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THE CONSERVATION-RESTORATION OF MUMMIES IN MUSEUM INSTITUTIONS: DEONTOLOGY, ETHICAL ISSUES AND PRACTICES

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Abstract. Conserving and restoring human remains in museums raises ethical, social and cultural issues. Unlike other museum objects, they appear as a specific heritage since they were human bodies or parts of them. If alterations of mummified human remains primarily concern the peripheral elements surrounding the body, and in particular the textiles, the body itself, when it is accessible, may also require an intervention. Then it must be the subject of a real reflection, knowing that minimal intervention is always preferred, as well as the restitution of the integrity to the body. Each conservation-restoration operation requires particular attention according to the state of conservation of the individual and the types of alterations highlighted, but also on ethical considerations. The restorations of Egyptian mummies kept in Anne-de-Beaujeu Museum in Moulins-sur-Allier and in the Local History Museum in Rueil-Malmaison (France) will present example of solutions that have been adopted.

Keywords. Human remains. Conservation. Restoration. Study. Deontology.

Human remains and mummies represent a specific part of museum collections because of the materials they are made of. They are particularly fragile and sensitive: on one hand from a conservation standpoint (sensitivity to variations of humidity, temperature and lighting) and on the other hand in regards to the public perception of the public sensitivity. Therefore, a great deal of subjectivity leads to a multitude of attitudes, particularly in museum practices when confronted to these collections (Cadot, 2007, 2009).

For a long time, there was little interest in their conservation, as it is understood today. Human remains were collected above all for scientific purposes (mainly study of populations in anthropological ways). No particular care was given to them. However, attitudes have changed, as has the way scientists and collection managers consider the subject, with an ever-increasing ethical and deontological questioning (Ameisen et Coz, 2010; Cadot, 2012; Novljanin Grignard, 2012). Human remains are not anymore only considered like other museum objects. More attention is paid to the human being behind the body and the scientific approach try to accommodate with the cultural and sacred values attached to it.

In the field of conservation-restoration, ethical and deontological issues have been rethought. Conservation-restoration of museum collections is based on doctrines and principles that guide interventions. Museum practices must be accompanied by ethical reflection, that is, reflection on the moral values that guide and motivate actions and frame professional activities. These values also determine the limits and principles of the carried out interventions in order to preserve these collections while respecting their integrity. These issues are prevalent when confronted to human beings (Timbart, 2016a).

1. HUMAN REMAINS AND CONSERVATION PROBLEMS

As they are composed of organic material, human remains are very fragile, perishable by nature. They suffered alteration mainly from their burial and their excavation but they can also have been damaged due to unsuitable storage and exhibition conditions (Cadot, 2007, 2016). Moreover, old restorations, like the use of inappropriate materials to consolidate and fix such as plaster, metal pins, modern glues, addition of textiles, fillings; "protective" varnishes, arsenic-based solutions used to treat infestations; and supports used for museographic purposes could have been at the origin of new alterations. Indeed, for a long time, these old restorations were based above all on an empirical do-it-yourself approach to over-

come the problems of conservation of these fragile materials (Cadot, 2016, Timbart, 2016a, 2016b).

Nevertheless most of the human remains kept in museums were never taken in charge by lack of interest and also because the institutions didn't know how to proceed. This led to various damages (McGowan & Laroche, 1996; Cadot, 2009).

For several years now, restoration projects and conservation measures ensure the preservation of human remains in the best possible conditions of respect and integrity of the body (Cassman & Odegaard, 2004; Cadot, 2015, 2016; Timbart, 2016b; Timbart, Guichard & Froment, 2016).

Restoration is one of the missions of museums, and is defined, in France, by national codes such as the Code du Patrimoine (Livre 4, article L 441-2 alinéa a). Like other museum objects the principles of the European Confederation of Conservator-Restorers' Organisations (ECCO)[1] must be applied to treatments of human remains. But since it is human material, the approach must necessarily be different from other museum objects even if no text is specifically dedicated to these collections (Timbart, 2016a, 2016b). The state of degradation of the bodies, their unavoidable destruction due to their organic composition, as well as the implementation process in their initial preservation according to the cultures from which they come, and thus the resulting limits must be consider in protocol treatments (Timbart, 2016b; Timbart, Guichard & Froment, 2016).

