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MTEMANKHOKWE: HUMAN SKELETAL REMAINS FROM A LATE IRON AGE CEMETERY IN THE MANGOCHI DISTRICT OF SOUTHERN MALAWI*

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ABSTRACT

Six human skeletons from a late Iron Age context in the Shire River Valley of southern Malawi have been analysed from a biological perspective. The age, sex and health status of each individual is presented. Population origin, evidence of social status and ethnicity, and health and diet, are discussed in the light of these data. The presence of intentional tooth mutilation in these individuals is the first demonstration of such a case from an archaeological context in Malawi.

INTRODUCTION

During 1987, Dr. Yusuf Juwayeyi and his colleagues at the Department of Antiquities of Malawi, excavated six human burials from a late Iron Age site in the Shire River Valley in southern Malawi (Fig. 1). The site appears to have been a cemetery built on the site of an earlier village. There are many parallels between this site and the one dug at Nkudzi Bay by Inskeep (1965), and pottery associated with the Mtemankhokwe burials is the same as that at Nkudzi Bay (Juwayeyi 1991).

Juwayeyi's analysis of the associated cultural material indicates a date for the cemetery site in the late eigthteenth or early nineteenth centuries. The importance of this date is that "the people buried at the Mtemankhokwe I site were the ancestors of the Nyanja speaking people" (Juwayeyi 1991:33). The movement of Yao-speaking and Ngoni-speaking peoples post-dates the burial phase of the Mtemankhokwe site.

In July 1991, upon the invitation of Dr. Juwayeyi, I had the opportunity to study the six skeletons housed at the Malawi Department of Antiquities in Lilongwe. The following report on the skeletal biology of the people is intended to parallel Juwayeyi's 1991 description of the cultural practices. Tables 1 to 4 present the measurement data for these individuals.

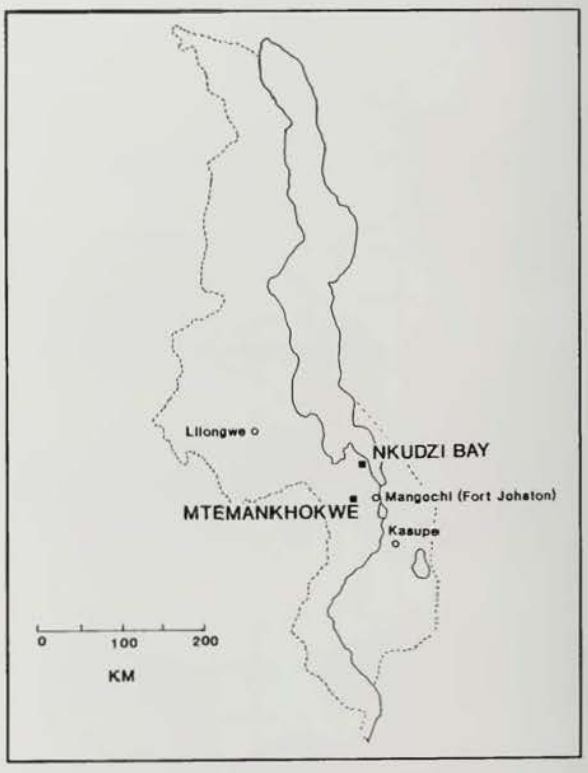

Fig. 1. Map of Malawi showing loction of Mtemankhokwe and Nkudzi Bay sites.

DESCRIPTION OF THE SKELETONS

Burial No. 1 (Fig. 2)

Burial number 1 demonstrates the poorest preservation of the six Mtemankhokwe individuals. Although both the face and vault can be reconstructed, crushing has resulted in substantial distortion and the two cranial sections cannot be assembled in an anatomically correct manner. The palate is also broken with several loose teeth that cannot be refitted into the damaged sockets. The mandible is in fairly good condition and shows some

Table 1. Cranial measurements (mm).

BURIAL NUMBER	1	2	3	5	6
SEX	M	F	M	M	F
Maximum Cranial Length (L)	-	188	181	190	178
Maximum Cranial Breadth (B)	133	130	119	131	127
Basibregmatic Height (H')	-	135	-	-	137
Bistephanic Breadth (STB)	110	117	101	115	109
Biasterionic Breadth (ASB)	113	101	98	113	93
Frontal Sagittal Arc (S_1)	-	133	126	138	121
Parietal Sagittal Arc (S_2)	123	135	127	141	131
Occipital Sagittal Arc (S_3)	115	120	105	106	105
Transverse Arc (Q)	-	315	291	307	296
Frontal Sagittal Chord (S_1')	-	109	109	118	107
Parietal Sagittal Chord (S_2')	112	118	115	123	117
Occipital Sagittal Chord (S_3')	92	102	93	91	90
Nasion-bregma Subtense (FRS)	-	32	25	29	26
Nasion Subtense Fraction (FRF)	-	44	55	62	48
Foramen Magnum Length (fml)	-	39	-	-	39
Foramen Magnum Breadth (fmb)	-	-	-	-	29
Mastoid Height (MDH)	24	25	34	29	27
Least Frontal Breadth (B')	-	100	-	103	85
Bizygomatic Breadth (J)	-	116	-	146	119
Bimaxillary Breadth (GB)	91	91	83	102	96
Upper Facial Height (G'H)	-	-	-	-	-
Total Facial Height (GH)	-	109	116	110	110
Nasion-Basion Length (LB)	-	104	-	-	102
Prosthion-Basion Length (BPL)	-	-	-	-	-
Bimaxillary Subtense (SSS)	-	18	25	18	23
Naso-frontal Subtense (NAS)	-	16	-	19	13
Inner Biorbital Breadth (M43.1)	95	93	-	100	88
Outer Biorbital Breadth (M43)	101	103	-	109	95
Bidacryonic Breadth (DC)	-	24	23	-	22
Bimaxillofrontal Breadth (IOW)	19	17	19	-	19
Orbital Breadth (O_1)	36	37	37	40	38
Orbital Height (O_2)	36	32	34	37	34
Nasal Height (NH)	46	47	48	46	48
Nasal Breadth (NB)	24	31	27	30	28
Least Nasal Breadth (SC)	6	9	7	-	7
Maxillo-alveolar Length (MAL)	-	-	56	-	-
Maxillo-alveolar Breadth (MAB)	-	63	60	-	64
Palatal Length (G'_1)	-	-	48	-	-
Palatal Breadth (G'_2)	-	36	37	-	40
Palatal Height (PAH)	-	10	13	-	14

