

SUDAN & NUBIA

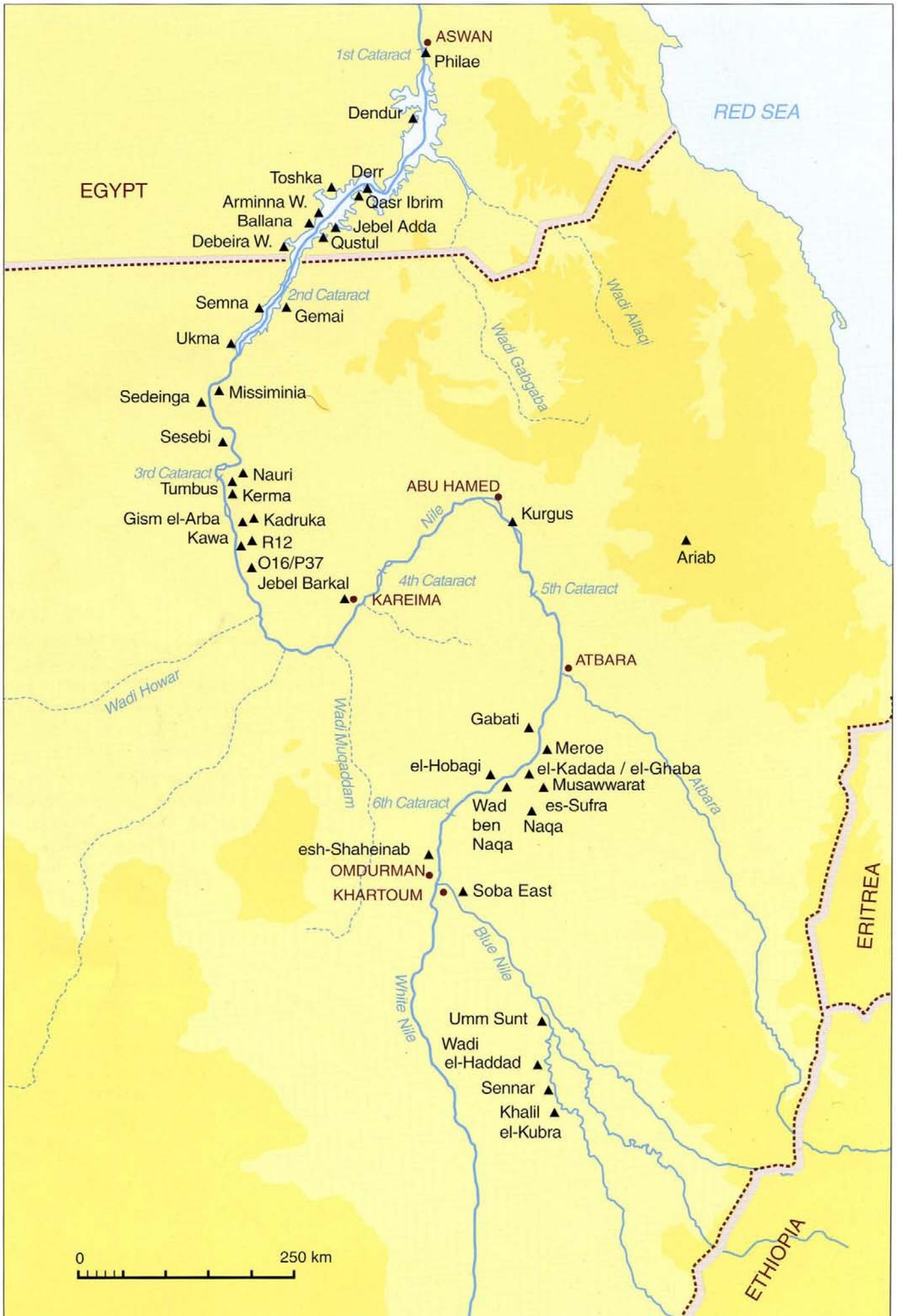
The Sudan Archaeological Research Society



Bulletin No. 5

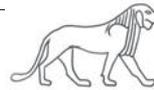
2001





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Front Cover: Beaker for funerary libation from el-Kadada, chalice shape, with incised geometric decoration, fired clay. Excavation n° KDD 76/3/59.

Introduction

Vivian Davies

The appearance of this, the fifth, issue of the Bulletin coincides with the tenth anniversary of our Society's founding. It has been an extraordinary first decade, remarkably productive in terms both of fieldwork and publication - one in which we have worked closely with our colleagues in the National Corporation for Antiquities and Museums of the Sudan to fill gaps in the archaeological record and meet, wherever possible, the threats posed to archaeological sites by modern development. We have organized and supported eight major field-projects (in Soba East, the Northern Dongola Reach, Kawa, the Shendi-Atbara Reach, Gabati, the Bayuda Desert, the Fourth Cataract, and Kurgus) and published five memoirs (two others are in press at the time of writing), as well as *Sudan & Nubia*, an annual bulletin of reports 'fresh from the field'. Furthermore, we have held each year an international colloquium on current fieldwork and research, and we now additionally host the annual 'Kirwan Memorial Lecture', in memory of our distinguished first President.

