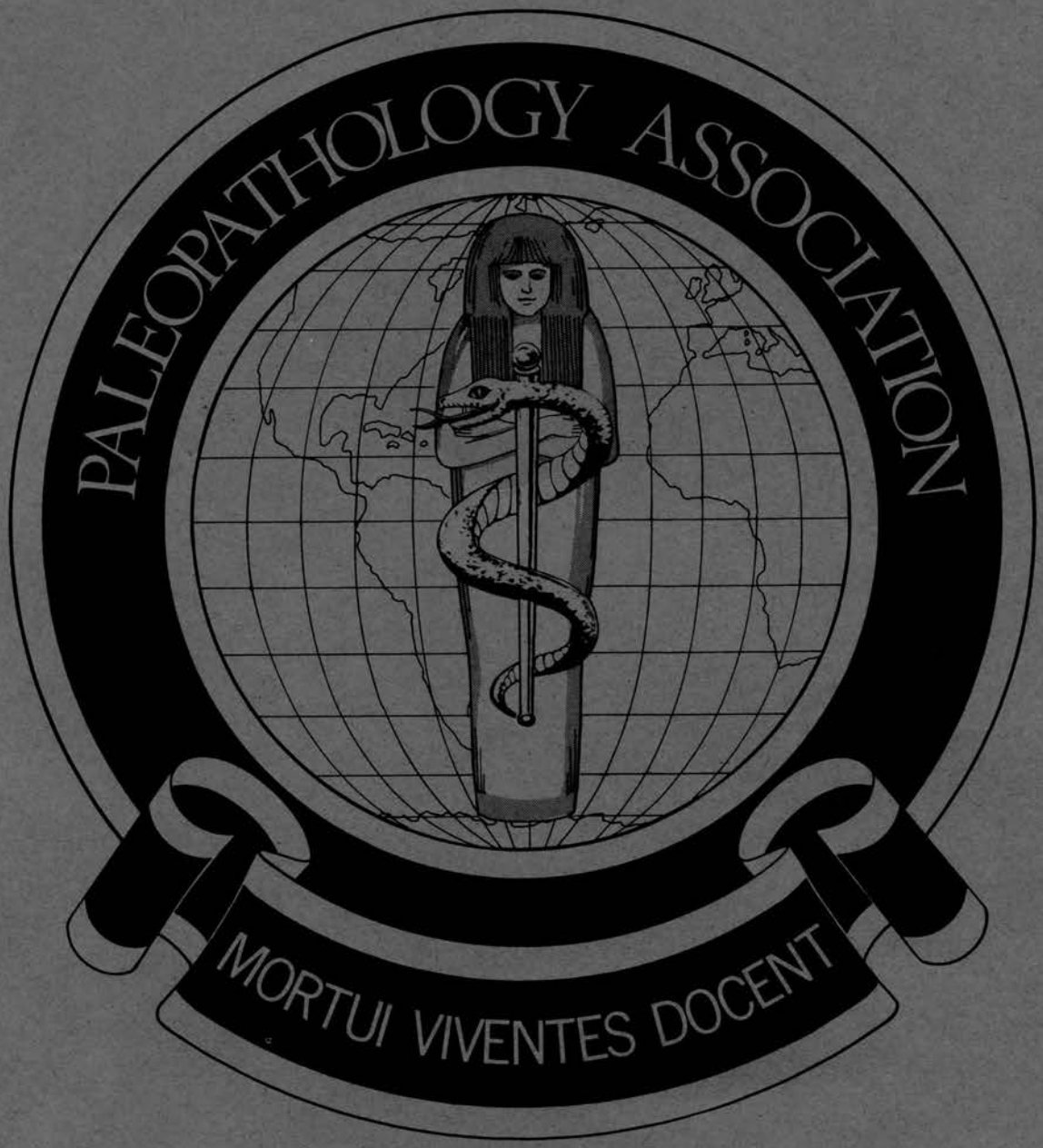
PAPERS ON PALEOPATHOLOGY

presented at the

Twenty Sixth Annual Meeting



27 and 28 April 1999

Columbus, Ohio

SECTION 1: WORKSHOPS

A. ENDOCRINE DISEASES, DYSPLASIAS, AND OTHER INTERESTING CONDITIONS

Organised by Donald J. Ortner, Smithsonian Institution and Bruce D. Ragsdale, Arizona State University, and conducted with assistance from Elizabeth Miller, California State University

