To date, the Masons have processed over 45,000 children in the Commonwealth of Massachusetts at no cost or obligation to their parents. All materials are given to

How Members Can Participate in the Toothprint™ Program

The Masons, with the support of the Massachusetts Dental Society, will be sponsoring several child identification programs-including Toothprints™-in the coming year.

MDS members, along with their staffs, can participate by donating their time at these events. This would involve working with the local Masons' chapter and being on site at the event to take the Toothprint™ bite impression.

A schedule of future child identification programs is available by calling the MDS Communications Department at (508) 651-7511, extension 239. The programs will also be publicized in the Districts where they will be occurring.

parents and no copies are kept on file. The program has engendered broad-based community support, but a dental component was not added until recently.

The *ADA News* of October 18, 1993, recalls a social tragedy for the Sturbridge, Massachusetts, family of Holly Piirainen, age 10, who was last seen on August 5, 1993, by her younger brother. The article titled *10 Year Old Girl Abducted; Dentist Appeals for Help* descriptively listed her dental characteristics (missing deciduous teeth D, E, F, M, N, O, P, Q, R; congenitally missing #7 and #10; sealants #3, #14, #19, and #30). It was obvious that dental professionals could do more to help.¹⁸

On August 12, 1998, the new Toothprints™ thermoplastic bite impression wafer was introduced at a CHIP event in Milton, Massachusetts (see Figure 2, p. 34). Unquestionably, this event was the most thorough and comprehensive children's identification program ever offered in the world. Since the Masons have processed hundreds of thousands of children across



Figure 1. Toothprints™ bite impression shows tooth characteristics, the position of teeth within the arch, and the relationship of the maxillary and mandibular arches.



Figure 2. Dr. Jim Lonborg, former Boston Red Sox pitcher, takes a bite impression at a community Masonic CHIP Safety Day event in Milton in August 1998.

America, Toothprints™ may become a vital part of all community child identification programs.

Similar to the reports in 1984, parents at the 1998 CHIP event expressed a need to increase their security and awareness regarding their child's safety, and were very interested in children identification programs. It has been shown that parents who have their children fingerprinted are most aware of the need for dental identification.¹⁹ On the other hand, parents tend to

shy away from DNA sampling, even when offered free of charge by the Florida Department of Law Enforcement.²⁴

After a recent major airline tragedy, parents had to wait weeks for DNA test results to come back. However, there were multiple cases of victims being quickly identified by dental records. Parents today are open to bite impressions to ensure the "peace of mind" that a comprehensive child identification program can offer.^{20,21} Toothprints™ bite

impressions add a diagnostic tool to the data set. In the future, computer scanning of bite impressions may also help locate thousands of individuals reported missing annually.

Gallup polls have shown dentists to be among the most respected individuals in the community.²⁴ By donating a humanitarian professional service along with other respected community leaders, organized dentistry can avail itself of the highest possible public respect.

Also, by having the dental professional participate in comprehensive community programs, the gravity of our concern will bring a new level of awareness to a very serious national problem. To this end, on February 15, 1999, the Massachusetts Freemasons, in cooperation with the Massachusetts Dental Society and the City of Quincy, held the second statewide child identification program to incorporate dental bite impressions. The August event in Milton and the Quincy event processed more than 700 children in those two towns alone.

The dentist is encouraged to become involved in community-sponsored comprehensive child identification programs. Clearly, on noncarious children without recorded noteworthy dental characteristics, the Toothprints™ bite impression would be an essential aid for law enforcement officials to locate and identify missing and unknown children.

For more information on community-sponsored comprehensive child identification programs, contact the Grand Lodge of Masons in Massachusetts at (800) 882-1020, extension 214, or the Massachusetts Dental Society. ●

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