

# Contributions of forensic dentistry regarding identification methods: literature review

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## ABSTRACT

**Objective:** to describe the main methods of body identification performed by dental professionals in criminal investigation, as well as to discuss the importance of archiving patient protocol data, as they may support criminal investigations. **Materials and Methods:** literature review counting on one book, code of dental ethics and articles published in English and Portuguese available in the PubMed database, Virtual Health Library, Scielo and Google Scholar, published from 2010 to 2019. **Results:** Forensic dentist is the specialized dental surgeon, legally qualified to perform criminal body examinations focused mainly on the head and neck area, who performs clinical activities and autopsies in the service of justice. Studies show that 70% of human identifications performed worldwide are made by these professionals, proving effectiveness and easy accomplishment. Due to the resistance of the dental element, in addition to the cranial aspects, there are several methods that can be used to identify cadavers, such as through DNA pulp, palatal roughness, sex determination by cranial characteristics, medical history, among others. **Conclusion:** it is possible to observe that forensic dentistry plays a significant role in post mortem recognition, making the performance of this professional indispensable in human identification. Additionally, there are numerous methods of identifying a body that can be applied by forensic dentistry. Thus, it is essential that ante-mortem records be properly archived and archived, as they can support the identification of a body.

**Keywords:** Forensic Dentistry; Forensic Anthropology; Dentistry.

## Introduction

Forensic Dentistry aims to apply the knowledge of the sciences that guide dentistry in the service of justice. Thus, the dental officer or expert is the legally qualified individual to perform examinations and inspections of certain criminal scenes. In his daily life, this professional acts in both clinical activities and autopsies.<sup>1,2</sup>

The literature shows cases of missing bodies that were found in decomposition and one of the few alternatives left for its identification was through dental elements, a methodology widely used in these cases. The dental identification process uses the criteria of preliminary assessment, postmortem examination (PM), *ante-mortem* investigation (AM) and direct comparison.<sup>3</sup>

In 2007, there was a air crash suffered by the company TAM in Brazil with the highest number of victims (195) in which 40.5% (79) were identified in isolation by forensic dentists from the Legal Medical Institute (IML), with bodies and remains being released by these professionals, thus punctuating the importance of the dentist as a member of the identification team.<sup>4</sup>

Thus, the aim of this paper is, through a literature review, to discuss the main forms of cadaver identification, associating the importance of recording the dental procedures that are performed, due to the eventual need to serve as subsidies in identifying cadavers that are found. in a state of decomposition, in addition to highlighting the importance of archiving medical record data, so that it may sometimes be necessary to support a body investigation or identification.

## Material and methods

Narrative literature review in PubMed, VHL and Google Scholar databases. For search, we used the descriptors “Forensic Dentistry” “Forensic Anthropology” and “Dentistry”, using the Boolean operator AND. We applied the full text filters, articles in English and Portuguese published between the years 2010 and 2019, seeking to draw a profile of the last 10 years on the subject, were excluded theses and dissertations, as well as articles that when analyzed were not suitable in the proposed theme; literature reviews, research and case reports were excluded, totaling 22 articles. Also included in the study, a book and the Code of Dental Ethics.

## Results

### Methods for Cadavers Identification

#### Identification by palatal rougae pattern - Palatal rugoscopy

Palatal rugoscopy occurs by observing palatine plaques or wrinkles located in the palatal vault, posterior to the upper central incisors, in the midline, near the incisive papilla. They are salient transverse lines, which have shape and dimensions that vary from one individual to another. These wrinkles originate from the bone rougae that appears during intrauterine life.<sup>4</sup>

What makes palatal rougae individual ranges from its configuration, width, number and even orientation, which even vary in monozygotic twins. This variation may be present, even in a lesser degree, between the two sides of the palate of the same individual, thus all these individual characteristics are unique and exclusive to each person.<sup>5-6</sup>

Fingerprints, which through biometrics are widely used for human identification, can be damaged for example in air crash. On the other hand, palatal rugae, due to its greater resistance derived from its anatomical bone formation, may continue to be present and support investigations to identify victims, even in the face of major disasters.<sup>7</sup>