For the eleventh workshop organized by Drs. Ortner and Ragsdale the emphasis was on endocrine diseases and dysplasias but with additional documented pathology cases of other interesting conditions that affect bone. Dr Ortner provided an initial review of endochondral and intramembranous bone formation. Both endocrine diseases and dysplasias can affect either or both types of bone development. This can make differential diagnosis challenging, particularly in evaluating abnormal archaeological human skeletal remains. Bruce Ragsdale gave an introduction to the pathological cases in which he noted the difficulty in finding specimens in a hospital setting that have paleopathologic relevance. Surgically arrested disease examples are generally mild expressions of what should be anticipated in excavated material. Even autopsy specimens are generally modified by treatment from what would be expected in the 'state of nature' after a significant disease has run its course. Exceptionally, cases do come along that approximate the end stage of a condition and these are crucial in developing diagnostic criteria for paleopathology.

The paleopathologic cases included three examples of diminished endochondral bone growth, one case of inadequate intramembranous growth and three cases where both types of bone growth were subnormal. Recognizing the differences between these three abnormal possibilities and the pattern of bones that are affected provides the major tools in differential diagnosis.

This year's workshop presentation of modern macerates re-examined 'pitting' or 'porosity' of the articular end plate and included two manifestations of neoplasia: a large osteosarcoma of the proximal tibia (only large tumors have paleopathologic relevance) and a neglected squamous cell carcinoma of the scalp, which eroded through calvarium to contact dura. A variety of gall stones was shown, making the point that certain chemical types can signal state of health (bilirubinate = anemia; pure cholesterol type may reflect diet or lipid disorder).

Approximately forty-five participants in the workshop formed small groups to review the cases brought for review. Groups recorded relevant variables and the type of bone abnormality exhibited by each of the archaeological examples of skeletal disease. Each group also recorded the collective opinion as to which of the seven basic categories of disease was manifest, as well as specific diagnosis for each modern specimen with known diagnosis. Their accuracy was 54% for general category and 35% for specific disease process. Disappointingly, 49% of the time no commitment as to specific disease state was given; 6% of the time, no category was specified.

B. CONGENITAL AND DEVELOPMENTAL ABNORMALITIES

Organised by Charles F. Merbs, Arizona State University and conducted with assistance from D. Troy Case and Scott Burnett, Arizona State University

Originally planned as a Round Table Discussion, this event ultimately developed into more of a workshop than a discussion. The objective was to observe, accurately record, and explain etiologically wherever possible, skeletal abnormalities that are present at birth or develop during infancy and early childhood. Presentations included numerous slides, with actual specimens available in some instances. Charles Merbs introduced the subject and dealt primarily with vertebral conditions such as segmentation error, sagittal clefting of the centrum, spina bifida and spondylolysis of clearly congenital origin. Scott Burnett then dealt with developmental errors of the dentition, particularly dental fusion, numeric anomalies, dental transposition, and Hutchinson's incisors. This was followed by a presentation by Troy Case on anomalies of the hands and feet, including brachydactyly, polydactyly, and tarsal coalition. Brenda Baker presented a case study of osteopetrosis in a neonatal skeleton from Abydos, Egypt, and Ethne Barnes presented cases studies dealing primarily with the axial skeleton which related to her work in the American Southwest and Corinth, Greece. Although it was generally individual cases and specific phenomena that were being considered, an effort was made wherever possible to relate the conditions to broader syndromes.

