

# The Dental History of the Manchester Mummies

by

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In present-day dental practice, in order to establish the well-being of an individual, it is customary to augment a visual examination with a radiological survey of the teeth and their supporting structures. The combination of the findings provides a complete record from which an assessment can be made. If ever it should happen that it became essential to sacrifice one of these surveys, it would be the visual one, as almost all the abnormalities except those of the gingivae and mucosa, would be clearly revealed in the x-rays. This is indeed fortunate, because as will be seen, radiology is the only method by which it is possible to evaluate by non-destructive means, the dental condition of mummified remains.

The radiological examination of the human dentition is common but not simple. Because of the involved shapes and angles of the palate and mandible, some fourteen intra-oral films are required to cover the essential areas. Extra-oral techniques are used for some selected parts, but the unavoidable super-imposition of tissues limits their applications. A recent development has been the Orthopantomograph Unit, a system that provides an ideal panoramic picture of all the teeth and their supporting structures. Unfortunately, the machine is not portable nor is it freely available and, it demands the active co-operation of the patient.

Human mummified remains come from Egypt in a variety of forms, a mummified body, a linen wrapped mummified body, a linen wrapped mummified body confined within a coffin, and sometimes, quite simply, a detached mummified head. Reviewing even the most uncomplicated of these instances, the bony tissues of the face are covered by hard, unyielding leather-like tissue, which effectively prevents the opening of the mouth so that only extra-oral radiographs can be taken. The details in the resulting pictures are frequently blurred, indistinct, and sometimes completely obliterated because of the super-imposition of calcified tissue and other radio-opaque material.

It is indeed fortunate that there exists large collections of dry skulls in various museums and universities, the examination of which, has provided a knowledge of the many pathological and non-pathological abnormalities commonly seen in the dentitions of the ancient Egyptians. It is this knowledge that can sometimes aid the interpretation of a radiograph, the details of which are obscured not only by the super-imposition of calcified tissues but also by the results of the preparation of the body by the embalmers for the life in the hereafter.

During the x-raying of the Manchester mummies, it was most fortunate, that as well as using normal projections, Professor Ian Isherwood was able in selected cases, to use tomographic techniques which provided unique

and very much desired records of sections of tissues. This valuable information would not be obtainable by any other means. I am indeed grateful for his ever ready co-operation, as some of the diagnoses would not have been possible without this additional information. I also owe a debt of gratitude to the Radiological Department of the Manchester Dental School, who provided excellent orthopantomograms of some of the detached mummy heads.

The following records of the dentitions and the comments on the dental health of each mummy have been made unless otherwise stated, from radiographs from these two sources.

Mummy No. 21470 (Nekht-Ankh)

<i>Teeth present</i>	8 7 6 5 4 3	1		1 2 3 4 5 6 7 8
	8 7 6 5 4 3 2 1			1 2 3 4 5 6 7 8
<i>Attrition</i>	Class III			

*Comments* With the exception of the upper right lateral incisor, all the teeth were present during life (a number have fallen from their sockets post mortem). All the teeth show extensive attrition and only because the deposition of secondary dentine kept pace with the wear of the cusps, no pulp chambers were exposed. There is a small carious pit in the occlusal surface of the lower right third molar and the corresponding tooth on the left side is represented only by its roots. The extensive loss of the buccal plate around the erstwhile socket of the upper right lateral incisor and its adjacent teeth, suggests that its premature loss was the result of some form of violence.

Mummy No. 21471 (Khnum-Nakht)

<i>Teeth present</i>	8 7 6 5 4 3 2 1		1 2 3 4 5 6 7 8
	8 7 6 5 4 3 2 1		1 2 3 4 5 6 7 8
<i>Caries</i>	Nil		
<i>Attrition</i>	Class II		

*Comments* The two upper central teeth are abnormally large, and the left one has a vertical groove extending from the occlusal edge to the root tip. These represent a rare example of double gemination. Gemination or fusion of teeth can occur between teeth of different dentitions, but more usually between teeth of the same dentition. The most common is between an upper central incisor and a supernumary tooth. It can result in one of two forms:



Mummies 21470 and 21471.  
Nekht-Ankh and Khnum-Nakht.  
Amongst the anatomical differences to be seen are: size and shape of calvarium, size of malar bone, orbits, nasal cavities and mandibles.



Nekht-Ankh: Persistence of metopic suture and supra-orbital foramen.  
Khnum-Nakht: Geminated upper central incisors and supra-orbital notch.

(a) The coneresed dental units have a common pulp chamber and may have a common pulp canal. The external sign is an enlarged tooth.

(b) The teeth are fused together and each unit has a distinct and separate pulp and pulp canal. It is characterized by a vertical groove between the two elements. The central incisors of Khnum-Nakht exhibit examples of both types.

*Note* The maxilla, mandible and the dentitions of Nekht-Ankh and Khnum-Nakht could not be more dissimilar. This complete lack of resemblance or similarity also applies to many anatomical features to be seen in the skulls. So much so, that the conclusion must be in accord with that of Dr John Cameron, who together with Dr Margaret Murray, made the first skeletal investigation of 'The Two Brothers'. He wrote: 'The differences are so pronounced that it is almost impossible to convince oneself that they belong to the same race, far less to the same family'.

#### Mummy No. 5053 (Per-en-bast)

*Comment* The lower third of the face has an almost radio-opaque covering which, whilst not completely obliterating the underlying structures, effectively prevents their interpretation. Thinking perhaps censoriously, it may be that during life her facial appearances marred her beauty, but if that had been so, all such thoughts were obliterated before her burial, as her coffin was lined with Sacred Lotus flowers (*Nelumbo nucifera*).

#### Mummy No. 1766

*Comment* Because of the large size of the teeth and the dental arches, the mummy is probably an adult male, the dentition appears to be intact, but a radio-opaque area beneath the roots of the lower right first molar tooth suggests that there is an apical abscess. It is not possible to discuss the cause because of the unavoidable lack of detail in the radiographs.

#### Mummy No. 1767

*Comments* Apart from an absent lower right first molar there is a full compliment of teeth, but the dentition has suffered considerable post-mortem damage. Some of the teeth are extruded from their sockets and the mandible is no longer in normal articulation with the maxilla. There is evidence of Class I+ attrition on some of the molar cusps.

#### Mummy No. 1768

Teeth present	7	6	5	4	3	2	1		1	2	3	4	5	6	7
	7	6	5	4	3	2	1		1	2	3	4	5	6	7
Teeth unerupted						8								8	
						8								8	

*Comments* There is considerable fragmentation of both maxilla and mandible, the result of post-mortem damage. The dentition appears to be normal. The first and second molars have erupted, but the roots of the

second molars are not fully developed. The partially calcified crowns of the third molars are lying in their crypts. Dental age approximately 13 years.

