Case Report

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Analysis of smiling photograph; Operation US–Bangla Air Crash

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Samarika Dahal[1], Nitin K Agrawal[1], Gopal K Chaudhary[2], Mani R Maharjan[2], Eugen D Walung[2] and Tulsi Kadel[2]

Abstract

Human identification may be difficult when there is no antemortem data available. A photograph of the deceased may be valuable in such cases. Digital advancement and inclusion in the lives of ordinary people makes it easier to retrieve clear, high-resolution photos from social media accounts and other places. This paper describes three cases of forensic dental identification from a US–Bangla plane crash in Nepal in which a charred body was positively identified from a smiling photograph provided by the deceased's family. Each case is unique and their identification rests on the availability of pre- and post-mortem information. Thus, the number of concordant points may vary from single to multiple; there is no defined criteria for minimum number of concordance for a positive dental identification.

Keywords

Disaster victim identification, forensic dentistry, Nepal, smiling photograph, US–Bangla air crash

Introduction

Identifying human skeletal remains is difficult and requires a multidisciplinary approach.[1–3] Along with traditional methods of identification such as fingerprints, DNA matching and dental examination, sex, age, stature and individualisation factors may have to be considered depending on the nature of the disaster and the availability of the antemortem data.[2] Some cases may lack or have an incomplete dental treatment record, necessitating the search for antemortem data from personal belongings.[3,4] Of the many types of personal information that can be retrieved, smiling photos are easier, reliable and fairly common.[5] As of yet, there have been very few reported cases of smiling photos used for identification purposes. We describe three forensic cases from the US–Bangla air crash in Nepal where charred bodies were positively identified using "smile photos" provided by their families.

Case presentation

The US–Bangla Flight BS 211 DAC, a DHC8-Q400, with 71 individuals on board from Dhaka, Bangladesh, caught fire during attempted landing at the Tribhuvan International Airport (TIA) in Kathmandu at 14.20 hours on 12 March 2018. The bodies of 41 people were recovered from the crash site and transported to the Department of Forensic Medicine (DoFM), Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal that day. The remaining eight bodies were transferred from the Kathmandu Medical College and Teaching Hospital. DoFM was given the authority and responsibility for disaster victims' identification (DVI) of a total of 49 dead bodies. The DVI operation was conducted by seven forensic medicine specialists, eight forensic medicine residents and four mortuary helpers from DOFM along with two forensic odontologists (FO), plus four dental professionals. Out of the 49 deceased, 19 were identified on dental grounds.

[1]Department of Dentistry, Tribhuwan University Teaching Hospital, Institute of Medicine, Kathmandu, Nepal
[2]Department of Forensic Medicine, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal

Corresponding author:
Samarika Dahal, Department of Dentistry, Tribhuwan University Teaching Hospital, Institute of Medicine, Kathmandu, Nepal.
Email: dr.samarika@gmail.com

Figure 1. An antemortem smiling photograph with a PFM crown on 26 (FDI) (yellow arrow) compared to the post-mortem dental finding of the same.

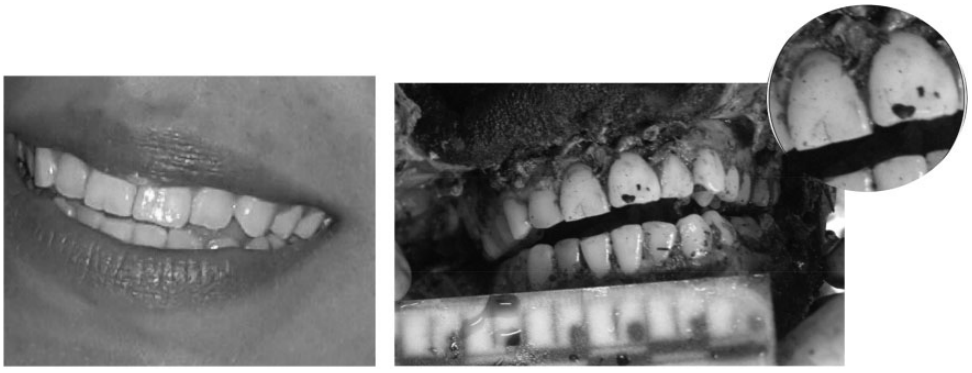

Figure 2. Antemortem smile photograph with notches on the 11 (FDI), 12 (FDI) and 21 (FDI) and post-mortem dental findings of the same.

Case 1

The body USB-0001 on external examination revealed a charred black body with pugilistic attitude or heat stiffening of the larger joint. The post-mortem examination revealed a normally built adult male measuring 71 inches from crown to heel. There was a mole of 0.1×0.1 cm over the left side of the nose. The post-mortem dental examination was conducted and documented on Interpol Form 600s. The teeth were numbered according to the Fédération Dentaire International (FDI). On examination, a porcelain fused to metal (PFM) crown was present on 26 (FDI), 36 (FDI), and 47 (FDI). The antemortem team could not gather any antemortem dental information. However, the family, while unable to provide us with dental records, provided us with a smiling photograph of the deceased. The photograph revealed PFM on 26 (FDI) on which basis his identification was established (Figure 1).

