

Virdentopsy and E-Identification: A Case Report

Abstract

Human identification relies on primary identifiers such as DNA, fingerprints, and dental data. However, the availability of forensic odontology services for dental profiling is not always consistent. To address this, a potential solution is the implementation of a virtual and remote dental autopsy called virdentopsy. The human identification laboratory at the University of Turin, Italy has offered this service since 2020, extending it to volunteering associations involved in missing and unidentified persons. In this case report, we present a case involving an unidentified human skull handled by the Volunteering Association, Penelope Piemonte, Turin, Italy. Through virdentopsy, antemortem dental data from the missing person's family was compared with postmortem dental data collected remotely from the skull. The positive e-identification process confirmed the identity, providing conclusive evidence and closure for the family. Virdentopsy serves as a valuable metaverse resource in humanitarian forensic odontology and forensic dental identification, ensuring respect for the human rights of the deceased.

Keywords: Case report, dental profiling, e-identification, forensic odontology, human identification

Introduction

The identification of unidentified human remains requires the collection and comparison of primary identifiers, such as fingerprints, dental data, and DNA, following INTERPOL standards.^[1] Dental profiling in the human identification process plays a crucial role in both the preliminary generic profile definition and in the definitive identification process, through the comparison of postmortem data collected during the dental autopsy with the antemortem dental data of compatible biological profiles obtained from missing persons' reports.^[2,3] The identification process not only allows closure for grieving families but also upholds the fundamental human rights of the deceased, ensuring their dignified disposition.^[4]

However, the involvement of forensic odontologists in the identification process is not always feasible, resulting in the loss of valuable information and delays in identification, causing prolonged suffering for the relatives and next-of-kin awaiting information about their loved ones. To address this limitation, a possible solution is a teleconsultation in forensic odontology using the virdentopsy protocol,^[5] a virtual and remote dental autopsy proposed by

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

the human identification and forensic odontology laboratory at the University of Turin. In this case report, we present the significance of implementing virdentopsy as a means to achieve e-identification in a case involving an unidentified human skull handled by a volunteering association of missing persons.

Case History

In August 2022, an unidentified skull was discovered near Trento, Italy. In November 2022, a volunteering anthropologist of the Association of Missing Persons, Penelope Piemonte, authorized by penal court in charge of the case, conducted an anthropological evaluation. The evaluation resulted in a generic biological profile compatible with a 47-year-old man who had gone missing in January 2020 within the region. The missing persons association obtained a portrait picture and panoramic x-ray image from 1997 [Figure 1] of the individual, as well as three periapical images [Figure 2] and plaster study models from their dentist.

The missing person association contacted the Human Identification and Forensic Odontology Laboratory at the University of Turin to request a forensic odontology assessment for a definitive identification. The odontologist directly contacted the family dentist to acquire tailored clinical information about the patient.

How to cite this article: Nuzzolese E, Pace F. Virdentopsy and E-identification: A case report. Indian J Dent Res 0;0:0.

Emilio Nuzzolese, Fabrizio Pace¹

Department of Forensic Odontology, Section of Legal Medicine, Department of Public Health and Pediatric Sciences, University of Turin, Turin, ¹Department of Criminology, Independent Researcher, Penelope Piemonte, Turin, Italy

Address for correspondence:

Prof. Emilio Nuzzolese,
Human Identification
and Forensic Odontology
Laboratory, Corso Galileo
Galilei 22, 10126 Turin, Italy.
E-mail: emilio.nuzzolese@
unito.it

Received : 20-07-2024

Revised : 12-10-2024

Accepted : 19-10-2024

Published : 06-03-2025

Access this article online

Website:

<https://journals.lww.com/ijdr>

DOI: 10.4103/ijdr.ijdr_485_24

Quick Response Code:



Under remote instructions from the odontologist, the anthropologist was able to acquire a panoramic x-ray image of the skull [Figure 3] from the private dentist of the family and collect photographic images of the jaws and teeth, following dental autopsy recommendations provided by the odontologist.^[6,7]