The considerable funds needed to carry out this extensive programme have been forthcoming most substantially from the Bioanthropology Foundation and the British Museum, upon whose generosity we continue to rely, as we do also on that of the Society's individual Patrons. We intend to mark the Society's achievements with a special publication to be issued in the coming year. As to the future, the reports in this volume, on sites ranging in date from the Neolithic to the Mediaeval Period, amply demonstrate the huge potential for important new discoveries and scholarly progress in our area of interest, both in Sudan and Egypt, promising a second decade as exciting and rewarding as the first.

Palaeotrauma: a profile of personal injury during the Kerma Period

Margaret Judd

Interpersonal and collective violence plagues our global society and, lest we try to ignore it, media representations assault our waking moments. Injury, not caused by intentional violence, is also reported - especially incidences with tragic outcomes, for example, transportation accidents, sporting events, and occupational hazards. Fortunately, we are spared reports of the mundane injuries that reflect the daily mishaps of the individual due to our failing health, our inability to get along with others, our awkwardness, and perhaps our comic misfortune. Trauma, whatever the aetiology, is part of our daily lives, and by analogy, this must have been true for past societies.

While some people are in fact susceptible to injury, whether through lifestyle, clumsiness, or physiology, entire cultures may also exhibit unique injury profiles that reflect their environment, social structure, worldview, economy, and health. For example, was interpersonal violence and abuse more prevalent in an egalitarian society? Was daily living more difficult before industrialisation? Was one group susceptible to multiple injuries, which may indicate an occupational risk or propensity for physical aggression? Were there differences in injury patterns between males and females, or city and country folk? In order to answer these and many other questions that we have about a specific ancient society, it is essential that skeletal samples from other cultures, sites, and eras be compared. Our own society, in particular, provides an effective model with which to contrast human palaeotrauma.

In this investigation nonfatal trauma among the rural and urban people of the Kerma culture is explored. The ancient city of Kerma, home of the earliest state power that dominated Upper Nubia, was located just south of the Nile's Third Cataract in a strategic position that monitored trade between Egypt, Central Africa, and the Red Sea from 2500 to 1520 BC when Thutmose I of Egypt destroyed it. George Reisner (1923a; 1923b) of the Harvard-Boston Expedition excavated parts of the Kerma site, including the cemetery, in 1913-1916. The skeletal sample recovered is now curated at the University of Cambridge's Bioanthropology Department and 212 individuals from this collection comprised the urban component of this investigation. The rural sample was excavated from two small cemeteries, sites O16 and P37, during the SARS Northern Dongola Reach Survey (NDRS) from 1994 to 1997 and consisted of 55 individuals, who now reside at the British Museum in the Department of Ancient Egypt and Sudan.

Determining the injury mechanism

The fundamental question when assessing trauma aetiology is whether or not the injury was due to violence or accident - but how can this be determined from skeletal remains? We are unable to interview the patient, there is no dossier describing their medical history, and witnesses to the event are unavailable. Bioanthropologists are further restricted in the assessment of nonlethal injury by the absence of soft tissue in most samples, which might record evidence of contusions, haematomas, and lacerations, which typically represent 70% of assault lesions (e.g., De Souza 1968; Ebong 1978; Mock *et al.* 1995; Muelleman *et al.* 1996; Shepherd *et al.* 1987). Therefore, we must rely on the injury pattern visible on the skeleton - that is the type of injury, injury location, and number of lesions.

Certain injuries are associated with interpersonal violence in clinical practice and forensic investigations. These include (Jurmain 1999, 214-215; Jurmain and Kilgore 1998; Maschner and Reedy-Maschner 1998; Walker 1989):

1. multiple lesions at various stages of healing due to habitual or severe assault.

2. skull injuries:

- a. blunt force injury, which is attributed to a direct blow to the skull. A low velocity blunt object, such as a rock or club, which creates a localised crushed depression at the point of contact, causes this injury.

- b. penetration injury, which is created by a high velocity sharp object that penetrates the skull and leaves very sharp edges perpendicular to the skull vault.

3. direct force ulna fractures, more commonly known as the 'parry' or 'nightstick' fracture. These fractures are deemed to be the outcome of raising the forearm in front of the face to divert an incoming blow to the head. This injury typically occurs on the distal end of the ulna and its neighbouring bone, the radius, is not usually involved. This is because the ulna protects the radius when the arm is raised and thus absorbs the full impact of the blow (Richards and Corley 1996, 912). Alternatively, the attacker may suffer the forearm injury if their forearm delivering the blow is volleyed by a defensive gesture.

Once the skull and parry fractures have been isolated a broad spectrum of other types of injury that may be due to any number of injury mechanisms remain for description and interpretation.

State-sanctioned violence at Kerma

Anthropological research in our own and other modern cultures reveals that certain aspects of a society's infrastructure, which may be represented by material culture, are seen as indicators of the society's propensity for interpersonal violence and some societies, therefore, are more aggressive than others through social learning. Such characteristics include initiation rites, such as male and female circumcision;



criminal punishment; infanticide; ritual; child rearing practices; treatment of animals; torture of captives; polygynous marriage; military or religious subcultures; and methods of conflict resolution (Levinson 1989). At Kerma, some of these factors were manifest in the archaeological record in addition to the more obvious representations of state warfare, such as fortifications, weapons, victory monuments, and artistic depictions.