Mummy No. 1769

Teeth present	e d c b a	a b c d e
	e d c b a	a b c d e

*Comments* The eruption sequence of the teeth appears to be normal, although the picture is marred by the considerable post-mortem damage suffered by the maxilla and mandible. The cusps of the first permanent molars are calcified and lying in their crypts, the crowns of the premolars are beginning to calcify thus giving a dental age of between three and four years.

Mummy No. 1770

Teeth present	7 6 5 4 3 2 1	1 2 3 4 5 6 7
	7 6 5 4 3 2 1	1 2 3 4 5 6 7
Teeth unerupted	8	8
	8	8

*Comments* The radiographs of this mummy taken prior to the investigation revealed extensive post-mortem damage to the skull, and advantage was taken of the unwrapping to make a detailed study of the bones of the head.

*Maxilla* The palatal arch is small but regular and there are sharp wave-like crests of bone lying anteroposteriorly. The right canine is instanding (palatally inclined). Because of the mal-position of this tooth, there is an enlarged area of alveolar bone between it and the lateral incisor. The alveolar bone in the incisor region is pitted whilst that in the buccal area is normal.

*Mandible* The lower incisors are imbricated and the two centrals are over-erupted. The right canine is outstanding and articulates on the buccal side of the upper one. When in occlusion, the upper lateral incisor is in traumatic occlusion with it. The one remaining condyle (right side) is normal in shape and shows no evidence of any pathological changes.

*Facial bones* The canine fossa below the left orbit shows a greater depression than on the right side and this suggests a congenital facial hemiatrophy.

*Nasal cavity* The nasal septum was partially present when first examined but enlarged and deviated (it has since completely fractured, the bone being extremely fragile). The nasal conchae or turbinate bones are all much enlarged and displaced, almost filling the nasal cavity. The nasal spine is absent and the lower border of the anterior nares is rounded.

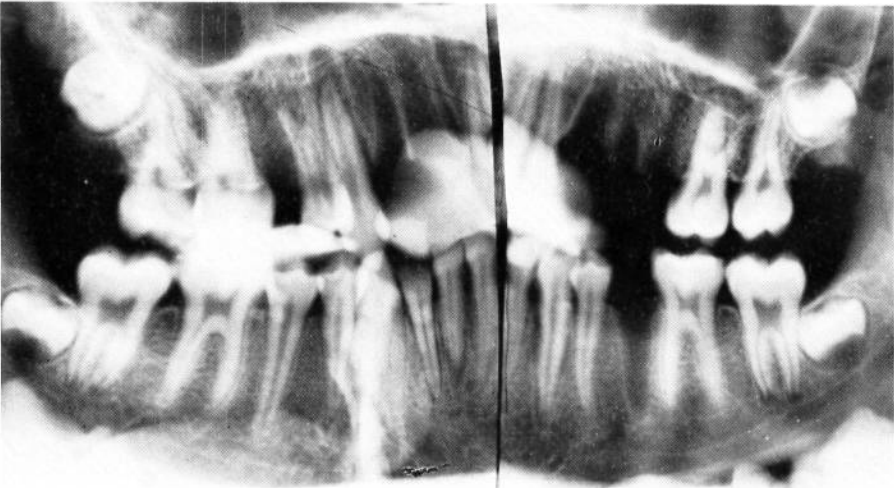
*Sinuses* The maxillary and supra-orbital sinuses are normal in shape.

*Observations* Between the years of twelve and eighteen the evidence for the dental age is derived from the degree of development of the apices of the second molars and the amount of calcification of the cusps of the third molars or wisdom teeth. In this instance the apices are not quite closed and the cusps of the third molars are only partially calcified (radiographic evidence). Thus when death intervened the age was between thirteen and fourteen years.

The most probable cause of the mal-position of the upper right canine was the prolonged retention of the deciduous tooth, a non-pathological abnormality. It could have a genetic origin but usually arises spontaneously.

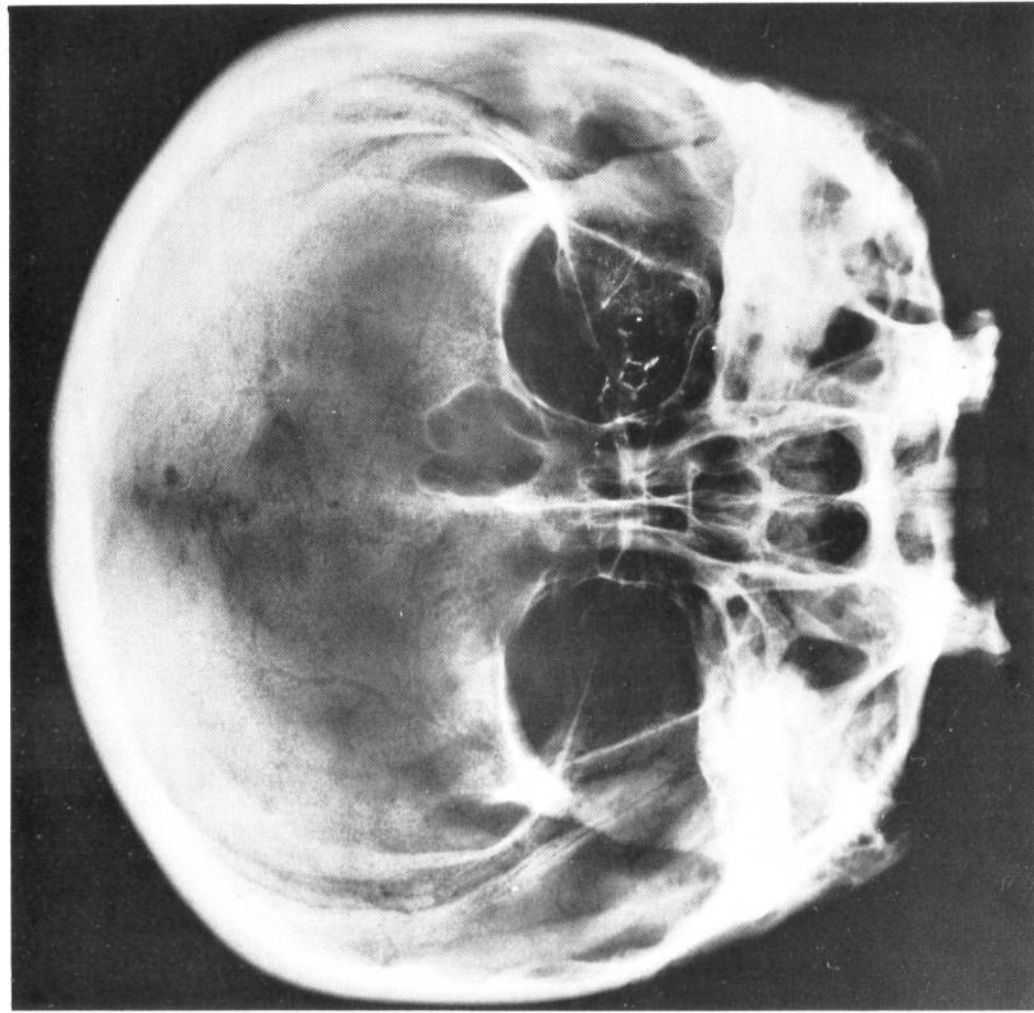
When two teeth are placed irregularly in the arch, as in the case of the upper right lateral incisor and canine, the interdental space is abnormally shaped and provides a constant trap for food particles which are difficult to remove. This retention quickly results in an inflammation of the gingival crest to be followed by a pathological crater and pitting of the alveolar bone. That no such changes are apparent suggests that there was a total lack of fibrous food in the diet, consequently it must have been a liquid or semi-liquid one. This fact is supported by the absolute absence of attrition on any cusps of the teeth, so characteristic of almost every ancient Egyptian permanent dentition and seen even on deciduous ones.

