



## Identification in forensic anthropology: Its relation to genetics

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**Abstract.** Within forensic activity, whenever identification is a problem, it is generalized that DNA analysis is the solution. However, it is well known both by forensic pathologists and anthropologists that, apart from the immense potentiality of this technique, there are many situations where the classical forensic anthropology examination is still useful and irreplaceable. Through the presentation of two forensic routine cases of the National Institute of Legal Medicine (NILM) in Portugal, the interdisciplinarity between forensic anthropology and forensic genetics is discussed showing the benefits as well as the pitfalls of each of these sciences. © 2006 Elsevier B.V. All rights reserved.

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### 1. Introduction

In recent years it is largely widespread that, in the majority of the cases, DNA could lead to identification of human remains, namely skeletal remains. The aim of this work is to emphasize that DNA can not replace the anthropological analysis [1,2]. If, in one hand, some of the benefits of genetic analysis are their exclusivity, on the other, a genetic profile can not provide data on some of the essential parameters of the biological profile, such as age at death and stature. Thus, it is the combination of both anthropological (including a sort of ancillary examination such as the odontological one) and genetic expertise that can, indeed, lead to a positive identification. Without a biological profile given by the anthropological expertise, the DNA could be useless.

We here present two cases which, in a way, can be considered antagonistic. In the first, genetics was not conclusive, while in the second, identification was confirmed by DNA analysis.

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## **2. Materials and methods**

### *2.1. Case 1*

A complete skeletonized victim of a homicide was recovered from the field below an amount of stones, in Pico Island (Azores), after denunciation by one of the murder witnesses. At that time, around 1 year after the crime had been committed, the victim was autopsied by local practitioners and buried.

It was supposed to be a Portuguese-American individual and DNA analysis were performed to confirm his identity. Although the genetic profile was achieved, the prosecutor did not accept it as an unequivocal identity proof, since it could also be compatible with eventual existing brothers. It was known that the victim had brothers, though the exact number and their location was not possible to be known since they allegedly were living in an unknown part in the USA. Consequently, in order to confirm identity, further data was required, namely dental charts which were sent back from the USA to be matched with the victims' one. Due to some inconsistencies in the first autopsy report related with the odontological data, this matching was problematic.

The victim was exhumed under request of the prosecutor and a second autopsy was then performed including, this time, a forensic anthropologist. Because of the peri and post-mortem destruction of both maxillas, the verification of correspondence between ante and post mortem dental records was hard to be done. Yet, some compatibility was found between the ante-mortem X-rays, taken several years before the death occurrence, and the dental chart obtained during the second autopsy.

Furthermore a thorough anthropological analysis led to the achievement of a much more reliable characterization of the individual, providing more data to confirm his identity. Traumatic injuries both on the skull and thorax permitted to substantiate the cause of death: blunt trauma of the head, eventually made by stones (as confirmed by the murder in court), on frontal head, mandible and on both sides of the thorax.

### *2.2. Case 2*

An almost complete skeleton from an isolated site in the field, missing the bones of extremities, was accidentally found superficially buried, 15–20 cm depth, by a rural worker who was planting trees.

The field work was very well accomplished by the Criminal police permitting the recovering of small details such as pieces of his clothes, some of which with signs of carbonization.

The autopsy was performed by a multidisciplinary team composed by a forensic pathologist and a forensic anthropologist at a regional Office of Forensic Medicine. The body was almost skeletonized, fully invaded by plant roots, especially on the thorax, limbs and even inside the vertebral foramen of some thoracic vertebrae. The growth of these roots helped to estimate the minimum time elapsed since death (more than 1 year), compatible with the date the suspected body had disappeared.

The biological profile, achieved by anthropological and odontological analyses, indicated that the body had belonged to a Caucasoid male, approximately 174 cm in height who died older than 40 and younger than 60 years of age.

This profile matched with a missing individual in the area who has disappeared for 4 years. DNA analyses performed on bone and teeth samples later on, once compared with the one of a relative, confirmed the individual's identity.

Since this person was reported as missing, a police investigation had previously begun and the genetic profile of the victims' relatives was available at the NILM for matching, leading to an easy confirmation of the identity already suspected by the anthropological multidisciplinary expertise.

The victim was suspected to have been murdered by his wife and daughters. However, on the basis of the skeletal remains, it was not possible to establish the cause of death, since many traumatic perimortem injuries were detected.

### 3. Results and discussion

We argue that it is important for the forensic community and even to the general public to be aware both of the benefits and drawbacks of genetic analysis when dealing with non-identified human remains.

Genetics is really an excellent tool for identification. However, it is not the only method. In spite of one of the advantages of genetics is being able to supply a quantitative result, the lack of relatives to compare with sometimes invalidates its usefulness [3]. In these circumstances the classical anthropological analysis remains as valid as ever, as emphasized by different authors in many situations within the context of human rights violation such in Bosnia-Herzegovina [2] or in mass disasters like the World Trade Center victims [1]. Moreover anthropological identification will reduce the number of bone samples to be analysed by DNA laboratories [2].

On the other hand, in many cases, anthropological expertise by its own, without genetics, is not able to provide a clear-cut result. Furthermore, until now, it quite fails to quantify the outcome. The case studies discussed above can be seen as good examples of that. In the first one, despite the DNA of the victim was retrieved, inaccuracies about their direct relatives preclude it to be used as an unambiguous prove of identity. It was the anthropological analysis performed in the second autopsy which permitted identity confirmation.

In the second case, it was the biological profile indicated by the anthropological analysis, which lead to the suspicion of identity. Without it, the DNA results (already available) would have been useless. Yet, the biological profile by its own would not have been enough to attain a positive identification. It is therefore the crossing over of both expertises that enhanced the chances to arrive to a positive identification [1–3]. We argue that a good cooperation between forensic anthropology, forensic pathology and genetics, as it is practiced in the Portuguese NILM, is a precondition to well succeeded cases.

### References

- [1] Z.M. Budimlija, et al., World trade center human identification project: experiences with individual body identification cases, *Croatian Medical Journal* 44 (3) (2003) 259–263.
- [2] L.N. Yazedjian, et al., The importance of using traditional anthropological methods in a DNA-led identification system, in: 54th Proceedings of the American Academy of Forensic Sciences, vol. 11, 2005, pp. 312–313, New Orleans.
- [3] C. Cattaneo et al. Personal identification of cadavers and human remains, in: A. Schmitt, E. Cunha, J. Pinheiro (Eds.), *Forensic Anthropology and Medicine: Complementary Sciences From Recovery to Cause of Death*. Humana Press, New Jersey, in press.