Table 2. Cranial indices.

BURIAL NUMBER	1	2	3	5	6
SEX	M	F	M	M	F
Cranial (100 B/L)	-	69.1	65.7	68.9	71.3
Cranial Height (100 H'/L)	-	71.8	-	-	77.0
Frontal Chord/Arc (100 S_1'/S_1)	-	82.0	86.5	85.5	88.4
Parietal Chord/Arc (100 S_2'/S_2)	91.1	87.4	90.6	87.2	89.3
Occipital Chord/Arc (100 S_3'/S_3)	80.0	85.0	88.6	85.9	85.7
Foramen Magnum (100 fmb/fml)	-	-	-	-	74.4
Orbital (100 O_2/O_1)	100.0	86.5	91.9	92.5	89.5
Nasal (100 NB/NH)	52.2	66.0	56.3	65.2	58.3
Palatal (100 G'_2/G'_1)	-	-	77.1	-	-

Table 3. Mandibular measurements (mm) and indices.

BURIAL NUMBER	1	2	3	4	5	6
SEX	M	F	M	F	M	F
Maximum Mandibular Breadth (w_1)	120	106	-	112	116	114
Bicoronoidal Breadth (crcr)	95	91	91	91	85	93
Bigonial Breadth (gogo)	95	75	96	83	82	90
Bimental Breadth (zz)	44	44	42	46	46	42
Proj. Rameal Height (rl)	68	49	-	48	62	46
Proj. Coronoidal Height (crh)	68	55	66	56	57	55
Proj. Corpus Length (cpl)	80	77	73	83	85	72
Proj. Mandibular Length (ml)	98	104	-	101	103	104
Length of Condyle (cyl)	24	20	-	17	22	23
Breadth of Condyle (cyb)	10	9	-	8	9	10
Minimum width of Ramus (rb')	36	36	38	34	36	33
Molar-premolar chord (m_2p_1)	-	27	28	-	28	
Symphyseal Height (h_1)	35	-	36	-	35	31
Mandibular Angle (M)	101	116	-	125	106	123
Mandibular Index (100w_1/ml)	122.5	101.9	-	110.1	102.9	109.6
Rameal Index (100 rb'/rl)	52.9	73.5	-	70.8	58.1	71.7

pathologies. The post-cranials are fairly complete, but both humeri, the right tibia, both fibulae, and the left femur are broken and cannot be measured.

This individual is clearly male. The pelvis demonstrates a narrow sciatic notch and a narrow sub-pubic angle. That the individual was an adult is unquestioned, and the complete formation and fusion of the medial epiphysis to the shaft of the clavicle indicates an age in excess of 25 years. Although the face of the pubic symphysis has remodelled extensively, the remodelling is not as extensive as the oldest age category (McKern 1970). The sagittal and coronal sutures have begun to obliterate. No osteophytosis is present on the

Table 4. Long bone measurements (mm).

	Burial 1		Burial 2		Burial 3	
	lt	rt	lt	rt	lt	rt
Humerus						
Maximum Length	-	-	284	286	312	318
Epicondylar Breath	-	61	52	52	55	56
Midpoint Circumference	70	70	64	66	65	65
Radius						
Maximum Length	249	251	224	226	-	276
Ulna						
Maximum Length	271	272	243	248	-	296
Femur						
Maximum Length	-	419	-	-	-	-
Tibia						
Maximum Length	354	-	-	322	329	-
Mid-shaft (ant-post)	30	-	-	27	32	-
Mid-shaft (med-lat)	19	-	-	18	23	-

	Burial 4		Burial 5		Burial 6	
	lt	rt	lt	rt	lt	rt
Humerus						
Maximum Length	279	-	299	304	302	309
Epicondylar Breath	55	54	62	62	59	59
Midpoint Circumference	58	58	64	64	39	40
Radius						
Maximum Length	232	-	259	261	246	245
Ulna						
Maximum Length	255	-	280	280	274	273
Femur						
Maximum Length	-	-	-	-	-	-
Tibia						
Maximum Length	-	-	356	-	-	-
Mid-shaft (ant-post)	-	-	31	-	-	-
Mid-shaft (med-lat)	-	-	21	-	-	-

vertebral column, the ventral rib ends are cupped but not extensively, and the sternal corpus has not united to the manubrium. All these features indicate an age less than 40 years. The indication is therefore that Burial 1 represents a man who was probably in his 30's at death.