C. INVITED LECTURE

MESENCHYMAL MODULATION: A MECHANISM OF MATRIX MODIFICATION

Bruce D. Ragsdale, Arizona State University

Differentiation is the process by which a cell commits to becoming mesodermal rather than endodermal or ectodermal. Once in a specific functional state (e.g., fat cell), some leeway remains for change in shape and organelle content, in response to three influences. These are circulation, metabolic factors, and mechanical stress. These operate in variable proportion in every disease state. When altered, they can induce functional mesenchymal cells to change their activity state (phenotype), a process best termed modulation. The molecular and bioelectric signals triggering modulation are now becoming better understood. The subsequent cellular activity following modulation can modify the skeleton pathologically. Under this concept, there is no need to postulate 'uncommitted', 'stem' or 'reserve' mesenchymal cells. If clonal experiments make it clear a lamb can be produced from an udder cell, then it seems likely that 'no cell rides for free'; all are -- at all times -- contributing to the structural whole.

Examples of mesenchymal cells adopting 'an alternate life style' (modulating) can be found in fracture where marrow fat cells lose their lipid and elaborate endoplasmic reticulum to participate in the production of osteoid for callus. Similarly, friction over a bony prominence will induce cells formerly fibroblastic to round up and secrete cartilage matrix, which will in turn will be likely to trigger the enchondral ossification sequence creating a bump (e.g., bunion) or bony projection (e.g., subungual exostosis. However, all that remains after decomposition is the mineralised matrix, which records only the actions of two cell types, osteoclasts and osteoblasts, which worked predominantly on pre-existent surfaces. Therefore, the dry bone expressions of many different diseases significantly overlap. Some imagination is required to look at a dry bone specimen and intuit the cloaking soft tissue responsible for a certain modification of structure, but doing so is a powerful technique for accurate diagnosis.

SECTION 2: CONTRIBUTED PAPERS

PALEOPATHOLOGY OF ARCHAIC INFANTS IN ABDERA, GREECE

Anagnostis Agelarakis, Adelphi University

As indicated by the Greek ethnohistorian Herodotus, the Greek-Ionian city of Clazomenai, in Asia Minor, was besieged around 656-652 BC by the forces of the Persian empire. The Clazomenians, securing a day's truce with the Persians, fled with their ships, relocating to the Thracian coast of Greece, where they established a city they named Abdera. Allegedly, the Clazomenians were implicated in polemic activities with the Thracians and could not sustain their city. Later, in 545 BC, Greek-Ionians from the city of Teos, in Asia Minor, also fleeing from Persian attacks, rebuilt Abdera successfully. To date archeo-anthropological investigations reveal that the Clazomenian cemeteries, dominated by neonates and infants, had been used continuously, chronologically associated with the arrival of the Teans. This paper offers archeometric, paleopathological, and paleoepidemiological data (e.g., childhood infectious diseases, anemias, and scurvy extorted a heavy toll from the very young) that provide unique explanatory arguments for the Clazomenian fate in Abdera.

POSSIBLE TREPONEMATOSIS IN PRE-CONTACT OHIO

T.S. Barette, H.J.H. Edgar and L.R. Lease, Ohio State University

The Richards site is a Philo Phase village found along the Muskingum River in eastern Ohio. Occupied during the latter half of the 13th century, it represents the early entry of the Fort Ancient tradition into the Muskingum Valley. Mortuary practices at Richards are unique and differ greatly from the typical Fort Ancient pattern of discrete burial pits. Instead, human remains at Richards are found in general trash pits along with other faunal and cultural materials. The remains exhibit a wide range of taphonomic changes associated with cultural activities. Evidence of cutting, burning, breakage, and abrasion is present. Among the remains are two human skulls with significant changes attributable to infectious disease. At least one skull exhibits the wavy, dense, thickened bone and stellate scarring associated with treponemal infection. Further evaluation of the Richards skulls may provide evidence of treponematosis in pre-contact Ohio.

