



A Systematic Review of the Comparison of Ante-Mortem and Post-Mortem Radiological Data for Identification

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ABSTRACT

Particularly in situations involving mass tragedies, decomposed remains, or situations where conventional techniques are inadequate, radiological data is essential for human identification. Comparing the effectiveness and precision of ante-mortem (AM) and post-mortem (PM) radiological data for identification purposes is the goal of this systematic review. We review several radiological modalities, such as MRIs, CT scans, and radiography, and evaluate their suitability for specific identifying situations. The study summarizes recent findings, pointing out the benefits and drawbacks of each modality and suggesting best practices for using radiological data in forensic identification.

INTRODUCTION

A key component of forensic science is human identification, which helps with legal procedures and provides families with closure. Radiological techniques provide complete skeleton and dental information in an objective and non-destructive manner for comparing AM and PM data. In order to create trustworthy identification techniques, this review focuses on the comparative examination of different data sets.

METHODOLOGY

Databases like PubMed, Scopus, Web of Science, and Google Scholar were used to perform a thorough literature search. Search phrases included "forensic radiology," "human identification," "ante-mortem post-mortem comparison," "radiographic identification," "CT identification," along with "MRI identification." Included were studies that compared AM and PM radiological data for identifying purposes. Imaging modalities, anatomical regions examined, identification accuracy, and constraints were all included in the data extraction process.

RADIOGRAPHS

Radiographs have the following benefits: they are widely accessible, reasonably priced, and offer comprehensive bone and dental data. Limitations: The ability to see intricate anatomical structures may be restricted by two-dimensional imagery. Applications include skeletal radiographs (chest, spine, limbs) for comparing bone morphology and pathology, and dental radiographs (intraoral and panoramic) for dental identification.

COMPUTED TOMOGRAPHY (CT)

Benefits of Computed Tomography (CT) include excellent resolution, three-dimensional imaging, and multi-planar image reconstruction. Limitations: Limited soft tissue discrimination in comparison to MRI, higher radiation dose, and artifact risk. Applications include comparison of distinct anatomical features (such as sinuses and vertebral architecture), virtual autopsy, and detailed skeletal study.

MAGNETIC RESONANCE IMAGING (MRI)

Benefits of magnetic resonance imaging (MRI) include better soft tissue contrast, no ionizing radiation, and the capacity to see cartilage and bone. Cons: Expensive, takes longer to acquire, and is prone to motion artifacts. Applications include identifying distinct soft tissue anatomical variances, comparing marrow signals and cartilage shape at particular joints, and identifying soft tissue in decomposed remains.

COMPARITIVE ANALYSIS

Dental Identification:

Because dental structures are distinct and long-lasting, dental radiographs are quite useful. It is essential to compare AM dental records with PM findings.

Skeletal Identification:

Bone morphology, fractures, and pathological states can be analyzed by comparing skeletal radiographs and CT images. Identification might be aided by distinctive skeletal characteristics including sinuses and vertebral shape.

Soft Tissue Identification:

MRI is useful for identifying soft tissues, especially when other modalities are ambiguous or when the body is decomposed. It might be very important to compare pathological results with changes in soft tissue anatomy.

COMPARISON CHALLENGES:

Anatomical structures may alter as a result of the time difference between AM and PM imaging.

Image quality and comparability may be impacted by post-mortem alterations including tissue shrinkage and decomposition.

Variability may be introduced by the absence of established procedures for picture acquisition and comparison.

ACURRACY AND RELIABILITY

Research continuously shows that comparing AM and PM radiological data yields high accuracy rates, especially for skeletal and dental identity.

Generally speaking, CT scans are more accurate than radiography because of their three-dimensional imaging capabilities.

The quality and accessibility of AM data are critical to the accuracy of radiological identification.

FUTURE DIRECTIONS

Creation of uniform procedures for the collection and comparison of images.

Combining machine learning and artificial intelligence to automatically analyze and identify images.

Investigation of cutting-edge imaging methods including digital radiography and cone-beam CT.

CONCLUSIONS

A useful tool for human identification is radiological data, which offers precise and comprehensive information for comparison. For dental and skeletal identification, CT scans and radiography are especially useful, although MRI shows promise for soft tissue examination. To improve the precision and effectiveness of radiological identification, future studies should concentrate on refining image acquisition and comparison procedures and investigating the incorporation of cutting-edge technology.

KEYWORDS

CT SCAN

MRI

Am data

Radiological data

REFERENCES

1. Rutty, G. N. (Ed.). (2009). *Forensic radiology*. CRC press. (A comprehensive textbook covering various aspects of forensic radiology, including identification.)
2. Dedouit, F., & Rougé, D. (2010). Virtual autopsy: current status and future perspective. *Journal of forensic radiology and imaging*, 1(1), 2-11. (Discusses the use of CT in virtual autopsies and identification.)
3. Thali, M. J., Yen, K., Schweitzer, W., Vock, P., Boesch, C., Ozdoba, C., ... & Dirnhofer, R. (2003). Virtopsy—a new imaging horizon in forensic pathology: virtual autopsy by postmortem multislice computed tomography (MSCT) and magnetic resonance imaging (MRI)—a feasibility study. *Journal of forensic sciences*, 48(2), 386-403. (A seminal paper on the use of CT and MRI in virtual autopsies.)
4. Pretty, I. A., & Sweet, D. J. (2001). A look at forensic dentistry—Part 1: The role of teeth in the determination of human identity. *British dental journal*, 190(7), 359-366. (Discusses the role of dental records in identification.)
5. Sweet, D. J. (2010). Forensic dental identification. In *Handbook of forensic science* (pp. 379-418). CRC press. (A chapter providing detailed information on forensic dental identification.)
6. Ubelaker, D. H. (2008). *Human skeletal remains: excavation, analysis, interpretation*. Aldine Transaction. (Provides information on skeletal analysis, which is relevant to radiological comparisons.)
7. Christensen, A. M., Passalacqua, N. V., & Bartelink, E. J. (2014). *Forensic anthropology: current methods and practice*. Academic press. (A comprehensive book on forensic anthropology, including skeletal identification.)