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## IDENTIFICATION OF ROYAL SKELETAL REMAINS FROM EGYPTIAN PYRAMIDS

**ABSTRACT:** *Most pyramids were repeatedly robbed in the past and human remains were found in them only exceptionally. A few bones were discovered in the granite chamber of the Step Pyramid at Saqqara in 1926 and 1934. Our macroscopic and histological re-examination (1988–95) revealed embalming techniques not corresponding with that of the 3rd Dynasty and strikingly well preserved remains of soft tissues. Aspective and histomorphometric investigation proved for single bones different individual ages and  $^{14}\text{C}$  determination disclosed their different dating, all but within the common range of 8th–3rd cent. BC. Not a single of them could have belonged to the 3rd Dynasty King Djoser. However, a skull and two bones of an adolescent girl found in another place of the Step Pyramid yielded  $^{14}\text{C}$  age range 3532–2878 years BC, even predating the chronological range of the Third Dynasty (2700–2600 years BC) accepted by Egyptology. A coffin with a mummy in the depository of the British Museum were attributed to King Mycerinus. According to our examination in 1990, the Egyptological dating of the coffin was confirmed by  $^{14}\text{C}$  date (range 12th–9th cent. BC), while the mummy was found to be a natural one and as late as from 7th–9th cent. AD. In 1998 the mission of the Czech Institute of Egyptology unearthed in the burial chamber of the Unfinished Pyramid of King Neferefra at Abusir fragments of his burial equipment together with a few bones. According to their identical external appearance, similar physical features, perfect articulation of two of them, similar age at death and sex, and the same embalming technique used, they originate from the same individual, a 20–23 year old male. This agrees with the King's reign of mere 2–3 years and his young facial features depicted on statues found in his mortuary temple. Remains of 5th Dynasty King Djedkare Isesi were found in his pyramid at Saqqara South in 1945. Their external appearance, embalming technique, physical features and dating were compared with those of his two daughters found by the Czech mission in separate tombs at Abusir in the late 1970s and 80s. All their  $^{14}\text{C}$  data except one were compatible and fell into the range of 2886–2507 years BC, exceeding the Fifth Dynasty range 2500–2350 years BC accepted by Egyptology.*

**KEY WORDS:** *Egypt – Old Kingdom Kings – Identification – Anthropology – Histology – Histomorphometry – Radiocarbon dating – Blood groups*

### INTRODUCTION

Because pyramids, conspicuous free-standing structures of monumental dimensions, were repeatedly robbed in the past, human remains were found in them only exceptionally by the pioneer archaeologists, starting from the end of the 19th century. It is, therefore, not surprising that many theories about the alleged non-burial function of the

pyramids emerged. Nevertheless, there exists a handful of skeletal finds from burial chambers of a few pyramids. Of these we succeeded to locate up-to-date in different collections the remains thought to be of Old Kingdom Kings Djoser, Mycerinus and Djedkare Isesi. Recently, also skeletal remains of King Neferefra were unearthed by Czech Institute of Egyptology at Abusir. Reported remains attributed to Djer from Abydos and to Unas, Teti, Pepi I.



FIGURE 1. Detail of the foot attributed to King Djoser from (a) dorsal and (b) ventral sides.

and Merenre I from Saqqara (Petrie, Smith 1908, Edwards *et al.* 1971) were, however, not yet located in the pertaining collections.

Methods used in identification of the mentioned remains comprised their macroscopic description, standard X-ray examination, histological investigation of their preserved tissues, histomorphometric determination of their individual ages and radiocarbon dating by means of AMS (accelerator mass spectrometry) (Strouhal *et al.* 1994, 1998). In the case of Djedkare Isesi and his daughters also blood grouping was used (Tesař, Klír 1984).

## DJOSER AND AN UNIDENTIFIED WOMAN

The granite chamber at the bottom of the huge central shaft of the Step Pyramid at Saqqara was found empty by J. S. Perring in 1837 (Vyse 1842: 45–46) while B. G. Gunn found there two human skeletal fragments in 1926 and J.-P. Lauer three additional fragments comprising a well preserved human foot in 1934 (Lauer, Derry 1935). These finds were described by D. E. Derry (1935) who concluded that they came from the same individual, a male of advanced age. Because of moulding of some features of the foot in linen soaked in an adhesive material, he suggested for this as well as for the other bones a 3rd

Dynasty date and attributed them to King Djoser.

