

Development of Bite Impression Technique for Use in Identification of Missing and Unknown Children

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The issue of missing and abused children has received much attention in local and national media. Although forensic dentists have long been involved in identification of unidentified persons, only recently have private practitioners become interested and involved in dental-charting programs

Although chartings have been instrumental in making an identification in many cases, children's dental records have not been able to provide adequate descriptive characteristics in the absence of caries and restorations. This paper presents a new method of recording dental characteristics which is simple and nonthreatening for the young child. The method described provides a way of introducing young patients to dental care and has given parents the incentive to bring children to the dentist at an early age.

Problem

The issue of missing and abused children in Massachusetts and the United States is being addressed on both the local and national level. However, law enforcement, human-services agencies, and other government committees have not cut through the bureaucratic red tape to the point where a systematic mechanism has been developed to deal with this social tragedy.

The magnitude of the problem is reflected by the absence of reliable statistical data pertaining to the numbers of missing children in the United States today. Two sources, the Illinois Criminal Justice Information Authority and the Illinois Department of Law Enforcement, report national

figures commonly quoted including: "between one and two-million children run away annually; parental kidnappings account for about 100,000 to 150,000 disappearances a year; 50,000 children are abducted by strangers each year."

Every hour, 205 American children are reported missing, which means 4,920 per day. In Massachusetts alone, there are an estimated 30,000 runaways of which 1,600 to 4,500 children have vanished without a trace each year.

The problem with runaway children, according to a Florida study, is that 75 percent of those runaways who stay on the streets for more than two weeks find themselves involved with drug dealing, prostitution, or pornography. It is further suggested that abuse in the home is the reason for runaways.

The saddest statistic of all is the fact that approximately 5,000 children are found murdered each year, and 2,500 of these bodies remain unidentified leaving those family members hoping and praying and, in many cases, spending their life savings in search of their children.

The startling reality of this outrage is that more children are being murdered, abused, or abandoned in the United States today than the number of Americans killed in the Vietnam conflict. Yet, only \$3.3 million is being spent nationally to combat this problem, while America spent that much money per day to prolong the fight in Vietnam.

New England K.I.D.S.

On April 27, 1984, Massachusetts Secretary of State Michael J.

Connolly signed into existence New England Kids Identification Systems (K.I.D.S.) as a nonprofit corporation. At the same time, Secretary Connolly was named New England K.I.D.S.'s first honorary chairman, giving the organization statewide recognition and credibility.

New England K.I.D.S. provides parents with the means of establishing identification records (in the form of fingerprints, photographs, dental charting, or teeth-bite impressions and written descriptive information). Each identification kit is returned to the parents for safe keeping; no record of any child is kept by K.I.D.S. or any other agency.

In addition, community-oriented groups that are willing to work with school officials and law-enforcement agencies will be created to form a supportive coalition which will try to eradicate the problem. This will give parents the means to effectively undertake a search for their missing children. It will also help reduce the overwhelming sense of helplessness felt from not knowing whether to grieve the permanent loss of their children or hope for their eventual return.

For a two-week period, Secretary Connolly offered the use of his Citizen Information Service's toll-free telephone lines to recruit volunteers. However, because the response was so overwhelming, the use of those lines has been extended indefinitely.

His office has assisted in the efforts of providing not only public information but also organizing volunteers, community groups, human-service organizations, law-enforcement agen-

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cies, and local community schools. The response from volunteers has been heartwarming. Since that time over 400 citizens have come to the assistance of this organization to try to put a stop to child abduction and abuse.

In the first five days of the organization's implementation, this program identified, fingerprinted, and photographed over 6,000 children in the Worcester Center Galleria. Using that event, K.I.D.S. developed a format which was made available to other shopping centers (Holyoke Mall and K-Mart in Fitchburg), community groups, schools, and municipalities.

In less than 25 days, through the efforts of volunteers from law-enforcement agencies, public and private schools, businesses, and youth and elderly groups over 30,000 children were fingerprinted, and thousands of parents received some basic educational information on the prevention and safety aspect of children. Chapters were established in the following communities: Worcester, Springfield, Holyoke, Fitchburg, Leominster, and Westminster. Additional chapters are being established in Arlington, Belmont, Concord, Malden, Newton, Lexington, Watertown, Waltham, Cambridge, Lowell, and the South Shore area of Boston.

