

IDENTIFICATION OF UNIDENTIFIED HUMAN REMAINS - VALIDITY OF DENTAL RECORDS

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ABSTRACT

The aim of this study was to examine the validity of dental records for the identification of unidentified human remains. The sample is composed of 100 subjects selected randomly from the Dental College of King Saud University. Information retrieved from dental records, including charting, radiograph findings and dental progress notes were used as ante-mortem data. The subjects were further clinically and radiographically examined and this subsequent data were used as postmortem records. The post-mortem data were compared to the ante-mortem data to examine the probability of correct identification using the percentage of confidence of certainty. The results showed that all the individuals were identified by their ante-mortem records with variable degree of certainty. The mean percentage of positive identification was 79.49%. Most subjects showed a discrepancy between the simulated post-mortem data and ante-mortem data. These findings were attributed to dynamic changes of dental status and human errors during the processes of initial charting.

Key words: Identification, dental records, forensic odontology.

INTRODUCTION

Since late 1890s, forensic dentistry has gradually established itself as an important science in medico legal cases.' Forensic dentistry has been described as the proper handling and examination of the dental evidence in the interest of justice so that the dental findings may be properly preserved and evaluated, in order to make them meaningful in a legal context and for court purposes.' It is probably one of the fastest developing sub disciplines of dental science implicating in its name the conjunction with the law and dentistry in all its manifestations.' This may be attributed to the increase in mass disasters consequent to civil war, acts of terrorism and genocide where severe mutilation or burning of bodies may happen.

Identification of unidentified human remains has been recognized as an essential issue in modern societies for legal and humanitarian reasons. Various methods are used in identification such as by traditional visual recognition, clothing and personal effects, fingerprint examination, DNA technology and dental examinations and radiographs.' Identification is estab-

lished when data concerning a recovered human body matches data from a known missing person. The identification procedure itself can be divided into four steps: 1) collection and recording of post-mortem data of the unknown body, 2) collection and recording of ante-mortem data of the person who is reported missing, 3) comparison of ante-mortem and post-mortem data and finally; 4) completion of report on the outcome of the comparison.⁵

Dental records, including dental charting, radiographs, casts, photographs and dental progress notes, offer an excellent ante-mortem database for identification. The use of dental records is justified by the facts that most people have visited a dentist at least once in their life and that natural teeth and dental restorations are the most durable and preservative items of human body remains. They are able to survive a long period of time even if the body is immersed in strong acid or destroyed by other agencies like fire or water.⁶ The dental treatment *per se* is the biggest single contribution to the uniqueness of an individual dentition along with the developmental characteristics.' It is the key enabling identification of the deceased by examination

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of the oral cavity. In the majority of the cases, dental identification is accomplished by the comparison of all the post-mortem findings with the ante-mortem record that is available in the decedent's medical and dental chart.⁸

This method of identification is now well established and the authority of dental records for post-mortem identification has not been questioned of late. The aim of the current study was to re-examine the validity of dental records in the identification of unidentified human remains.

MATERIALS AND METHODS

A randomized consecutive sample was selected from the Dental College of King Saud University, Riyadh, Saudi Arabia. The Dental College clinic is a large tertiary care centre in the kingdom and treats a large number of dental patients from the greater Riyadh city and the neighbouring countries. Patients are offered comprehensive treatment with full dental charting.

One hundred subjects, 50 males and 50 females, were selected and clinically and radiographically examined. The age range was 17-52 yrs with a mean age of 35 yrs. The clinical examination recorded the current dental status and dental treatment. Radiographic examinations were used to evaluate the details of clinically unseen changes within the teeth and jaws such as fillings, embedded roots or teeth and bone pathology using bi-lateral bite-wings and orthopantomogram (OPG). Two dentists carried out the clinical examination and the radiographical interpretation. The inter-examiner and the intra-examiner reliability were assessed and agreed to be approximately 89%. The time lapse between initial examination and charting for use as ante-mortem data and the post-mortem-like examination ranged between 24 and 52 months with a mean of 39 months.

The data retrieved from the dental record of the selected subjects including charting entries, clinical observation, treatment and all other information which could be helpful in the process of identification were considered to be the ante-mortem data. In contrast, the findings of the clinical and radiographical examination conducted for the purpose of this study were used to simulate post-mortem evidence. All data were collated onto two separate sheets designed for this study and used for comparison of similarities and dissimilarities.

The identification was carried out by blindly cross-referencing and assortment of similarities of the ante

and post-mortem charting data on the basis of dental recording by the author of this study. Positive identification was determined by the magnitude of compatibility (concordant points), as suggested by Keiser-Nielson in 1977.⁹ Any discrepancies between ante and postmortem data resulted either from human-error (points of discordance) or from expected changes in dental status (dynamic changes) during the time lapse between initial charting and post-mortem examination (for example, a tooth present in the post-mortem examination with restoration or being missing that was clearly previously reported existent and healthy in the ante-mortem examination).