Photographs and x-ray images were sent to the odontologist via e-mail. The remote odontological assessment involved the definition of a dental profile following INTERPOL standards of both the unidentified skull and the missing person. The antemortem (AM) and postmortem (PM) dental odontograms, as well as the AM and PM x-ray images,^[8-10] were compared to assess matches, correspondences and discrepancies.^[8-10] The utilization of a portrait picture as supplementary evidence further supported the alignment of the individual's dental characteristics and of attrition. In December 2022, the human identification and forensic odontology laboratory at the University of Turin released the final report: the dental data proved sufficient to establish a positive e-identification, despite the challenges



Figure 1: Panoramic x-ray image of the missing person



Figure 2: Periapical x-ray images of the missing person. (a) shows tooth with bug cavity; (b) shows tooth 36 with endodontic treatment and a mesio-occlusal filling; (c) shows tooth 36 with a crown



Figure 3: Panoramic x-ray image of the unidentified skull

posed by attrition and dental treatments performed in the years between the two panoramic x-ray images, with no irreconcilable discrepancies, confirming that antemortem and postmortem dental data originated from the same individual. Eight correspondences and no discrepancies were found between the antemortem and postmortem dental data [Figure 4]. In this case, DNA comparison was not necessary to confirm the identity.

Discussion

The viridentopsy project emerged as a response to the unprecedented challenges presented by the global COVID-19 pandemic, which significantly disrupted traditional on-site procedures for collecting and analyzing dental data from unidentified human remains.^[5] By leveraging remote capabilities, viridentopsy revolutionizes the field of forensic odontology by enabling consultation and analysis of dental data by forensic odontologists, even in the absence of their physical presence on-site.

The remote consultation aspect of viridentopsy allows forensic odontologists to provide a comprehensive and generic biological profile of an individual based on the gathered dental evidence. By remotely accessing various imaging techniques such as radiographs, CT scans, photographs, videos and intraoral 3D scanning, forensic odontologists can conduct an analysis of the dental features, assess an odontobiography and compare PM with AM dental data and records. This remote analysis not only enhances the efficiency and accuracy of the human identification process but also contributes to a wider respect of the human rights of the deceased.

The successful implementation of the viridentopsy protocol has been demonstrated in this case report, where it played a pivotal role in achieving e-identification of unidentified human remains. Through the comparison of antemortem and postmortem dental records, viridentopsy provided conclusive evidence and closure for the grieving family. This highlights the significance of viridentopsy as a valuable tool in addressing the limitations of on-site forensic odontology services, particularly in circumstances where geographical constraints hinder access to specialized expertise. However, it must be also emphasized that data quality and interpretation variability could pose challenges in capturing detailed information remotely. Remote capabilities may lack the tactile feedback and comprehensive examination possible only through traditional methods. Another critical aspect is data integrity issues and the necessity of obtaining informed consent for remote procedures, which could be challenging.

The integration of this procedure may require adaptations in existing legal frameworks to ensure their admissibility in court. By increasing awareness among legal practitioners, law enforcement and the public about the benefits and reliability of advanced forensic odontology techniques, we could foster acceptance. This process can lead to