In recent years, a reflection on how to restore these collections has been developed with the training of conservators specialized in this field (Cadot, 2015). Given their particular status within the collections, human remains require a particular approach in terms of conservation-restoration guided by an awareness of the respect due to the individual (Timbart, 2016a).

The products are selected according to criteria of stability, reversibility and compatibility with original materials. In this perspective, particular attention is paid to:

- the readability of the interventions. The aim is to avoid so-called illusionist interventions and thus make it possible to distinguish the intervention and the products used by means of analyses in particular.
- the reversibility and safety of the actions, techniques and products used. Non-contaminating techniques and materials in terms of analysis are preferred in

[1] Article 9 of the ECCO code.

order not to compromise the possibilities of scientific investigation and consequently the scientific value of individuals.

- the documentation of interventions.

These collections represent an undeniable scientific interest in various aspects of a civilization (religious beliefs, funeral practices, living conditions, etc.) (Cadot, 2007; Timbart, 2016b): conservation restoration operations must ensure that the witnesses to their history and use are preserved. Thus, more than for any other intervention, the conservators' approach on human remains focuses on the minimal aspect of the interventions and is limited to strictly curative or stabilization treatments and the implementation of preventive measures (Timbart, 2016b). This preservation requires finding compromises between the state of conservation, the envisaged uses and the technical possibilities of the conservator to stabilize the degradation processes inherent to the body (Cadot, 2009, 2012). The conservator's goal is that his treatment can extend the life of the object, but the priorities will differ according to the objectives and uses (scientific or museum). When an intervention is necessary, it must be as non-intrusive as possible in order to respect the integrity of the body as much as possible and to preserve the historical and scientific information it conveys in order to promote its scientific exploitation, hence the need to find compromises (Cadot, 2009). Very often, therefore, treatment is limited to a simple dusting and anatomical reconnection of the skeletal bones if it is accessible and necessary (Timbart, 2016b).

2. JURIDIC AND ETHICAL ASPECTS IN FRANCE

Unlike the Anglo-Saxon countries[2], in France no guide exists to conservation and scientific exploitation practices specific to the field of human remains (Cadot, 2007; Timbart, 2016a, 2016b). The National Scientific Commission for

[2] In Great-Britain, we can mention: Department of Culture Media and Sport, Care of Historic *Human Remains, A consultation on the Report of the Working Group on Human Remains*, DCMS, Londres, 2004; Department of Culture Media and Sport, *Guidance for the care of Human Remains in Museums*, DCMS, Londres, 2005; Fletcher, A., Antoine, D. et Hill, J.D., *Regarding the dead: Human remains in the British museum*, British Museum Research Publication, n°197, 2014; *The British Museum Policy on Human Remains*, London, The British Museum; [online] URL: http://www.thebritishmuseum.ac.uk/PDF/HumanRemains.pdf. In the USA, we can note: *Human Remains: Guide for Museums and Academic Institutions* by Cassman, V., Odegaard, N. & Powell, J., 2007.

French Collections designated a working group on human remains (officially constituted on the 23rd of December 2014). It recalls, in its annex to the Parliament Report n°14, that "the question of the legal status of collections collecting or containing human remains is governed by a complex set of rules derived in part from the Civil Code (bioethical laws), the Penal Code, the General Code of Property of Public Persons, the General Code of Local Authorities (funeral laws) or the Heritage Code" (CNSC, 2015). This working group also distinguishes between so-called study collections (collections of human biological samples for medical and scientific purposes) and heritage collections found in museums (Timbart, 2016a).

These several legal and ethical texts mentioned by the working group are in fact used in debates on the question of human remains in museums and serve as landmarks in museum practices such as conservation-restoration. These texts emphasize the respect for the human body like the article 16-1-1 of the Civil Code: "the respect for the human body does not cease with death; the remains of deceased persons, including the ashes of those whose bodies have been cremated, must be treated with respect, dignity and decency" (Cornu, 2009) (Cadot, 2007; Timbart, 2016a, 2016b). In fact, it is above all a question of respect for the person in question, rather than the "body". The Bioethics Law n° 94-653[3] also insists on respect for the human body.