The pathological changes seen in the bones of the nasal cavity, together with the concomitant oedematous condition of the overlying mucous membrane, would have resulted in an almost complete blockage of the nasal passages. The outward sign of this would have been persistent

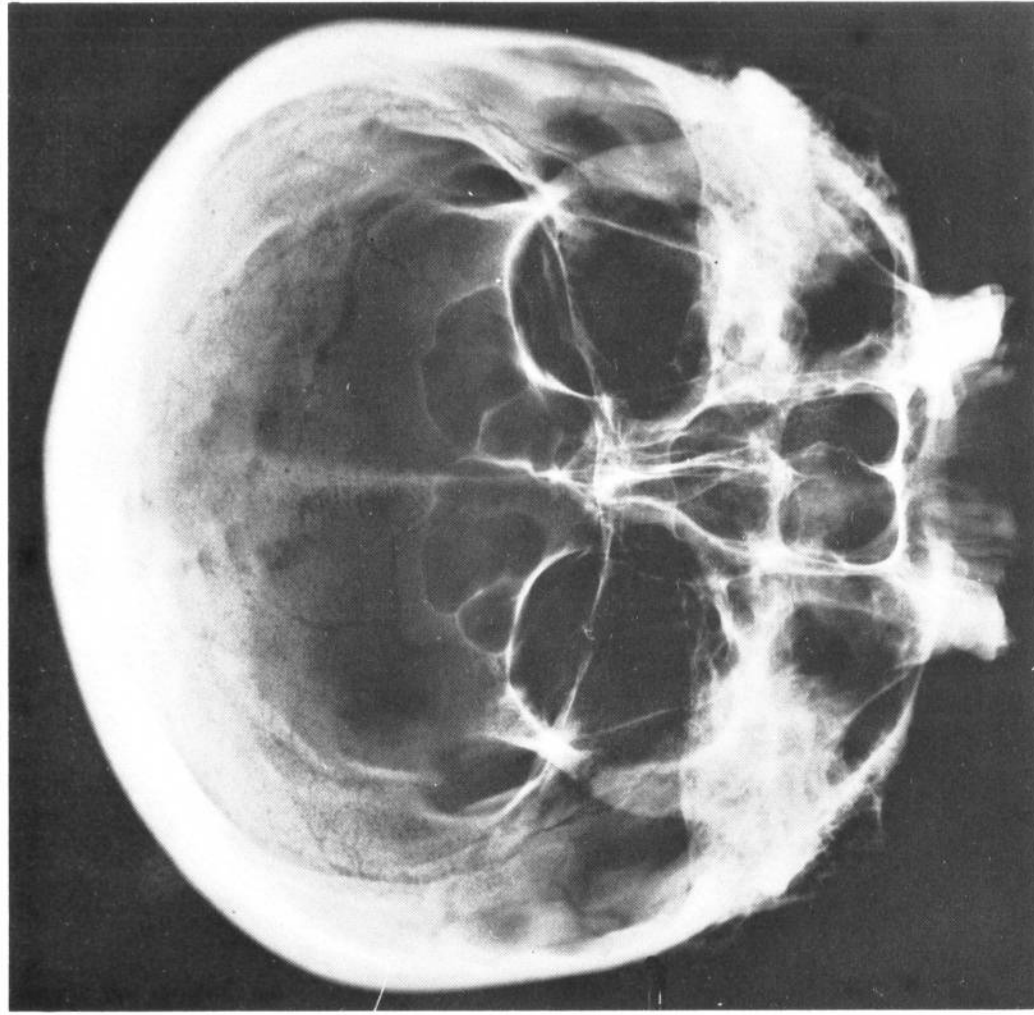


Mummy No. 1770.  
The apices of the second molar teeth are not fully calcified and only the crowns of the third molars are developed, thus giving a dental age approx. 13 years. The teeth missing from the dentition became dislodged during the examination.





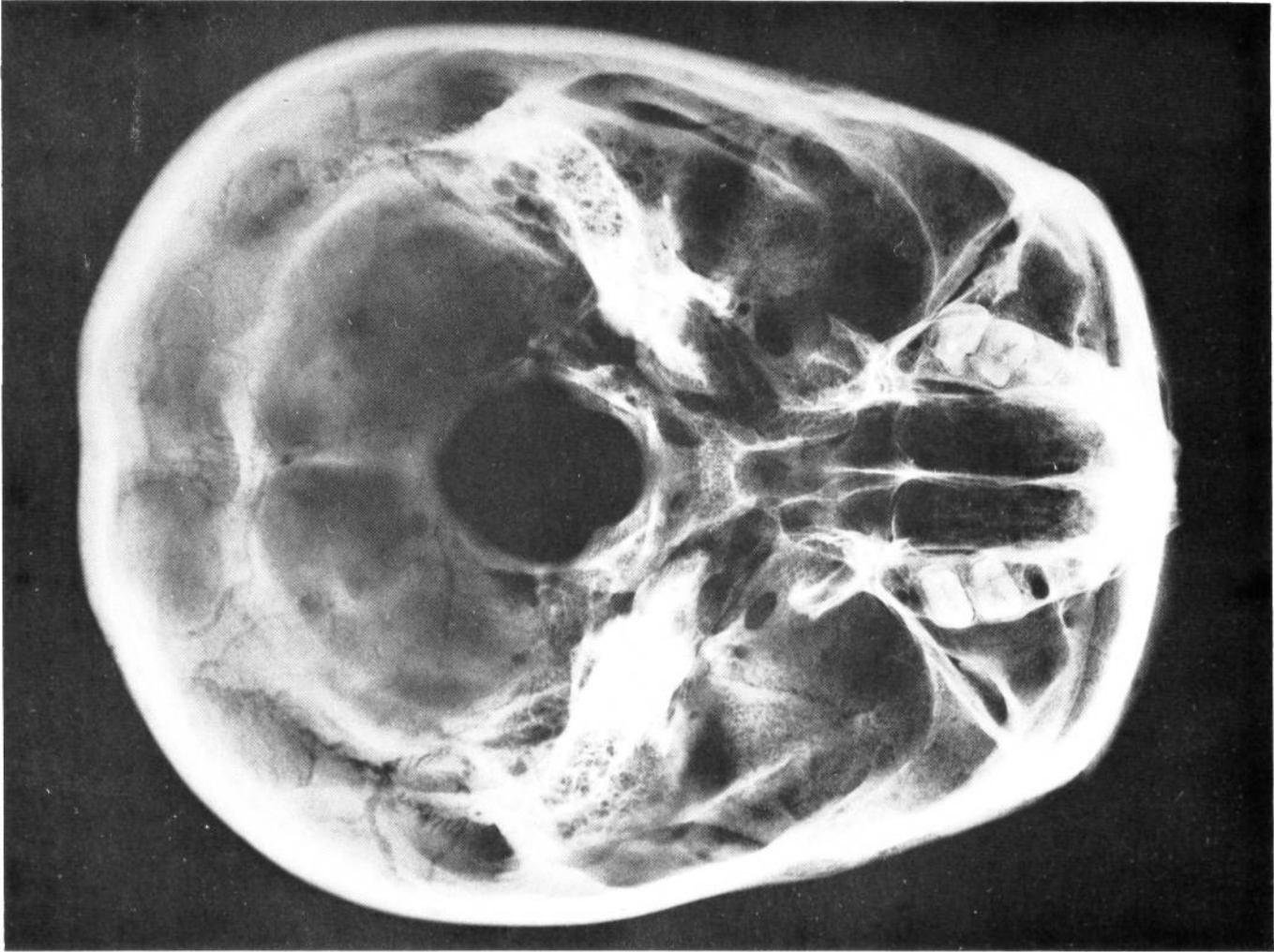
(A)