These remains are deposited in the Batrawi's anthropological collection at the Department of Anthropology, Qasr el-Aini Medical Faculty, Cairo University in a box with a label signed by J. E. Quibell on November 15, 1934 (A.I.490). In course of our study also a box labelled "Skull of a young woman, Princess of 3rd Dynasty (?) from Djoser's Pyramid, also an iliac bone and a humerus. Intrusive?" (A.I.446) was revealed. The finding place of these remains is not known, but it could had been one of the eleven galleries below the eastern half of the pyramid, of which five are considered to be the burial place of members of Djoser's family (Beckerath 1975, Stadelmann 1985).

Gunn's finds are a part of the thoracic spine (T<sub>4</sub>–T<sub>9</sub>) and the incomplete right hip bone. Lauer's finds comprise the *manubrium sterni* with fused upper part of the corpus (1st sternebra) and the well fitting left 1st rib, proximal half of the right humerus and the left foot (distally from proximal faces of the navicular and cuboid bones). On all fragments remains of soft tissues and layers of resin have been preserved.

Especially thick layer of resin has been applied to the surface of the foot (*Figure 1a, b*), covered by thick wrappings, whose deeper layers were also soaked by resin. In the middle third of the dorsal side of the foot, above the

TABLE 1. Survey of results concerning individual fragments thought to be of King Djoser.

Samp. no	Fragm. of	Sex	Age (yrs.)		<sup>14</sup> C – dating		Conclusion on person
			macroscop.	histomorph.	convent. (yrs BP)	dendrochr. calibr. (BC)	
1	spine	male	20–30	19–25	2465±55	771–409	separate
2	os coxae	male	20–30	–	2220±55	392–153	separate or with previous
3	sternum + 1st rib	male	40–60	–	2410±55	763–390	could have belonged
4	humerus	male	40–60	48±9	2465±55	771–409	
5	foot	male	20–30	–	2630±60	907–757	separate

metatarsal bones, a kind imitation of the tendons of the extensors of the toes and depressions between them were moulded from the wrappings.

In histological and electron microscopic examination the tissues were found desiccated and brittle. They showed much better histological condition than any sample of the Old Kingdom studied previously (Němečková 1993).

While the general robusticity and a few other features do not exclude the possibility of male sex of all the fragments, estimations of their individual ages differed. Thus sample taken from the 7th left rib of Gunn's spinal fragment yielded histomorphometrically the  $\pm$  one sigma range for the estimated age 19–25 years. The estimated age for the mid-diaphyseal section of the right humerus, found by Lauer, resulted, however, in  $48.3 \pm 9.5$  years. This difference is too large to allow for a possibility that both bones originated in the same individual.

Moreover, conventional radiocarbon ages of 7 samples taken from the 5 fragments (in the case of the foot one from a bone, the other from its wrappings) and from one of the two small fragments of wrappings not containing bones found by Lauer, showed using the high precision calibration curve based on dendrochronological dating (Stuiver, Pearson 1986) a relatively large common range from 762 to 251 years BC with considerable differences between single samples.

By combining individual ages and dating (Table 1) we came to the conclusion that the finds represent five to three distinct individuals. Either all fragments came from separate persons, or more probably, fragments Nos. 3 and 4, and less probably Nos. 1 and 2, could have belonged together. The calibrated (dendrochronologically corrected) ages are two sigma ranges (= 95% confidence interval) and were calculated by Programme CalibETH (Niklaus *et al.* 1992).

Not a single fragment could be identified with King Djoser, supposed to have reigned 2720–2700 years BC (Schneider 1996: 175) or 2630–2611 years BC (Lehner 1997: 84).

