

Using scientific techniques in Examining and Studying of an Egyptian Mummy in India

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Historical background

City of Akhmim Located at east bank of the Qina bends in the River Nile, 470 km south of Cairo. In Ancient Egypt Akhmim site was in nine provinces, in Upper Egypt, Nome Min, the site of Akhmim was one of ancient Egypt's greatest cities. Its importance as a religious center was matched by its significance in regional administration, textile manufacture and trade. There is evidence of continuous habitation at the site extending back over 5000 years. Consequently, the cemetery district at Akhmim is enormous, consisting of three major necropolis areas: Al-Salumuni in the north; the el-Hawawish cliff site in the south east, and the el-Hawawish Ridge Cemetery in between (Robinson et al, 2005).

The cemetery areas of Akhmim were discovered prior to 1884, yet their excavation and salvage did not take place until this time. A member of Napoleon Bonaparte's expedition noted disturbance at Akhmim and mummies being desecrated as early as 1777(<http://www.amscresearch.com/research.html>). More than a century later, Egyptologist Gaston Maspero (1893) noted extensive looting of Akhmimic cemeteries. Upon inspection of the site in December of 1881 Maspero described "the first time that (he) thought about researching the cemetery, villagers were carrying to their homes white stone, some of the human form. They attached no value of those antiquities and give no assistance to search for them (Maspero ,1893).

The first excavation at Akhmim was undertaken by Maspero from 1884 until the early 1890s in the el Hwawish "ridge cemetery "area (Elias, 2013). Maspero (1893:215) described the excavation "15 days and we uncovered 20 tombs drawing from them 800 mummies". The "ridge cemetery " mummies primarily date to the late 20th Dynasty ,as well as ,Third intermediate period ;Late period and Greco-Roman periods.(Maspero 1893,Elis and Lupton 2005,Elies 2013) .

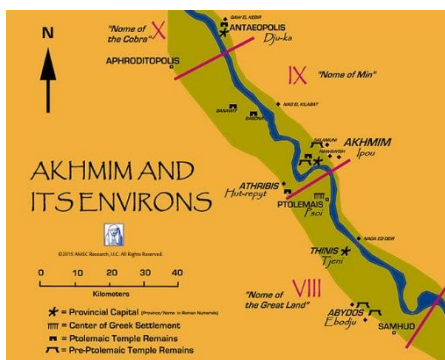


Fig.(1) The location of Akhmim in ancient Egypt



(2) cemetery of Akhmim

The mummies were stolen from the site by looters, especially prior to an organized recovery; many were later excavated quickly and then legally sold to travelers, as Akhmim became a center of trading of Antiquities (McNally and Schrunck 1993, Elies et al.2007). During the 19th century number of this mummies ended up in North American museums collection and universities. Today Akhmimic mummies can be found on every inhabited continent such as Chile, South Africa, The United States, Canada, New Zealand, and several countries within Europe. (<http://www.amscresearch.com/research.html>)

Material

The Egyptian mummy in India

The mummy discovered in 1884 or some years before because Brugsch Bey the inspector of Cairo museum "gifted" it to Jaipur museum in 1884 . In 1887- Albert Hall Museum opened and one of its main exhibits was a mummy the only one in India at that time. From 1887 until 2011 the mummy was displaying in Egyptian corridor in Albert Hall museum.

Fig.(3)The Egyptian corridor in Albert hall museum

General description of the Egyptian mummy

The mummy and his coffin display in one show case , in two levels from the first view we recognized that the type of this display case is not suitable for this ancient Egyptian Coffin and Mummy for such reasons :

- *The shape of the display case differ than the ancient Egyptian art, also it is very high and not suitable for all visitors to see the decoration and the inscription of the cartonnage.
- *The lid of the coffin is near the top of the display case, and is not easy to see.
- *This display case is not suitable also for the preservation of organic material (mummy, wood and cartonnage) especially for long time.