In addition to assisting in the identification process, the palatal rugae functions in the oral cavity to facilitate conduction of food, to interact with chewing, to help grind food, to retain saliva (which is important for initial digestion), to protect the palate mucosa from trauma and even help in phonation, since wrinkles disperse sound waves in different directions.<sup>5</sup>

### DNA identification from dental pulp

Although there are a variety of sources that provide DNA, including samples of blood, saliva, bone, semen, hair, and other biological materials, there are situations in which such samples are contaminated, degraded, or fragmented to such a degree that they are unviable for study.<sup>8,9</sup>

In these situations, forensic examinations opt for genetic analysis, and it is possible to extract DNA from the dental pulp since the pulp cavity is a framework that protects it through cementum, dentin and enamel walls and is a great source of genetic material. The dental pulp can be extracted through endodontic files to make the exam possible.<sup>8</sup>

Dental methods for human identification have shown a shorter execution time when compared to conventional DNA tests. In addition, identification through forensic dentistry is considered a primary method for human identification, alongside typing and DNA examination.

### Identification by dental arch

As mentioned above, the dentist comes into activity mainly in front of bodies with advanced stages of decomposition, ossification, carbonization, or even when the bodies are in states that prevent the most common identification, highlighting once again the resistance of the dental elements in face of major disasters.<sup>10</sup>

For the identification through the dental arch to occur, it is essential that the victim dental surgeon has properly executed and stored the medical records and all dental documents because they serve as a subsidy for the dental expert, make the comparison between the data *ante-mortem* and *post-mortem* data. 11 At this stage, facial and intraoral photographs, radiographs and even arch shaping can be performed.<sup>10</sup>

Figueira Júnior and Moura (2014)<sup>12</sup> highlight that physical anthropology is composed of measures that help in identification, the main ones being the width and maximum length of the dental arch, the curve of the dental arch and

the anterior curve also of the dental arch. The palate shape also varies for each ethnic group, such as the triangular shape in Caucasian ethnicity, rectangular in Black ethnicity and horseshoe shape in Mongolian ethnicity, even though approximately 85% of the population present the elliptical shape.<sup>12</sup>

Thus, this form of identification uses a comparative methodology, requiring the availability of dental documentation by the dental surgeon, in order to establish similarity or discrepancy points either quantitatively or qualitatively.<sup>13</sup>

### Identification with smile photography

Knowing the difficulties that forensic dentists may encounter in *post-mortem* identification, it is up to the forensic community to obtain alternative dental methods for human identification, for example, photographs in which a smile appears, as well as the most recent and popular selfies.<sup>14</sup>

Dental elements have biometric properties that can be useful for *ante-* and *post-mortem* comparison. Hence, photographs in which the anterior teeth are visible, there are reference points that can be established for identification. The most noticeable features used for identification include crown shape, morphological features, size, width, contour, facial profile, as well as dental anomalies, diastemas, and teeth alignment.<sup>15</sup>

Casual and selfie photographs are increasingly common in society and have great value in comparison with *post-mortem* findings of disaster victims, being an up-to-date, safe and effective method for determining the identity of victims.<sup>14</sup> Miranda et al (2016)<sup>15</sup> also attest that it is possible to positively identify a cadaver using this type of photography, especially in the impossibility of traditional methods.

However, although there are case report studies using smile assessment in photographs to compare with human remains, the biggest difficulty presented is still the lack of medical-dental records for the conclusion of these cases, and low resolution photographs can difficult the identification.<sup>16</sup>

### Identification by cheiloscopia

The lips present lines that personify and give peculiar characteristics to the individuals, thus, the cheiloscopia corresponds to the study of the lip impressions, that can subsidize the human identification by examining the lip ridges as well as their distortions, lip thickness and the lip commissures, since the impression of the lips represents a personal unique characteristic.<sup>17</sup>

This technique is easier in terms of obtaining *ante-mortem* data, being a method frequently used. And although it is used in specific cases, cheiloscopia proved to be relevant in the scope of forensic investigation because of its high

reliability and universal character.<sup>17,18</sup>

The use of the cheiloscopia method in forensic dentistry occurs by recording the vermilion of the lip and the inherent characteristics of each person. Although it is a technique that requires a lot of experience of the examiner, there is scientific support as to the peculiarities that present this anatomical structure.