We may conclude that fragments found by Gunn and Lauer originated in the Saite, Late Period and early Ptolemaic burials recorded in the South Gallery and in the northern descending corridors of the pyramid (Perring



FIGURE 2. Skull of the unidentified young female in frontal norm.

quoted by Vyse 1842). They could have fallen to the bottom of the shaft, and during archaeological activities there, could have found their way more than once into the granite chamber. Thus our re-examination confirmed the original view of Firth (quoted by Lauer and Derry 1935) who doubted the authenticity of the purported Djoser's remains.

This negative result is contrasted by a positive one attested in the case of the other individual from the Step Pyramid. Its wholly preserved calvarium (Figure 2) shows the *synchondrosis sphenoooccipitalis* and all cranial sutures open. The dentition is fully erupted except for the 3rd molars whose crowns are still deep in the sockets. The upper humeral epiphysis had not yet started its fusion with the diaphysis, while the distal epiphysis is already fused. The lateral epicondyle is fully fused with the diaphysis, while the medial one shows a deep fissure after recent



fusion. The acetabulum is fused except for a roundish hole in the centre caused by a fallen out interstitial bone. The *crista iliaca* and *tuberositas ischiadica* did not yet begin to fuse. The age at death of this individual was 16–17 years.

Secondary sexual features, small dimensions and gracility of the remains attest the female sex. Morphological features and dimensions of the skull fit well into the female range of the Egyptian population (Strouhal, Bareš 1993). The total skeletization of the remains corresponds with the still imperfect state of the embalming technique of the first three Dynasties (Strouhal 1994).

Radiocarbon dating brought in this case a very high result with a wide range (3532–2878 years BC) which is several centuries older than the range 2700–2600 years BC accepted for the Third Dynasty by Egyptology.

Two possible explanations can be offered:

1. The young woman either died long before the beginning of the 3rd Dynasty and was deposited in a monument preceding the Step Pyramid, whose existence is suggested by stone vessels from the 1st and 2nd Dynasties found in six of 11 eastern galleries (Beckerath 1971).
2. If the female belonged to Djoser's family, being e.g. one of his three recorded daughters, then the time range attributed by Egyptologists to the 3rd Dynasty is too low. This possibility has been supported by about 70 radiocarbon dates of 17 monuments built during the 3rd–6th Dynasties which were found 300–400 years older than their Egyptological dates (Haas *et al.* 1987).

## MYCERINUS

On September 27, 1990 one of us (E. S.) got the opportunity to examine the purported mummy of King Mycerinus (5th Dynasty) at the British Museum, London, by a very appreciated kind permission of the Keeper of Egyptian Antiquities Dr. W. V. Davies.

In the lower burial chamber of the King Mycerinus pyramid at Giza, Vyse (1842) found together with Perring in 1837 his beautifully decorated sarcophagus of basalt. It

was removed and transported to England by ship Beatrice, which was wrecked off the Spanish coast. Fragments of its missing lid and a wooden coffin, containing remains of a human body, were discovered in the overlying upper burial chamber and were later transferred safely to the British Museum (Baedeker 1928, Fakhry 1961, Lehner 1997).

The coffin was studied by Battiscombe Gunn who dated it according to its shape, style and inscriptions into the period of 22nd–26th Dynasties. There was a possibility that an older mummy was restored and put into a new coffin when the older coffin decayed. W. Budge, who inspected the body later, however, expressed the opinion that it could have originated even in the Islamic Period (Davies, September 27, 1990 – oral comm.).

The damaged mummy without head (*Figure 3*) is mostly bare with only tiny remains of coarse linen used to protect the body, perhaps parts of a shroud, not recalling the usual Ancient Egyptian linen wrappings. The exposed dry skin does not show any remnants of resin or spots after its application. The specimen represents a natural mummy, a body preserved simply by favourable climatic conditions.

According to the pelvis, the male sex of the individual is unambiguous. The lower part of the spine (T5 to L5) shows outstanding osteophytes (more than 3 mm long), but not overbridging intervertebral spaces. On the first sacral body the osteophytic fringe is up to 8 mm large. This reveals that the individual probably reached mature age (40–60 years). According to the length of the left femur (480 mm) his stature was 171.5 cm (using tables for American Black Africans by Trotter and Gleser 1952, which fit best to proportions of both Ancient Egyptians and Nubians according to Robins 1983 as well as to Strouhal, Jungwirth 1984: 119–122).