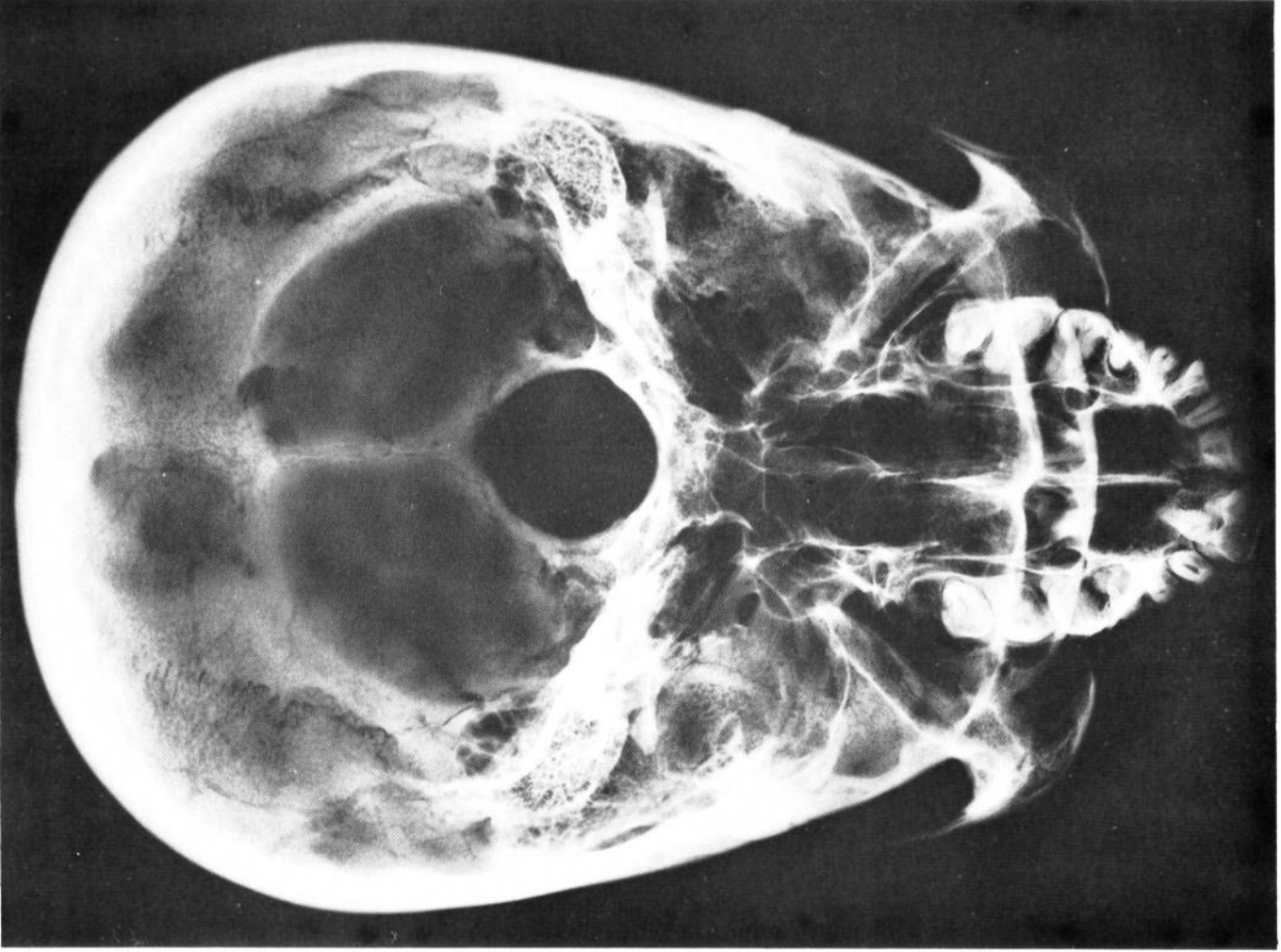
(B)

Radiographs  
 (A) Nekht-Ankh. Antero-posterior projection of cranium.  
 (B) Khnum-Nakht. Antero-posterior projection of cranium.  
 (C) Nekht-Ankh. Baso-superior projection of cranium.  
 (D) Khnum-Nakht. Baso-superior projection of cranium.