CHILDHOOD TUBERCULOSIS: THREE POSSIBLE PREHISTORIC CASES FROM EAST-CENTRAL ARIZONA

Andrea Buck, Arizona State University

Progressive primary tuberculosis most often occurred in children prior to modern drug therapy and was known as childhood tuberculosis. Skeletal involvement in children differs somewhat from that in adults. Skeletal lesions in children often occur near the vertebral end plates, in the metaphyseal area of long bones and in the diaphyses of hand phalanges. Tuberculous meningitis (TBM) is a common occurrence in childhood tuberculosis and is usually fatal. Hydrocephalus often accompanies TBM and can leave imprints of the brain gyri on the inner table of the skull. Additionally, periosteal reactive bone can occur on the cranial inner table as a result of the increased pressure. Three children with possible evidence of tuberculosis are present at a prehistoric (AD 1100-1300) site in east-central Arizona.

PATHOLOGICAL ALTERATIONS OF THE SKULL VAULT - A CONTRIBUTION TO THE ETIOLOGY AND EPIDEMIOLOGY OF DISEASES IN NEOLITHIC POPULATIONS FROM CENTRAL EUROPE

P. Carli-Thiele and M. Schultz, University of Göttingen

In paleopathological research, the evaluation of epidemiological data is very important for the understanding of living conditions (e.g., nutrition) and health of prehistoric and historic populations. The skulls of 71 adults from the early Neolithic population from Wandersieben (Thuringia, Germany) were examined by macroscopic, radiological, endoscopic, and, in selected cases, light and scanning electron microscopic techniques. Pathological changes (e.g., meningitis, injuries, caries) were registered and documented by photography and x-rays. The skulls showed evidence of numerous diseases; in one case there were vestiges of a severe injury of the frontal bone (cut). Furthermore, vestiges of inflammatory and/or hemorrhagic processes of the external lamina, the internal lamina (e.g. meningitis), the venous sinuses of the brain, epidural hematoma, chronic inflammation of paranasal sinuses, the hard palate and the alveolar bone were diagnosed. The frequencies of occurrence of the diseases were compared with those among the subadult individuals from Wandersieben and with results from paleopathological investigations of other Neolithic populations.

NONDESTRUCTIVE ANALYSIS OF MUMMIFIED AND SKELETAL REMAINS: APPROACHES TO MAXIMIZING IMAGING OUTCOMES
(Introduction to the Seven Poster Symposium)

Gerald J. Conlogue, William Hennessy and Ronald G. Beckett, Quinnipiac College and John Posh, Muhlenberg Hospital

This presentation describes the rationale and methodology of various imaging techniques used for the nondestructive analysis of mummified and skeletal remains. Areas discussed include positioning, exposure, film variations (screened, double loaded casettes, Polaroid, stereoscope), portability, on-site applications, video endoscopy (instrumentation and technique), and advanced modalities such as helical computed tomography and magnetic resonance imaging. The importance of correlation among the modalities described and a suggested decision-making tree to determine when to use which modality are also discussed, along with a rationale regarding the importance of nondestructive assessment of existing collections.

DENTAL EVIDENCE FOR PRECONTACT CONGENITAL SYPHILIS ON THE NORTHWEST COAST OF NORTH AMERICA

A. Joanne Curtin, Simon Fraser University

Despite the relative abundance of New World skeletal remains exhibiting osseous lesions characteristic of treponemal disease, compelling evidence for congenital infection in pre-Columbian material has been lacking. This paper presents a probable case of congenital syphilis in a 5-year-old child from Gabriola Island, British Columbia, 1400 ± 40 years BP(calibrated date AD 650). Mandibular dental lesions in this individual include bilateral Moon's molars and severe apical hypoplasia of the permanent canine; the developing permanent incisors, however, appear normal radiographically. Additional treponemal lesions (caries sicca, sabre-shin, and gummatous periostosis) affecting adults from the site are also described. The distribution of reported cases of prehistoric treponemal disease on the Northwest Coast is reviewed, and alternative diagnoses discussed.