Four samples were submitted for radiocarbon dating to the Institute of Particle Physics at the Federal Institute of Technology in Zürich, Switzerland. These were:

1. Fragment of the wooden coffin attributed by inscriptions to King Mycerinus (Inv. No. 6647).
2. Fragment of an enigmatic piece of wood allegedly found with the mummy (which could have been even a remnant of the original coffin of the King).



FIGURE 3. Middle and lower part of the body attributed to King Mycerinus (courtesy of Dr. Michael Taylor, British Museum).

3. Two small pieces of the coarse linen adhering to the skin of the mummy.
4. Right posterior region of the thoracic wall of the mummy containing skin, muscle and fibrous membranae (Inv. No. 18212).

The results of dating, submitted on May 26, 1992, are listed in *Table 2*.

TABLE 2. Results of  $^{14}\text{C}$  dating of items concerning Mycerinus.

Sample No.	ETH No.	AMS – $^{14}\text{C}$ Age (years BP)	Delta $^{13}\text{C}$ (‰ o)	Calibrated Age (years BC/AD)
1	8021	2835±60	–17.0 +1.0	1212 – 846 BC
2	8022	2145±60	–26.9 +1.0	374 – 55 BC
3	8023	1140±60	–17.5 +1.3	724 – 1012 AD
4	8024	1245±60	–21.9 +1.0	658 – 896 AD

The calibrated (dendrochronologically corrected) ages are two sigma ranges (= 95% confidence interval) and were calculated by Programme CalibETH (Niklaus *et al.* 1992).

The calibrated dating of the coffin attributed to Mycerinus by its inscriptions to the late New Kingdom and Third Intermediary Period (1212–846 years BC) is somewhat older than its dating by Gunn into the 22nd–26th Dynasties (945–525 years BC). There is, however, a century long overlap of the two ranges (945–846 years BC). It cannot be excluded that older wood was used for fabrication of the coffin, or an older coffin was reused and repainted for Mycerinus during the Third Intermediary Period.

This happened in the time when mummies of New Kingdom Kings were hidden by the priests in caches to avoid their further violation. Perhaps also remains of Mycerinus were transferred from a decayed old coffin into a new or newly restored one.

Dating of the enigmatic piece of wood into the Ptolemaic Period to beginnings of Roman Period (374–55 BC) excludes the hypothesis that it could be a remnant of an older one, even the original coffin of Mycerinus.

The much later date of the mummy (658–896 AD) and its shroud (724–1012 AD), showing a mutual overlap of 172 years, proved the validity of Budge's hypothesis that it could have originated in the Islamic Period of Egypt.

Our investigation firmly disclosed that a Middle Age male body, most probably of an anonymous fellah buried in the surrounding desert, was deliberately inserted into the second coffin of Mycerinus. This could have easily happened during the time of investigation of the pyramid of Mycerinus in 1837 (Vyse 1842: 86).

## NEFEREFRA

The fifth King of the 5th Dynasty Neferefra belongs to less known sovereigns of Ancient Egypt because of the

short duration of his reign (2–3 years between 2460–2455 years BC according to T. Schneider 1996, pp. 261–262 or 2419–2416 years BC according to chronology by J. Baines and J. Málek, Lehner 1997: 8).

The expedition of the Czech Institute of Egyptology started excavations of the mortuary temple and pyramid of this ruler in 1980. After a few years it was proved that the temple was used in spite of the unfinished state of the pyramid for his mortuary cult. It was, therefore, logical to assume that the King had probably been buried in the pyramid.

Sounding in the descending corridor of the pyramid started in the mid-80s and continued in 1995. During the excavation season 1997–98 the mission investigated thoroughly the antechamber and burial chamber of the pyramid.

