



Forensic odontology

ARE DENTAL CHARTS (ODONTOGRAMS) OBSOLETE RECORDS FOR COMPARATIVE DENTAL ANALYSIS?

Os odontogramas são registros obsoletos para uma análise dental comparativa?

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ABSTRACT

This communication aims to briefly present the importance of dental charts (odontograms) in the comparative dental analysis for human identification considering the time elapsed between its introduction and the current use in times of rapid technological changes in Dentistry. Future discussions about the rank of importance amongst the different types of dental records are necessary.

KEYWORDS

Forensic dentistry; Human identification; Dental chart.

INTRODUCTION

In 1840, the history of dentistry and photography began when the first dental school was opened and operated by a dentist turned photographer¹. Twenty-one years after, Adolf Zsigmondy created the first tooth notation system to designate the position of teeth in the mouth. This would facilitate the recording of oral status, diagnosis and treatment plan in the form of dental charts. Over the years, other systems would be available in several styles of charts such as anatomic, geometric, and numeric coding system that could be recorded manually and much later,

also digitally². In 1895, the X-ray would be discovered accidentally by a German scientist named Dr. Wilhelm Conrad Röntgen, with great consequences to the diagnostic treatment in Medicine and Dentistry, including diagnosis and recording³.

An average set of dental records include medical and dental history; clinical examination comprised of written records, charting, dental casts, photographs and radiographs; diagnosis; treatment plan; and documentation of informed consent⁴. Some include limitations, for instance, dental charting and dentists' notes are highly

subjective forms of data because they are a written representation of the opinion of the dentist as to a person's oral status as opposed to radiographs and photographs which are a pictorial representation of the oral status and are less subject to human error⁵.

Forensic dentists need to be supplied of antemortem dental data of individuals to perform comparative dental analysis. This analysis is undertaken to determine whether the postmortem findings are in agreement with the provided antemortem data, in order to achieve a positive identification⁶. Nowadays, antemortem data including images such as radiographs, computerized tomography (CT) data and three-dimensional (3D) scans are considered more reliable than written dental charts and odontogram⁷. The aim of this brief communication is to challenge the importance of dental charts in the comparative dental analysis due to the advancements in Dentistry and Forensic Odontology.

CHALLENGES IN THE INTERPRETATION OF DENTAL CHARTS

Dental chartings are expected to be provided to forensic dentists even though they are prone to human error⁵. Forensic dentists might be facing the task of deciphering difficult handwriting, making sense of codes, abbreviations and symbols and notations which very often may be nearly illegible or incomplete. Also, interpretation of the large variety of tooth nomenclature and dental charting systems used throughout the world are labour-intensive during disaster victim identification

operations⁸. The use of codes and symbols tend to be counterproductive as dentists can use their own particular coding systems and the variety of dental charting software are tailored to meet the requirements of individual dental practices or companies⁹.

Considering restorative treatment, the incorrect registration of dental restoration is one of the most common errors; there is often confusion when noting down the extension of a filling from the occlusal surface onto buccal/lingual or mesial/distal surfaces⁸. A British study found that 44% of dental charts of 1128 patients were inaccurate: dental charts had too many teeth charted and other had too few (5% each); dentists would fail to record amalgam restorations and tooth-coloured restorations (13% and 18% respectively); other charts had amalgam and tooth-coloured restoration surfaces incorrectly recorded (5% and 9% respectively). For 7.5% of charts, amalgams were charted but not actually present¹⁰. Considering number of teeth, supernumerary teeth and absence of teeth might not be recorded by some dentists or other ones may use the incorrect tooth number for the absent tooth⁸.

RECEIVING DATA COMPOSED OF RADIOGRAPHS

In Dentistry, imaging methods such as intra-oral periapical X-rays and cone beam computed tomography have become mandatory with the need for more precise diagnostic tools¹¹. Intra-oral and extra-oral dental radiographs objectively display anatomic and pathologic features that are not visible to the naked eye¹². Also, internal anatomical features may be assessed such

as root morphology, canal, trabecular bone pattern, and sinus radiographic outlines.

Moreover, the shape of the restorations is unique in the radiographs¹³ because not always the dentist chart the extension of the filling on dental charts and they would be shown only on the outer surface. A reduced number of forensic odontologists would be confident enough to depend solely on non-radiographic records¹⁴. Their importance is highlighted by the guidelines for human identification such as the American Board of Forensic Odontology (ABFO), in which the radiographic assessment of the victim is encouraged despite the condition of the cadaver¹⁵. In New South Wales, Australia, forensic dentists can only confirm an identification if antemortem radiographs are available for the case¹⁶.

Digital dental photography is important for the accurate recording of the clinical manifestations of the oral cavity¹⁷. It is well-known that accurate and well-maintained records and appropriate communication skills provide a step forward in quality dental treatment and good interdisciplinary dentistry¹⁸. Moreover, photographs show the colour of dental materials, which is impossible for dental casts or radiographs (only the density of metallic or non-metallic fillings). During the dental autopsy the ante-mortem photographs of the smile and selfies can be compared with the post-mortem images of the dentition as supplementary dental ante-mortem evidence¹⁹.