There are no obvious post-cranial abnormalities or pathologies, although slight arthritic lipping can be seen on the phalanges of the foot, particularly on the great toes. The bones of the right upper limb are longer than the left indicating that the individual was probably right handed.

The jaws of Burial 1 do demonstrate interesting features. The four upper incisors have been lost antemortem, but only the sockets of the central teeth have been completely resorbed. The sockets for the lateral incisors are still present although resorption is evident. The post-mortem breakage of the jaws means that many teeth have been lost after death. Other than the four upper incisors, the right lower P1 and M2 have been lost ante-mortem. The mandible also shows severe apical abscessing at the root of the right M1 and especially at the roots of the left premolars. The maxillary molars have marked buccal calculus, particularly on the right M2.

Burial No. 2 (Fig. 3)

This skeleton is in better condition than the previous individual. The cranium is nearly complete with some minimal damage to the base of the skull and to the back

Fig. 2. Facial and left lateral views of Burial 1.

of the palate. The mandible is complete and nearly all of the bones of the post-cranial set are present. Some vertebra, a few hand bones and most of the foot bones have been lost. The femora, tibia and fibulae have suffered regional damage and none are complete.

The morphology of the pelvis in general is not particularly indicative of the sex of this individual. Confirmation of sex comes only from the shape and structure of the pubic symphyseal face, which is feminine. Very faint parturition-like scarring can be seen on the dorsal edge of the pubis, and the presence of well defined pre-auricular sulci suggest that these are indeed parturition scars. The age of the individual at death is past 40 years. The rib ends are strongly cupped, calcification of the cartilage has begun on the ventral end of the 1st rib, and osteophytosis is present on thoracic vertebrae (T5 to T7) and at the lumbar 4/5 junction. The coronal suture has been obliterated and the sagittal is nearing fusion. The pubic symphyseal face is flattened with a strong rampart and fitting the 50's age category from the Suchey-Brooks pubis aging models (Suchey *et al.* 1988). All in all, these features would indicate a woman well past the 40 year mark, and probably in the sixth decade of her life.

There are few obvious abnormalities seen on the skeleton. The muscles markings are clear and well delineated, and the right upper limb bones are longer than the left. As previously stated, osteophytosis is present on the vertebral column and is especially severe at the junction of L4 and L5. Osteoarthritis is recognizable by slight lipping around the glenoid fossa of both scapulae, and also on the heads of the second and third metacarpals of both hands.

The dental health is not particularly good. Of the 25 teeth still in their sockets, 3 are carious (12%) and antemortem loss has removed the left lower M1 and M3. Calculus is present throughout the tooth set and is marked buccally on the upper premolars and buccally and lingually on the lower incisors. Once again, the upper four incisors are missing and the alveolar process around their sockets entirely resorbed.

Burial No. 3 (Fig. 4)

The cranium of Burial 3 has been damaged on its left side and on its base. The mandible has lost both of its condyles, and the post-cranial skeleton is fragmentary, with only the humeral pair, the right radius & ulna, and the left tibia intact. The vertebral column is well preserved in the lumbar region, but is represented in the thoracic segment by vertebral arches only.

The initial identification of sex by Juwayeyi (1991) was as a female, but closer examination of the fragmentary pelvis and the cranium indicate a male sex. There is no pre-auricular sulcus, a fairly narrow sub-pubic angle and a high well curved iliac blade. The cranium is also high with a narrow and nearly right angled mandibular ramus. Muscle markings on the cranium are generally well delineated and the gonial flare of the mandible is marked. The fact that this was the tallest of the six Mtemankhokwe individuals adds support to its identification as a male.

Age is more difficult to assess because the diagnostic pubic regions are missing. The medial end of the clavicle is fully formed and united to the shaft indicating an age in excess of 25 years. The rib ends do not appear to be

Fig. 3. Facial and left lateral views of Burial 2.

Fig. 4. Facial and right lateral views of Burial 3.

cupped significantly and the corpus of the sternum is free of the manubrium. All sutures of the vault remain patent, and the dental attrition is the least of all six individuals from this site. Although only an estimate, the most likely age at death would have been in the man's late 20's or early 30's.

The health condition of the skeleton is quite good. There is a very mild periosteal reaction on the distal end of the popliteal surface of the right femur. No osteophytosis is present on the available vertebral bodies. Caries is not present on the dentition, but the lower right M1 has been lost ante-mortem and its socket is partially resorbed. The ante-mortem loss on this comparatively young individual is coupled with the development of calculus on the buccal surfaces of all of the upper teeth. The lower molars and premolars are clear of calculus, but the lower incisors and canine are heavily encrusted on both buccal and lingual surfaces.

The most distinctive feature of the dentition of this skeleton is the mutilation of the upper incisors. The two central incisors had been removed some time before death as the sockets of these teeth have been substantially

resorbed. The two lateral incisors are intact, but the alveolar process on their mesial edge is partly resorbed and little bony material is holding the teeth in their sockets. These lateral incisors have been chipped buccally to remove a notch from the crown. The lesions are mirror image bilateral and are clearly not accidental.

Burial No.4

Skeleton 4 is the least complete of the six individuals. Juwayeyi's report indicates that this individual was buried sitting upright. No cranium (nor its fragments) was found. The mandible is present but the post-cranial set is damaged with many missing elements. The left arm is represented only by the distal half of the humerus and the vertebral column consists of C 1-7, T1-5, T12, and L 1-4. The pelvis is damaged and none of the bones of the leg is complete.