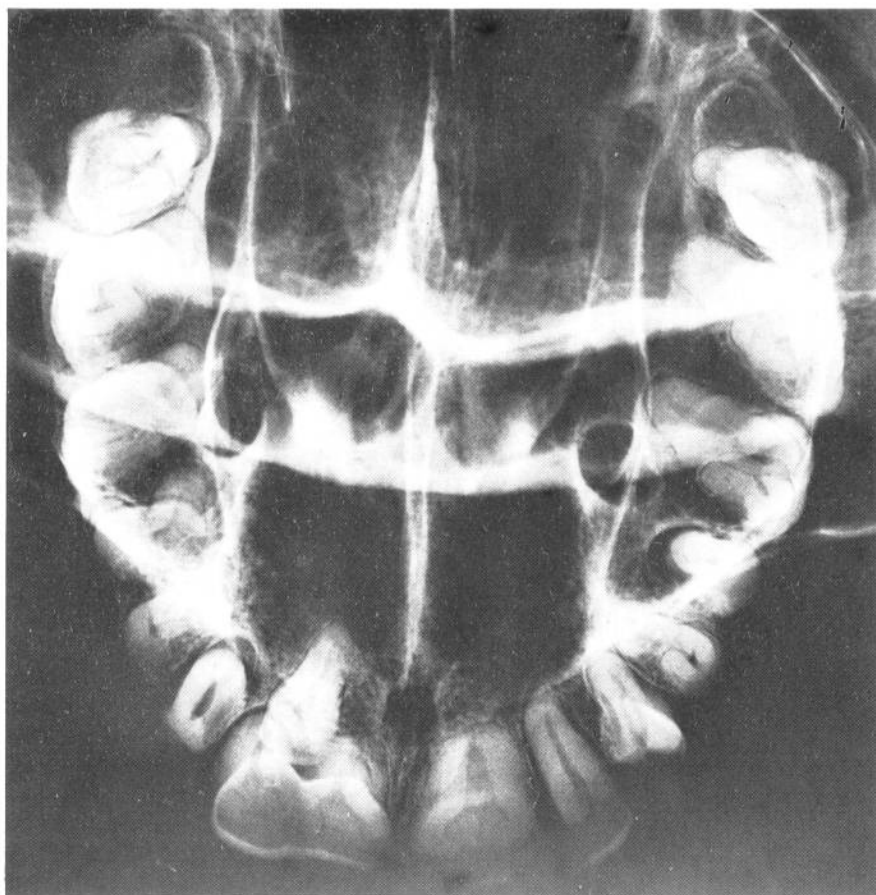
During his examination in 1910, Dr John Cameron recorded many anatomical differences between 'The Two Brothers'. To these can be added size, shape and thickness of calvarium, size of orbits, frontal sinuses, foramen magnum and nasal cavities, size and shape of teeth and palate.



(C)



(D)



(E) Khnum-Nakht. Maxilla. Both upper central incisors have undergone fusion with supernumary teeth but exhibit morphological differences. The left incisor is instanding because of lack of room within the dental arch.

open lips. This latter appearance was probably aided by a short upper lip pattern. That she did not persistently thumb-suck in her youth is borne out by the fact that the incisor teeth are aligned at their normal angle. A short upper lip pattern together with a thumb-sucking habit usually results in protruding upper teeth.

All these aforementioned factors add up to suggest that during life she was a frail adolescent creature of poor constitution, with a slightly asymmetrical face and her lips constantly open.

During embalming an opening into the cranial cavity was usually made in order to facilitate the removal of the brain. The most usual route was an entrance via one or both nostrils through the cribriform plate of the ethmoid bone. Less frequently, a hole was made through the wall of the orbit. In this instance no such procedures had been followed.

#### Mummy No. 1775 (Artemidorous)

**Maxilla** Only the roots of the incisor teeth with one or more apical abscesses are present and the molar teeth are extruded from their sockets, the latter condition being the result of a longstanding lack of opposing lower teeth.

**Mandible** Only the incisor teeth are present. That the posterior teeth had been absent for a long period is revealed by the senile shape of the alveolar bone.

**Comments** The conjectural assessment of the dental history of the later years of Artemidorous, as gained by the interpretation of the radiographs and tomographs, is that an overclosure of the mandible took place during mastication. The lower incisors biting on the roots of the upper ones, which at times must have been painful because of apical abscesses, and the upper molar teeth biting on the pad of gum covering the lower jaw.

#### Mummy No. 1777 (Asru)

**Maxilla** Edentulous except for a few incisor teeth; the palate is flat, the result of the complete absorption of the alveolar bone. This is consistent with the earlier involvement of periodical disease and its culminating in periodontosis.

**Mandible** Some of the posterior teeth are missing (lost ante-mortem), and those that are present exhibit Class II attrition and marked periodontal infection.

#### Mummy No. 2109

Teeth present	e	d	c	b	a		a	b	c	d	e
	e	d	c	b	a		a	b	c	d	e

**Comments** All the deciduous teeth have erupted and the cusps of the first permanent molars and the crowns of the incisors have commenced to calcify, thus giving a dental age of between two and three years.



Mummy No. 3496

*Comments* The skull of this infant has suffered severe post-mortem damage, so much so that it is impossible to see in the x-rays any eruption sequence. The degree of calcification of some of the crowns indicate an age of approximately one year at death.

Mummy No. 9319

<i>Teeth present</i>	e d c b a	a b c d e
	e d c b a	a b c d e

*Comments* All the deciduous teeth have erupted and the cusps of the first permanent molars are beginning to calcify. This would indicate an age of between two and three years.

Mummy No. 9354 (Khary)

<i>Teeth present</i>	7 6 5 4 3 2 1	1 2 3 4 5 7
	7 6 5 4 3 2 1	1 2 3 4 5 6 7 8
<i>Abscesses</i>	6 5	4 5
	6	

*Attrition* Class II and III

*Comments* Attrition is marked on all the incisor teeth and the wear on the buccal ones extends to the pulp chambers. Only the roots of some of the premolar and molar teeth are present, and each of these exhibits an apical abscess. There is marked destruction of the buccal alveolar bone, the result of severe periodontal disease. Three of the third molar teeth are absent and the fourth is represented by its apical third. The appearance of the alveolar bone in these areas points to their loss being the result of advanced periodontitis.

Mummy No. 10881 (Ta-Aath)

<i>Teeth present</i>	6	4 6
	7 6 5 3 2	2 3 4 5 6 7 8

*Comments* The sockets of the missing anterior teeth are clearly defined but bony repair appears to have

commenced. This would indicate that their removal had taken place only weeks before death. The upper right canine is unerupted and lying mesially inclined in the palate.

The space for the lower two central incisor teeth appears to be contracted, this suggests their early loss or more probably, the failure of the tooth buds to develop. Anodontia vera is also probably the explanation of the absence of the lower left third molar. The lower left first premolar is also absent from the arch, and whilst the x-ray does not provide a good rendering of the tissues in this area, in all probability its absence is also due to the same reason.

Several cervical vertebrae and the mandible are dislocated, probably the result of post-mortem manhandling of the mummy.