The substructure of the pyramid must have been finished at the time of the King's premature death, while only the first step of the core of the pyramid was completed and faced by four courses of limestone coating. Because of lack of interest to continue the building of the pyramid by Neferefra's successor King Niuserre, it was left unfinished and the surface of the top was levelled and covered by a layer of clay into which desert stones were stuck. The pyramid is, therefore, referred to as the "Mound" on a fragment of papyrus from Neferefra's mortuary temple archive (Verner 1999: 71).



FIGURE 4. Left hand of King Neferefra.



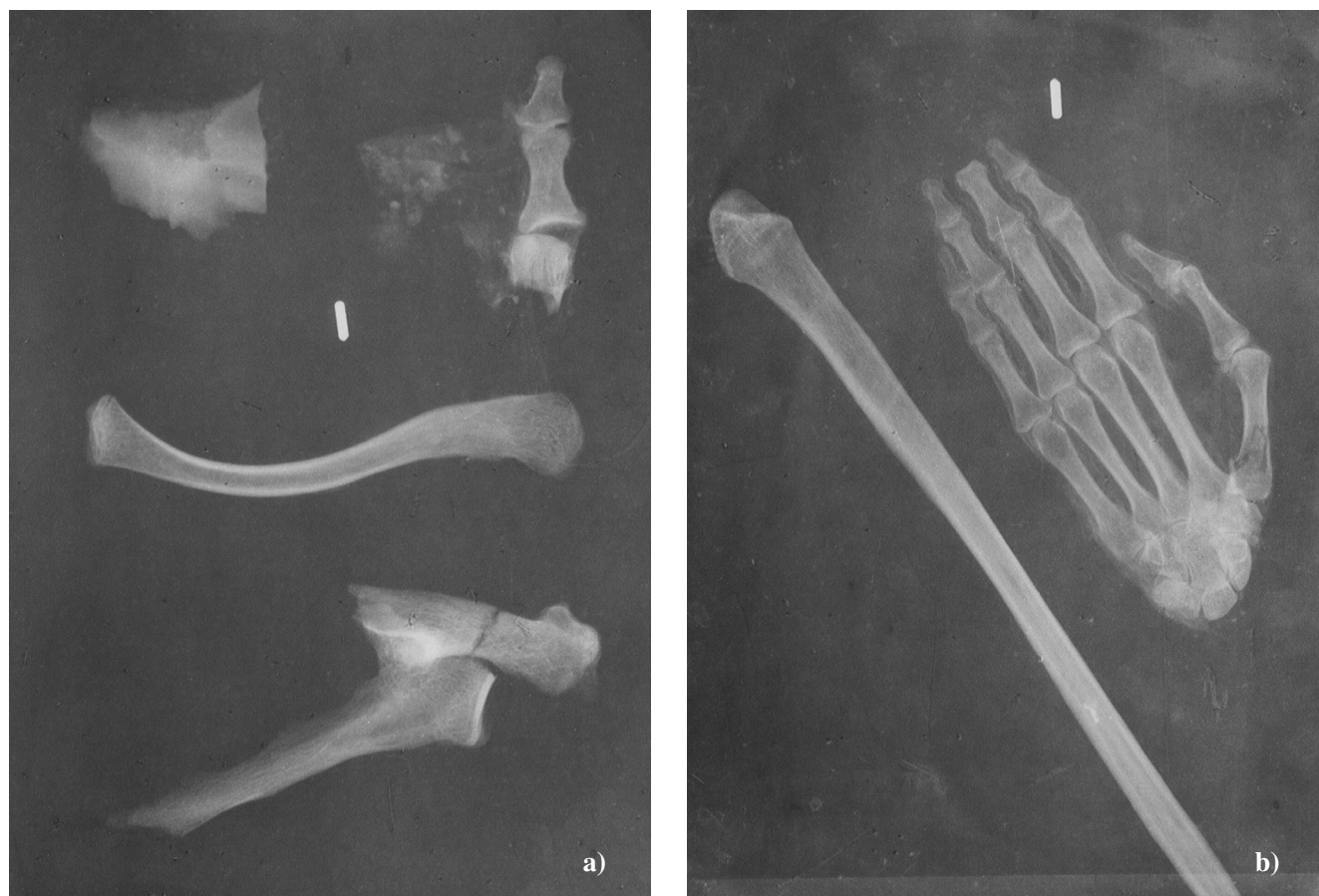


FIGURE 5. Radiographs of the (a) fragment of occipital scale of King Neferefra (upper left), intrusive find of the right hallux of the medieval male (upper right), left clavicle (centre) and left scapula (bottom), as well as (b) right fibula (left) and left hand (right) of King Neferefra.

