



## Importance of Orthodontic records in forensic odontology

Anshul Chaudhry<sup>1</sup>, Girish Chaudhary<sup>2</sup>

<sup>1</sup>Associate Professor, Orthodontics, Christian Dental College, CMC, Ludhiana 141008, Punjab

<sup>2</sup>Associate Professor, Orthodontics, BJS Dental College, hospital and research institute, Ludhiana 141010, Punjab

### ABSTRACT-

Forensic odontology plays a crucial role in forensic investigations, particularly in cases involving human identification. Orthodontic records, comprising dental casts, radiographs, and photographs, have emerged as valuable sources of information for forensic odontologists; they offer unique dental characteristics that aid in the identification of human remains. Dental casts provide detailed three-dimensional representations of dental arches and dental occlusion, enabling comparisons with antemortem records. Radiographs facilitate the identification of specific dental features, including root canal treatments, restorations, and anomalies. Photographs capture distinct dental and facial features, facilitating the identification process. Combining these records with antemortem dental records allows forensic odontologists to establish positive identifications and bring closure to families of the deceased. Additionally, orthodontic records are invaluable in bite mark analysis, a significant aspect of forensic investigations. Dental casts aid in the comparison of bite marks found on victims to the dentition of potential suspects. Analysis of bite marks involves examining the unique characteristics of tooth shapes, dental alignment, and spacing. Orthodontic records contribute to accurate bite mark analysis, helping identify the perpetrator and providing crucial evidence in criminal cases.

Furthermore, orthodontic records serve as essential tools for age estimation, particularly in cases involving individuals of unknown age or minors. Dental development and eruption patterns can be assessed using orthodontic records, assisting forensic odontologists in estimating the age of an individual at the time of death. This information is particularly valuable in cases where traditional methods of age estimation, such as skeletal examination, are not feasible. This review article highlights the relevance of orthodontic records in forensic odontology, emphasizing their contributions to human identification, bite mark analysis, and age estimation.

### Introduction

Forensic dentistry or forensic odontology is a specialized discipline of forensic medicine that focuses on the identification and examination of human remains, as well as the analysis of dental evidence in forensic investigations<sup>1,2</sup>. Among the various fields of dentistry, Orthodontics is recognized for its rigorous patient data collection and meticulous maintenance and storage of records over extended periods.

Orthodontists possess the expertise to gather and manage comprehensive patient data, including meticulous dental records and diagnostic images, thereby enabling them to monitor the progress of patients over prolonged durations. These records encompass vital information such as dental models, radiographs, and intraoral photographs.

In the realm of forensic odontology, orthodontists play a pivotal role in establishing positive identifications<sup>3,4,5</sup>. By comparing the dental records of a missing person with the dental characteristics observed in unidentified human remains, forensic odontologists contribute significantly to the identification process. The distinct dental features,

including dental restorations, anomalies, and recorded information, serves as valuable evidence aiding in the resolution of forensic cases. Here is some information on how orthodontic records can contribute significantly in forensics<sup>4,5</sup>.

The various records which orthodontists maintain in their routine practice are:

1. Detailed personal history
2. Study casts – plastered or digitized forms

### Address for Correspondence:

**Dr. Anshul Chaudhry**

Associate Professor, Department of Orthodontics

Christian Dental College, CMC

Phone number: 9872688198

**Email id:** anshul.chaudhry@cmcludhiana.in

dr.anshulchaudhry@gmail.com

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### 3. Radiographs – 2D or 3D

A. 2D includes OPGs, Lateral Cephalograms, and occlusal radiographs

B. 3D includes CBCTs and CTs

### 4. Photographs- intraoral and extraoral

In the context of dental comparisons in a court of law, a comprehensive collection of antemortem records, coupled with postmortem information of the deceased, is crucial<sup>6</sup>. Antemortem data comprises a range of records including case history records, study models, radiographs, and photographs. Study models can be either plastered stone casts or digitized casts, both of which hold significant value in comparisons, assessments, superimpositions, and evaluation of teeth morphology and palatal rugae patterns. The comprehensive analysis of these antemortem records, including case history, study models, and radiographs, in conjunction with postmortem information, forms a critical foundation for dental comparisons and assessments in forensic odontology cases within the court of law.