Case 2

The body USB-0011, on external examination, had no personal belongings or clothing. The post-mortem examination showed a normally built charred adult female measuring 61 inches in length from heel to vertex. The post-mortem dental examination revealed a notch in 11 (FDI), a labially inclined 21 (FDI), a retroclined 22 (FDI), and a labially placed 23 (FDI). Caries was present in 17 and 37 (FDI). The only antemortem data available was the smiling photograph of the deceased (Figure 2). The body was identified on one point of agreement based on the incisal notch.

Case 3

The body USB-0027, on external examination, showed a normally built charred adult male in a pugilistic attitude, measuring 67 inches in length from heel to vertex. The exposed teeth were charred. Both nostrils were impacted with thick soot particles. The head hair, beard, moustache, and body hair over the back were singed. The post-mortem examination showed all 32 teeth to be sound. However, there was spacing present between 11 and 12, 12 and 13, 21 and 22, 22 and 23. The antemortem information extracted from the FDI photograph provided by the family revealed spacing

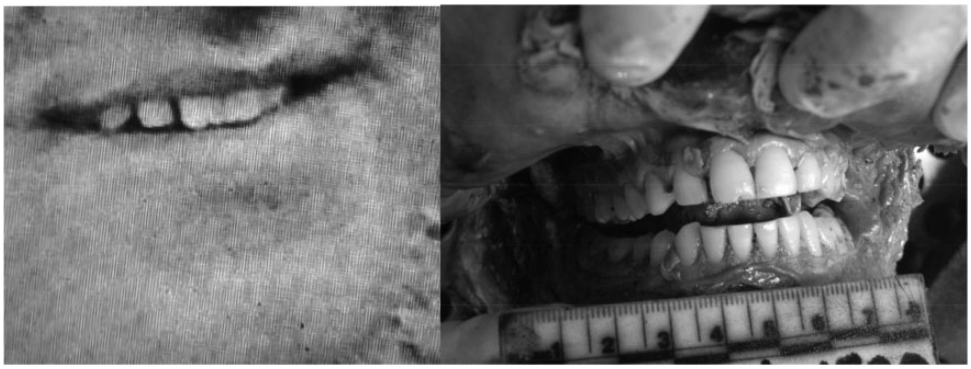

Figure 3. Comparison of the antemortem smile photograph with spacing between 11 and 12, 12 and 13 with the post-mortem dental finding of the same.

between 11 and 12, 12 and 13 FDI (Figure 3). The body was identified by the dental findings.

Materials and methods

The photographs were analyzed by two methods. The first one was the direct comparison of the antemortem and post-mortem photographs of the same anatomical location by keeping them side-by-side. Secondly, the outlines of the incisal edges were also compared. This approach is particularly useful for identifying present and missing teeth, analyzing dental crown morphology, determining the position of the dental arches, detecting dental interventions, and even identifying oral pathologies.

Discussion

The use of smiling images to identify unknown victims has recently been highlighted in forensic medical literature. The advancement of digital photography technology, as well as the low cost of smart phones, high-speed internet, mobile data, and accessibility to mobile phones for people of all ages, has led to the implementation of digital forensics in human identification.[6,7]

In this age of digital inclusion, people are more familiar with photography gadgets, such as cameras and smart-phones. People capture casual smile images from their mobile phones and cameras and store them on their phones and share them on their social media accounts.[8,9] Due to digital advancement, high-resolution images are not too difficult to acquire,[10] and can be utilised as antemortem data during human identification. This low-cost, quick and easy technique can be valuable during a disaster.[3]

Smile images capture the size, position, angulation, form, colour, incisal alignment and occlusal relationship of the maxillary and mandibular anterior teeth. Other identifiers, such as dental restorations and prosthetic equipment, may be recorded in smile images taken with the mouth wide open in rare cases. In the absence of medical and dental records, these images provide a rich source of antemortem data as well as an alternative form of human identification.[11,12]

The first case has a PFM crown in the photograph. PFM crowns are common in upper molars, but they may not be able to be used as a basis for identification until a complete dental record is retrieved from the dentists. In the event of an open disaster, insufficient information like this could lead to possible identification. However, the context of the closed disaster as in this case and two methods of photo comparison as mentioned above led to the identification of the individual based on a single point of agreement, as none of the victims had a PFM crown on the same tooth.

For various reasons, the incisal notch occurs on the incisal edges of the anterior teeth. One of the common causes is nail biting, which misshapes the incisors, giving a unique v-shaped notch in the incisal edge.[13] Depending upon the extent and duration of the force causing the regressive alteration of the incisors, a unique shape and size of notch can develop. This unique finding can be utilized in human identification due to its unique characteristics.

The spacing between the teeth may appear quite common and be easily overlooked by the treating dentists, so it may not be noted in the dental records. Similarly, the FO may also easily miss it during a forensic dental examination. In this case, the forensic odontologist noted the spacing between the teeth, which was obvious in the antemortem photograph as well. The photograph provided by the family was of lower quality, but the spacing between the teeth was obvious. This comparison was used only when three male bodies were to be identified. One of them was considered to be elderly, whereas another had only a single testis.