Fig.(4) The mummy and the coffin inside the display case

1-The coffin

The coffin is anthropoid shape and black color, the fernery decoration written by yellow color it is very important for scholars of Akhmim mummies. The face of the coffin is beautifully and sensitively featured and nicely gilded. The director of (AMSC project) wrote about this still of coffin” One of the prominent classes is termed ‘yellow-on-black’ since it features decoration in yellow pigment upon a black background. Coffins of the type have proven unstable in collection environments and are particularly fading (Elias & Mekis, 2016). In this case the preservation state of coffin was very good.



Fig.(5) The lid of the coffin and the fernery decoration (yellow-on-black)

The base of the coffin colored black from outside and white inside , goddess Mut drawn by black outline on white background and the name of the coffin owner written beside the goddess shape.



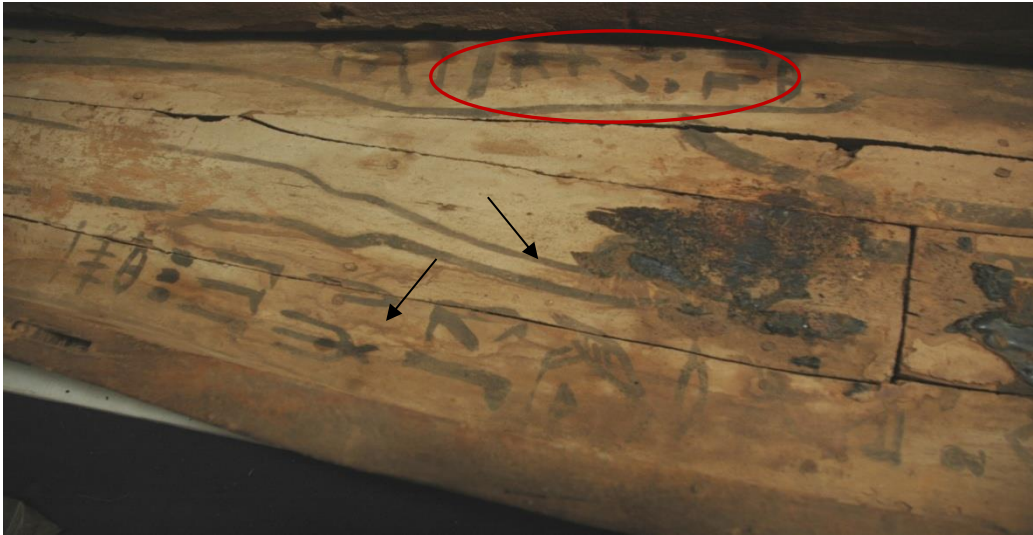


Fig.(6)The base of the coffin

2-The Mummy: In identification card of the mummy written, it was discovered in an ancient city called (Panopolis) during the late period or “Ptolemaic Period”, which was known after that under the name of “Akhmim” in Upper Egypt. The mummy of a lady called “Tutu”. She was one of the members of priest’s family of God “Min” the local God of this city.

From examination the mummy confirmed inside coffin; in good condition; outfitted with polychrome cartonnage body plaques–board sandal pattern on bottom, and mask with painted wig (gray-blue) and gilded face.

3-The mummy was covered by a large piece of textile, by examining it, we recognized that it was not original, it’s modern textile and perhaps it used from the time of sending it from Egypt to Jaipur .The original textile found as small pieces pot above this layer.



Fig (7) the last layer of textile

Method

Biological Profile Estimation

The Egyptian mummy in Albert Hall unstudied before while the mummies have the unique ability to “reach across time and space” to provide information about their individual lives and about the culture from which they were a part (Gardner et al. 2004:228), so we ask the Albert Hall staff to examine the mummy by one of the radiographic techniques . The staff difficultly can bring portable X-ray to examine the mummy inside the museum. Of course, it isn’t the best technique but it will improve our knowledge about this mummy.