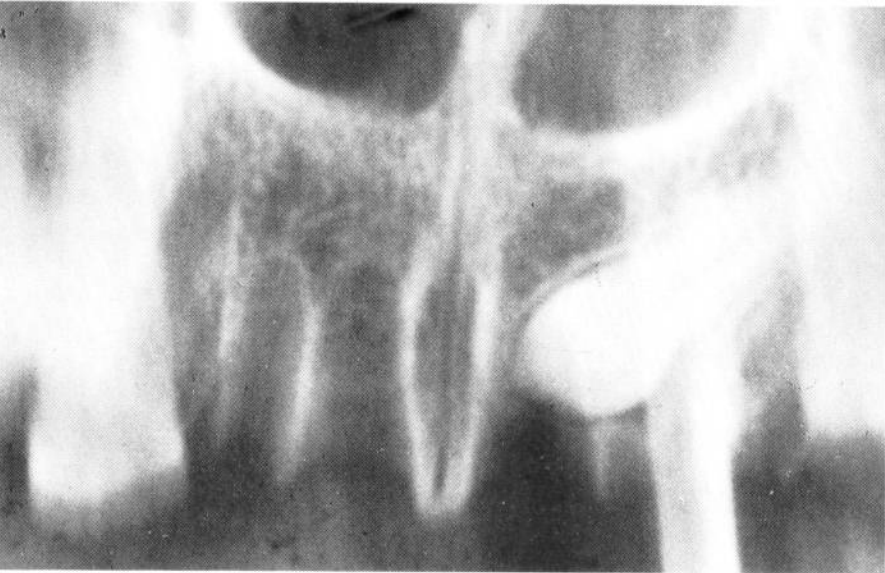
Mummy No. 20638 (Demetria, wife of Icaious)

<i>Teeth present</i>	8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8
	8 7 6 5 4 3 2 1	1 2 3 4 5 7 8

*Comments* The dental arches are well developed and the teeth are regular and correctly spaced. The four third molar teeth are fully erupted and calcified. The lower first molar is absent from the dentition and the right one is represented only by its abscessed roots. This is probably the result of a successful and an unsuccessful attempt respectively, to extract them. For what reason it is difficult to imagine, as all the other teeth are caries free and with but little attrition on the cusps.

Mummy No. 1976/51a

<i>Teeth present</i>	- - - - -	- - - - -
	7 6 5 4 3 2 1	1 2 3 4 5 6 7
<i>Caries</i>		
	8 7 6	5 6 7
<i>Abscesses</i>		
	8 7 6	2 5 7
<i>Attrition</i>	Class II	



Mummy No. 10881. Ta-Aath. The upper canine lies mesially inclined buried in the palate. The sockets of the missing incisor teeth have begun to be filled with regenerating bone, thus indicating that these teeth were lost only weeks before death.

**Comments** The senile anadontia and the almost flat palate suggests that the maxillary teeth were lost because of advanced periodontal disease, nevertheless he/she almost certainly lived an appreciable time afterwards. The carious cavities are very advanced, the bacterial invasion of the pulp chambers has resulted in at least four apical abscesses and although the radiographs do not give definite confirmation, the remaining carious teeth most probably are similarly affected. The septic foci in the mandible must surely have undermined the well-being of the last years of life.

#### Mummy Head No. 5275

<i>Teeth present</i>	5 4 3 2 1	1 2 3 4 5	8
	7 6 5 4 3 2 1	1 2 3 4 5 6 7	
<i>Caries</i>	3 4 5		
	7		
<i>Abscesses</i>	1		
	6		

**Comments** Whilst there is only slight attrition on the cusps of the molar teeth, the occlusal edges of the anterior teeth are much reduced. There is an apical abscess below the distal root of the lower right first molar. Also one above the root of the upper left central incisor, most probably the result of a blow on the tooth. The carious cavities are in each case small and interstitial. Much salivary calculus is present around the lower incisors and there is considerable loss of alveolar bone around all the teeth, a manifestation of advanced periodontal disease.

A molar tooth is lying loose in the cranial vault (in one x-ray it is to be seen lying on the floor of the vault, whilst in another, it resides in the nasal cavity). The movement of this tooth is allowed by the excessive amount of bone removed by the ancient embalmers, in order to extract the brain.

#### Mummy Head No. 7740

<i>Teeth present</i>	8 7 6 5 4 3 2	3 4 5	7 8
	8 7 6 5 4 3 2	1 2 3 4 5 6 7 8	
<i>Caries</i>	8 7 6	4	7 8
	5		
<i>Apical Abscesses</i>	7 6	4	7
		5 6	
<i>Attrition</i>	Class II and III		

**Comments** The missing teeth from the maxilla were lost as the result of severe periodontal disease. The remaining teeth of both jaws are similarly involved but to a lesser degree. Caries has invaded the pulps of some six or seven teeth, resulting in apical abscesses. A tooth is lying horizontally buried in the mandible in the pre-molar area.

The orthopantomogram shows a wide interdental space on the right side, whilst those on the left are in occlusion. Also the mandibular teeth on the left side are displaced the width of a whole tooth mesially. Such deformity is consistent with a dislocated mandible. This

diagnosis is confirmed by the tomograph of the temporo-mandibular joint, which in addition reveals arthritic changes and marked liping of the condylar head. A most unenviable dental history.

#### Mummy Head No. 21475

<i>Teeth present</i>	8 7 6 5 4 3 2 1	1 2 3 4 5 6 7
	8 7	5 4 3 2 1
<i>Caries</i>	Nil	1 2 3 4
<i>Abscesses</i>	6 5 4	
	1	
<i>Attrition</i>	Class II and III	

**Comments** Each of the abscesses above the apices of the upper right buccal teeth are due to the death of the pulp, the result of attrition. The dentition being completely free from caries. The circumscribed cystic cavity beneath the root of the lower central incisor could also have arisen from the same cause, but more probably was the result of a blow or sudden impact on the tooth. The 6 7 had been removed prior to death but the other teeth missing from the dentition have been shaken from their sockets post-mortem.

The articulation exhibits a Class III skeletal pattern, and this edge to edge articulation resulted in severe attrition to the anterior as well as the buccal teeth. So much so, the stresses involved resulted in inflammation and thickening of the periodontal membrane and whilst details in the radiographs are not distinct, there seems to be abscess formation on several incisor teeth.

A Class III articulation is very infrequently encountered in ancient Egyptian dentitions, it is however not uncommonly observed amongst negroid races. Even in modern times, when only refined and easily masticated foods are eaten, dentitions exhibiting this type of articulation show considerable wear of all the teeth, more especially the incisors.

#### Mummy Head No. 22940

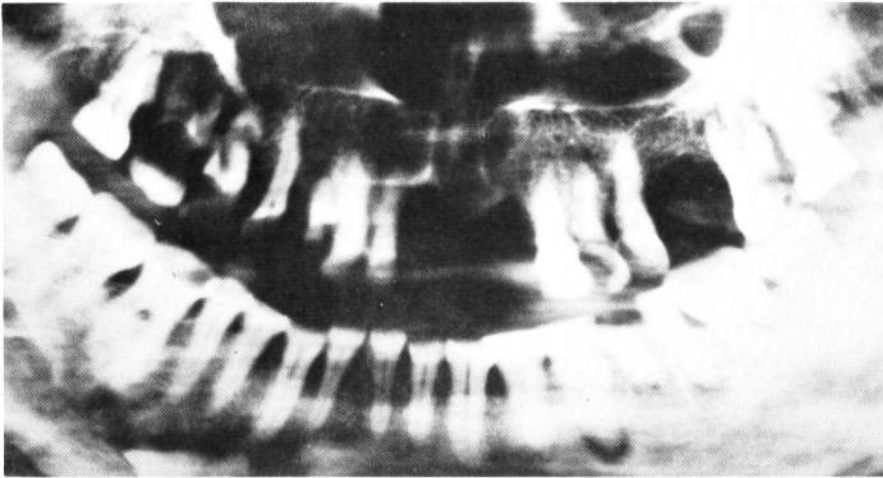
<i>Teeth present</i>	7 6 5 4 3 2 1	1 2 3 4 5 6 7
	7 6 5 4 3 2 1	1 2 3 4 5 6 7 8
<i>Caries</i>	7	7
<i>Abscesses</i>	7	7
<i>Attrition</i>	11+	

**Comments** There is marked absorption of the alveolar bone around all the teeth denoting advanced periodontal disease. The lower left third molar is extruded from its socket, the result of congenital absence or premature loss of its opposing member.