The city of Kerma began as a bustling village, but became fortified with a system of walls, ditches three to six meters deep, gates, and towers by the Kerma Moyen period, about 2000 BC (Bonnet 1994). Earlier evidence of Kerma's evolution to a more complex society and power to be reckoned with was recorded in the biography of the Egyptian merchant, Harkhuf, about 2200 BC. His inscription chronicled his first two trade expeditions through various provinces south of Egypt that were each governed by a chieftain; on his final visit, a solitary ruler controlled the land and granted permission for Egyptians to trade on his soil (Breasted 1962, 154). The ancient Nubians were renowned for their prowess with the longbow and were drafted as mercenaries into the Egyptian army as early as the Egyptian Old Kingdom (Fischer 1961). While many warriors were likely buried where they fell during battle, weapons that accompany burials may identify individuals that survived conflicts and died at home; for example, one young male from the Kerma cemetery was buried clasping his bow (Bonnet 1990a). Other males of the Kerma Classique period retained their bronze daggers by their sides (Reisner 1923b) in the grave.

Perhaps the most striking evidence of Kerma's success was not found at Kerma, but down river at the Second Cataract. A system of 11 Egyptian forts was developed with colourful names, such as 'Warding off the Bows' and 'Curbing the Countries.' These forts were designed to prevent the growing Nubian expansion into Egypt (Watterson 1997, 55). Kerma reciprocated on the Eastern front by constructing a surveillance fort 18 miles inland to monitor trade and military activity (Bonnet *et al.* 1993; Kendall 1997).

Ritual violence was evident in the funerary programme. Humans were dispensable as burial retainers within the Kerma society, when 'sacrificial corridors' that contained hundreds of people bisected the burial tumuli of the royal families (Bonnet 1990c; Kendall 1997; Reisner 1923a). Smaller burials surrounded these royal graves and emulated them on a less grandiose scale. The main burial was placed on an ivory or mica inlaid bed on the south side of the tomb and was surrounded by an array of other humans. These auxiliary burials were interpreted as human sacrifices, but whether these individuals were members of the king's entourage, heroic volunteers, or prisoners of war is a mystery. The Egyptians, who were so fond of reporting the atrocities and barbaric customs of their neighbours, remained silent on this subject. Signs of violent perimortem trauma were absent and it is proposed that the people sacrificed themselves willingly or perhaps were aided by a strong narcotic (Kendall 1997).

Humans were not the only sacrifice. Animals, usually sheep or goats, accompanied the deceased, although occasionally a dog was included. These animals were typically placed on the west side of the grave pit and retained their lead or head-dress. Again perimortem violence was not observed. Surrounding the surface of the tumulus was a crescent of bucrania (cattle frontal bones with horns), as many as 4000, in some cases (Louis Chaix, pers. comm.). Cattle were indeed important to this culture, both economically and ritually, but like humans, they too were dispensable.

The militaristic material culture coupled with socially sanctioned ritual deaths implied that state-sanctioned violence (as defined by our modern Western standards) was condoned among the Kerma inhabitants. When the results of this skeletal analysis were compared to trauma studies from other Egyptian and Nubian sites that dated from the Neolithic to Christian periods (Alvrs 1999; Anderson 1968; Kilgore *et al.* 1997; Podzorski 1990; Smith and Wood-Jones 1910) (Table 1), the skull and direct force ulna injuries were more prevalent among individuals from the urban cemetery at Kerma. The people of Kerma, therefore, appear to have experienced a more physically aggressive lifestyle in their daily lives when contrasted to other temporally diverse cultures of the ancient Nile Valley.

Table 1. Comparison of violence-associated injury frequencies among Nile Valley skeletal samples.

Site	Ulna	Skull	Combined
Kerma	7.6	9.4	17.0
Sahaba	10.6	0.0	10.6
Naga-el-Der	0.6	0.2	0.8
Semna South	1.9	13.1	15.0
Kulubnarti	15.1	0.0	15.1
ASLN	0.5	0.3	0.9

Comparison between the rural and urban Kerma groups

Although the rural hinterland south of Kerma was not known to be a major exchange depot for Egyptian trade, the rural dwellers interacted with the Kerma traders and adopted many aspects of the popular urban culture such as pottery design, burial practices, and ritual (Gratien 1999; Welsby 1996; 1997). It was not surprising, therefore, that the frequency of nonlethal interpersonal violence among the rural dwellers was comparable to that of their urban neighbours. When the two skeletal samples were compared (Table 2) the following observations were made:

- injuries due to interpersonal violence were present at both sites and the frequencies were not significantly different (Judd 2000);
- males suffered from more skeletal injuries from all

causes than females in both samples;

- males and females from the rural sites experienced more injuries than the individuals from the urban city of Kerma;

- the difference in the frequency of multiple injuries, which included the ribs, vertebral column, thorax, hands and feet in addition to the skull and long bones, was most dramatic. The variation in multiple injuries was due to the increased occurrence of radial and lower leg injuries among the rural males, as well as numerous hand and foot injuries among both rural males and females.

Table 2. Distribution of injury frequencies associated with interpersonal violence among NDRS and Kerma adults.