The presence of a well preserved mandible but no sign of a cranium is not surprising considering the cemetery had been used for cultivation in recent times. Juwayeyi indicates that Burial 4 was identified at 1.4 metres depth, well below the cultivation zone, but "it took some time before we realized that the few bones - mainly ribs - already recovered were part of a complete burial" (Juwayeyi 1991:30). The cranium had obviously been much higher in the soil column and cultivation practices sometime in the past had allowed its exposure and subsequent loss. This same pattern of cranium loss in an otherwise undisturbed Iron Age sitting burial has been seen in South Africa (Taylor 1979).

Burial 4 is definitely that of a woman. The broken hip bones cannot be aged, but they show wide sciatic notches and minor parturition scarring inside a pre-auricular sulcus. No maximum age at death can be defined, but the union of the medial epiphysis to the end of the clavicles indicates that the woman was fully adult and probably older than 25 or 30 years at death.

Arthritis is the only osteological disorder visible on the skeletal remains. The zygopophyseal joints between the arches of C5 to T1 all demonstrate slight arthritic changes, and the preserved ulna of the right arm has lipping on its humeral articulation. The arthritic problems appear to have been relatively minor and probably did not affect the woman's way of life to any significant degree.

The mandible of Burial 4 is striking because of the extensive ante-mortem tooth loss. Of a total of 16 tooth positions, 11 have been lost antemortem, and the corresponding sockets have been extensively resorbed. The chewing function of the five remaining teeth must have been minimal as only the two left premolars provide an extended occlusal surface and the other teeth (the right canine, right M3 and left M2) are isolated from each other by gaps. All teeth demonstrate moderate wear and the M3 presents some calculus.

Burial No. 5 (Fig. 5)

Burial 5 is represented by a fairly complete skeleton. The cranium is somewhat crushed, with much of the face and base broken. Some distortion is present on the left side due to the crushing of the left frontal region. The

Fig. 5. Facial and left lateral views of Burial 5.

biometric point nasion has been lost. The mandible is well preserved.

The post-cranial skeleton is essentially complete, but quite a number of the bones are broken. Most of the cervical vertebra are broken, but the whole pre-sacral set can be identified. The feet and hands are complete, but the right tibia and both femora are broken at their ends.

The structure of the pelvis of burial 5 identifies it as a

male with a particularly narrow greater sciatic notch and sub-pubic angle. The pubic symphysis is well preserved and indicates an age greater than 36 years (McKern 1970). That the age is well in advance of 40 years is confirmed by extensive cupping at the rib ends complete fusion of the coronal suture and partial fusion of the sagittal suture. Although further age estimates, such as from the radiographic structure of the proximal femur, are not available, the general appearance of the skeleton suggests an age older than 50 years at death.

Osteophytosis is present on the lower thoracic and lumbar vertebra, and is particularly severe on the lower lumbars.

As with the previously described crania, this individual demonstrates tooth mutilation on the anterior maxilla. All four upper incisors have been lost ante-mortem and the sockets are entirely resorbed. The general health condition of the dentition is similar to the other individuals. Caries is present on the left lower M1. The corresponding tooth on the right side had been lost ante-mortem as has been the upper left M1. Severe abscessing is present at the root apex of the lower left M1 and calculus is present on most teeth. Buccal calculus is marked on the lower left canine.

Burial No. 6 (Fig. 6)

The last burial is the best preserved of the series. The cranium and mandible are extremely well preserved, complete with styloid processes and anterior nasal spine intact. Post-cranially most bones are present, including the hyoid. The long bones of the lower limb, although present, are all damaged at the knee and the hip and no lengths can be measured.

The excellent preservation of the pubic area allows identification of this individual as a female and also provides a reasonable estimate of her age. The face of the pubic symphysis appears quite smooth indicating that she was probably in her late 40's at death. Slight parturition scars are evident on the dorsum of the pubis. An interesting anomaly is the presence of an extra thoracic vertebra.

The dentition has once again been mutilated, and all four upper incisors have been lost with substantial alveolar resorption. An interesting note here is that part of the sockets of the lateral incisors are still visible. The evidence suggests that the upper incisors were lost earlier than the laterals. Caries is not present on the remaining teeth, but there are extensive ante-mortem losses other than the upper incisors. The left upper M2 and M3 and the lower right P2 and M1 were lost before death. The right lower central incisor is also missing with some loss of socket alveolar process. Calculus is present on nearly all lower teeth.

The T2/3/4 zygopophyseal joints of the thoracic vertebral arches are moderately affected by arthritis, as is the base of the 4th right metatarsal. Slight osteophytosis is present on the junctions of the bodies of T8/9, T10/11, and on all the lumbars. The bones of the lower limb show some pathological features that may be quite significant in terms of the individual's lifestyle. The left femur, patella and tibia are larger than their

Fig. 6. Facial and left lateral views of Burial 6.

corresponding members. The bones do represent the same individual, but left femur is some 15 mm larger in mid-shaft circumference, and the linea aspera on the right femur is nearly non-existent. The proximal end of the right tibial shaft shows a lateral pathology marked by periosteal inflammation and deposition. If this represents a chronic disorder, it may account for the thinner right limb as bone wastage if the individual actively avoided placing weight on the limb for a long period of time.

