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A specific case involving fingerprinting of a mummified corpse

Summary

This article describes an approach for fingerprinting a male corpse, mummified in ancient times and deposited in the Museum of the Department of Descriptive and Clinical Anatomy, Medical University of Warsaw. The authors present a practical approach to sampling of comparative material for dactyloscopic studies with the use of techniques adequate to physical properties of the research object, as well as the results obtained. The study revealed that the corpse which underwent mummification more than two thousand years ago still carries the skin areas within fingers and toes preserved well enough to obtain valuable material for dactyloscopic identification studies.

Keywords antiquity, dactyloscopy, fingerprinting, mummy, mummification

Introduction

When examining the past, one can not only discover more about the specific time period but also find references to the reality and contemporary times. Human remains can serve as the best verifier of our views on historical times and at the same time as evidence that humans remained unchanged throughout all the epochs, their phenotypes and genotypes being reproduced, notwithstanding the significant individual variability. This article presents partial results of an anthropological study concerning the morphological specifics of a human corpse which underwent mummification in ancient times.

Characteristics and origin of a mummy

The presented study involves a mysterious research object, namely a human male mummy, probably originating from the Ptolemaic period, corresponding to the dynasty ruling over Egypt in the years 305–30 BC. It is possible that the mummified man originated from

Nubia, a historical region located in northeast Africa on the borderline between southern Egypt and northern Sudan, in the middle course of the Nile. However, as no artifacts have been discovered that could be linked to the mummy, this hypothesis awaits verification.

The research object has for many years been deposited in the Museum of the Department of Descriptive and Clinical Anatomy, Medical University of Warsaw. Unfortunately, there are no written records available, indicating how it became a part of the museum's collection. The most probable hypothesis states that the mummy was brought to Poland by Prof. Tadeusz Dzierżykray-Rogalski, an organizer and leader of anthropological expeditions which took place in the years 1959–1962 in northeast Africa. This anatomist, anthropologist and physician, who rendered great service for Polish and European science, donated a part of his collection from excavations carried out in Alexandria and Sudan to the Department of Descriptive and Clinical Anatomy, Medical University of Warsaw. It is therefore possible that the male mummy was among the exhibits brought from Africa.

As little was known about the research object, in the first place, the mummy was subjected to external visual inspection aimed at assessing whether the mummification process was intentional or resulted from natural drying. A cut in the lower abdominal area with the wound edges pulled together and filling of natural body cavities with fabric suggested human intervention and that mummification of the corpse was an intentional process. The man was tentatively classified as belonging to an older age group, however, this hypothesis will be further verified, based on computer tomography image analysis, involving an assessment of cranial suture obliteration and tooth abrasion. At present, dactyloscopic analysis and computer tomography have been carried out, iconographic analysis is ongoing, while biochemical and genetic analyses aimed at quantitative identification of the mummy are scheduled to be completed.

Fingerprinting a mummy

A description of the activities related to the fingerprinting of a mummy and the effects thereof should begin with a statement that it is particularly cumbersome to collect material amenable to dactyloscopic identification from

a mummified corpse. This relates primarily to the physical properties of mummified tissues, including corrugated skin with relatively smaller surface carrying fingerprints, the resulting illegibility of dactyloscopic features (minutiae) on significant parts of hands and feet, the lack of flexibility of the skin and subcutaneous tissue, the absence of active sweat and sebum substance as well as local epidermis damages and losses.

Considering the potential problems with obtaining legible fingerprints from the research object, this task was preceded by an attempt to fingerprint hand and foot fragments of other mummies belonging to the collection of the Department of Descriptive and Clinical Anatomy, Medical University of Warsaw. The goal of this approach was to gain knowledge about the performance of the fingerprinting methods known to the authors as they apply to mummified corpses as well as to exclude inadequate methods, taking into account the characteristics of the research object and the necessity to apply only non-invasive techniques (leaving no permanent signs of interference). The first technique tested was macro photography. It enabled the recording of fingerprint images which, in the case of at least two fingertip fragments, were sufficient for individual identification. Subsequently, the same areas were subjected to an ink-based method, wherein dactyloscopic ink was applied onto the fingertips using a soft swab, followed by an attempt to collect fingerprints onto a flexible, self-adhesive dactyloscopic foil. The effects obtained with the use of the above method have proved highly unsatisfactory. Despite several attempts, no legible fingerprints have been obtained. Next, the material was collected using a two-component silicone mold (Microsil paste, grey). In this case, good effects were observed within the previously photographed (using a macro lens) areas, indicating the possibility of identification of a mummified corpse.