Injury	NDRS Males	NDRS Females	Kerma Males	Kerma Females
Skull	31.6	11.8	14.5	9.0
Ulna	17.9	3.7	15.1	2.3
Long bones	39.3	22.3	25.8	12.3
Multiple injury	71.4	51.9	23.7	13.8

These observations conform to the model presented by modern clinical research in our own society - similar levels of violence exist at the acquaintance level among all groups of the same culture owing to a common ethos, regardless of location (Poole *et al.* 1993; Websdale 1998, 55-56; Williams *et al.* 1997; Wladis *et al.* 1999). Also in keeping with the clinical model was the fact that male injuries were more severe and were more frequent than injuries to females for both samples.

The parry fracture was the most common long bone injury between both groups. The appearance of the fracture was similar for all of the fractured ulnae (Plate 1), which suggests a common aetiology. Classic injuries identified with breaking a fall are those to the forearm, particularly the radius, or outer bone. When pronated, in order to break the fall, the radius snaps over the inner bone or ulna (Loder and Mayhew 1988; Rogers 1992, 841-842). Injuries to the bone shaft that are caused by a fall are identified by an oblique fracture line ($>45^\circ$), and may be measured from a radiograph, or even from the bone itself. In some cases, both bones will break and result in severe rotation unless properly set. This is a result of the proximity of the fracture in relation to the *pronator teres* muscle that pulls one half of the broken radius across the ulna; continuous movement may result in the fractured bone failing to unite (Plate 2).

Similar injuries also appear on the lower leg should one go over on their ankle. These injuries were expected to occur in this environment where reliance on the Nile River presented an obstacle to those inclined to falls and poor footing. However, because the lower leg does not incorporate a muscular mechanism that permits it to pronate like the forearm, the linear distortion is not nearly as severe. Other long bone lesions observed are also typical outcomes of falls.



Plate 1. Direct force distal ulna fractures showing common morphology.

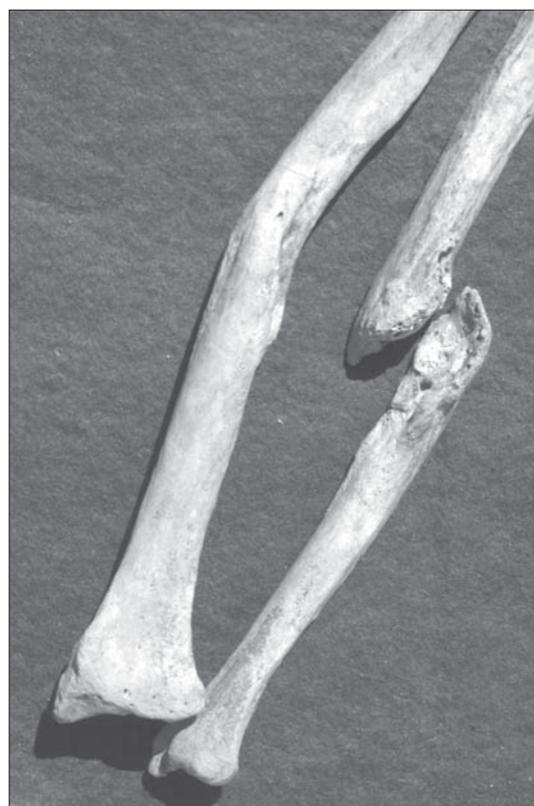


Plate 2. Ununited forearm fracture due to opposing muscle actions.



Should the force transmitted on contact of the fall travel up the arm to the shoulder area, the clavicle (collarbone) will snap at its weakest point on the central shaft rather than force the stronger ligamental attachments at either end of the clavicle to move (Dandy 1993, 182). In contrast, when the clavicular fracture occurs at the junction with the sternum, a fall onto the shoulder is indicated - the clavicle shifts into, and slightly in front of, the sternum resulting in a crush injury (London 1991, 23) (Plate 3). In all cases, however, one cannot ascertain the cause of the fall - was it an accident or was the individual pushed?



Plate 3. Sternoclavicular fracture.

The lower frequency of injuries due to falls among the people of Kerma may be explained by the differences between urban and rural activities and work areas. Nonfatal occupational fractures are more prevalent among people who work in primary industries, such as timbering, mining, and agriculture, where heavy equipment, treacherous terrain, and close animal contact are high risk factors (Barber 1973; Björnstig *et al.* 1991; Busch *et al.* 1986; Pratt *et al.* 1992).

The possibility of sports-related injuries cannot be ignored, as the Nubians were renowned for their archery and wrestling abilities, which were often depicted in Egyptian art (e.g., Carroll 1988; Filer 1997; Fischer 1961). Two males suffered from oblique midshaft humeral fractures and in both cases the distal humerus was angled medially and posteriorly in relation to the proximal segment. The oblique nature of the fracture indicates that a torsional twisting force was involved, which occurs as a routine injury from arm-wrestling (London 1991, 26-27).

Multiple trauma

Further evidence for a less demanding lifestyle among the urban dwellers exists in the distribution of injuries (Fig. 1).