The conservative approach to human remains has been renewed in recent years by an ethical approach mentioned in ethic codes. The reflection launched by ICOM in its Code of Ethics in 2004[4] aimed to oversee heritage practices through ethical recommendations. The principles put forward aim to give a moral framework to a set of practices in terms of research or conservation-restoration (Cadot, 2009; Timbart, 2016a, 2016b).

In 2013, the ICOM Code of Ethics for Natural History Museums was adopted. The first section deals with human remains. In this code, the notion of dignity is highlighted: "Human remains should be stored and displayed with dignity, in appropriate environmental conditions" (section 1C). This code is a

[3] Law on respect for the human body n° 94-653 of the 29th of July 1994.

[4] ICOM rules state that the conservation and display of human remains, sensitive cultural material, must be in accordance with professional standards and, when known, the interests and beliefs of the community or ethnic or religious groups of origin (article 2.5).

more in-depth version of the 2004 ICOM Code of Ethics since these museums are very often facing this type of collection. Section 1D emphasizes the obligation to work with highest professional standards and when possible with representatives of the cultural group. Section 1E is about the artefacts made with human remains. Here again, dignity must be at the beginning of every act on these objects.

But there is a lot of room for interpretation on the application of these ethical principles and their limits. What about the practice of restoration on these specific collections and therefore the related ethics?

Like all museum objects, restoration work is carried out in compliance with the ethical and methodological rules of the conservator's profession. Restoration involves understanding the mummy from the point of view of the materials from which it is made as well as the techniques of implementation.

The condition of report and the diagnostic examination are the first step. It is necessary to determine the nature of the human remains which is going to be restored (skeleton, tissues or only peripheral elements), its state of fragmentation, its mode of preservation and the mechanisms implemented (natural, artificial) as well as the degree of intentionality to give a context back (Cadot, 2009, 2012). In this way, alterations inherent in the preparation and preservation process can be distinguished from those that have occurred after.

Then the restoration itself occurs. For human remains, the degree of intervention varies according to whether one acts on the environment or on the body itself, through preventive conservation measures (environmental control, storage, handling) or curative treatment.

3. THE CONSERVATION OF MUMMIES KEPT IN FRENCH MUSEUMS: PROBLEMATICS AND SOLUTIONS ADOPTED

The Centre de recherche et de restauration des musées de France (C2RMF), as a service with national competence under the French Ministry of Culture, ensures the scientific and technical follow-up of restoration interventions and notably projects related to human remains preserved in museums. Ethical and deontological principles applied follow the juridic and ethical codes.

The operations conducted on Egyptian mummies in two museums, will show examples of solutions adopted for the treatment of these particular collections regarding to the ethic and the deontology applied in France.

3.1. Anne-de-Beaujeu Museum in Moulins-sur-Allier

The Anne-de-Beaujeu Museum keeps in its collections two funerary sets composed of a coffin, a mummy and cartonnages brought from Egypt in the 19th century by Pierre Grand, called «Grand Pacha» and Victor André Cornil.

They were given to the museum at the end of the 19th century and the beginning of the 20th century.

- The first one (inv. N°4.2.1) probably from Akhmîm according to the style, belongs to Isis-the-Great, and is dated from the beginning of the 4th century BC.
- The second one (inv. N°4.2.2) of the 22nd dynasty has an unknown origin and owner.

Two other pieces (a head and a foot of a mummy), not related, are kept in the collection. They come from the Edmond Tudot collection who was archaeologist, curator and collector but also artist. Mummy feet were among the most popular souvenirs of the 19th century tourists and can explain the presence of lots of body fragments in museums collections (Henon, Bèche-Wittmann & De Larquier, 2015; Timbart, 2017).

The entire human remains collections of the museum were restored at the C2RMF between November 2011 and April 2013 in order to be presented in the new rooms of classical archaeology.

Due to the material that composed the mummies, the intervention supposed the presence of complementary specialized conservators in human remains and textiles.

3.1.1. The Ptolemaic mummy (-330 -30 av JC) (inv. N°4.2.1)

In order to better understand its state of conservation and to define the appropriate protocol for the intervention, a scientific study was conducted. X-rays were carried out to consider the manipulations of the body and to know the state of conservation of anatomical connections, and the points of fragility. They also helped to determine the age and the sex of the individual.