Even the news media have clearly demonstrated willingness to respond to this outcry by providing time on the radio, print in the newspapers, and coverage on television for these events. They are willing to assist in making communities aware of the problem and provide the documentation of these events which are coordinated through the efforts of determined and enthusiastic volunteers.

Dentistry's Involvement

Forensic odontologists have often admonished the profession for the lack of detail contained in private dental records. Some schools now have courses and electives in forensics with the hope that graduates will gain an appreciation for descriptive records and become involved in forensics upon graduation (there are only about 50 board-certified forensic dentists in the United States).

Organizations, such as Child Keyopers chartered in Florida and California, have integrated dental chartings into "child identification days." Although an adjunct in identification, the chartings may not contain enough descriptive information to allow for a definitive identification. This is especially true in younger children (age 3-6) without caries, restorations, or radiographs.

Another method, the bonding of the Maxwell-Conover Micro to the side of the tooth, has been promoted by Dr. Jeffrey Maxwell of Pekin, IL. The disc is a piece of plastic containing vital data which, when removed, can be read under a magnifying glass. The major drawback is:

- the discs are somewhat costly (\$15.00) with some dentists charging for the bonding procedure
- some parents have viewed the technique objectionable as a "branding of children"
- can be easily removed by the abductor

Intraoral photographs have occasionally been discussed, but again the problems of cooperation for mirror placement in younger children, variations in cameras and film, and angulation during exposure may not give a photographic series which would be a verifiable record in a court of law.

The Wax Bite Impression/Impression Technique

The Toothprints™ bite impression was developed as a method for dental identification of missing and unknown children. The technique provides a simple means of recording the child's dentition in a nonfrightening way.

In fact, experience indicates it provides a fun way to introduce the child to dentistry during the initial visit. Parental enthusiasm and support has been overwhelming.

In research conducted by Thatcher Marketing Concepts during June-July 1984, two groups of parents were interviewed to ascertain parental attitudes about bite-impression identification procedures. Thirty-eight parents whose children had bite impressions taken at the dentist were

asked what prompted them to have a toothprint taken of their child.

Responses ranged from a feeling of fear to the need for additional security, awareness of possible need to identify the child, and the desire for additional identification information for their records. It is interesting to note that of the 38 parents who had their child "toothprinted" 40 percent had previously had the child fingerprinted.

Twenty-five parents interviewed, in a second group, had no prior exposure to a bite-impression technique. They were given a brief description, shown the wax wafer, and given the opportunity to ask questions. Fifty-two percent said they would purchase a bite impression kit, 28 percent said they would not, and 20 percent were undecided. Of those undecided, many indicated that they wanted the procedure to be available at their dentist's office.

A number of studies have confirmed the uniqueness of the human dentition,^{1 2 3 4} and court cases have legally upheld the uniqueness concept.^{1 5} Recently, a computer comparison of bite marks in monozygous twins revealed that arch form and individual tooth positions, even in so-called identical twins, are in fact not dentally identical.⁶

Although the term "bite impression" has been used previously in prosthetic dentistry⁷ and forensics,⁸ it has not been defined in terms of a technique for use in identification of missing and unknown children. The Toothprints™ bite-impression technique used in identification involves an impression of the child's dentition which is made in a contoured wax wafer when the child bites in to it, in a similar manner that a bite registration is taken. It records tooth characteristics, tooth position, and jaw relationships.

Preliminary findings by Kane and Schmit⁹ on 40 bite impressions indicated that a contoured wafer will provide the necessary 20-30 percent greater crown height needed on the anterior region in primary and mixed dentition. When done properly, the wax bite impression can serve as a verifiable record of the child's dental characteristics.¹⁰ (Figure 1.)

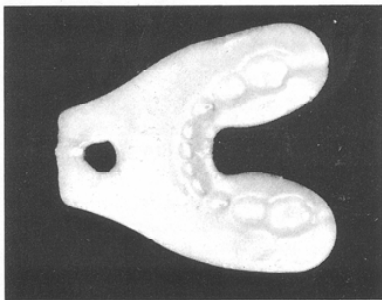


Figure 1. Wax bite impression showing child's characteristics.

Proposed Standardization of Wax Bite Impression Technique

The following generic requirements for the wax bite impression technique are proposed to allow for standardization. Without such standardization, the reliability and verification of the technique in each child may be questioned by forensic authorities.

Requirements:

1. laminate type wax wafer with 20-30 percent anterior/posterior taper which records dentition down to gingival margin and has identification tab or tag (Figure 2.)