The conclusions drawn up, based on the above preliminary tests encouraged the attempts at fingerprinting the mummy that was of interest to the authors (Fig. 1). The case described herein involved not only all the aforementioned adverse conditions, but also an additional substantial challenge. Namely, the upper limbs of the mummy were stretched out along the body's longitudinal axis with palms facing thighs (Fig. 2). This resulted in the obstructed access to the majority of palm and finger surfaces or even a lack of access, as the distance between the fingertips and the thighs was at best limited to a few centimeters. The next stage consisted in the inspection and assessment of fingers and toes of the mummy, aimed at identifying those areas that carry legible individual characteristics, sufficient for identification (the authors decided not to collect fingerprints from palms and bottoms of feet).



Fig. 1. Male mummy deposited in the collection of the the Department of Descriptive and Clinical Anatomy, Medical University of Warsaw.



Fig. 2. Position of the hands in relation to the surface of the thighs.

The analysis revealed that a number of palms and toes carried minutiae numerous and legible enough to carry out an identification procedure. It is important to note that in the case of some fingertips it was possible to determine the pattern (categorically or with high probability) but there were difficulties with the identification of a sufficient number of individual characteristics. Moreover, only one toe tip (great toe, left foot) yielded a complete fingerprint image. In the case of the remaining finger and toe tips and sections qualified for fingerprinting, the individual characteristics were only partially legible and limited to relatively small areas. Aside from the great toe of the left foot, selected fragments of all five right-hand fingers, left-hand thumb and right-foot little toe were pre-qualified for identification. The evaluation carried out led to the conclusion that in the case of fingers and toes, the identifiable areas make up less than 20% of the skin surface bearing fingerprints.

After completion of the above evaluation, the material for dactyloscopic identification analysis was secured. The first technique used was macro photography which, due to the reasons mentioned above, was limited to the recording of fingerprints visible on two toes (right pinky toe and left great toe). The effects are shown on Fig. 3.

Next, silicone casts were taken off the selected fingers using Microsil paste, gray (no fingerprinting was performed using the ink-based method). After solidification, the casts were placed in labeled



Fig. 3. Distal section of the great toe, left foot.

zip-lock pouches and subjected to final evaluation of their suitability for identification studies. This assessment revealed that some of the casts, i.e. corresponding to the great, middle and pinky finger of the right hand, did not carry sufficient numbers of individual characteristics and they were therefore not photographed. Photographic images of the remaining casts are shown on Figures 4–8.

The use of a silicone-based method has brought the desired effects in that it allowed for an analysis of fingerprints, both in the context of their patterns and individual characteristics (minutiae). As regards the left index finger and left great toe, it was possible to

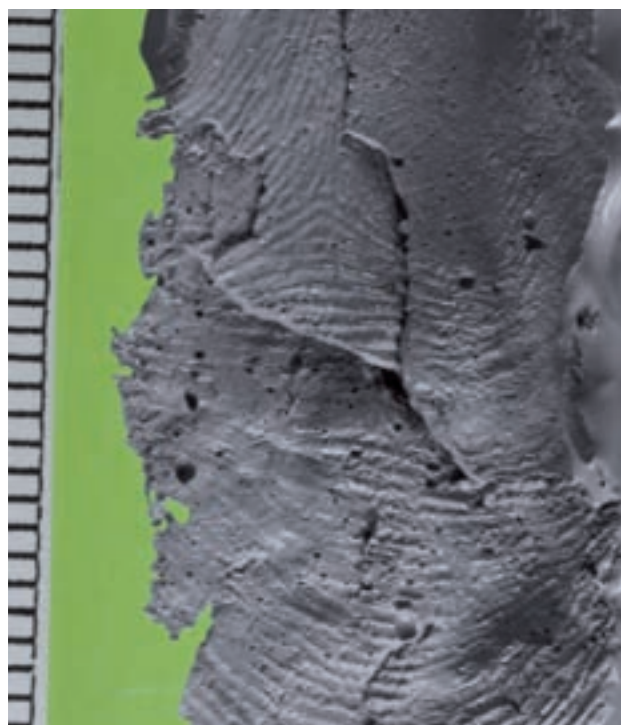


Fig. 4. Fragment of the distal section of the index finger, right hand.

unambiguously determine the fingerprint patterns of the distal sections, whereby the former carried the whorl pattern (Fig. 4), while the latter – left loop pattern (Fig. 3 and 7). In the case of left pinky toe, the loop or arch pattern was observed (Fig. 8). Moreover, this cast displayed well preserved and visible sweat gland outlets (pores) in its central part. One of the best preserved areas (side sector, distal section of the left thumb) was used to single out twenty individual characteristics (Fig. 9). Both this cast as well as those shown on the photographs would enable the identification of the mummified corpse.