Burial 6 also contains some remains of a second individual. The proximal half of a left radius and most of a set of lower limb bones of a smaller individual were excavated with the complete individual. Careful

comparison on the bones confirms that there is no confusion with the thinner femur of the first individual. The lower limb bones consist of a tibial pair (the left tibia is nearly complete and is 347 mm in length), a damaged fibular pair, a pair of tali, the right calcaneus, 10 metatarsals and 6 phalanges. The reconstructed height from the left tibia gives a stature of 1,52 or 1,55 m (depending on sex), both figures of which are well below the 1,59 m calculated for the complete individual.

SEX, SOCIAL STATUS AND ASSOCIATED ARTEFACTS

The analysis of the archaeology of the burials by Juwayeyi (1991) brought to light a number of questions concerning the social identification of the individuals in relation to their burial posture or associated grave goods. In particular, Burials 4 and 5 were assigned the roles of "chief" and "slave" respectively, based on their burial position. Now that the skeletons have been analysed, the sex and age categories can be compared more fully to the burial information.

The six individuals from Mtemankhokwe consist of three males and three females (Burial 3 was incorrectly identified as a female in Juwayeyi's paper). The grave goods associated with Burials 1 to 3 and 6 form an interesting pattern. The males were associated with clusters of arrowheads, while the females were buried with clusters of pots. All individuals wore beads or wire decorations. The inclusion of Burials 4 and 5 cloud this initial clarity. Burial 4, that of an adult woman, has a particularly rich decoration of ivory and iron bangles and also is associated with the largest cluster of 26 arrowheads. Burial 5, that of an older man, has no grave goods at all other than beads. Juwayeyi has suggested that the difference in grave goods between Burials 4 and 5 indicates social status. If this is true, then matrilineal power, or recognition of matrilineal importance, must have been an aspect of the Mtemankhokwe social life. The assumption that Burials 4 and 5 are linked temporally is an interesting one, but in the light of the disturbances evident in the burial sequencing at Nkudzi Bay and the presence of parts of an extra individual with the Mtemankhokwe Burial 6, the assumption of contemporaneity of Burials 4 and 5 may not be correct.

The posture of Burial 6 is unlikely to represent any particular aspect of the death of this individual. The posture is abnormal in that all of the other Mtemankhokwe and most of the Nkudzi Bay burials are extended on their back. One Nkudzi Bay burial, that of the infant number VII, is loosely flexed on its side (Inskeep 1965). Mtemankhokwe Burial 6 demonstrates no osteological features which reflect the terminal illness of the individual, but evidence is present indicating some osteoarthritis and a long term wastage of the right leg.

RECONSTRUCTED STATURE AND POPULATION ORIGINS

No large comparative series of modern crania from south-central Africa is currently available for comparison to the Mtemankhokwe remains. The only excavated skeletons that can be compared are the archaeologically similar series from Nkudzi Bay, but this is a very small sample. Of the 12 burials identified by Inskeep (1965) only three were of adults or near adults and none have been fully published. Brauer (Brauer & Rosing 1989) has included three crania with some measurements from this site, but one is mis-identified and is not from Nkudzi Bay (Livingstone Museum 6408 is recorded in the Museum catalogue as coming from Barotseland), and although the other two are certainly specimens from the Inskeep excavation (Museum number 6709), the burial number has not been recorded for either individual. Brauer has tentatively identified these two individuals as being one male and one female, and his published measurements are included here in Table 5. No statistical comparison is warranted for such small samples, but a comparison of the Mtemankhokwe and Nkudzi Bay data show their basic similarity.

Table 5. Comparison of Nkudzi Bay and Mtemankhokwe.

SAMPLE	Mtemankhokwe		Nkudzi Bay	
SEX	M	F	M	F
n	3	2	1	1
MEASUREMENTS (mm)				
Maximum Cranial Length (L)	185.5	183	190	175
Maximum Cranial Breadth (B)	127.7	128.5	134	-
Basibregmatic Height (H')	-	136	134	127
Least Frontal Breadth (B')	103	92.5	109	92
Bizygomatic Breadth (J)	146	117.5	(138)	-
Prosthion-Basion Length (BPL)	-	-	(72)	60
Orbital Breadth (O_1)	37.7	37.5	46.5	42
Orbital Height (O_2)	35.7	33	36.5	30
Nasal Height (NH)	46.7	47.5	53	43
Nasal Breadth (NB)	27	29.5	35	25
INDICES				
Cranial (100 B/L)	67.3	70.2	70.5	-
Cranial Height (100 H'/L)	-	74.4	70.5	-
Orbital (100 O_2/O_1)	94.8	88.0	78.5	71.4
Nasal (100 NB/NH)	57.9	62.2	66.0	58.1

Each of the Mtemankhokwe skeletons has been used to reconstruct the height of the individual in life (Table 6). The formulae used for this procedure are from Lundy (1983) and Lundy & Feldsman (1987) and are based on South African Negro peoples. Lundy's 1983 analysis showed that the traditional Trotter and Gleser formulae based on American Negro peoples consistently over-estimated the living stature of South African peoples, and that his new calculations were substantially more accurate. Applying these South African formulae to a Central African population is problematic, but these are currently the only formulae available for native African peoples.