Biological profile estimation is fundamental for physical anthropologists attempting to describe unknown individuals and also to recreate past population demographics. There are four main

components or parameters to establishing a biological profile for an unknown person: sex, ancestry, age-at-death, and stature.

Metric methods are generally perceived to be more reliable and valid methods for biological profile estimation and are referred to as “objective” measures, while morphological methods are considered “subjective” (Rogers and Saunders 1994)

Radiographic analysis of mummies using conventional x-rays has been well documented and began less than a year after Röntgen’s discovery of x-rays in 1895 (Röntgen 1896, Hughes 2011).

G.Elliot Smith, first saw the possibilities of X-rays in the archaeological investigation. In his catalog he wrote, “In the case of many mummies, especially those in the best state of preservation, there was singularly little that an anatomist could do, provided of course that he refrained from damaging the body. Examination with the aid of X-rays would, no doubt, have provided much additional information” (Smith, 1912). Dunand and Lichtenberg (1994) note that x-ray technology in conjunction with Egyptian mummies failed to produce significant results until the 1930s, after the advent of portable machines, and often only royal mummies were studied in great detail. Many of these initial x-ray studies focused on finding amulets within the mummy bundle. In the 1950s the prior amulet-driven focus shifted to the identification of diseases within the body (Ikram and Dodson 1998). Radiology offers considerable advantage to study of mummies by nondestructive techniques, offers the opportunity of investigation, not only of disease in ancient mummies, but of age at death, craniofacial morphology, and even undiscovered funerary artifacts (Harris&Wente, 1980).

Before X-ray, we measured the mummy as following:-

- Total length of Mummy : 172 cm
- Shoulder width : (WS) 38.5 cm
- Feet :- High feet (HF) 22cm & width feet (WF) 16.5 cm

Fig(8) The Egyptian mummy was filmed by potable X-ray.



Results of X-ray radiography

Plain X-Ray for The Skull (AP and Lateral views)

- No bony abnormality could be detected.
- No fracture lines are seen.
- Age: range from 45-50 years.

Sex: mostly male from mandibular angle and prominence of occipital tubercle.

Fig. 9(A&B)

Plain X- Ray for The Cervical Spine (AP and Lateral views)

- No bony or articular abnormality is detected.
- No bony cervical ribs.
- Preserved disc spaces.

Fig.10(A&B)

• Plain X- Ray For The Chest (AP and Lateral views)

I-Clavicle

1. No bony or articular abnormality is detected.
2. Age is mostly range around 45-50 years.
3. No fracture line is seen.

II-Upper limbs

4. No bony or articular abnormality is detected.
5. No fracture line is seen.

III-Ribs

6. No fracture line is seen.

IV-Thoracic and lumbar spine

- Mild degenerative changes of the lower thoracic and lumbar vertebrae in the form of osteophytes with mild narrowing of L3-L4 disc space.

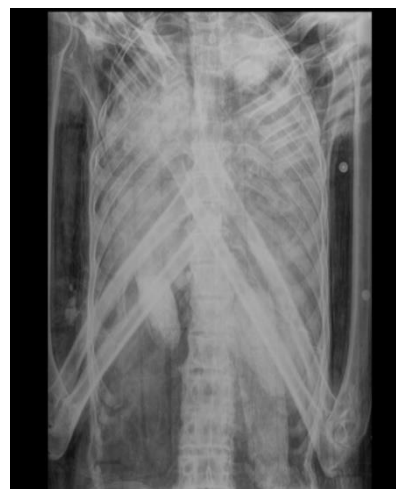


Fig. 11(A&B)

Plain X- Ray for The Pelvis (AP and Lateral views)

Fig.12(A&B)

7. No bony or articular abnormality is detected.
8. No fracture line is seen.
9. Sex is mostly male.
- Plain X-Ray for The Lower Limb (AP and Lateral views)



Fig.13(upper A&B) – (Lower C;D&E)F F:FFFFf

*Head femur (Age is mostly range around 45-50 years).