OSTEOARTHRITIS IN PREHISTORIC THAILAND

K. M. Domett and Nancy G. Tayles, University of Otago

The investigation of health in prehistoric Southeast Asia is relatively recent. A study analysing osteoarthritis in a collection of Thai prehistoric populations is presented. The samples are a coastal Neolithic population (Khok Phanom Di) and two inland groups, Ban Lum Khao (Bronze Age) and Ban Na Di (early Iron Age). There are no significant differences in age among these populations. The two inland samples show no significant difference in osteoarthritis rates between each other, whereas both populations show statistically less osteoarthritis compared to the coastal site. The people of Khok Phanom Di are known to have been skilled potters and this may have contributed to the high

level of osteoarthritis in their hands. The different geographical and temporal situations of these sites, including their methods of subsistence and technological level, will be discussed with reference to osteoarthritis patterns.

THE DETAILED STRUCTURE AND TIMING OF DENTAL ENAMEL DEFECTS IN KNOWN AGE CHILDREN FROM CHRIST CHURCH, SPITALFIELDS, LONDON

S. W. Hillson and D. M. Antoine, University College London

The defects of enamel hypoplasia are among the most common conditions seen in palaeopathology, but very little is known about how they are generated at the tooth crown surface. An opportunity to investigate this came when microscope sections were made of the full permanent dentitions of several children recovered from the crypt at Christ Church, Spitalfields. The dates of birth and death are known from coffin plates and parish records, and as tooth crown formation was interrupted by death, it is possible to calibrate the periodicity of incremental structures in the crown. By counts of prism cross striations (which represent a circadian growth rhythm), it is possible to derive the age, date and duration of enamel defects and to show in detail how they came to be formed. This has important implications for the recording and interpretation of enamel hypoplasia.

PROSTATIC CARCINOMA IN THE LOWER ILLINOIS VALLEY

T. L. Jolly and L. K. Klepinger, University of Illinois at Urbana

Skeletal remains were recovered from the Biede site, a Middle Woodland (50 BC-AD 250) site in the Lower Illinois River Valley. Led by McGregor in 1950, excavations of the bluff top burial site yielded four individuals (three male and one female). Paleopathological examination of the human remains revealed a possible case of metastasized prostatic carcinoma in a 35-45 year old male. The individual displaying this pathology was represented by the majority of the cranial and appendicular skeleton; most of the dentition was also recovered. Overall preservation of the skeletal elements was good. Differential diagnoses include pulmonary infections (such as tuberculosis) as well as other forms of metastasizing carcinoma.

POROTIC HYPEROSTOSIS IN PREHISTORIC SKELETONS FROM SOUTH ASIA

Kenneth A. R. Kennedy, Cornell University

The first reported case of a hematological disorder from the prehistoric skeletal record of South Asia is from Baghai Khor, a Mesolithic rockshelter site in Uttar Pradesh dating to the third millennium BC. Cranial lesions involving the outer tables of the parietal and frontal bones of a skeleton, identified by the present investigator as a young adult female, bear the signs of porotic hyperostosis. Although this condition has been recognized in South Asian skeletons associated with early food-producing cultures of the Indian Bronze Age, the Baghai Khor specimen was recovered from a Mesolithic cultural context of hunter-foragers. This suggests that porotic hyperostosis may not have been a hematological disorder restricted to earlier farming sedentary village communities. There are other cases of this condition in skeletons from Late Pleistocene sites in Sri Lanka. This paper discusses the probable causes of porotic hyperostosis in South Asian prehistoric populations, with particular attention to malaria-driven thalassemia.