Lundy's & Feldsman's calculations can be used for most of the limb bones, but the accuracy is greatest for the long bones of the lower limb. Since these bones are not well preserved at Mtemankhokwe, comparison of heights calculated from different bones and summarising heights calculated from different bones on the same skeleton is difficult. The problem is solved here by multiplying the calculated stature by the square of the r-correlation coefficients (the coefficient of differentiation). This weights the formulae according to their accuracy.

The stature of living Malawian people has been the

Table 6. Height reconstruction.

Burial 1 (male)	Bone	Height	error
	Femur	155.02	+/- 2.80
	Tibia	156.88	+/- 3.44
	Radius	161.82	+/- 3.64
	Ulna	162.92	+/- 3.73
Burial 2 (female)	Bone	Height	error
	Radius	150.30	+/- 3.39
	Ulna	150.64	+/- 3.63
	Humerus	149.33	+/- 3.72
	Tibia	146.60	+/- 4.13
Burial 3 (male)	Bone	Height	error
	Tibia	162.96	+/- 3.44
	Humerus	160.69	+/- 3.83
Burial 4 (female)	Bone	Height	error
	Radius	153.63	+/- 3.39
	Ulna	155.24	+/- 3.63
	Humerus	147.68	+/- 3.72
Burial 5 (male)	Bone	Height	error
	Tibia	157.37	+/- 3.44
	Radius	165.52	+/- 3.64
	Ulna	166.08	+/- 3.73
	Humerus	156.92	+/- 3.83
Burial 6 (female)	Bone	Height	error
	Radius	159.46	+/- 3.39
	Ulna	162.51	+/- 3.63
	Humerus	155.25	+/- 3.72

r^2 corrected average stature for each burial

#1 (Male)	158.9	#2 (Female)	149.3
#3 (Male)	161.9	#4 (Female)	152.3
#5 (Male)	161.2	#6 (Female)	159.1
Average Male	160.7	Average Female	153.6

object of a most interesting study by George Nurse (1968). Nurse collected data on 40,000 Malawian men who had been recruited for various jobs, and he analysed the data according to location of origin (but not ethnic identity) in Malawi. The national average for men in Malawi was 1,6556 +/. 0,582 m, but Nurse noted that the average for men in various parts of the country either exceeded or was below the national average. Nurse's explanation was that the deviations from the national average were due to population origin differences.

The average stature for the Mtemankhokwe men is 1,607 m, well below the national average for modern Malawi. The regions studied by Nurse include 389 men from Fort Johnston District (at the southern tip of Lake Malawi) and 1185 men from Kasupe District on the Shire River below Zomba. The statures in these areas were near the national average (Fort Johnston) or slightly above the national average (Kasupe). Nurse's data show that some 24.7% of men at Fort Johnston, and 19.1% of men at Kasupe, were below 1,60 m, indicating that the smaller stature at Mtemankhokwe is not unrealistic. If we use Nurse's argument that stature reflects the population origins of modern Malawians, then the Mtemankhokwe people either represent a non-Maravi group, or that the modern Nyanja-speaking peoples have undergone a secular trend in stature that has produced substantially larger average heights in modern times. Unfortunately, arguments about origins and secular trends must wait until the South African height reconstruction formulae are checked against living Malawian populations.

DENTAL HEALTH AND DIET

One of the notable features of the dentition of the Mtemankhokwe burials is the relatively poor state of dental health. Every individual presents both calculus and ante-mortem loss of teeth (even if the incisors discussed below are excluded). Three of the individuals have caries, and two demonstrate abscesses on the tooth roots.

The frequency of caries is related to three major factors; genetic susceptibility of the individual, geochemical variations in the local food/water sources, and kind of diet. The presence of fluorine and other cariostatic compounds in the local water source has a great impact on the amount of caries, but if the geochemical background is known and can be corrected for, then comparisons of caries rates between populations will primarily reflect the dietary pattern. It is recognized that agricultural diets with their preponderence of soft and sticky foodstuffs, tend to be extremely cariogenic (Turner 1979). If caries are prevalent, ante-mortem loss of diseased teeth is a frequent result.

Turner (1979) has compared the frequency of dental caries in samples drawn from populations with different economic backgrounds and has noted the frequency of carious teeth to be 1.6% of the total tooth number for 12 hunter-gatherer samples, 5.1% for 13 samples with mixed economies (agriculture supplemented by hunted and gathered foods) and 10.4% for 32 samples of populations whose food sources are entirely agricultural. Turner speaks of a 2% non-agricultural threshold below which a purely hunting and gathering people can be identified. Traditional pastoralists also are very active hunters and gatherers and therefore will also fall within this range.

For the case of the Mtemankhokwe skeletons, there are some possible African examples for comparison. Morris (1992) has described the pattern of dental disease amongst the Riet River and Kakamas peoples (late pre-historic and proto-historic groups of herders in the middle Orange River valley) and amongst the Griqua (an early historic group of agro-pastoralists with access to refined foods from the Cape Colony). Other comparative samples can be drawn from the San of the Kalahari (Van Reenen 1964), from the urbanizing South African Negro populations of the Witwatersrand in South Africa (Staz 1938), and from the data provided by Walker & Hewlett (1990) on Central African pygmy foragers and neighbouring Bantu-speaking farmers.