Similar to palatal rugoscopy, cheiloscopia has several classification systems. In addition to other characteristics of this technique, it meets the requirements to be considered as a viable and easily obtainable form of human identification.<sup>6,17</sup>

## Discussion

With increasingly more specific examinations, human identification through forensic dentistry reaches higher levels, due to the improvement of both techniques and professionals, especially in view of the need for techniques of identification of accident victims, since due to the disaster, it is impossible to recognize victims' bodies.<sup>12</sup>

The forensic dentist's role for human identification is usually requested when the bodies are in advanced stages of putrefaction, ossification or carbonization, when the body is in a state that makes conventional identification impossible, highlighting air, environmental and automobile disasters, for example.<sup>10</sup> Therefore, the comparison of dental data is shown as a valid and effective scientific method, as well as fast and low cost, which enable the use of this alternative,<sup>21</sup> besides meeting the applicability requirements: uniqueness (unique characteristics of an individual), immutability (characteristics do not vary over time), practicality (quality over costs, ease of collection) and classifiability (ability to classify for proper storage).<sup>17,20</sup>

The particularity of the dental elements, emphasizing the great resistance that feature, supporting high temperatures, humidity and excessive pressure make these organs play a role in comparisons during human identification *post-mortem*, since there is great variety of possible combinations cavities, which may involve 160 dental surfaces, as well as the presence of prostheses, endodontic treatment and tooth extraction.<sup>21</sup>

In addition, cheiloscopia and palatal rugoscopy, as well as DNA identification from dental pulp, are sources of unique characteristics of individuals, serving as an *ante* and *post-mortem* comparison, as they are low cost and easy to handle, and can be applied when cadavers are in a great state of deterioration.<sup>4,10</sup>

There are several methodologies applicable for forensic dentistry in human identification. However, the application of any exemplified method depends on the existence and correct archiving of previous documentation allowing a

reliable comparison.<sup>3</sup>

Given the responsibilities of dental professionals, governed by the Code of Dental Ethics, and in accordance with Section X of Article 9 of Chapter III (CFO – Dentistry legislation of Brazil), the act of preparing and keeping up to date the medical records of their patients – including digital medical records –, besides keeping in its own archive, is one of the duties of the dental surgeon.<sup>21</sup>

Also, according to the Federal Council of Dentistry, it is recommended that the medical record meets the fundamental documents: clinical record, identification of the professional and the patient, anamnesis, clinical examination, treatment plan, treatment evolution and possible complications; and supplementary data such as prescriptions, medical certificates, dental services lease agreement and complementary examinations.<sup>14,18</sup>

Photographs have increased the possibility of human identification by teeth, being another method of identification, because through selfies, it is possible to obtain updated characteristics and patterns of individuals, however, this record is not always present in conventional dental documentation.<sup>18</sup>

There are disagreements regarding the time of custody of the medical record and all dental documentation, as they may support legal aspects when requested. Thus, it is recommended to keep the records of each patient as long as possible.<sup>23</sup>

Regarding this issue, Saraiva (2011)<sup>24</sup> suggests that the Consumer Protection Code (CPC) is more adapted to reality. Since it regulates the service relationship, the deadline indicated for a possible claim of the patient is five years from the date of knowledge of the damage and its authorship. It is emphasized here the importance as to the time that the professional should keep the patient's medical record.

## Conclusion

There are numerous ways to identify a cadaver, however, the choice of method depends on the state in which the body is, cost, practicality and viability. Those offered by forensic dentistry have proven to be practical, fast and reliable, since the elements of the oral cavity are better preserved in disasters, and in some cases the only form of identification.

Since the importance of *ante-mortem* records and documents is observed as an aid to the comparison with the cadaver to be identified, its accomplishment and archiving is crucial to enable the work of the forensic dentist and to collaborate with the identification process.

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## Mini Curriculum and Author's Contribution

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