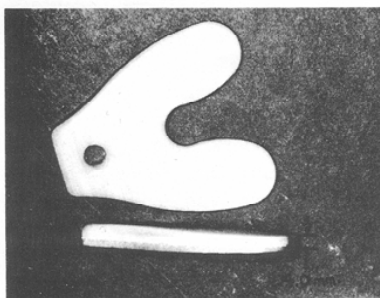
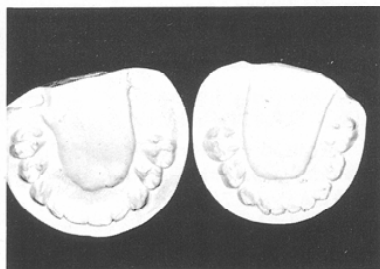


Figure 2. Contoured laminate type wax wafer.

2. made of wax which can be easily softened and will be soft and thin enough for children as young as three years old to bite through without difficulty or grinding
3. should have handle to aid in removal without difficulty or distortion
4. will not readily distort under prescribed storage conditions
5. will not readily distort when receiving dental stone or plaster to make models. (Figures 3, 4.) The pouring of the models should be under the



Figures 3, 4. Should the need arise, stone models can be generated from the wax bite impression.

- supervision of a board-certified forensic dentist.
6. requires storage container to protect wafer
7. requires security seal on storage container
8. wafer of such size and design to allow dentists to record bite impressions on young children

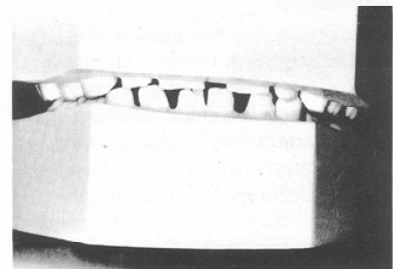
The importance of an anterior/posterior taper can not be over-emphasized. The approximate 7.5mm thickness anteriorly allows for the longer anterior crown heights to be recorded and is especially needed in open bite cases. Posteriorly, the thinner 4.0mm prevents children from having to "grind" their way through the wafer.

The extra wafer area as a result of the "handle" will allow accurate recording of a moderate to severe anterior overjet and facilitate easy removal. The hole serves the two purposes of allowing for some expansion of the wax when bitten and a way to attach a tag or tab with the name and date. (Figure 2.)

Although recommending that bite impressions taken on a yearly basis would be ideal, it is not a practical approach from a compliance perspective. In fact, it would probably be of no benefit over a prescribed periodic "retake schedule."

The recommended schedule for recording dental characteristics in this manner would be as follows:

1. initially at age 3 or after all the primary teeth are erupted
2. repeat after the mandibular incisors (age 6½-7) and the first permanent molars have erupted
3. repeat after the four maxillary (upper) incisors have erupted (age 8½-9)



4. repeat after all permanent teeth (excluding third molars) have erupted (age 12-13)

It is important to note that between any "repeat" periods, if dental treatment has been provided and can now serve as an "identifier," then repeat bite impressions may not be needed. Parents and dentists would use their own discretion in making this decision.

The Use of the Wax Bite Impressions to Aid in Identification of Missing and Unknown Children

Although protocols and procedures for reporting missing children vary from state to state, guidelines for the role of the wax bite impression should be defined.

1. law enforcement agencies should be notified of the availability of wax bite impression and would become the coordinating authority
2. such agency should contact the state or regional certified forensic dentist
3. forensic dentist would arrange for fabrication of stone, metal, or comparable models to be made from the bite impression
4. photographs, characterization, and narrative of models should be prepared by forensic dentist and integrated with any past dental history and/or charting as may be available
5. dissemination of information via national dental publication(s) and national and/or state dental meetings
6. establish communication with proposed federal registry of missing children

Conclusion

A technique for recording dental characteristics of children for use in identification has been presented.

Wax bite impressions should be considered adjunctive to photographs, fingerprints, medical identities, and dental chartings. Clearly, on non-carious children without noteworthy dental characteristics the wax bite impression would be essential if dental identification is to be made.

With upwards of 50,000 children reported missing every year (estimates run from 25,000 to 150,000), dentistry has a unique opportunity to play an integral role in one of the most important social problems of our time.

Special thanks to Patricia Thatcher

from Thatcher Marketing Concepts, Holliston, MA who conducted parental-attitudes survey.

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