There is a pronounced radiolucent area in the body of the mandible extending from the first premolar to the second molar region. This is not typical of any known pathological abnormality, consequently it is not possible to pronounce on its aetiology or cause.

The periodontal membranes of the upper incisor teeth are thickened and the roots of these teeth are fractured.





A

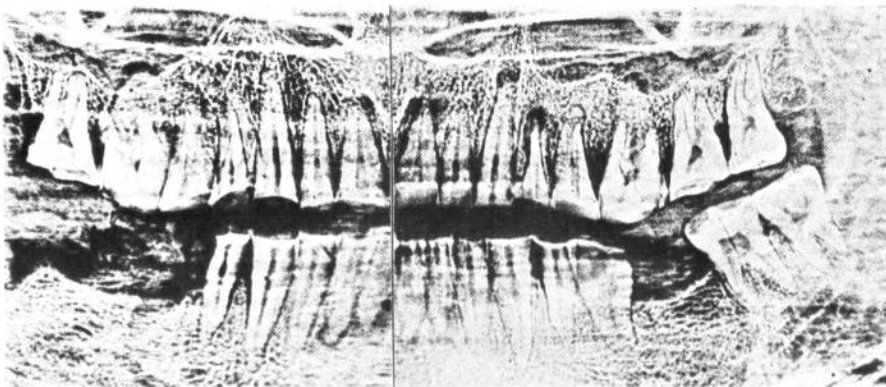
Mummy Head No. 7740.

(A) The alveolar bone around the upper central teeth is diseased; all the teeth display attrition; there are several carious cavities and abscesses also alveolar bone absorption. The mandible is displaced to the left side.



B

(B) Tomograph shows that the mandibular condyle is disarticulated from the glenoid fossa and that arthritic changes have taken place in the head.



Mummy Head No. 21475

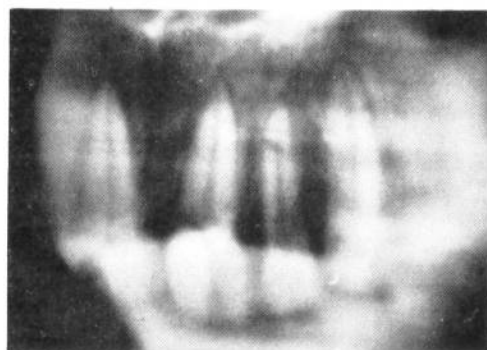
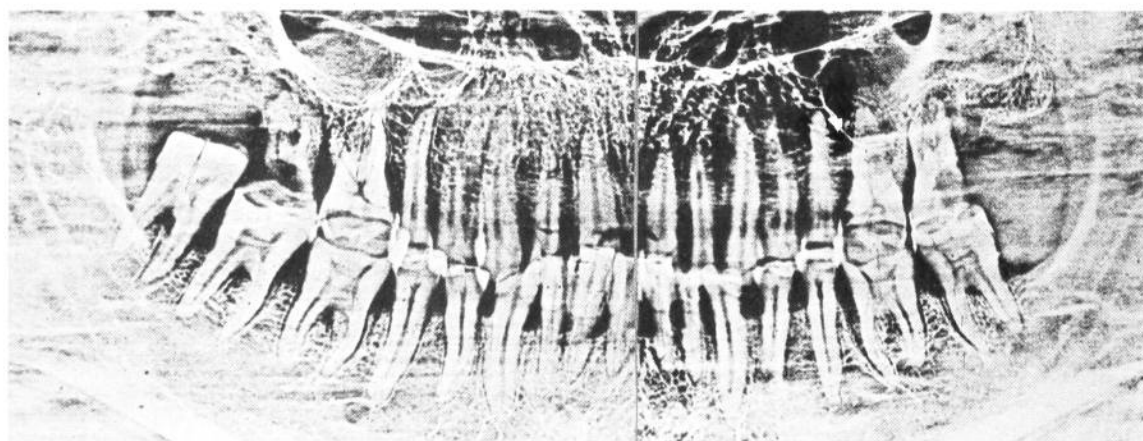
Advanced attrition caused the death of several pulps of the incisor teeth resulting in apical abscesses. Two of the four missing lower teeth were lost ante-mortem.



Mummy Head No. 22940.

(A) The soft tissue of the face is well preserved. Whilst the depression of the cartilaginous part of the nose was probably the result of the pressure of the embalmers bandages, the swollen lip, without doubt, was the result of ante-mortem injury.

(B) Panoramic zerograph of the dentition shows fracture of the upper incisors, absence of three third molar teeth, attrition and absorption of interdental alveolus.



(C) Tomograph of the upper incisor teeth reveals fracture of crowns and roots and thickened periodontal membrane.

Such damage is consistent with the results following a severe blow on the front of the face. This assumption is confirmed by the appearance of the upper lip, it being morbidly enlarged, which gives the face a particularly repugnant appearance. As the result of these and without doubt, other injuries, consciousness must have been lost almost immediately, otherwise the loose fractured crowns of the teeth would have been ejected. That death was not instantaneous is substantiated by the fact that time is required for the reaction of the periodontal membrane and the swelling of the lip to become manifest. Its intervention, however, could not have been long delayed.

**Summary of Abnormalities**

*Pathological and Traumatic*

- Caries: Nos. 21470, 1976/51a, 5275, 7740.
- Teeth lost ante-mortem: Nos. 21470, 21475, 1775, 9354, 10881, 1976/51a, 7740, 22940.
- Attrition: Nos. 21470, 1766, 21475, 9354, 5275, 1976/51a, 21471.
- Anodontia senile: No. 1976/51a.
- Dislocated mandible: No. 7740.
- Fractured teeth: No. 22940.
- Abscesses: Nos. 9354, 20638, 1976/51a, 7740, 21475.
- Periodontal Disease: Nos. 1777, 9254, 1976/51a, 7740, 22940.

*Non-pathological*

- Anodontia vera: No. 10881.
- Unerupted and buried teeth: No. 10881.
- Gemination: No. 21471.
- Articulation, Skeletal pattern Class III: No. 21475.

**Summary**

Whilst the collection of human remains in the Manchester Museum is small, the dentitions follow the general pattern as seen in much larger collections. Dentitions of the early Dynastic periods show a remarkable freedom from caries, and the two examples from the Middle Kingdom, namely Nos. 21470 and 21471 reveal only one small pit cavity. This was probably of developmental origin, certainly not one that had arisen because of disintegration of the enamel.