The interpretation of the results was based on the definition that the correct matching between ante and post-mortem findings were giving a weight of 100%, calculated as 3.13% for every tooth. Changes due to expected dynamic process in dental status and point of discordance that often lead to discrepancies were also identified and calculated as concordant points and used to demonstrate the mismatching data. All subjects admitted to this study gave verbal consent for participation. Subjects aged less than 17 years old or younger were excluded for the reason that these subjects are more susceptible to rapid dynamic changes of the dental status within a short period of time.

RESULTS

In this study all the individuals were positively identified, but with variable degree of certainty. The percentages of matching data (absolute identification with high degree of certainty) were ranged between 39.38% and 100% with a mean value of 79.67%. Among these there were six cases, which have been identified with no discrepancies between ante-mortem and post-mortem recordings and 24 cases that showed 90% or more concordant points. Twenty two cases had a compatibility of 80-89% and the other 44 cases between 53% and 79% while only 4 cases were reported to be below 41% of certainty of correct identification (Fig 1).

A certain discrepancy between ante-mortem and post-mortem data (mismatching data) was observed in most of the cases (n=94), the percentages ranged between 3.13% and 65.62 % with a mean of 20.84%. In this category, 14 cases have showed more than 40% of dissimilarities but it was only less than 10% in 22 cases. The other cases were between 37.5% and 12.5% of mismatching data (Fig 2). These discrepancies resulted either from dynamic changes of the dental status of the subjects (logical changes) or from human error in

documentation during the initial charting and recording or during post-mortem-like recording of patient's data.

Changes in dental status, with variable presentation, due to dynamic changes of dentition were observed in 74 cases. The highest percentage was recorded to be 43.75% and the lowest to be 3.13%, the mean value was 9.23%. Thirty-six cases showed changes in dental status ranging between 12.87% and 43.75%. In 24 cases these changes were accounted for less than 20%, in the other 38 cases less than 10% (Fig 3).

In 30 cases there were no dynamic changes that could be logically predicted and the discrepancies were merely due to human error presented as a point of discordance (for example, a tooth present in the findings of post-mortem examination that is clearly shown to have been recorded as extracted tooth previously). The percentages of human error ranged between 3.13% and 59.37% with a mean value of 11.57%. In the majority of the cases we saw less than 20% of discordance and only in two cases the changes were found to be more than 50% (Fig 4).

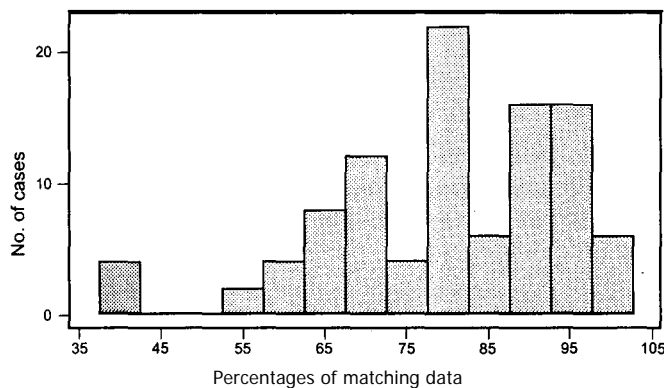


Fig 1: Distribution of cases relating to the percentages of matching data

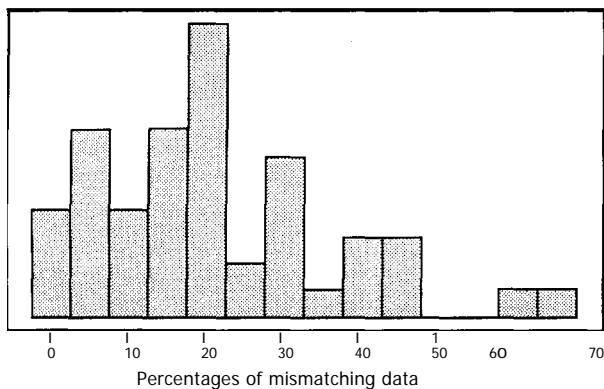


Fig 2: Distribution of cases relating to the percentages of mismatching data

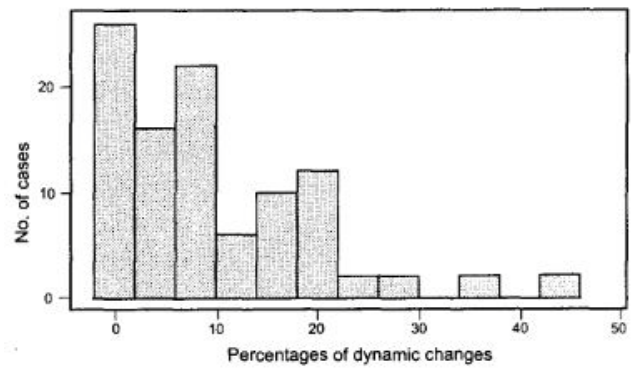


Fig 3: Distribution of cases relating to the percentages of dynamic changes in dental status