Analyses were performed to identify embalming materials with gas chromatographic analyses (Langlois, 2012a). An altered beeswax, animal fat and a *Pistacia sp*. resin were found, no bitumen nor natural gum.

This information was useful to adapt the material of restoration and the intervention protocol to the nature of the specimen.

The mummy was not in a very good state of conservation (Dal Prà, Bajon-Bouzid & Cadot, 2012). Unbleached linen strips with tears, gaps, holes were noted.

Wear was also observed on the canvas where the bitumen-coated strips underneath form protrusions and have been in contact with the cartonnage. The textile oxidized and differences in color were noted at the location of chest cartonnage and where the strips were originally placed (Fig. 1).

Some strips were glued to the cloths with an adhesive that became brown and brittle. This adhesive forces the textile and deforms it.

The x-rays (Fig. 1) show that the neck was clearly separated from the body. It was repaired in modern times with a beige canvas strip strongly glued and roughly fixed all around. This band exerted tensions and the head moved.

The feet were broken at the ankles. The entire part in contact with the cartonnage had in fact become independent of the rest of the body.

The strips on the back were blackened and some at the edges were lacunar and brittle in the lower part. They have been fixed by modern gluing on the linens with an adhesive that has become brown and brittle. This adhesive forces the textile and deforms it.

For the present restoration project, the wish to show the body to the public introduced the problem of the presentability of the mummy. For reasons of comprehension and legibility, it was necessary to restore a logical arrangement and cohesion to all textiles. In order to a minimal intervention, the approach of the conservators was confined to stabilization treatments and mechanical repositioning, the use of gluing techniques being considered only as a last resort, if no alternative had been found.

Moreover, non-contaminating techniques and materials in terms of analysis were preferred in the event of future analyses and scientific studies.

The mummy was first removed from its coffin (Dal Prà, Bajon-Bouzid & Cadot, 2012). The whole was dusted by micro-suction. The upper part of the top strip has been covered with colored crepeline to protect it from the friction of the cartonnage. It has been maintained both by sewing and by gluing with starch glue when too degradated to be sewn.

Various tests helped to choose the appropriate solvent for glue removal on bandages. The adhesive that attached the ends of some strips was peeled off but the glue could not be completely removed because it penetrates the fibers. Textile was consolidated when needed by fixing directly of by supporting on strips below.

A mechanical solution was chosen for the feet with a polyester wadding pad covered with several layers of crepeline manufactured to the size of the space to be padded. The whole was gathered to the body by a stretched crepeline veil, held

Fig. I. The Ptolemaic mummy (Inv. N°4.2.1) before treatment and the x-rays of the mummy. The x-rays show that the neck and the feet are separated from the body © C2RMF/ A. Chauvet & © C2RMF/ G. De Puniet and J. Réquilé.

by sewing and using starch glue stitches in places too rigid or brittle in the fabric to support a seam.

Although the feet were repositioned and held by the consolidation of the strips, it was necessary to design a suitable support in order to reinforce the junction between the body and the feet. An external thermoformed transparent plexiglass was created for that use (Dal Prà, Bajon-Bouzid & Cadot, 2012).

The fragments of the bulging part of the head were glued back together with Japanese paper and 5% Klucel G in ethanol (hydroxypropylcellulose) (cellulose ether).

The mummy was placed on a handling support which can be used for manipulations and display. It was made in epoxy aluminium honeycomb covered with a cotton fleece and polyester wadding and decatized linen canvas dyed in matching colour cut to the shape of the mummy.

3.1.2. The unstripped mummy (inv. N°4.2.2)

The mummy from the 22nd dynasty was unwrapped in 1996. So when the project of restoration was conducted, it consisted of several elements preserved separately: the body, the skull, the mandible and the bandages. Some limbs were still bandaged (lower body, arms, pelvis) (Carminati, Bonneau & Blaise, 2013; Bèche-Wittmann & al., 2016). The bandages removed from the body were rolled, individually or on top of each other, around standard cardboard rolls and wrapped in tissue paper.

A multidisciplinary study was conducted to document the mummy, to better understand its conservation state and to help to make decisions for the protocol of intervention. The museum kept no documentation about the mummy, except some photographs of the unwrapping, operated in 1996 and a summary report[5] (Bèche-Wittmann & al., 2016).