Case history records provide essential personal information, including medical and dental history. These records often contain specific details related to race and ethnicity, which are important considerations as they may present challenges in treating certain malocclusions and maintaining retention.

Radiographs, whether in 2D or 3D form, offer reliable information in forensic odontology. 2D radiographs can be hand-wrist radiographs, lateral cephalograms, orthopantomograms, and occlusal radiographs. Hand-wrist radiographs<sup>7</sup> are used to assess the skeletal maturation of an individual, which can aid in age estimation. Lateral cephalograms<sup>8</sup> are employed to evaluate maxillomandibular relationships and can be used alongside hand-wrist radiographs for assessing maturation status. OPGs<sup>7</sup> provides valuable information on dental age, bone, and teeth characteristics, including tooth number, condyle positions, bone levels, calcifications, and the presence of fractures, if any. Occlusal radiographs<sup>9</sup> are useful in identifying the presence of clefts in the maxilla and evaluating the status of sutures.

Three-dimensional radiographs provide a comprehensive assessment of the oral cavity, providing volumetric data and detailed anatomical information about the teeth, jaws, airways, and craniofacial structures. They allow for precise analysis of occlusal discrepancies, morphology of the maxilla and mandible, as well as identification of any

anomalies in teeth and jaws. Moreover, 3D radiographs facilitate the evaluation of airway anatomy and can aid in identifying abnormalities. They also enable a thorough examination of craniofacial structures, providing valuable insights into forensic odontology<sup>10</sup>.

Extraoral photographs are essential in capturing the external appearance of individuals and serve as a valuable tool for identification purposes. These photographs can reveal identifying features such as scars, asymmetries, facial clefts, and anomalies of the jaws. They are particularly useful in cases involving personal identifications or the assessment of facial features related to forensic investigations. The analysis of extraoral photographs contributes significantly to the comprehensive examination of individuals in forensic odontology<sup>11</sup>.

Intraoral images play a crucial role in assessing occlusion, malocclusions, and the morphology of teeth. They provide detailed information about the condition of the dentition, including the presence of missing or extra teeth, dental anomalies, and the state of periodontium. Intraoral photographs can also aid in the detection of oral health-related issues and contribute to a comprehensive assessment of individuals in forensic odontology<sup>12,13</sup>.

Photographs captured from different angles are particularly valuable for profile comparisons. These images provide a comprehensive view of an individual's facial structure, aiding in the identification and verification of individuals in forensic investigations<sup>11,12,13</sup>.

Sex determination can be facilitated through dental examination, considering factors such as the eruption status and developmental pattern of teeth. Additional assessments include evaluating the inclinations of the gonial angle and analyzing variations in soft tissue thickness, which differ between males and females and can vary among different ethnic groups. These dental and facial features contribute to the determination of an individual's sex in forensic odontology cases<sup>14,15</sup>.

Furthermore, dental morphology<sup>16</sup> can provide insights into an individual's profession or habits. For example, notching of incisors may be indicative of certain occupational practices, while fractures in the upper anterior teeth may suggest traumatic incidents related to specific professions. Additionally, the shape of the palate and proclined upper anterior teeth can provide valuable information regarding habits like mouth breathing or thumb sucking.

In forensic investigations, the analysis of bite marks<sup>17</sup> can be



facilitated through the utilization of stored photographs and digitized casts obtained from orthodontic records. This allows for accurate comparison and assessment of bite marks patterns, aiding in the identification of perpetrators or establishing associations between individuals and physical evidence.

#### Conclusion:

In summary, orthodontic records are highly relevant in forensic odontology, providing valuable information for human identification, bite mark analysis, and age estimation. The integration of various dental records, including 3-D radiographs, extraoral photographs, intraoral images, and dental morphology assessments play a pivotal role in forensic odontology. These records and analyses contribute significantly to the identification and examination of individuals in forensic investigations, ensuring comprehensive and accurate assessments for medico-legal purposes. The utilization of these records enhances the accuracy and reliability of forensic investigations, assisting in the resolution of criminal cases and the administration of justice.

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