1. Both knees
Mild osteoarthritic changes of both knee with preserved joint space.
2. Both leg and Ankle joints
 - No bony or articular abnormality is detected.
 - No fracture line is seen.
3. Both feet



The image is hazy however can't identify any fracture lines also the joint spaces are preserved.
Report of X-Ray written by:-

Some notes about the X-Ray:-

1-Body position

The body is in an extended position and fully articulated, in the head position the crania was upright in proper anatomical position. The arms extended beside the body until the elbow (humerus bone) and the (radius and ulna bones) flexed position with the arms crossed upon mid-chest, the left arm was placed anterior to the right arm Fig.9, 10&11.

2-Mummification process

The brain removal and resin injected inside the skull. The heart and the internal organs traditionally removed during the evisceration process, but in x-ray appears that the heart was returned in the left side and more than one of visceral packets contained within the thoracic, abdominal cavity (Fig11-A).

3-Paleopathology

Thoracic and lumbar vertebrae show mild degenerative changes of the lower thoracic and lumbar vertebrae in the form of osteophytes with mild narrowing of L3-L4 disc space also, both knees Mild osteoarthritis changes of both knees with preserved joint space (Fig.11A, Fig.12A&Fig.13B).

Discussion

Biological Profile Estimation

We know that individuals of both sexes were mummified in ancient Egypt; existence abundantly both male and female mummies have survived. Historically sex estimation in mummies has relied on both biological and cultural clues. Preserved soft tissue, specifically in the genital region, is indicative of an individual's sex in the case of mummies that have been unwrapped. Traditional skeletal morphology and metric methods have been applied and adapted in the case of x-ray or CT analysis for those mummies still wrapped and for which the soft tissue did not adequately preserve or was not clearly visible. Finally, cultural factors often corroborate sex identification. These include coffin inscriptions and coffin adornments or sex specific preparatory treatments such as genital coverings. In rare cases the funerary preparations may reflect gender roles that disagree with the biological sex of an individual (Sweeney 2011). For this reason, it remains wise to consider both the biological indicators and cultural contextual clues to estimate the sex of an ancient Egyptian individual.

1- Sex estimation:-

The pelvis, when available and the cranium were morphologically analyzed for sex estimation. Traits of the pelvis that are traditionally used in forensic and bioarchaeological contexts were assessed for "maleness" or "femaleness" (Phenice 1969, Buikstra and Ubelaker1994, Rogers and Saunders 1994).

In this case the x-ray sheets inform the sex of the mummy is male from the morphological analysis of the skull and the pelvic regions also the male genital organ present in figure (12-A). From archaeological evidence the hieroglyphic determinative following the name "Tutu" was written on the cartonnage is a seated man and also in the base of the coffin with determinative man (Fig.6), In fact Tutu is frequently a male name at Akhmim . **The sex identification might change from "female" to "male" according to the new data.**



Fig.(14) the name Tutu with determinative man.

2-Age-at-Death Estimation

The physical Anthropologists estimate the age at death by evaluated the Level of maturation for sub adult, they was based on the union of epiphyses to the diaphyses also on dental eruption, and for adult based on cranial suture closure and the pubic symphysis and auricular surface changes and dental attrition (Lovejoy et al. 1985; Meindl and Lovjoy, 1985; Brothwell, 1981 ;Buikstra and Ubelaker1994 and White 2000).

Estimate age at death by conventional x-rays, impossible by some methods like cranial suture closure because it remained impossible to differentiate between a score 1 and a score 2. Also we can't record change in the pubic symphysis and auricular surface changes. The sternal ends of the ribs can evaluated to determine if osteophytic lipping and cartilage calcification were present. Next, the density of the trabecular bone in the proximal femur was assessed using the method outlined by Szilvassy and Kritscher (1990).

The Age at death is mostly range around 45-50 years for the Egyptian mummy (Tutu).