Tables 7 and 8 compare the caries and ante-mortem loss rates in these various populations. The Kakamas and Kalahari San demonstrate the very low caries rates for hunter/herder populations in high fluorine environments, both well below Turner's non-agricultural threshold. The Riet River people who live in a lower fluorine environment have an elevated caries level, and a slightly elevated rate of ante-mortem loss. The Griqua also have an somewhat elevated caries and substantially elevated ante-mortem loss rate, but because they are in a relatively

Table 7. Comparative caries incidence.

	number indivs	% indivs with caries	total teeth	% teeth with caries	av. # of carious teeth per mouth	Ref
Riet River	46.5*	41.7	1061	4.3	1.0	1
Kakamas	42.5*	18.8	989	1.3	0.3	1
Kalahari San	104	7.7	3335	0.5	0.2	2
Griqua	26	42.3	575	5.2	1.2	1
Rural S.A.Negro	300	38.3	9226	2.3	0.7	3
Urban S.A.Negro	300	90.0	9178	14.3	4.4	3
African Pygmies	184	-	5149	5.6	1.6	4
Zaire Bantu	21	-	630	8.1	2.4	4
Mtemankhokwe	5.5*	83.3	115	5.2	1.0	5

* some individuals represented by mandible or maxilla only.

References
1) Morris 1992
2) Van Reenen 1964
3) Staz 1938
4) Walker & Hewlett 1990
5) this study

Table 8. Comparative ante-mortem tooth losses.

	number of indivs	% of teeth lost ante-mortem	average number of ante-mortem losses per mouth	Ref
Riet River	46.5*	6.1	2.0	1
Kakamas	42.5*	4.1	1.3	1
Griqua	26	17.0	5.4	1
African Pygmies	184	11.9	3.8	2
Zaire Bantu	21	5.4	1.7	2
Mtemankhokwe	5.5*#	17.6	5.6	3

* some individuals represented by mandible or maxilla only.
\# extracted incisors not included as ante-mortem losses.

References
1) Morris 1992
2) Walker & Hewlett 1990
3) this study

high fluorine area, this does reflect the introduction of agricultural food and sugars (Morris 1992). Staz's (1938) data for non-urbanized Negro populations is lower than the Griqua sample, but the relatively high number of affected individuals demonstrates the agricultural link between the two. The diet of these rural African people is based on a staple of cereal maize and sour milk and it is probably only the fairly high dental attrition rate and perhaps a higher fluorine level that has allowed the caries incidence to remain low. Both the Central African pygmy and the neighbouring Bantu-speaking groups rely heavily on agricultural foods and this is reflected in the relatively high caries percentage. Although the pygmies are primarily hunters, their trade with their neighbours has introduced a great deal of agricultural products (Walker & Hewlett 1990). The very high number of ante-mortem losses amongst the pygmy groups is due to the habit of decorative tooth chipping which seems to predispose these teeth to dental decay and exfoliation. Of the teeth lost amongst the Mbuti, 59% are incisors (Walker & Hewlett 1990).

The Mtemankhokwe individuals seem most to resemble the Griqua sample. The overall caries rate is 5.2%, and 17.6% of teeth have been lost ante-mortem. The average number of ante-mortem losses per mouth is nearly the same as in the Griqua sample. Table 9 summarizes the disease pattern by tooth type and emphasizes the similarity of Mtemankhokwe to the Griqua. In non-agricultural peoples, the 3rd molar is the tooth most frequently affected by caries and incisors and canines tend to be fairly disease free. When agricultural foods are involved, the 2nd molar is most frequently involved, but it is 1st molar that is most commonly carious in European samples where the amount of occlusal attrition is very reduced and the food sources are

Table 9. Dental disease by tooth type.

NUMBER OF CARIOUS TEETH (Jaws combined)

	Riet River		Kakamas		Griqua		Mtemankhokwe	
	n	%	n	%	n	%	n	%
I1	0	0.0	0	0.0	3	10.0	0	0.0
I2	0	0.0	0	0.0	1	3.3	0	0.0
C	0	0.0	1	7.7	3	10.0	1	16.7
P1	3	6.5	1	7.7	3	10.0	0	0.0
P2	7	15.2	0	0.0	4	13.3	0	0.0
M1	5	10.9	4	30.8	5	16.7	3	50.0
M2	14	30.4	3	23.1	7	23.3	1	16.7
M3	17	37.0	4	30.8	4	13.3	1	16.7
TOTAL	46		13		30		6	

NUMBER OF TEETH LOST ANTE-MORTEM (Jaws combined)

	Riet River		Kakamas		Griqua		Mtemankhokwe	
	n	%	n	%	n	%	n	%
I1	6	6.3	7	13.0	18	11.8	4	12.9
I2	5	5.3	8	14.8	15	9.9	2	6.5
C	2	2.1	7	13.0	15	9.9	3	9.7
P1	9	9.5	5	9.3	16	10.5	1	3.2
P2	9	9.5	7	13.0	19	12.5	3	9.7
M1	19	20.0	4	7.4	23	15.1	10	32.3
M2	21	22.1	4	7.4	26	17.1	4	12.9
M3	24	25.3	12	22.2	20	13.2	4	12.9
TOTAL	95		54		152		31	

refined Staz (1938). Mtemankhokwe shows this pattern very well.

Juwayeyi (1991) has provided evidence that the Mtemankhokwe people were the ancestors of the living Nyanja-speaking people of southern Malawi and were agriculturalists who grew sorghum, millet and maize but also hunted. A mixed agricultural diet with a substantial input of hunted foods does seem to be likely from the evidence of diet as seen through dental disease.