A sizable majority of urban people, 59%, did not suffer from any trauma whatsoever, while among the rural group the opposite was true - 63% bore two or more injuries. Seventy percent of the urban individuals were excavated from the royal tombs and probably experienced a longer, more genteel lifestyle in keeping with their status as members of the royal family, administrators, court personnel, business people or religious specialists, although some had military affiliations that predisposed them to an earlier death (Bonnet

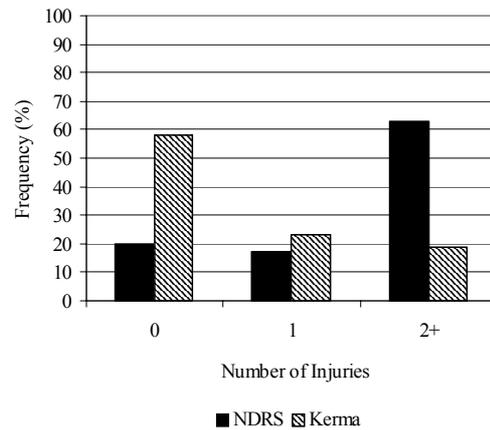


Figure 1. Injury distribution for Kerma and NDRS.

1990b). The urban bureaucrats or even the household slave most likely enjoyed a more comfortable existence than the working-class family who had greater contact with the daily environmental hazards of the Nile River, desert terrain, and domesticated animals. A similar pattern was observed in the colonial southern United States where rural antebellum slaves suffered more severe and frequent injuries from heavy manual and agricultural labour in contrast to the injuries observed among domestic slaves in the city (Owsley *et al.* 1987).

The disparity in the frequency of multiple trauma was further emphasised when the injuries were distributed by age for both of the sites (Fig. 2). People from the rural site sustained higher levels of injuries for each age group, with the oldest adults exhibiting the highest frequency of multiple injuries. This upholds the clinical premise that older people will experience more injuries as they have been exposed to more years at risk - younger people, therefore, should have fewer injuries, all other factors such as occupation and environment being constant. It is well known that modern agricultural workers labour well past the retirement age that most of us enjoy and this increased risk time, combined with the increased occupational risk of farming, exposes them to even greater injury risk (Purschwitz and Field 1990).

The decreased number of injuries among the older urban people contrasts sharply with the rural group and the clinical model, which again implies that city dwellers benefited from a less arduous lifestyle and a limited exposure to trauma risk throughout their lifetime. Among the older groups, none of the fall-related injuries observed were due to old age, where loss of bone mass predisposes the weakened bone to

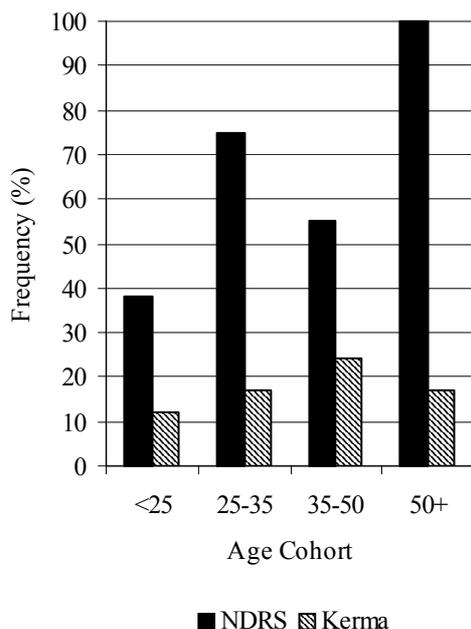


Figure 2. Multiple injury distribution for age for Kerma and NDRS.

fracture during falls, which are thought to be more frequent due to age-related sensory deterioration (Buhr and Cooke 1959; Stini 1990). These osteoporotic fractures are typically located at the hip or distal forearm; the bone is very light-weight and the fracture poorly healed.

Injuries to the hands and feet

The addition of the small hand and foot bones created a higher prevalence of multiple fractures among rural individuals for both sexes. Among the Northern Dongola Reach Survey sample 24% of the adults suffered from multiple hand injuries and 18% sustained multiple foot injuries. In contrast, only one individual, or 0.5%, of the urban group, exhibited multiple injuries for each of the hands and feet. Because the physical environment was identical for both groups, a behavioural explanation must explain the discrepancy. The high frequency of hand and foot injuries in the rural sample is not unreasonable when compared to modern clinical and nonhuman primate research that found the hands to be the most frequently fractured region when all injury locations were considered (e.g., Barton 1988; Bramblett 1967; Lovell 1990). Variation in activity and occupation may explain this finding, but injuries encountered during physical confrontation were also implicated, particularly when more than one element is involved.

In clinical practice, most adult victims of physical assault claim to suffer injuries from a punch, hit, push, or kick and, therefore, some injuries must appear on the extremities of the person delivering the blow (Shepherd *et al.* 1990). Common injuries are caused by holding or twisting the hand, parrying a weapon with the side of the hand, and human or animal bite injuries on the fingers (e.g., Ip *et al.* 1996; Jonge *et al.* 1994; Mock *et al.* 1995).

While some of the hand injuries were likely the result of striking or absorbing a blow, the blow may not necessarily involve another individual or it may be delivered in a socially acceptable venue, for example, competitive sports such as stick fighting, boxing or wrestling, or even play. It is most important to realise that injuries to the hands and feet can be the result of any number of injury mechanisms, and discrete extremity injuries are not really conclusive evidence of interpersonal violence.