When combined with other physical findings, the spacing comparison helped in the final identification.

All three of the above cases appear tricky at first glance, implying that only one point of agreement from a single smile photograph of the deceased was considered during the identification procedure. However, a closer examination reveals that all of the data from the available dentition was considered. The other findings, such as sound, carious, missing teeth, and morphological arrangement of the teeth, were also considered in the exclusion of an individual.

The number of concordant features can range from one unique feature to multiple common features. A single concordant feature is scientifically accepted in human identification.[14] There appears to be no basis for defining a minimum number of concordant points required before a positive identification on dental evidence may be made. Rather, this study supports the concept that each situation is unique and should be treated as such.[14,15]

However, there are drawbacks, such as the restricted number of visible teeth in the photograph, low image quality, the regressive alteration of teeth after the antemortem image was taken, and the difficulty of making comparisons due to the different orientation of the photo.[3] When in doubt, multiple parameters should be adopted to avoid bias and error.[15] Identification based on single concordant features should be avoided unless the identifier is considerably distinct.

Conclusion

These cases illustrate how photographic images can be used to identify a person. This type of information could be significant, especially if no antemortem data is available. It may not always lead to the establishment of an identity. However, it can help people get one step closer to identification.

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References

1. Dirkmaat DC and Cabo LL. Forensic archaeology and forensic taphonomy: Basic considerations on how to properly process and interpret the outdoor forensic scene. *Acad Forensic Pathol* 2016; 6: 439–454. https://doi.org/10.23907/2016.045.
2. Dahal S, Chaudhary GK, Maharjan MR and Walung DE. A dental perspective on the successes and limitations of the disaster victim identification response to the Nepal earthquake. *Foren Sci Res* 2022; 7(3): 366–370. https://www.tandfonline.com/doi/full/10.1080/20961790.2022.2034716.
3. Miranda GE, de Freitas SG, de Abreu Maia LV and Melani RFH. An unusual method of forensic human identification: use of selfie photographs. *Forensic Sci Int* 2016; 263: e14–e17. https://doi.org/10.1016/j.forsciint.2016.04.028.
4. Silva RF, Franco A, de Souza JB, Picoli FF, Mendes SDSC and Nunes FG. Human identification through the analysis of smile photographs. *Am J Forensic Med Pathol* 2015; 36: 71–74. https://doi.org/10.1097/PAF.0000000000000148.
5. Silva RF, Pereira SD, Prado FB, Daruge E and Daruge E. Forensic odontology identification using smile photograph analysis – case reports. *J Forensic Odontostomatol* 2008; 26: 12–17.
6. Hookano R, Knight LD, Brunelli RA and Stoppacher R. Applications of social network media in medicolegal death investigation. *J Forensic Sci* 2013; 58: 1628–1632. https://doi.org/10.1111/1556-4029.12173.
7. Nuzzolese E, Lupariello F and Di Vella G. Selfie identification app as a forensic tool for missing and unidentified persons. *J Forensic Dent Sci* 2018; 10: 75–78. https://doi.org/10.4103/jfo.jfds_80_17.
8. Yang Y. Smartphone photography and its socio-economic life in China: An ethnographic analysis. *Global Media and China* 2021; 16: 259–280. https://doi.org/10.1177/20594364211005058.
9. Peters C and Allan S. Everyday imagery: Users' reflections on smartphone cameras and communication. *Convergence* 2018; 24: 357–373. https://doi.org/10.1177/1354856516678395.
10. Boissin C, Fleming J, Wallis L, Hasselberg M and Laflamme L. Can we trust the use of smartphone cameras in clinical practice? Laypeople assessment of their image quality. *Telemed J E Health* 2015; 21: 887–892. https://doi.org/10.1089/tmj.2014.022.
11. Fakher MGAA, Al-assaf M, Mimas S, Fakher MAA, Abdul-hak M and Nofal H. The forensic value of smile photograph and medical radiograph analysis in identifying human skeletonized remains: a case report. *Egypt J Forensic Sci* 2020; 10, 28. https://doi.org/10.1186/s41935-020-00204-4.
12. Valente-Aguiar MS, Castro-Espicalsky TL, Magalhães T and Dinis-Oliveira RJ. Computerized delineation of the teeth and comparison with a smiling photograph: identification of a body skeletonized by cadaverous

ichthyofauna action. *Forensic Sci Med Pathol* 2021; 17: 517–521. https://doi.org/10.1007/s12024-021-00384-y.
13. Marouane O, Ghorbel M, Nahdi M, Necibi A and Douki N. New approach to managing onychophagia. *Case Rep Dent* 2016; 5475462. https://doi.org/10.1155/2016/5475462.
14. Acharya AB and Taylor JA. Are a minimum number of concordant matches needed to establish identity in forensic odontology? *J Forensic Odontostomatol* 2003; 21: 6–13.
15. Mazur M, Górka K and Aguilera IA. Smile photograph analysis and its connection with focal length as one of identification methods in forensic anthropology and odontology. *Forensic Sci Int* 2022; 26: 111285. https://doi.org/10.1016/j.forsciint.2022.111285.