X-rays showed the absence of anatomical connections (Carminati, Bonneau & Blaise, 2013):

- the right clavicle is no longer in its original position but has moved on the thorax,
- the left clavicle is no longer connected to the sternum and rises,
- all vertebrae are present,
- the cervical vertebrae are no longer connected or in their original position,
- the thoracic wall is collapsed,
- the right shoulder blade and several right ribs are fractured.
- Ribs, clavicles, shoulder blades and sternum are no longer anatomically connected.

[5] This report was prepared by the doctor of the Moulins' hospital who made the x-rays of the mummy in 1996 (standard x-rays and CT scan).

- The spine had dislocations.
- The bones of the forearms, hands and lower skeleton are retained in anatomical connection.
- the foot is disordered.

Observations on the x-rays and analytical data done gave information concerning the mummification process and the various steps used to prepare the body[6]:

- the sinus and the cavity of the skull are partially filled with an "inhomogeneous" material,
- the abdomen, pelvis and thorax are filled with soil and a little of sodium salts, certainly natron.

The deceased would be a female. However, there is insufficient information and the state of preservation of the body is too degraded to estimate the age at the time of death and its causes (Carminati, Bonneau & Blaise, 2013; Bèche-Wittmann & al., 2016).

Micro-samples were taken to identify the materials present and to determine if any of them correspond to embalming materials, human remains or sediments. Mass spectrometry analyses were conducted and revealed the presence of animal fat, certainly linked to human remains more than to mummification balms (Langlois & Vandenberghe, 2013).

The analysis of the mineral compounds from the powder present in the thorax of the mummy showed the presence of beige earth and translucent grains which are sodium salts (chloride and sulfate), certainly the natron used during the mummification process, and organic remains and fibers (human remains and pieces of bandages) (Langlois & Vandenberghe, 2013).

These analyses were necessary to document the mummy and to help for the choice of the protocol treatment. Here, the conservators knew that the powder was not dust to remove.

A large number of insects, pupae and exuvia were present on the strips and on the body. The archaeo-entomological study (Huchet, 2010, 2015, 2016) identified three species of necrophagous insects: the beetle Dermestidae *Dermestes frischii*, the beetle Cleridae *Necrobia rufipes*, the dipter Calliphoridae *Chrysomya albiceps*. Necrophagous insects (larvae) intervene each at a given time during the decompo-

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6 The processes identified during the study are characteristic of the mummification techniques developed during the 21st and 22nd dynasties (Bèche-Wittmann & al., 2016).

sition of the body. They developed within two weeks of death, i.e. before the bandage was applied. The presence of these insects at several stages of development (pupa still containing the imago before its exuviation, empty pupa and adult) testifies that all the specimens could not leave the body and were trapped in the strips. They are not witness of a modern infestation. Perforations in the strips closest to the body may be caused by adults trying to escape. They were trapped during embalming.

The entomological study also showed that the deceased suffered from severe ectoparasitosis due to lice. A very large number of nits and lice at different stages were found in the remains of scalp, hair and powder from the skull kept apart. Such concentration has never been found before in ancient Egypt (Huchet, 2010, 2015, 2016).

The general structure of the body was poor (Carminati, Bonneau & Blaise, 2013). The upper part of the skeleton was very altered with various anatomical disconnections.

The degradations were mainly linked to the unwrapping with lots of wear and tear in the textiles but also deposits related to mummification. Deformation due to unwrapping was noted as well as water damage like brown bites.

The conservators established the diagnosis of the alterations by comparing the observations with the documentation of 1996 and 2012 in order to see the evolution of the alterations. They showed that before her unwrapping, the mummy already presented alterations which, at least for some, could be due to handling accidents outside the coffin, or possibly to an intentional intervention (looting). They could be linked to the alterations of the cartonnage (tears, cracks, deformations, lack of the foot) but soft tissue degradation may also be due to the way mummification was performed, the techniques or products used to treat the body, or the storage conditions after mummification (Carminati, Bonneau & Blaise, 2013; Bèche-Wittmann & *al*., 2016).