Skull injuries

A small number of males sustained penetration injuries caused by a sharp object, such as a stick or spear. The pattern of injury among the Kerma people contrasted with clinical findings on assault. In our society, the face is the most frequent target of injury resulting in a fractured nose, jaw or cheek bone, particularly among females (e.g., Greene *et al.* 1997; Mwaniki *et al.* 1988; Shepherd *et al.* 1988). Among the Kerma period samples the majority of skull injuries occurred on the side or front of the skull, which represents an injury pattern unique to the culture. Depression fractures caused by a blow from a blunt object were the most common injury for both sexes. Although the location of the injury was similar between the two samples, the severity of the injury was distinct. The urban depression lesions tended to have well-defined edges that averaged 4cm² in area and ranged to 13cm² (Plate 4).



Plate 4. Kerma skull injury.

The rural skull injuries, in contrast, were very shallow depression fractures that measured up to 4cm² and were on average 2cm² in area. A modern clinical study of Samoan individuals with injuries received from thrown stones revealed that the victims survived and that the healed injuries ranged from 7 to 33cm² in area (Judd 1970). While the size of many of the urban skull injuries fell within the observed clinical



findings, the size range of the skull lesions among the rural group was well below the average. These people either used much smaller stones as a weapon, or some other interpretation is necessary.

Choice of weapon

Injuries caused by the hands and feet are widespread in clinical reports of nonlethal violence, although individuals involved in spontaneous physical conflict often grab any object close at hand, such as a traditionally carried stick or knife, stone, coconut or household item (e.g., Babapulle *et al.* 1994). The choice of weapon varies with the biological sex of the assailant and intended victim. Some societies develop rules for acceptable interpersonal violence as a method of resolving disputes and this will influence the observable injury pattern. The indigenous Australians of Mangrove, for example, sanction the use of gender-specific weapons, such as a 3-foot long women's fighting stick, to strike or block blows and limit the targets to the legs, arms and fingers - striking the head and chest is strictly forbidden (Burbank, 1994).

In ancient Nubia, any common object, such as a staff, throw stick, rock, pottery vessel, or axe was eligible for use as a weapon to inflict injury and may account for the more severe lesions among the residents from Kerma, since injuries produced by the hands and feet would be less prominent. In 1910, Smith and Wood-Jones proposed the use of a staff as a weapon in ancient Nubia based on ethnographic observation during their Archaeological Survey of Ancient Nubia. Since then artistic evidence of the use of the staff as a fighting tool has been discovered in early Nubian and Egyptian depictions of sport and battle, as well as representations of mock scrimmages of boatmen wielding their punting poles against each other (Carroll 1988; Filer 1997). The staff was also present in Egyptian art as a traditional walking companion for males, an emblem of male authority, a crutch or postural aid, or a male accessory, and thus a very convenient weapon - at least among males (Loebl and Nunn 1997). The hard wood throwing sticks, measuring up to 76cm accompanied several Kerma burials and were a valued possession among the Egyptian elite males since the 4th millennium. They were frequently depicted in hunting scenes, but may have been burnished as weapons in this culture (Kendall 1988).

A second factor influencing weapon choice at Kerma may have been the desire of the elite to emulate the actions of the ruler, and the severity of some of the urban skull injuries may be connected to the urban social hierarchy. The pharaoh's act of 'smiting the forehead' with a mace head, battleaxe, or sword to subdue the enemy was a frequent theme throughout Egyptian art and textual sources, the most renowned being the Narmer palette dated to about 3000 BC (Filer 1997). The urban elite, many of whom were Egyptianized Nubians during this later period, may have imitated this practice on a less deadly scale as a method of

exerting power over their minions. This mimicry would also explain the high proportion of skull vault injuries over facial injuries as the preferred target.

Additional support for this interpretation rests with the burial distribution - the male and female retainers interred in the sacrificial corridors of Kerma's royal tumuli bore a higher frequency of skull injuries than the individuals buried in the elite burial vaults or smaller subsidiary burials. The abundance of the extremity and minor skull injuries observed among the rural group, in contrast to the more severe skull injuries and paucity of extremity injuries experienced by the adults from Kerma, may reflect a variation in weapon choice that was influenced by social position, if some of the injuries observed, particularly those to the skull, were indeed due to interpersonal violence.

Conclusions

The politically and economically expansive Kerma period and its 'culture of violence' exhibited in the archaeological record may have influenced the higher levels of violence-related injuries that were observed among both rural and urban Kerma communities in comparison to the injury profile of other ancient Nile Valley groups. The distribution of skull injuries for the Kerma people was contrary to the clinical model - the skull vault sustained the majority of injuries as opposed to the face - a deviation that may have reflected a cultural preference for inflicting injury. The severity of these skull injuries was greater at the urban site of Kerma and indicates that sturdy inanimate objects were more frequently brandished to inflict injury on the urban people and may reflect a status-related choice of weapon.