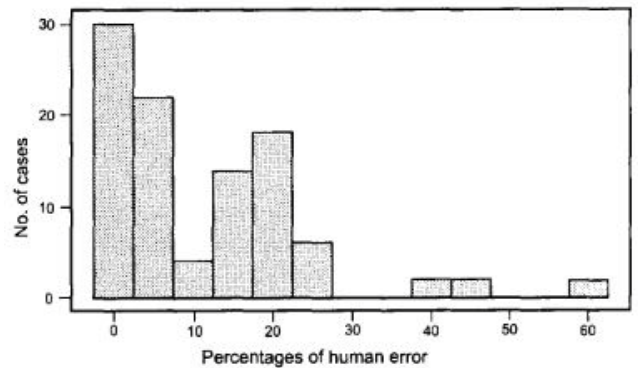


Fig 4: Distribution of cases relating to the percentages of mismatching due to human error

DISCUSSION

The identification of unidentified human remains is believed to be very important for legal and social reasons and therefore various methods of identification have been employed with variable degree of certainty. The validation of data obtained by several reliable methods would successfully appear to elevate the probability of identification.⁹ One of the most reliable methods, which have been used for many years and in numerous incidents all over the world, is the comparison between ante-mortem dental records and post-mortem findings. Whittaker (1994)¹⁰ claimed that 60% to 70% of all individuals could be identified entirely or partly through dental evidence methods. This leads to the belief that a single ante-mortem dental radiograph compared to a post-mortem record would need matches in seven comparative points.¹¹ However, in the law of courts, Keiser-Nielson (1977)⁹ in Denmark suggested that three to four points of extraordinary concordant to be probably sufficient for identification.

In the practice of forensic dentistry, the identification procedure is based on a strong presumption of

identity when ante-mortem and post-mortem radiographs or records successfully verify the supposition.¹² On the other hand, identification of unidentified person with no *priori* presumption of identification enforces gathering of detailed description of the dentition and the surrounding structure for the comparison with data of different missing persons.⁴ It is usually a complicated procedure executed by an experienced dentist who can indicate the dental and oral status of the deceased including all the similarities and dissimilarities between ante and post-mortem records. The occurrence of dissimilarities has to be explained in a satisfactory way before reaching a conclusion in relation to the deceased person in order to make such data useful with a high degree of certainty. When the ante-mortem and post-mortem data are clearly inconsistent or show a high number of dissimilarities, the exclusion method, although being remarkably less reliable, is the only possible choice under certain circumstances.^{6,13}

In this study the percentage compatibility between simulated post-mortem and ante-mortem records was calculated by the cumulative sum of a proposed weight given to each single tooth. Dental data including present and missing teeth, caries, restorations, root canal fillings and all were considered to be important criteria for comparison. Interestingly, all cases were identified on the basis of compatibility between ante-mortem and post-mortem recording despite the fluctuating level of certainty. This would indeed indicate the efficacy of dental records for positive identification. Nevertheless, notable problems were encountered during analysis and interpretation of data such as lack of adequate charting, lack of uniformity in charting, inadequate dental radiographs, dynamic state of the dentition and human errors. The existence of these problems explains the discrepancy experienced in the majority of cases. Previous investigators have mentioned as disturbing factors the negative effects of dental intervention performed between ante-mortem and post-mortem recording and the increased time lapse between ante-mortem and post-mortem examination.^{14,15,16}

The discrepancies experienced in the majority of cases were compatible with the dental treatment that had been carried out and had been recorded in the individual's files or predicted during data analysis and interpretation such as a tooth present in the post-mortem that is clearly shown to have been extracted previously. A single point of comparison may not necessarily have to be an entire tooth or restoration but can involve a small, yet distinctive structural or radiographic entity. Thus a smaller number of distinc-

tive characteristics may be more important than a greater number of unremarkable features and these may be important for positive identification. In some cases the ante-mortem records may have been acquired incorrectly or inaccurately and, of course, mistakes also may have been made when examining the post-mortem material.

Whilst identification had occurred largely by chance with a high degree of certainty, it is concluded that dental records can lead to positive identification of unidentified human remains, indicating its vital usefulness as post-mortem evidence. Therefore, it is very important to emphasize the necessity of keeping adequate dental recording for all dental patients and to make them available to the proper authority whenever needed in the future. Additional research is required in this field to further improve the method used in the current study that could simplify the task of forensic dentistry and increase the accuracy obtained.

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