However, most of the current alterations to the skeleton and textiles appear to be directly linked to the unwrapping, the quality of the mummification and storage conditions following this operation. As the bandages were removed, the skeleton was no longer held by the textiles, probably causing the fracture of the body at the pelvis and the elongation of the spine. They therefore collapsed and were discarded due to handling after unwrapping. The elements relating to the mummy were dispersed: the coffin, the cartonnage, a large part of the textiles, the body and the skull were separated and preserved separately. This operation weakened the body and exposed the dispersed elements to further degradation.

The ethical framework of the intervention was to minimize contamination and invasive procedures on the mummy but also on the peripheral elements. There was no question to wrap the mummy again. The aim was to stabilize and to keep the mummy in good conditions of conservation.

After unrolling[7], each bandage was initially observed, described and photographed. Dusting was then carried out on both sides using a vacuum cleaner and a soft brush. The textiles were reconditioned with inert material, one by one in two ways depending on their format: long strips and large textile pieces were rolled, and smaller textiles (which could fit into a medium box) and padding textiles (crumpled) were packed flat.

The bandages showed two types of deformation: folds related to the bandage and folds related to the packaging. The latter, when they were too marked to allow a good winding, were erased by a slight fitness. The folds related to use were not affected.

A new packaging (Fig. 2) was made using block of polyester wadding covered with Tyvek® sewn with white cotton thread. The textiles were rolled as tightly as

Fig. 2. The new packaging of the textiles which were unwrapped of the mummy © C2RMF/ A. Chauvet.

[7] After the unwrapping conducted in 1996, only seven original pieces of textiles were still visible on the body. Twenty-one pieces were rolled, packed in tissue paper and partially numbered (Bèche-Wittmann & al., 2016). For a precise study of the textiles, see Bèche-Wittmann & al., 2016, p.32.

possible to limit deformations, with a Bondina® interface between each layer to avoid adhesion phenomena. Areas of severe deformation were buffered with polyethylene foam. Once rolled, the textiles were wrapped in Tyvek® closed with ties. Tyvek® has the advantage of being low hygroscopic, breathable and not vulnerable to biological attack. An acid-free paper label was attached to the packaging and mentions the fragment number, its dimensions and its location on the mummy (Carminati, Bonneau & Blaise, 2013; Bèche-Wittmann & *al*., 2016).

The objectives of the mummy conservation treatment have been defined along three axes:

- to ensure better preservation conditions for the body and textiles by means of a new support for the former and new packaging for the latter;
- to find back the integrity of the body by reinserting the skull and the mandible in their place giving back cohesion to the body and repositioning anatomical elements;
- to allow the body to return to its coffin.

The objectives of the treatment on the skeleton were to bring together all the elements of the body preserved to restore its integrity, in a position which preserves the trace of its original aspect, and to carry out a minimum of manipulations so as to guarantee the conservation of a maximum of scientific information, to preserve the traces of the history of the mummy.

The textiles left on the mummy were dusted using a vacuum cleaner with low vacuum and a soft brush. The areas where the powder was present in large quantities were left as they were. As for the other bandages, the powder sucked throughout the treatment was kept separately in a polyethylene bag.

A specific support was designated for the head to restore integrity to the whole and to ensure:

- the connection of the skull and the mandible, without constraint on the teeth, by an external reversible and independent system, making it possible to avoid any direct intervention on the bones and on the teeth, carrying numerous information in particular genetic,
- the positioning of the head in a correct anatomical position, in relation to the body position and as close as possible to the original position, taking into account the space available today in the coffin,
- a stable holding of the connection, without risk of tipping of the skull, allowing an easy and secure handling.
- a visual integration.

The conservators used a curable paste based on epoxy resin, Araldite® SV427 (+ hardener HV427). The epoxy resin is chemically stable and compatible with all materials. It was lightened by the addition of a hollow filler.

A handling support for the mummy was designed to guarantee the stability of the body and the security of the body, in the event of displacement. It was cut to the exact shape of the box. The mummy was then replaced in the coffin (Fig. 3).

Fig. 3. The unwrapped mummy (Inv. N°4.2.2) before and after treatment © C2RMF/ A. Chauvet.