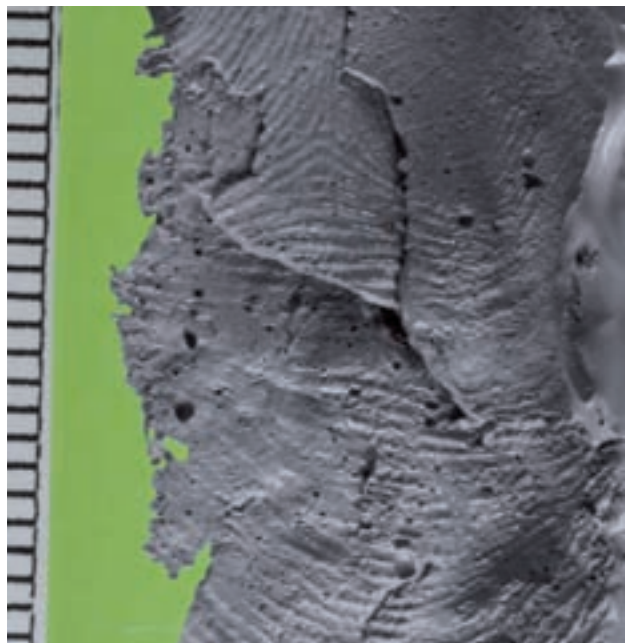


Fig. 5. Fragments of the intermediate and distal (tip) section of the middle finger, right hand.

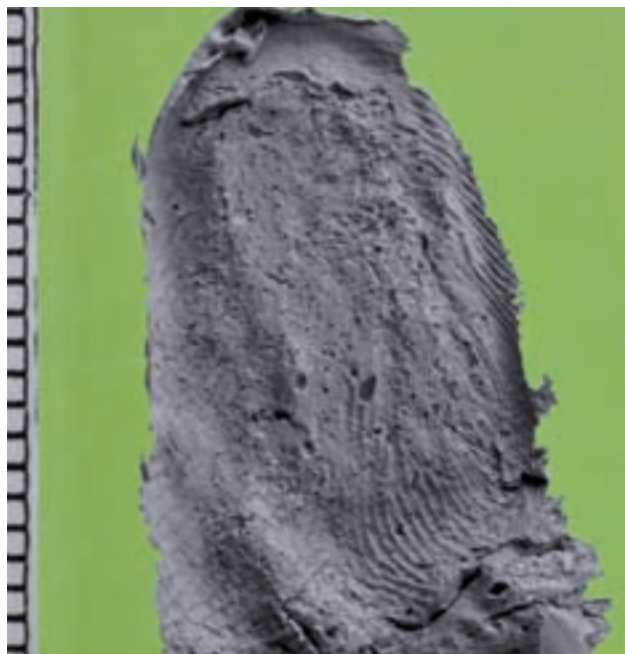


Fig. 6. Side sector of the distal section of the thumb, left hand. (used in Fig. 9).

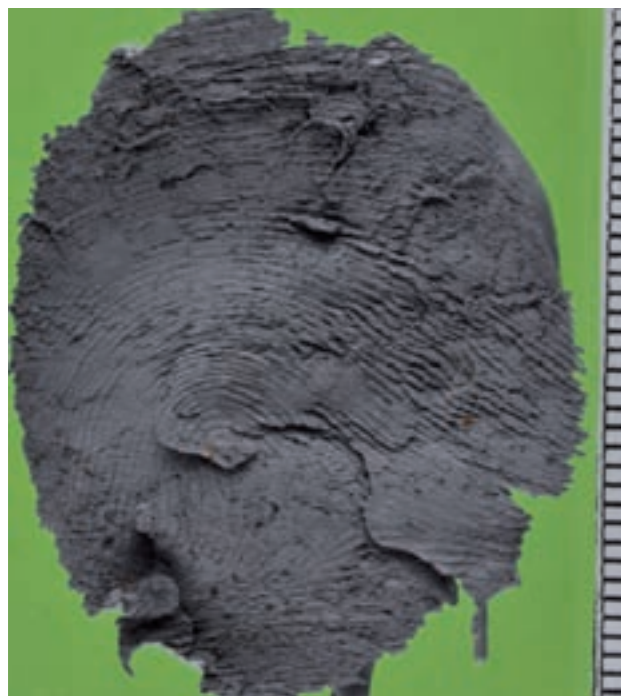


Fig. 7. Distal section of the great toe, left foot.