A SIMPLE DIAGRAM

A diagram (Figure 1) was created by the author to highlight the advantages of photographic and radiographic imaging. Needless to say, that the dentists will use their own cognitive skill during the examination. First, the use of different instruments during the examination by the dentist will dictate the quality of information registered. Second, when dentists compile a dental charting, the findings are the result of their interpretation according to their own knowledge and judgement. It is important to note that the photographs and radiographs taken will be interpreted as well, however, the pictorial image can be interpreted at a later stage by the same dentist, other dentists in case of referrals and by the forensic dentist in case of human identification. For this reason, possible mistakes made during the interpretation of images could be found and amended by the re-assessment of the images.

Various fields of dentistry use 3D imaging to aid diagnosis, in treatment planning and appliance construction. Modern techniques using virtual 3D images are continually evolving²⁰. In human identification, the application of 3D imaging was used for selfies and tooth reconstruction^{21,22}; however, forensic dentists have yet to address the comparative analysis between 2D (two-dimensional) and 3D (three-dimensional) data in more depth.

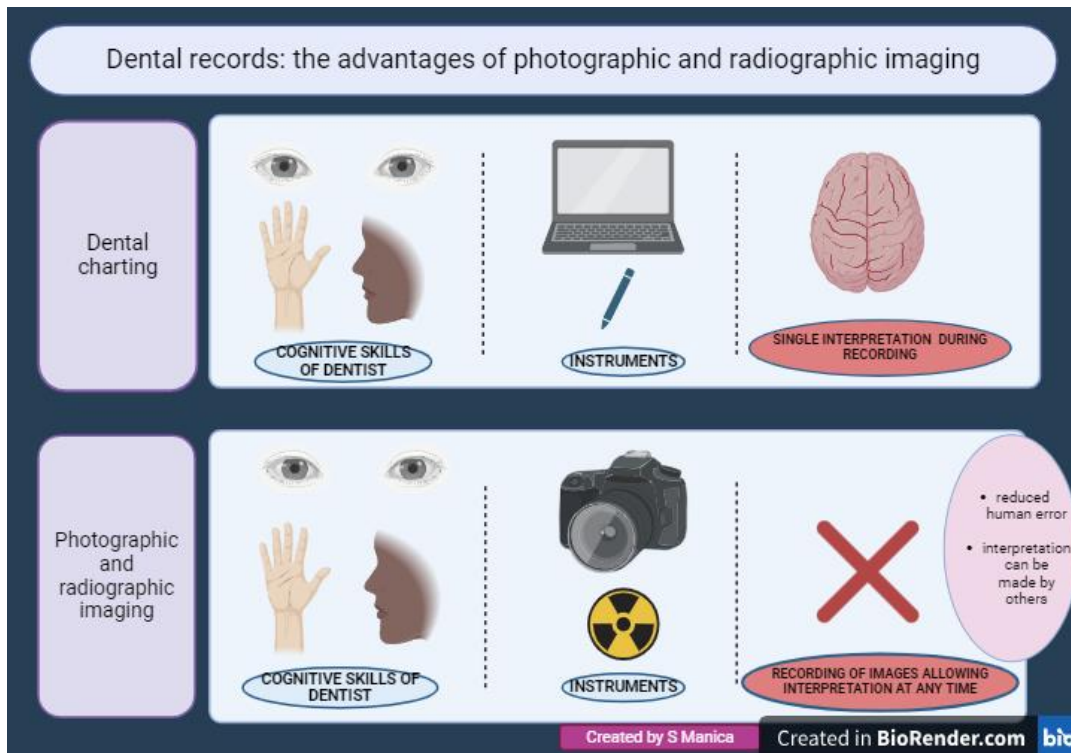


Figure 1. Dental charting X photographic and radiographic imaging.

FINAL CONSIDERATIONS

Dental chartings are not dispensable, and they might be the only available dental records; however, further discussion should consider the admissibility of dental charting as the only data or a supplementary data to establish a positive identification by dental means. Moreover,

the reduced number of therapeutic treatments will make the comparative dental analysis more labour-intensive when considering more analysis of the anatomical aspect of teeth and bone. In those cases, radiographs and photographs will be indispensable.

RESUMO

Esta comunicação tem como objetivo apresentar brevemente a importância dos odontogramas na análise odontológica comparativa para a identificação humana, considerando o tempo decorrido entre sua introdução e o uso atual em tempos de rápidas mudanças tecnológicas na Odontologia. Discussões futuras sobre o grau de importância entre os diferentes tipos de registros odontológicos são necessárias.

PALAVRAS-CHAVE

Odontologia legal; Identificação humana; Odontograma.

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