3.1.3. Other mummified elements

An isolated head of a mummy (inv. N°4.2.5) and a foot (inv. N°4.2.6) were also treated. The head consisted of a skull with independent mandible, no longer held in stable position. X-ray shows that no fracture was present and that the bone structure was in good condition. Remains of mummified tissue, very fragile and little adherent to the bone were observed as well as white crystallization (Carminati & Bonneau, 2013).

Analyses of two micro-samples of mummified tissues by gas chromatography coupled with mass spectrometry identified a vegetable resin of the *pinaceae* family which would have undergone a heat treatment prior to its use for embalming. Fats were also detected, which may come from the mummification balm or be derived from human tissues (Langlois, 2012b).

The treatment objectives were:

- to ensure better storage conditions by means of a support stabilizing the skull, limiting friction and handling
- to reconnect the head elements without fixing them to the bones, teeth, etc.

Fig. 4. The mummy's head (inv. N°4.2.5) on her support © C2RMF/ A. Chauvet.

Dust was first removed and the teeth were replaced before the confection of a handling support (Fig. 4) which allowed a reconnection of the skull and the mandible to find an anatomical coherence at the head. Chemically stable material that allows precise adjustment to the shape of the two elements were used (high density polyethylene foam Plastazote). The tray was trimmed to the shape of the honeycomb support to ensure ridigity of the whole.

The mummy foot (inv. N°4.2.6) had her skeleton in good condition (Carminati & David, 2013). Soft tissue was deficient in places and partially unwrapped with oxidized textile with losses, gaps.

Mechanical methods were favored to limit the use of products, particularly adhesives, and do not hinder any subsequent scientific research. The stabilization was insured with polyamide tulle to hold soft tissue and textile fragments. Dyed tulle is very little visible when closely fit to the original textiles. Wrapped around the foot, it has been sewn to itself, so that no stitch was done in the original textiles.

3.2. Local History Museum of Rueil-Malmaison

The mummy of a little girl of five years old from Ptolemaic period was found in 2000 in the trash of the city of Rueil-Malmaison (MRM D 08 101 0 8005). She was then transferred to the museum and analyses were conducted to collect information. A CT-Scan was done at that time which helps to determine the age of the little girl and an Egyptological study (iconography and texts) was realized at the same time.

A restoration project took place in 2014 in order to present the mummy to the public. The mummy was in a poor state of conservation (Bajon-Bouzid, Cadot & Dal Prà, 2014). Textiles were fragile due to their ageing and oxidized. They were very dusty with many cocoons of insects. The cartonnages were quite altered, the mask presented the most important alterations, including a major lacuna in the face weakening the peripheral areas.

The skeleton was in good condition despite the disappearance of patella leading to a disjoint at the knee joint. This leads to mobility at this level.

Dust was removed of textiles by micro suction. The bandages were placed at their original locations and held in place by fixing points. Crepeline was stretched over the entire back and on the face. The whole mummy was thus stabilized and protected from possible friction. The majority of treatments concerned the car-

Fig. 5. The mummy of Ta-Iset (inv. N° MRM D 08 101 0 8005) after treatment © C2RMF/ A. Chauvet.

tonnages. Like other mummies, a handling support was made to facilitate handling and to exhibit the mummy in the new room (Fig. 5).

CONCLUSION

The various projects conducted in France on the treatment and implementation of conservation measures for human remains collections in museums testify to the new interest in these collections. It also shows the desire to establish an intervention protocol adapted to their specificities: organic materials but above all human beings.

Today, restoration is reduced to a strict minimum, given the specific nature of these collections. In addition, the hindsights on old treatments helps to define the most appropriate ones. Consequently, preventive measures are usually preferred to act upstream, on the causes of damage. The choices of intervention, when necessary, are delicate and raise the question of the limits of the intervention: how far should we go? It is all a matter of individual subjectivity and sensitivity as human remains cannot be considered only from a material point of view.

So, human remains restorations imply compromises and it is necessary to integrate the human dimension to help the choices. There must be a balance between the need, the risk, the interest of restoration and ethics taking into account

the limits with specialized conservators developing a practice appropriate to the specificity of these collections. Ethical considerations must be present at all levels: from storage and handling to presentation and scientific studies.

In the absence of a defined policy, the principles of treating these collections with respect, care and dignity must guide museum professionals.

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