ASSESSING COMMUNITY ATTITUDES FROM SKELETAL REMAINS: THE BURIAL OF A CHILD FROM THE SUBMYCENAEAN CEMETERY OF THE KERAMEIKOS OF ATHENS WITH A CONGENITAL ANOMALY OF THE SPINE

Anna Lagia, American School of Classical Studies, Athens and Florian Ruppenstein, German Archaeological Institute, Athens

During the excavations in 1938 of the subMycenaean cemetery of Kerameikos (approx 1100-1050 BC), a five to seven year old child with a structural abnormality of the spine was found. The abnormality is due to bilateral failure of segmentation of the laminae of the lower cervical and upper thoracic vertebrae. It affected the bodies, neural arches, and vertebral ends of several adjacent ribs and resulted in thoracic kyphosis. According to modern medical literature, this condition has a severe restrictive effect on growth and causes respiratory and genito-urinary abnormalities. The archaeological record reveals that the child received formal burial, and the grave goods indicate one of the richest burials in the cemetery, in particular in comparison to the other child burials. The skeletal lesions are presented in association with the burial context in order to explore the significance of these lesions for the life of the child and its treatment by its community.

NON-ADULT PALAEOPATHOLOGY: LIMITATIONS AND POTENTIAL

Mary E. Lewis, University of Bradford

Data from non-adult skeletal material are believed to represent the most sensitive barometer of biocultural change. Survival of the children indicates the level of a population's adaptation to the environment, but the study of non-adult remains has been limited. Rapid growth can result in severe pathological lesions in young individuals, making some diseases easier to identify, but rapid growth also means that lesions can remodel at a greater rate. Methods for ageing non-adults are more accurate than those for adults as they concentrate on development rather than the deterioration of the skeleton. The study of 'growth' rather than a static adult 'stature' allows for the age at which children fall behind or recover their growth trajectory to be identified. Many stress indicators remodel as the individual gets older and therefore the true prevalence of these lesions can be more accurately assessed in younger skeletons. Issues involved in studying non-adult palaeopathology are discussed and future areas of research suggested.

PALEOPATHOLOGY IN A MEDIEVAL SPANISH OSSUARY (WAMBA, VALLADOLID, SPAIN)

I. Lopez-Bueis, University of California Santa Barbara and G. J. Trancho, Complutense University, Madrid

We study the frequency and distribution of osteoarthritis, periostitis and trauma in more than 2100 long bones from a Spanish ossuary (XVth - XVIIth Centuries) and correlate this information with historical data in order to obtain a more complete vision of the way of life of Spanish populations during the Middle Ages. The lower limb is significantly more affected by lipping around the joints than the upper limb, reaching 69.7% for the femur. We discuss the presence of asymmetry and sexual dimorphism in several joints, and the probable relation with different patterns of physical activity. The frequency of healed periostitis in the lower limb is above 50% while in the upper limb it is 10%; the frequency of active lesions is very similar in all the long bones analyzed. The overall frequency of trauma in the long bones is 1.2%, with the radius most affected (5.2%). These results suggest that the pattern of fractures found in our collection is probably due more to accidents such as falls than to any pattern of violence.

OSTEOPOROSIS IN A DOCUMENTED SKELETAL COLLECTION

Simon Mays, English Heritage

The analysis of osteoporosis in earlier human groups relies on the study of skeletal remains, as documentary sources are largely silent concerning this disease. Given the limitations of our techniques for age determination in adult skeletal remains, it is difficult to investigate in any detail patterns of age-related decline in bone mineral in those aged over about 50 years at death in past populations. In order to do this, we need to study material where age at death is documented. The aim of this paper is to present some preliminary results from material analysed from Christ Church, Spitalfields, London. The skeletons date from the 18th-19th centuries AD. The age at death is known exactly from coffin

plates and the assemblage contains large numbers of elderly individuals: these factors make it particularly valuable for investigating patterns of bone loss in old age in earlier times.