Rampant dental caries is to be seen however, in the dentitions of several adult Ptolemaic mummies, for example Nos. 21470, 1976/51a, 5275 and 7740. Such a plight is so rarely seen in earlier Dynastic skulls, that it gives rise to the speculation that this deterioration in the dental health was the result of an invasion of foreign ideas, leading to an adulteration of foods and a change in eating habits. This era was certainly a period of transformation in Egyptian history and upheavals in the daily way of life must have been constant.

The most common abnormality seen in the dentitions of early man, and those from ancient Egypt in particular, is attrition of the cusps of the teeth. This abnormality is universal throughout the ages and quite positively does not imply that the teeth of those days were deficient in calcium or suffered from hypoplasia. Quite the reverse, for they were all characterized by well developed enamel and dentine. In earlier times, food was generally more fibrous and contaminated by foreign particles, and consequently the cusps of the teeth would wear and become flattened.

Almost more important than the fibrous foods was that flour and consequently bread, principally from the grinding techniques employed, contained many impurities. This is particularly true of Egypt, as examination of bread originating from various sites and from different dynastic periods have shown, that not only were these same impurities from the soil, storage and grinding incorporated into the bread but in addition there was a marked contamination by quartz fragments, that is, wind-blown sand — unfortunately a very heavy contamination. As a result, by adult age not only had the cusps worn down, but in varying degrees the body of the tooth as well. In those cases where the deposition of secondary dentine in the pulp chamber did not proceed faster than the wear, the pulp chamber was exposed, bacteria invaded the root canal causing death of the pulp and eventually producing an apical abscess. This later became a foci of infection, which in minor cases would result in debility and lowered resistance to disease, whilst in more unfortunate instances, it would hasten the termination of life itself. Indeed some investigators are convinced that the death of Ramesses II was the result of dental infection.

The attrition pattern varied greatly, and this inconsistency of pattern has made generalizations and comparisons between individuals and also between different populations very difficult to assess. No system of classification has yet been devised that gives a truly representative picture of a particular dentition, and in this essay recourse has been made to the following general classification which only broadly covers the many types.

- Class I Denotes the flattening of the enamel cusps.
- Class II Denotes exposure of the dentine.
- Class III Denotes exposure of the pulp chamber.
- Class IV Denotes advanced wear of the body of the tooth.

One result of the patterns of wear of the dental cusps was that masticatory movements changed and consequently the action of the temporo-mandibular joint became complex. An outcome of which, in many instances, produced progressive or regressive changes in the shape of the head of the mandibular condyle and these in their turn must have produced arthritic syndromes.

Because of the abnormal movements of the temporo-mandibular joint, erratic stresses and strains during mastication were applied to the cusps of the teeth, and these were then transferred down the root or roots to the supporting structures, that is, the alveolar bone. Gradually these tissues were undermined and broken down



and sometimes with the addition of faulty hygiene, produced widespread periodontal disease. Many such cases advanced to such a stage that the various components of the dentition could have been dislodged by the application of only finger pressure. The astonishing fact is that many people were allowed to pass their last days in what must have been miserable circumstances only because of failure to perform such a simple operation.

Although many such cases of advanced alveolar disease are to be seen without infected and loose teeth having been extracted, there is a proportion of dentitions in which a tooth or teeth have been removed from strong and well developed arches. It must be accepted therefore, that some method of removal of teeth was known and practiced but no hint of the techniques used nor the instruments employed have as yet been revealed. In fact, although loose teeth and some suggested cures are mentioned in Medical Papyri, there is a reticence on discussions relating to teeth and their diseases. However in a Medical Papyri written during New Kingdom times but thought to have been copied from an even earlier manuscript, a method is described of the operative procedure essential to reduce a dislocated mandible which is almost identical to that practised today. It is more than probable that because of the changes in the shape of the mandibular condyle in so many people as the result of traumatic occlusion, such operative procedures were frequently necessary.

It is most interesting that in a small collection such as this one, that there should be an example of a dislocated mandible, as well as examples of fractured teeth and pathological abnormalities occasioned by accident or violence.

Of the non-pathological abnormalities to be seen in the dentitions, anodontia is one relatively common in ancient times. Whilst the tooth buds of lower premolars sometimes fail to develop, it is the third molar that, most frequently, is missing from the dentitions. Buried, misplaced and supernumary teeth are all common abnormalities, but to have the rare abnormality of the double geminated upper central incisors of Khnum-Nakht is of such uniqueness that it raises the dental interest of this collection to a point far beyond that which would be normal for one of its size.

## Glossary

### *Anodontia*

Absence of teeth.

### *Anodontia, senile*

Absence of teeth in the aged because of their earlier removal.

### *Anodontia, vera*

That due to the failure of the tooth bud to develop.

### *Attrition*

The wearing away of the cusps of the teeth. In this instance, by chewing foods contaminated by inorganic fragments.

### *Alveolus*

The bony socket of the tooth, that is, its supporting structures.

### *Apical Abscess*

A localized collection of pus around the apex of a tooth.

### *Buccal*

Of the cheek.

### *Caries*

A localized and progressive molecular destruction of the tooth usually referred to as 'decay'. It begins with the disintegration of the enamel by acids which result from the enzymic action of oral bacteria on carbohydrates.

### *Dentine*

The calcified tissue which forms the greater part of the tooth. It is covered by enamel over the crown and by cementum over the root. Within it is the pulp chamber and the root canals, which house the nerve and blood vessels.

### *Gemination*

See page 65 (Khnum-Nakht).

### *Gingiva*

That part of the gum which covers the alveolar bone and is attached at the junction of the root and crown of the tooth.

### *Mandible*

The lower jaw bone.

### *Maxilla*

The upper jaw bone.

### *Mucosa*

A mucous membrane.

### *Occlusal surface*

That part of the tooth which is in contact with its opposite number when the jaws are closed.

### *Periodontal membrane*

An elastic membrane inserted into the cementum and joining the tooth to the alveolar bone.

### *Periodontitis*

An inflammation of the periodontal membrane which usually extends into the surrounding alveolar bone, resulting in a purulent discharge. Commonly termed 'Pyorrhea'.

### *Periodontosis*

A later stage of periodontitis, characterized by alveolar bone resorption, epithelial proliferation, pocket formation, migration of teeth, culminating in exfoliation.

### *Secondary dentine*

That which is deposited by the cells of the pulp on the walls of the pulp chamber in response to stimuli such as produced by attrition or by advancing caries.

### *Salivary Calculus*

A deposit of mineral salts and organic matter, usually found on the lingual side of mandibular teeth and sometimes on the buccal side of upper ones. In cases of lack of oral hygiene is seen around the necks of all the teeth and when in addition, there is a lack of mastication, it can cover the occlusal surface as well.

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