3- Stature Estimation

In the case of conventional x-rays, it is impossible to take measurements of the long bones to calculate the stature, so we measured the total length of the mummy by morphological method, it was 172cm.

4- Ancestry

The last main point of our biological profile is ancestry, from archaeological information we know that the mummy discovered in Akhmim , the mummy called "Tutu". The mummy was one of the members of priest's family of God "Min" the local God of this city.

Klales AR. (2014) studied 25 mummies originating from the Akhmim region by using CT Scan, to obtain all possible information about biological profile; mummification process; kinship and affinity to other populations . To study the affinity to other populations the scholar used Howells' Craniometric Data Bank and cluster analysis, the results of this analysis reflected a high degree of heterogeneity in this sample and the 25 individuals classified into 11 different populations. In addition, most of the individuals in the sample (n=18) were classified into a group outside of Egypt. The scholar interoperated the variation present in the sample speaks to the cosmopolitan nature of ancient Egyptians from Akhmim. Lastly, the position of Akhmim along a critical bend in the Nile River likely contributed to the diversity of the population of this city. The Nile served as a corridor for the movements of people and goods during all periods of ancient Egyptian history. The biological diversity of Akhmim can be used as a model for other urban provincial, administrative, and religious centers in ancient Egypt (Klales , 2014).

Dating of the Egyptian mummy in Albert Hall museum

For dating this mummy Dr. Jonathan Elias, Director of (AMSC) project comparing it with other mummies discovered in Akhmim in the same period like a mummy in an American museum

(female named Nefer-ii-ne, Reading Public Museum, Reading Pennsylvania), which has the same style of cartonnage and he dated this mummy around 250 BC.

Conclusion

The Egyptian mummy in Albert Hall museum originating from the Akhmim and was gifted to display in Albert Hall in India in 1884. The mummy and his coffin display in one showcase. The coffin style called yellow on black and the preservation state is good. The mummy confirmed inside the base of the coffin; in good condition; outfitted with polychrome cartonnage and mask with painted wing (grey-blue) and gilded face. The mummy filmed by portable X-Ray machine, results was exciting and interesting, the sex of the mummy is male not female as they wrote, the age at death was 45-50 years. Thoracic and lumbar vertebrae show mild degenerative changes of the lower thoracic and lumbar vertebrae in the form of osteophytes with mild narrowing of L3-L4 disc space also, both knees Mild osteoarthritic changes of both knees with preserved joint space. While the brain removal and resin injected inside the skull. The body is an extended position and fully articulated the head upright in proper anatomical position. The arms extended beside the body until the elbow (humerus bone) and the (radius and ulna bones) flexed position with the arms crossed upon mid-chest, the left arm was placed anterior to the right arm. The heart and the internal organs traditionally removed during the evisceration process, but in x-ray appear more than one of visceral packets contained within the thoracic, abdominal cavity.