In the burial chamber of the pyramid scattered fragments of a red granite sarcophagus and remnants of burial offerings were found on the blocks underlying the floor slabs torn out by tomb robbers. In the same level in the eastern half of the burial chamber, five fragments of human remains and one of skin with subcutaneous tissue were found and analyzed (Strouhal, Vyhnánek 2000).

Most of the fragments show remains of layers of linen wrappings stained by black resin and covered by white dots or islets of whitish varnish, by limewash. In some places the fragments are skeletized. Near their finding spots, shreds of wrappings of fine linen of grey-ochre colour with darker spots were collected. The human remains comprise:

**1. A fragment of the central region of the occipital scale** (Figure 5a). Its external occipital protuberance protrudes strongly (Broca's grade 3 in Martin, Saller 1959), attesting the male sex of the individual.

**2. The whole left clavicle with remnants of skin and of insertions of ligaments.** The bone is relatively long (157 mm) but only medium thick (circumference in the middle 41 mm) with strongly built ends (the acromial one measuring antero-posteriorly 28 mm, cranio-caudally 12

mm, the sternal one 19 mm and 25 mm respectively). The muscular relief is, however, feeble. No *impressio* or *fossa ligamenti costoclavicularis* are developed.

By X-ray examination a narrow growth fissure, partly fusing, was detected at the medial end of the bone (Figure 5a). Fusion of this metaphysis occurs between 18–25 years (McKern, Stewart 1957: 97). The spongiotic structure of the bone is dense and fine, while the compact bone still thin, both features revealing the young adult age of the individual.

**3. The lateral third of left scapula without the upper third of the *cavitas glenoidalis* and the *processus coracoideus*.** The *facies glenoidalis* is large (breadth 23 mm), also the *acromion* (length 43 mm, breadth 27 mm), while the *osseous plate* of the *fossa supra* – and *infraspinata* is thin (1–1.5 mm). By X-rays a fracture line of the *acromial* end of the *spina scapulae* was found, without reparative changes, clearly resulting of a postmortem break (Figure 5a).

Surfaces of the *acromioclavicular joint* are smooth without degenerative arthritic changes. They fit together perfectly proving that both bones belong to the same individual.

**4. The whole left hand from the proximal carpal bones to the tips of distal phalangeae of fingers (only *phalanx distalis digiti III* missing).** No wrappings, but shrunk and longitudinally folded skin with subcutaneous tissues have been preserved, coated by a thin layer of black resin which in places penetrated to the surface of some bones and stained also the nails. On it in places a whitish stain caused by limewash is apparent (*Figure 4*).

The hand is medium long according to the measured distance between the most proximal point (between the *scaphoideum* and *lunatum*) and the tip of the second finger (167 mm), hence the length of the hand was about 180 mm. It is at the same time very narrow (breadth in the level of heads of *metacarpals* II–V only 55 mm).

X-rays show good mineralisation and on the base of 2nd and 3rd proximal phalanx remnants of lines of condensation in place of epiphyseal lines. No arthritic changes of the joints can be observed. Proximal half of the first metacarpal shows splitting of the compacta without healing which also occurred most probably postmortem (*Figure 5b*).

**5. The right fibula with broken off proximal end.** The length of the bone is about 370–380 mm (which yields a stature of 167–169 cm according to tables for Afro-Americans by Trotter, Gleser 1952), while its minimum circumference (estimated between 32 and 35 mm) was low. In contrast to the delicate diaphysis with almost lacking longitudinal grooving (cannelation), the lower epiphysis is strongly built.