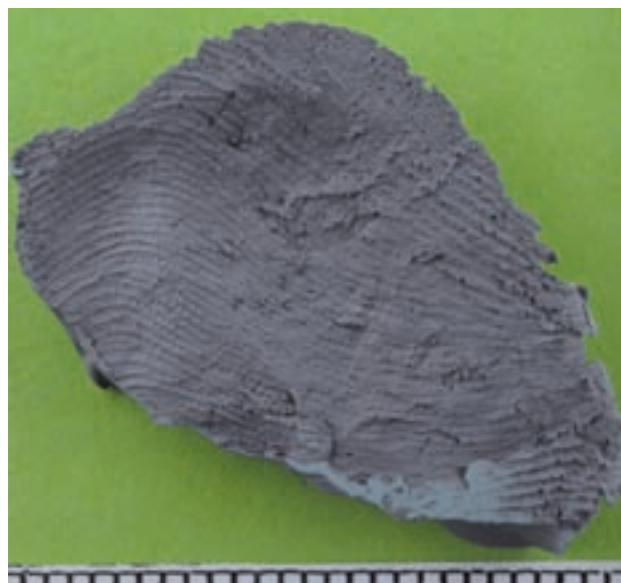


Fig. 8. Fragment of the distal section of the little toe, right foot.

Conclusions

Despite the fact that the described attempt at fingerprinting the mummified corpse was of a precedential nature (the authors are not aware of any results of similar experiments), the conclusions drawn up based on the obtained results indicate that:

- mummification process results in profound changes in physical properties of the human skin, however, it is not totally destructive as regards fingerprints;

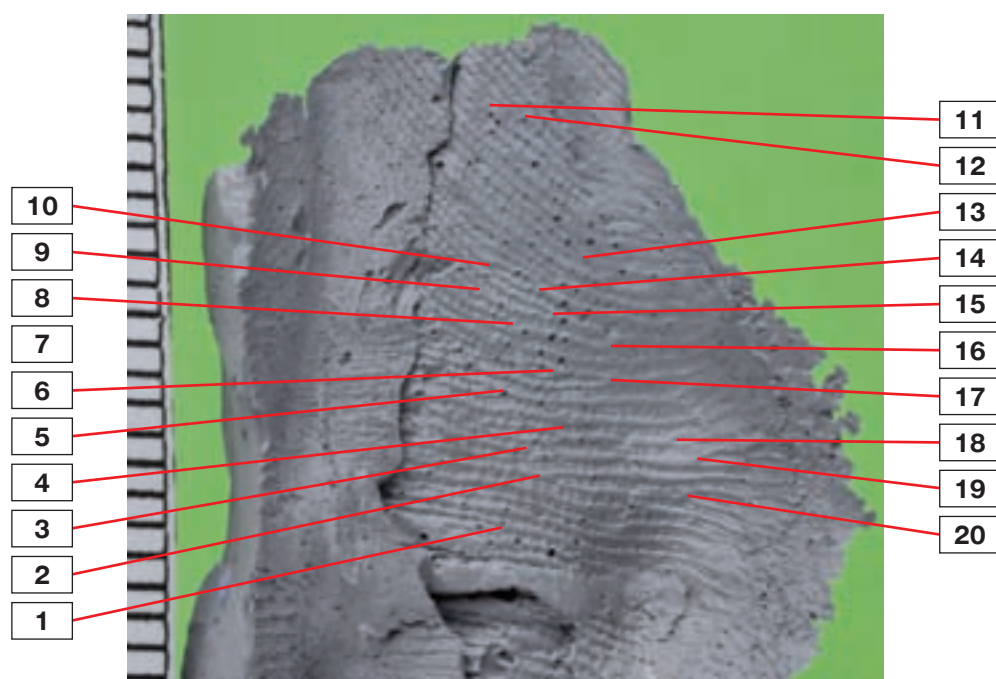


Fig. 9. Dactyloscopic features (minutiae) identified within the silicone cast taken off the side sector, distal section, left-hand thumb of the mummified corpse.

- mummification of a dead body, when correlated with the time elapsed between the moment of death and fingerprint collection, has undoubtedly a negative effect on dactyloscopic identification. However, the above factors do not preclude identification but they may merely reduce friction skin areas that yield material suitable for comparative studies;
- material sampling with the use of the ink-based method may not produce the desired results; hence macro photography and using silicone mold should be considered as the leading methods for obtaining legible fingerprint images.

Sources of figures: authors

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