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Bibliography

- Alvrus, A. 1999. 'Fracture patterns among the Nubians of Semna South, Sudanese Nubia', *International Journal of Osteoarchaeology* 9, 417-429.
- Anderson, J. 1968. 'Late Paleolithic skeletal remains from Nubia,' in F. Wendorf (ed.), *The Prehistory of Nubia, Volume 2*. Dallas, 996-1040.
- Babapulle, C. J., C. H. S. Jayewardene and V. Gammanpila 1994. 'Patterns of violence in the Kandy Area (Sri Lanka)', *Medicine and Law* 13, 105-127.
- Barber, H. M. 1973. 'Horse-play: Survey of accidents with horses', *British Medical Journal* 3, 532-534.
- Barton, N. J. 1988. 'Preface,' in N. J. Barton (ed.), *Fractures of the Hand and Wrist*. London, vii-ix.
- Björnstig, U., A. Eriksson and L. Örneholm 1991. 'Injuries caused by animals', *Injury* 22, 295-298.
- Bonnet, C. (ed.) 1990a. *Kerma, Royaume de Nubie: L'Antiquité Africaine au Temps des Pharaons*. Genève.
- Bonnet, C. 1990b. 'Limites et defenses de la ville,' in C. Bonnet (ed.). *Kerma, Royaume de Nubie: L'Antiquité Africaine au Temps des Pharaons*. Genève, 43-46.
- Bonnet, C. 1990c. 'Sépultures et coutumes funéraires,' in C. Bonnet (ed.). *Kerma Royaume de Nubie: L'Antiquité Africaine au Temps des Pharaons*. Genève, 69-86.
- Bonnet, C. 1994. 'Kerma: les apports historiques de l'archéologie,' in C. Bonnet (ed.). *Études Nubiennes*. Genève, 101-110.
- Bonnet, C., J. Reinold, B. Gratién, B. Marcolongo and N. Surian 1993. 'Les fouilles archéologiques de Kerma (Soudan): Rapport préliminaire des campagnes de 1988-1989, de 1989-1990, et de 1990-1991', *Genava* 41, i-xv.
- Bramblett, C. A. 1967. 'Pathology in the Darajani baboon', *American Journal of Physical Anthropology* 26, 331-340.
- Breasted, J. H. 1962. *Ancient Records of Egypt: Volume 1. The First to the Seventeenth Dynasties*. New York.
- Buhr, A. J. and A. M. Cooke 1959. 'Fracture Patterns', *The Lancet*, March 14, 531-536.
- Burbank, V. K. 1994. *Fighting Women: Anger and Aggression in Aboriginal Australia*. Berkeley.
- Busch, H. M., T. H. Cogbill, J. Landercasper and B. O. Landercasper 1986. 'Blunt bovine and equine trauma', *Journal of Trauma* 26, 559-560.
- Carroll, S. T. 1988. 'Wrestling in ancient Nubia', *Journal of Sport History* 15, 121-137.
- Dandy, D. 1993. *Essential Orthopaedics and Trauma*. London.
- DeSouza, L. 1968. 'The pattern of trauma at Mulago hospital, Kampala', *East African Medical Journal* 45, 523-531.
- Ebong, W. 1978. 'The pattern of fractures and dislocations in Western Nigeria', *Injury* 9, 221-4.
- Filer, J. M. 1997. 'Ancient Egypt and Nubia as a source of information for violent cranial injuries,' in J. Carman (ed.). *Material Harm: Archaeological Studies of War and Violence*. Glasgow, 47-74.
- Fischer, H. G. 1961. 'The Nubian mercenaries of Gebelein during the First Intermediate Period', *Kush* 9, 44-80.
- Gratién, B. 1999. 'Some rural settlements at Gism el-Arba in the Northern Dongola Reach', *Sudan & Nubia* 3, 10-12.
- Greene, D., R. Raven, G. Carvalho and C. Maas 1997. 'Epidemiology of facial injury in blunt assault', *Archives of Otolaryngology, Head, and Neck Surgery* 123, 923-928.
- Ip, W., K. H. Ng and S. P. Chow 1996. 'A prospective study of 924 digital fractures of the hand', *Injury* 27, 279-285.
- Jonge, J. D., J. Kingma, B. V. D. Lei and H. Klasen 1994. 'Phalangeal fractures of the hand', *Journal of Hand Surgery (British and European Volume)* 19B, 168-170.
- Judd, C. S. 1970. 'Skull injury from stoning', *California Medicine* 112, 14-18.
- Judd, M. A. 2000. *Trauma in ancient Nubia during the Kerma Period (ca. 2500-1500 BC)*. PhD thesis, Department of Anthropology. University of Alberta, Edmonton.
- Jurmain, R. 1999. *Stories from the Skeleton. Behavioral Reconstruction in Human Osteology*. Amsterdam.
- Jurmain, R. and L. Kilgore 1998. 'Sex-related patterns of trauma in humans and African apes,' in A. L. Grauer and P. Stuart-Macadam (eds). *Sex and Gender in Paleopathological Perspective*. Cambridge, 11-26.
- Kendall, T. 1988. 'Ethnoarchaeology in Meroitic studies', *Meroitica* 10, 625-745.
- Kendall, T. 1997. *Kerma and the Kingdom of Kush 2500-1500 BC: The Archaeological Discovery of an Ancient Nubian Empire*. Washington, DC.
- Kilgore, L., R. Jurmain and D. Van Gerven 1997. 'Palaeoepidemiological patterns of trauma in a medieval Nubian skeletal population', *International Journal of Osteoarchaeology* 7, 103-114.
- Levinson, D. 1989. *Family Violence in Cross-Cultural Perspective*. Newbury Park, California.
- Loder, R. and H. Mayhew 1988. 'Common fractures from a fall on an outstretched hand', *American Family Physician* 37, 327-328.
- Loebl, W. and J. Nunn 1997. 'Staffs as walking aids in ancient Egypt and Palestine', *Journal of the Royal Society of Medicine* 90, 450-454.
- London, P. 1991. *The Anatomy of Injury and its Surgical Implications*. Oxford.
- Lovell, N. C. 1990. *Patterns of Injury and Illness in Great Apes: A Skeletal Analysis*. Washington.
- Maschner, H. D. and K. L. Reedy-Maschner 1998. 'Raid, retreat, defend (repeat): the archaeology and ethnohistory of warfare on the North Pacific Rim', *Journal of Anthropological Archaeology* 17, 19-51.
- Mock, C. N., E. Adzotor, D. Denno, E. Conklin and F. Rivara 1995. 'Admissions for injury at a rural hospital in Ghana: implications for prevention in the developing world', *American Journal of Public Health* 85, 927-931.
- Muelleman, R., P. Lenaghan and R. Pakieser 1996. 'Battered women: injury locations and types', *Annals of Emergency Medicine* 28, 486-492.
- Mwaniki, D., J. W. O. Radol, E. Miniui and F. Manji 1988. 'The occurrence and pattern of facial bone fractures in Nairobi', *East African Medical Journal* 65, 759-763.
- Owsley, D. W., C. E. Orser, R. W. Mann, P. H. Moore-Jansen and R. L. Montgomery 1987. 'Demography and pathology of an urban slave population from New Orleans', *American Journal of Physical Anthropology* 74, 185-197.
- Podzorski, P. V. 1990. *Their Bones Shall Not Perish: An Examination of Predynastic Human Skeletal Remains from Naga-ed-Dêr in Egypt*. Surrey, UK.
- Poole, G. V., J. A. Griswold, V. K. Thaggard and R. S. Rhodes 1993. 'Trauma is a recurrent disease', *Surgery* 113, 608-611.
- Pratt, D. S., L. H. Marvel, D. Darrow, L. Stallones, J. J. May and P. Jenkins 1992. 'The dangers of dairy farming: the injury experience of 600 workers followed for two years', *American Journal of Industrial Medicine* 21, 637-650.
- Purschwitz, M. A. and W. E. Field 1990. 'Scope and magnitude of injuries in the agricultural workplace', *American Journal of Industrial Medicine* 18, 179-192.
- Reisner, G. A. 1923a. *Excavations at Kerma. Parts I-III*. Cambridge, MA.
- Reisner, G. A. 1923b. *Excavations at Kerma. Parts IV-V*. Cambridge, MA.
- Richards, R. R. and F. G. Corley 1996. 'Fractures of the shafts of the radius and ulna,' in C. A. Rockwood, D. P. Green, R. W. Bucholz and J. D. Heckman (eds). *Rockwood and Green's Fractures in Adults*. New York, 869-928.
- Rogers, L. 1992. *Radiology of Skeletal Trauma*. New York.
- Shepherd, J., M. Y. Al-Kotany, C. Subadan and C. Scully 1987. 'Assault