The muscular and ligamental relief on the diaphysis is developed in a slightly granular to trabecular form. It is stronger, prominent up to 3 mm, on the lateral side of the *malleolus lateralis*. Some short osteophytes can be found behind the *facies articularis malleoli lateralis*. No traces of fissure can be detected on the *facies articularis malleoli*. On the X-ray, however, a line of condensation is apparent on its place (*Figure 5b*). The *fossa malleoli lateralis* is smooth with pitting for blood vessels on its bottom, adding also an argument for young age.

**6. A fragment of soft tissues covered by skin** (35 × 30 mm) originating at an edge of a globular structure (eye-socket?) with remnants of resin and whitish varnish complements the set of human remains found.

We may conclude that the external appearance of the finds (whitish varnish), their embalming technique (limited use of resin), perfect articulation of two of them and their similar physical features reveal their origin from the same individual. The length of the preserved bones, robustness of their terminal parts and a preserved secondary sexual feature (the external occipital protuberance) attest the male sex.

Gracility and slenderness of the bones, the not yet developed *impressio ligamenti costoclavicularis*, traces of fissure after fusion of the clavicular epiphysis and the lines of condensation after closing epiphyseal lines in several

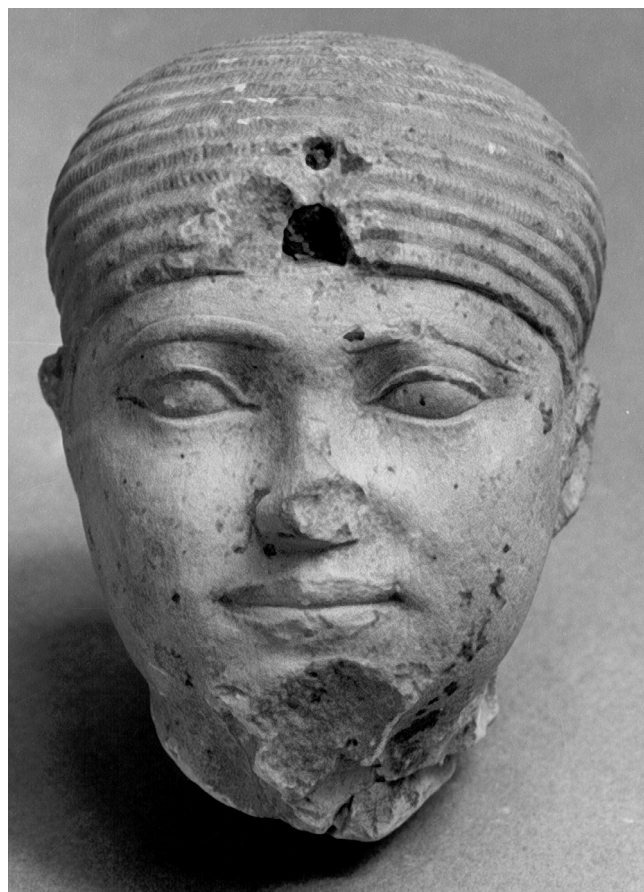


FIGURE 6. Limestone head of King Neferefra betraying his young plump face (photo by M. Zemina).

other bones as well as absence of pathological changes of the joints reveal young adult age of about 20–23 years.

This conclusion agrees well with the unfinished state of the pyramid and finding of a mason's inscription which mentions "the year of the first census", i.e. the second (or third) regnal year of King Neferefra, who probably ascended the throne in the age of about 18–20 years (Verner 1999: 76). He died after only 2–3 years of reign. This corresponds well with his young facial features depicted on statues found in his mortuary temple (*Figure 6*, Verner 1985, 1986).

The authenticity of the remains was finally proven by the range of chronometric dating (2628–2393 years BC, according to fragment No. 1).

We have to note that during the excavations of the unstratified layer of limestone fragments, debris and sand in the antechamber, two other human fragments were found, lying 2.16 m and 3.00 m respectively above the destroyed floor level, viz. (7) **phalanges of the right hallux with the adjoining distal half of metatarsal I** (*Figure 5a*) and (8) **a skin fragment with underlying soft tissue resembling the medial wall of a left human foot**.