Acknowledgment

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References

- 1-**Brothwell, D. R. (1981)** Digging up Bones the Excavations, Treatment and Study of Human Skeletal Remains. Third edition. British Museum (Natural History). Oxford University Press.
- 2-**Buikstra JE, Ubelaker DH. 1994.** Standards for data collection from human remains. Fayetteville, Arkansas: Arkansas Archaeological Survey Research Series No. 44.
- 3-**Dunand F, Lichtenberg FD. (1994).** Mummies: a voyage through time. New York: Gallimard.
- 4-**Elias J, Lupton C. (2005).** The role of computed axial tomography in the study of the mummies of Akhmim, Egypt. In Rabino-Massa E, editor. Proc V World Congress on Mummy Studies. *J of Biol Res LXXX(I)1:34-38.*
- 5- **Elias J, Lupton C, Gill-Robinson H. (2007).** The eyes of my soul: A woman of old Akhmim. *Ancient Egypt 7:29-32.*
- 6-**Elias JP. 2013.** Akhmim (Pharaonic Period). In Bagnall R, Broderon K, Champion C, Erskine A, Huebner S, editors. The encyclopedia of ancient history. Oxford: WileyBlackwell.
- 7-**Elias J. and Mekis T. (2016)** The yellow-on-black coffin of the oracle scribe Hor in the Swansea Museum. *Chronique d'Égypte XCI (2016), fasc. 182 pp. 227–263.* – doi: 10.1484/J.CDE.5.113208
- 8-**Gardner JC, Garvin G, Nelson, AJ, Vascotto G, Conlogue G. (2004.)** Paleoradiology in mummy studies: the Sulman Mummy Project. *J Can Assoc Radiol 55(4):228-234.*
- 9-**Harris JE, Wente EF. (1980).** An x-ray atlas of the royal mummies. Chicago: University of Chicago Press.
- 10-**Hughes S. (2011).** *CT in archaeology. In Saba L, editor. Computed tomography: Special applications. Rijeka, Croatia: In Tech Publishing.*
- 11-**Ikram S, Dodson A. (1998).** The mummy in Ancient Egypt: Equipping the dead for eternity. New York: Thames and Hudson.

- 12- **Klales AR. (2014).** Computed Tomography analysis and reconstruction of Ancient Egyptians originating from the Akhmim Region of Egypt: A Biocultural Perspective, PhD. Dissertation, Department of Anthropology, University of Manitoba Winnipeg, MB Canada.
- 13-**Lovejoy CO, Meindl RS, Pryzbeck TR, Mensforth RP. (1985).** Chronological metamorphosis of the auricular surface of the ilium: A new method for the determination of adult skeletal age at death. *Am. J. Phys. Anthropol* 68:15-28.
- 14-**Maspero G. (1893).** Premier rapport a l'Institut Egyptien sur les Fouilles Executees en Egypte de 1881 a 1885. In *Etudes de Mythologie et Archaeologie. Tome I:146-220.* Paris:Leroux
- 15-**McNally S and Schrunk ID. (1993).** Excavations in Akhmīm, Egypt: Continuity and change in city life from late antiquity to present. BARS International Series 590. Oxford: Hadrian Books.
- 16-**Meindl RS, Lovejoy CO. 1985.** Ectocranial suture closure: A revised method for the determination of skeletal age at death based on the lateral-anterior sutures. *Am. J. Phys. Anthropol.* 68:57-66.
- 17-**Phenice TW. (1969).** A newly developed visual method for sexing the os pubis. *Am. J. Phys. Anthropol.* 30:297-302.
- 18-**Robinson HG, Elias JP, Bender F, Allard TT and Hoppa RD. (2006)** Using image analysis software to create a physical skull model for the facial reconstruction of a wrapped Akhmimic mummy, *Journal of Computing and Information Technology - CIT 14, 2006, 1, 45–51*
- 19-**Rogers T, Saunders SR.(1994).** Accuracy of sex determination using morphological traits of the human pelvis. *J Forensic Sci* 39:1047-1056.
- 20-**Röntgen WC. (1896).** On a new kind of rays [Translated by A. Stanton]. *Nature* 53:274-276.
- 21-**Smith GE.(1912).** The Royal Mummies. Catalogue General des Antiquités Égyptiennes du Musée du Caire, Nos. 61051-61100. Cairo: Institut Français d'Archéologie Orientale. London Duckworth, 2000.
- 22-**Sweeney D.(2011).** Sex and gender. In Frood E, Wendrich W, editors. UCLA Encyclopedia of Egyptology. Los Angeles: UCLA.
- 23-**Szilvássy J, Kritscher H. (1990).** Estimation of chronological age in man based on the spongy structure of long bones. *Anthrop Anz* 48(3):289-298.
- 24-**White, T.D. (2000).** Human Osteology. 2nd Ed. Academic Press, Inc, San Diego, New York, Boston, Sydney, Tokyo, Toronto.
- 25-.(<http://www.amscresearch.com/research.html>)