TOOTH MUTILATION AND ETHNICITY IN SOUTH-CENTRAL AFRICA

Two patterns of tooth removal and mutilation are seen at Mtemankhokwe. The two upper central incisors of Burial 3 have been removed and the state of the tooth sockets indicates that resorption of these sockets was well underway at the time of death. The two lateral incisors are intact but each tooth has been chipped on its buccal surface to remove a notch from the crown. Each notch has removed about half of the occlusal surface of the tooth and given the tooth a stepped appearance. The alveolar process on the mesial edge of both lateral incisors has begun to resorb and the lateral incisors have rotated distally in their sockets (Fig. 7). The second pattern of mutilation at Mtemankhokwe involves the removal of all four upper incisors. Burials 1, 2, 5 and 6 have been treated in this manner.

If we examine the age at death of these five individuals, it becomes apparent that only one pattern of mutilation is present, and that the loss of the lateral incisors is a factor of progressive alveolar loss, not of intentional extraction. The youngest individual (Burial 3), in his late 20's or early 30's, retains his chipped lateral incisors, but already at his age, the loss of the central incisor alveolar process has altered the support for the more lateral teeth and they have begun to twist in their

Fig. 7. Close up of tooth mulitation on Burial 3. Facial and palatal views.

sockets. This process has progressed in Burials 1 (in his 30's at death) and 6 (in her late 40's at death), and the alveolar process of the lateral incisors has resorbed to the state where the teeth have been exfoliated. In both cases the sockets for the root tips are still present but the teeth are gone. Burial 2 (female) and Burial 5 (male) were both over 50 years old when they died, and the progression of alveolar loss has resulted in the complete removal of the sockets for the lateral as well as the central incisors. Burial 5 has the most extreme pattern of resorption, and the socket of the right canine is also partly resorbed with the ante-mortem loss of that tooth as well (Fig. 5). The presence of calculus on the teeth of all of these individuals must have added periodontal disease to the oral environment and this would have enhanced the speed of resorption of the tooth sockets.

The age at which the mutilation occurred cannot be directly identified. The central incisor sockets of Burial 3 were still not completely resorbed by the age of late 20's or early 30's, which suggests that removal did not occur at a time long past and that a removal age perhaps in the late teens or early 20's was likely. Van Reenen (1986) records the timing of this event for people in northern Namibia and indicates that it is variable. Most Kavango, Ovambo and Herero practioners operate when the child has just reached puberty, but some Kavango groups delay the process until puberty is well advanced because the operation is less painful the longer it is delayed.

The single pattern of dental modification at Mtemankhokwe appears to have been the removal of the two upper central incisors and the concomitant chipping of the buccal edges of the lateral incisor crowns. This particular pattern has not been recorded in the literature. Most Central African mutilations do not involve removal of teeth, but instead concentrate on a pattern of tooth chipping (Konnild n.d., Walker & Hewlett 1990). The removal of the lower incisors (and sometimes the canines as well) is much more established in East Africa where it corresponds strongly with the presence of Nilotic groups. Konnild (n.d.:30) goes so far as to state that "the removal of all of the lower incisors has a significant influence in the pronounciation of the Nilotic languages" and that the accepted pronounciation requires the removal of these teeth.

Konnild's (n.d.) extensive review illustrates that the upper central incisors are a frequent target of the mutilators, but that the removal of these incisors seems to be rare except in North African archaeological sites older than 4000 years ago. The most similar pattern of maxillary incisor removal seems to be among the Tonga people of the plateau region of southern Zambia (Werner 1906; Colson 1958). Of importance here is that it is done on both boys and girls.

The reason for mutilating or extracting the anterior teeth can be as decoration, as a mark of ethnic (tribe or class) identification, or as a rite of passage. The striking feature of the Mtemankhokwe mutilations is that all five cases are the same, for both men and women. Where the mutilation is for purposes of decoration, the patterns seen vary substantially from individual to individual. Colson, in her discussion of the Tonga people (1958), describes how the tooth removal is done as a rite of passage for both boys and girls shortly before puberty. The passage through this rite is critical to the social well-being of the individual, and Colson remarks that a girl cannot successfully be secluded at puberty if her teeth are not removed. Colson is of the opinion that use of this maturation rite for both boys and girls has the significance of marking the initiation of children into the community and that the pattern of removal is considered to be a special mark of the Tonga (Colson 1958:277). With the opening up of Tongan society to the wider Zambian community, the custom of tooth removal has stopped. The specific pattern of mutilation at Mtemankhokwe strikes me as being similar to the Tongan case. The removal, probably done as a rite of maturation, probably represents an element of ethnic identification.

SUMMARY

The six human skeletons from Mtemankhokwe represent the remains of the people of southern Malawi who lived during the late 18th or early 19th century. Archaeological evidence suggests that they were probably the ancestors of the modern Nyanja-speaking peoples. All six were adult, three men and three women. Four of the individuals demonstrate small amounts of osteoarthritis, but this should not be considered abnormal, for only one individual (Burial 3) was relatively young. The people of Mtemankhokwe were shorter than the average modern Malawian, but this remains to be verified with reconstruction formulae corrected for the local Malawian populations.

The rather poor dental health of these people is typical of agricultural peoples. The most distinctive dental feature is not the disease profile, but the dental mutilation pattern. The five crania present in the series all demonstrate the same mutilation pattern - the removal of the central incisors and probably the chipping of the buccal edges of the lateral incisor crowns.

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