

TECHNICAL NOTE

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A Simple Overlay System for Data Comparison in Dental Identification

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ABSTRACT: A system for handling dental data in mass disasters and in individual cases is described. The basic method allows for a quick overlay comparison of antemortem and postmortem records. After systematic hole punching in the postmortem form, it can be placed over the antemortem form and nonmatches can be easily detected. Suggested uses in mass disaster and individual cases are discussed, as well as its potential for acquainting rural law enforcement with the value of dental data and its management.

KEYWORDS: odontology, human identification, overlays, dentition

Human identification by dental means is dependent on comparison of antemortem and postmortem records. This process can be a simple matching of a decedent's dental characteristics with those of a possible missing person, or it can be the systematic utilization of gathered dental data to actually narrow the field of possible matches. Systems, like the ones used by the National Crime Information Center and the state of Washington, have successfully demonstrated the feasibility of finding identities when dental data are the only information available.

It was recently brought to the author's attention that many smaller local coroner and law enforcement offices have neither the organization nor a practical idea of how to pool this type of information. To use dental data successfully for identification in those cases where non-dental clues are not available, certain procedures have to be employed. The necessary steps are the same ones that are required during mass disaster situations. As described by Lorton and Langley [1], three processes must be followed: data gathering, data comparison/selection, and final verification. Without these three steps the system breaks down and the identity is not established.

The gathering of dental data includes both antemortem and postmortem reports. Coroners and the police often gather postmortem data when a body is found, but antemortem dental data are not always available as part of their missing person report. Often, if dental clues are the only information available, no comparison/selection can be accomplished and the process ends.

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An approach to remedying this situation would be to devise a simple method based solely on dental characteristics. One obvious answer, of course, is computerized record searching, but this is not available to many rural agencies. In addition, many hardworking officials have never been exposed to the possible uses of collected dental data. Perhaps a simple method to help them understand the potential of dental identification could be a first step toward integration into a central network. With these ideas in mind, a system using an overlay of record forms was developed that can help both in the individual case and in mass disasters by speeding or facilitating comparison/selection.

Overlay System

This system is based on the fact that changes in the characteristics of teeth are unidirectional; that is, once a tooth surface is altered, it can never be restored to its original condition. Once a tooth surface has decayed or been filled, it will never again be found to be without decay or restoration. For the present system, the 5 surfaces of the 32 teeth are considered either intact (no decay, no restoration) or changed in some way (filling, crown, missing, and so forth). If a postmortem examination indicates that a surface is intact then any antemortem records with that surface altered cannot possibly be a match. The same obviously applies for tooth present postmortem, tooth missing antemortem. By thus comparing only intact postmortem surfaces with the corresponding antemortem surfaces, mismatches can be detected easily and quickly.

On separate antemortem and postmortem forms (Figs. 1 and 2), all restored or decayed surfaces are marked, as are missing teeth. The unmarked surfaces on the postmortem forms are then punched out; these represent intact, unchanged surfaces. When this form is overlaid on top of the antemortem form and properly aligned, quick comparisons can be made. In this manner, the concept of unidirectional change is used to find mismatches between the two records.

Missing Person Report Form (Antemortem Report)

The missing person report form should be filled out by the missing person's dentist or by a forensic odontologist from records provided. Each tooth is given a separate line, which contains boxes for information on the five separate surfaces. These are represented as follows: "M" mesial; "O" occlusal or incisal; "D" distal; "F" facial, labial, or buccal; and "L" lingual. A sixth box, "X," is provided to indicate whether the adult tooth is present or absent. If a surface has a restoration or gross decay in the antemortem records, the appropriate box is filled in with red. If the tooth is missing and not replaced by a primary tooth, all of the boxes are filled in with red. If a tooth is unerupted, a red "U" is placed in the last box. If the tooth in question is deciduous, any decay or restorations are marked with a "D," but not in red; X-rays should indicate whether to mark the last box in this case with "U" or fill in with red. Finally, each tooth is provided with a space for written description of that tooth. Include surfaces restored, materials used, unusual findings, and so forth.

Postmortem Report Form

The postmortem report form should be filled out by a forensic odontologist whenever possible and colored pencils or pens should not be used. The reporting of decay and restorations for permanent teeth is relatively easy. Upon examination, if a surface has a restoration or decay, an "X" is placed in the appropriate box. If the tooth is missing and not replaced by a primary tooth, all of the boxes are marked with an "X."

Name: _____

Agency: _____

DENTAL MISSING PERSON REPORT — Overlay System

M	O	D	Tooth #	Description	F	L	X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	21	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	22	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	23	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	24	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	26	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	27	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	28	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	29	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	30	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	31	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	32	-----	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Unusual Dental Characteristics: _____

Individual's Characteristics: _____

Age _____ Sex _____ Race _____ Ht. _____ Wt. _____ Date Missing: _____

Personal Dentist: _____

Reporting Agency: _____

 _____ Phone No.: () _____

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FIG. 1—Dental missing person report (antemortem form).

Case No.: _____

Agency: _____

DENTAL POSTMORTEM REPORT — Overlay System

M	O	D	Tooth #	Description	F	L	X
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	3	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	4	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	5	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	6	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	8	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	9	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	10	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	11	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	12	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	13	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	14	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	15	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	16	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	17	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	18	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	19	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	21	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	22	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	23	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	24	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	25	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	26	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	27	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	28	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	29	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	30	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	31	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	32	-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Unusual Dental Characteristics: _____

Individual's Characteristics: _____

Age _____ Sex _____ Race _____ Ht. _____ Wt. _____ Date Found: _____

Examining Dentist: _____

Reporting Agency: _____

_____ Phone No.: () _____

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FIG. 2—Dental postmortem form.