There are no traces of resinous coating or wrappings and the surface of the fragments has "fresh" appearance. Stratigraphically they clearly came from a different, late



TABLE 3. Radiocarbon dating of remains of Djedkare Isesi and his daughters.

Person	ETH No.	Sample	Conventional <sup>14</sup> C – age (BP)	Dendrochron. calibrated age range (BC)
Djedkare	4340	linen wrapping	4025±55	2864–2460
	5334	body soft tissue	4385±80	3340–2787
	5335	charcoal	4200±75	3014–2580
	5336	linen wrapping	4235±75	3031–2612
Hedjetnebu	5337	linen wrapping	4205±65	2920–2600
Khekeretnebt	6949	linen wrapping	4020±65	2869–2403

Medieval burial, as was proven also by the radiocarbon dating. The dendrochronologically corrected range was 1297–1421 years AD according to fragment No. 7.

### DJEDKARE ISESI

Skeletal remains of this penultimate king of the 5th Dynasty were discovered by Abd El Salam M. Hussein and A. Varille in the pyramid "Haram esh-Shawaf" at the SE angle of the plateau overlooking Saqqara village in 1945–46. They are kept in Batrawi's collection in the Department of Anatomy, Cairo University, and were listed and described with respect to their embalming method (Batrawi 1947). Their anthropological and demographic study has recently been performed (Strouhal *et al.* 1993).

Its results have shown that all fragments belong to the same person, a male, whose body-built tended to gracility and underdeveloped muscular relief. His age determination in the range of 50–60 years according to standard macroscopic ageing criteria was confirmed by histomorphometry ( $52.8 \pm 8.5$  years). It agreed well with the original determination of 50 years by Batrawi (1947).

A clue to the identity of the remains of King Djedkare Isesi was gained by the archaeological discovery of two mastabas, attributed by inscriptions to two 'daughters of his own body', Princess Khekeretnebti and Hedjetnebu at the Southern Field of Abusir in 1976 and 1987 (Strouhal 1984 a, b, 1992). Both had unambiguous feminine features, Khekeretnebti being 40–45 year old and Hedjetnebu 18–19 year old at death.

Craniometric, odontometric and osteometric features of Djedkare Isesi were compared with those of his daughters. They revealed a clear morphological proximity of the three persons, stressing their tendency to gracility and short stature. Moreover, all these persons possessed identical blood group A (Tesař, Klír 1984).

The decisive proof for accepting the authenticity of the King's remains was the radiocarbon dating of six samples (Table 3). Concerning Djedkare, the dendrochronologically calibrated age range of three samples of mummy wrappings and charcoal was 3031–2460 years BC, while that of

Khekeretnebt was 2869–2403 years BC and of Hedjetnebu 2920–2600 years BC. These ranges mutually overlapped, yielding weighted mean of  $4121 \pm 30/48$  years BP with the common range of 2886–2507 years BC.

Higher dating was obtained only from Djedkare's body soft tissue (3340–2787, ETH No. 5334), but serious doubts about the validity of this result were expressed, as the sample was so soluble in water that it was not possible to purify it chemically (Woelfli in Strouhal *et al.* 1993: 105).

Once more, the radiocarbon data, about 160–390 years higher in comparison with the Egyptological dating of the 5th Dynasty (2500–2350 years BC), confirm the discrepancy of the radiocarbon chronology compared with the Egyptological dating of the Old Kingdom Period, suggested by the data obtained by Haas *et al.* (1987).

### CONCLUSION

Our results show that not all assumed royal remains from the Old Kingdom pyramids are genuine. Of the four identifications two cases were positively proven (Neferefra, Djedkare Isesi), while two others had to be refused (Djoser, Mycerinus).

The significance of using all available multidisciplinary methods for examination of even smallest human skeletal remains which survived by chance after millennia of looting the pyramids has to be stressed. The research might ideally be continued by revision of the remaining five cases, mentioned in the literature (Djer, Unas, Teti, Merenre I, Pepi I), if they were found.

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