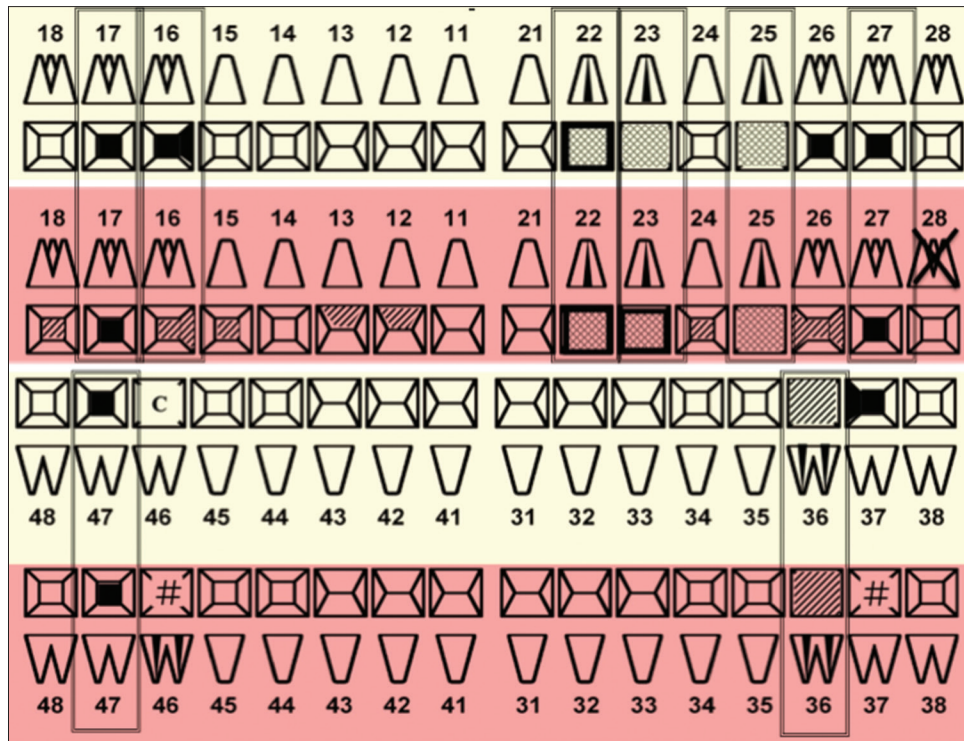


Figure 4: Antemortem and postmortem odontogram highlighting correspondences

quicker resolutions and reduced costs in investigations for the judicial systems facing resource constraints. The case presented demonstrates effectiveness and reliability, which can serve as a reference for future cases, leading to the establishment of legal precedent, even if in another jurisdiction, especially in those identification cases involving human remains of unknown nationalities.

Beyond its immediate applications, virdentopsy represents a remarkable metaverse opportunity in the field of forensic odontology. By embracing virtual and remote dental autopsy techniques, virdentopsy not only serves as a solution to current challenges but also opens new avenues for education and training. It represents a solution in humanitarian forensic odontology, enabling remote consultation and analysis of dental data, enhancing the efficiency of e-identification processes and ensuring the best respect for the human rights of the deceased.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. INTERPOL Guide 1. Disaster Victim Identification (DVI). INTERPOL. Available from: <https://www.interpol.int/How-we-work/Forensics/Disaster-Victim-Identification-DVI>. [Last accessed on 2024 Jul 02].
2. Nuzzolese E. Dental autopsy for the identification of missing persons. *J Forensic Dent Sci* 2018;10:50-4.
3. INTERPOL. Annexure 12: Methods of identification. Available from: http://www.interpol.int/en/content/download/5759/file/E_DVIGuide2018_Annexure12.pdf. [Last accessed 2024 Jul 02].
4. Nuzzolese E, Lupariello F, Ricci P. Human identification and human rights through humanitarian forensic odontology. *Int J Forensic Odontol* 2020;5:38-42.
5. Nuzzolese E. VIRDENTOPSY: Virtual dental autopsy and remote forensic odontology evaluation. *Dent J* 2021;9:102.
6. Senn DR, Weems A. *Manual of Forensic Odontology*. 5th ed. Boca Raton (Florida): CRC Press; 2013.
7. Silver WE, Souviron RR. *Dental Autopsy*. Boca Raton (Florida): CRC Press; 2009.
8. Viner MD, Robson J. Post-mortem forensic dental radiography—A review of current techniques and future developments. *J Forensic Radiol Imag* 2017;8:22-37.
9. Du H, Li M, Li G, Lyu T, Tian XM. Specific oral and maxillofacial identifiers in panoramic radiographs used for human identification. *J Forensic Sci* 2021;66:910-8.
10. Chiam SL, Page M, Higgins D, Taylor J. Validity of forensic odontology identification by comparison of conventional dental radiographs: A scoping review. *Sci Justice* 2019;59:93-101.