Some other conditions do require special marking rules:

1. For teeth lost postmortem, the last box is left open and the others are filled in. In this way we are accounting for the tooth having been present antemortem, but are making no judgements on surface involvement.
2. If a tooth is unerupted and a deciduous tooth is not present, a "U" is placed to the right of the last box, leaving the box empty; all other boxes should be filled with an "X." In this case, a tooth unerupted postmortem will only match with the same antemortem condition. By marking the other boxes, the possible matching with previously present deciduous teeth is eliminated.
3. If the tooth in question has a deciduous tooth in its place, all decayed or restored surfaces are marked normally and the last box is marked with an "X" or "U" as indicated above. It should be emphasized that on this form the "U" is not placed in the last box, but adjacent to it.

The description space is filled in as on the Antemortem Form. As stated before, it is important that no red be used on this form as it may make later overlay comparison more difficult.

Overlay Comparison Process

Anyone can make these comparisons, but it is strongly advised that a dentist with forensic science training do the process.

Using the "Postmortem Report" form, punch a clean hole in each empty, unmarked box. A special paper punch is needed to be able to reach all the holes. One source is P. J. Mieth Mfg. Co., Point Pleasant, New Jersey; Style 405, round hole size $3/16$ in.

The "Post" form is superimposed on the "Missing" form, being sure to line them up properly. In this way, a direct comparison of unaltered postmortem surfaces and teeth can be made to their antemortem counterparts. The results can be as follows:

1. If any red shows through the holes, then there is a mismatch for that tooth, unless the red is a "U" in the last box. This allows for eruption since the antemortem record was made.
2. If the last box has a "U" next to it, then a "U" should show through the hole. If not, then there is a mismatch. Once a tooth has erupted, later submersion is doubtful.
3. If any "D" shows through the holes then there is a mismatch but *only* if the last box is *marked* with "X" or "U." This insures that deciduous surfaces are being compared to deciduous surfaces and not permanent to deciduous.

An alternative method is to ignore any deciduous teeth present antemortem and postmortem. This will simplify the process somewhat, but discretion should be used, as it does eliminate some potentially valuable data.

In many cases, some elimination can be done before any comparison is necessary. For example, if the unknown remains are a child and the missing person an adult, then there is no need to compare. One should be careful about these preliminary comparisons, since some characteristics such as sex, age, race, and so forth are not always apparent.

During the actual comparison process, the investigator should remember that the system is not designed to find the matching records, but to eliminate the ones that are nonmatches.

Because of the real possibility of error, those forms with only one or two teeth that do not match should not be totally discarded as nonmatches. A difference of opinion concerning tooth numbers is very possible where missing and migrated teeth are involved. The reliability of the antemortem record always has to be somewhat suspect for a variety of reasons.

Once two forms are found to be compatible, then a tooth-by-tooth comparison of the written descriptions should be made. If it appears that the two may in fact be a match, then the case should be referred for final verification. It is important to remember that this system only starts us on the way to a possible match. It is not intended to be used as a certification of

identity. This final process and eventual documentation should be referred to a forensic odontologist.

Uses

Mass Disasters

This system for comparison/selection could be used during a mass disaster identification operation. The antemortem and postmortem forms can be filled out and used as described in the instructions. If a computer is not available, and if the number of victims is not too great, this system could greatly reduce the time in matching remains to antemortem records.

As part of our training program in Idaho, we will be testing this system in comparison with other manual methods. Since most forms in use today do not require precise morphologic recording of dental restorations, these forms are essentially doing the same thing, just not in the same schematic way. Dr. Gary Bell of Seattle, Washington has contributed input during the development of this system and is planning to test it during one of his training sessions for their mass disaster team. No results are now available from either effort.

Individual Cases

This system was not designed for areas or agencies that are now using computer systems. Its development was intended for use by rural law enforcement agencies that do not have the other tools available to them.

In the individual case involving an unidentified body, it is not practical to collect all the possible antemortem records from a specific geographic area for direct comparison. Instead, when a person is reported missing and a reasonable amount of time has elapsed, the agency in charge should have a "Missing Person Report" form filled out by the missing individual's dentist or the agency's consulting odontologist. This is then held by the agency until possible matches occur. It is advisable that a single county/area agency keep these forms to facilitate subsequent requests.

When a victim's remains are found, the responsible agency should have its consulting odontologist fill out a "Postmortem Report" form. Copies can then be made and sent to other agencies using this system. Comparisons can be done and when possible matches are found the original antemortem record and radiographs should be sent to the requesting agency. For this system to be practical, all or most of the coroners and law enforcement offices in an area would have to use it. Without widespread use it will not be an effective aid in identification of the individual case.

Conclusion

Many rural agencies are not now utilizing all the scientific identification processes available to them. Perhaps this simple system might help correct some of these deficiencies by demonstrating that there are better ways to handle the data involved in missing and unknown persons cases. Coordination of agencies is the first step, hopefully, toward eventual computerization of the entire process of identification.

Reference

- [1] Lorton, L. and Langley, W. M., "Decision-Making in Postmortem Identification," *Journal of Forensic Sciences*, Vol. 31, No. 1, Jan. 1986, pp. 192-196.

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