- and facial soft tissue injuries', *British Journal of Plastic Surgery* 40, 614-619.
- Shepherd, J., J. Gayford, I. Leslie and C. Scully 1988. 'Female victims of assault', *Journal of Cranio-maxillary-facial Surgery* 16, 233-237.
- Shepherd, J., M. Shapland, N. X. Pearce and C. Scully 1990. 'Pattern, severity and aetiology of injuries in victims of assault', *Journal of the Royal Society of Medicine* 83, 75-78.
- Smith, G. E. and F. Wood-Jones 1910. *The Archaeological Survey of Nubia. Report for 1907-1908. Volume 2: Report on the Human Remains*. Cairo.
- Stini, W. A. 1990. 'Osteoporosis: etiologies, prevention and treatment', *Yearbook of Physical Anthropology* 33, 151-194.
- Walker, P. L. 1989. 'Cranial injuries as evidence of violence in prehistoric Southern California', *American Journal of Physical Anthropology* 80, 313-323.
- Watterson, B. 1997. *The Egyptians*. Oxford.
- Websdale, N. 1998. *Rural Woman Battering and the Justice System*. Thousand Oaks, CA.
- Welsby, D. A. 1996. 'The Northern Dongola Reach Survey, a. the 1995/6 season', *SARSN* 10, 2-9.
- Welsby, D. A. 1997. 'The Northern Dongola Reach Survey: the 1996/7 season', *Sudan & Nubia* 1, 2-10.
- Williams, J. M., P. M. Furbee, D. W. Hungerford and J. E. Prescott 1997. 'Injury recidivism in a rural ED', *Annals of Emergency Medicine* 30, 176-180.
- Wladis, A., L. Bostrom and B. Nilsson 1999. 'Unarmed violence-related injuries requiring hospitalization in Sweden from 1987 to 1994', *Journal of Trauma* 47, 733-737.