FUNCTIONAL MORPHOLOGY OF CLAY-SHOVELLER'S FRACTURE

Susan Mercer and Nancy Tayles, University of Otago

The so-called 'clay-shoveller's fracture' is a fracture of the spinous process of a lower cervical or upper thoracic vertebra. It is believed to be an activity-related lesion, resulting from vigorous activity involving the upper limbs. It has been documented in situations where men have been digging using long-handled shovels and throwing the excavated material upwards. The little experimental work which has been done has shown that this reflects sudden hyperflexion or hyperextension of the cervical spine. The clinical literature is confusing as it provides inaccurate descriptions of the anatomy and mechanisms of injury. This paper addresses the underlying functional morphology of the condition, illustrating the relationship of muscles, fibrous tissues and bones to the movements which can result in the occurrence of this fracture.

PALEOPATHOLOGY, DEMOGRAPHY, AND HEALTH OF HUMAN SKELETAL MATERIAL FROM THE SITE OF YASILEH, JORDAN

Bryan Renfro, University of Arkansas

Preliminary assessment of health and demographic composition of a Late Roman-Byzantine population is based on analysis of human skeletal material. The small village site of Yasileh was located in a rich agricultural zone at the junction of trade routes connecting the Decapolis cities. Demographic analysis indicates a high infant and childhood mortality rate; it is, however, one lower than that reported for the larger neighboring site of Abila. Paleopathological assessment indicates cases of generalized infection, vertebral osteoarthritis, and trauma. Two cases of childhood cribra orbitalia are reported, indicating childhood malnutrition or parasitism. The results are compared to the contemporaneous populations of the larger city of Abila and another small rural site, Sa'ad.

THE CEPHALOMETRIC ANALYSIS OF A MUMMY FROM THE TOLEDO MUSEUM

Russell T. Reynolds, Derry, New Hampshire, James E. Harris, Ann Arbor, Michigan and Sandra Knudsen, Toledo Museum of Art

Recently two Egyptian mummies in the Toledo Museum have been studied. The first mummy has been identified as female, ca AD 750. The second mummy is identified as male, ca AD 100. The female mummy is of particular interest because the arms are crossed, a rare if not non-existent funerary practice in Greco-Roman times. Both mummies were examined by x-ray cephalometric techniques and the resulting lateral cephalograms were profiled against the mean computer plots of Egyptian Old Kingdom nobles from Giza and Aswan and of the New Kingdom pharaohs and priests of the XXI Dynasty tombs of Deir el-Bahari. Multivariate analyses (cluster analysis) were used to estimate the morphologic similarities of these two mummies to the established norms of the ancient Egyptian samples. This study demonstrates the craniofacial similarities between the female mummy and the mummies of the New Kingdom period with a with a straight profile.

THE ANOMALY OF MEDICAL SCHOOL IN PHYSICIAN EVALUATION OF PALEOPATHOLOGY

Bruce M. Rothschild, Arthritis Center of Northeast Ohio

As the role of anthropologists has become more central in teaching anatomy to medical students, a flawed perspective of medical science seems to have arisen. Lack of appreciation of the science of medicine can easily derive from the 'dumbed down' nature of medical school courses. Acceptance to medical school is usually predicated upon quality of performance in a scientific curriculum that

includes laboratory and theory courses in physical sciences; thus the student has substantial experience with scientific methodology, and understands that any study is only as good as the substantiation of its premises. Medical school is anomalous, as it assumes a lack of time to evaluate the validity of premises, but often seeks only to transmit information. The purpose of this presentation is to clarify the nature of physician assessment of paleopathology, and to distinguish what is 'passed on' in medical school, the scientific methodology and data base that the physician brings to the field.

THE GALLER COLLECTION: A LITTLE KNOWN SWISS BONE REFERENCE SYSTEM

F. Rühli, University of Zurich and T. Böni, Orthopaedic University Clinic Balgrist, Zurich, Switzerland

The aim of this presentation is to show the most impressive cases from a remarkable historic bone assemblage from Switzerland. More than 600 bone specimens, some dating back to the 1830s, have been collected by famous pathologists like E. Uehlinger and Ch. Hedinger. E. Galler, a preparator at the Pathology Department (University of Zurich), spent most of his life working in this unique collection. Actual investigations include review and new interpretation of uncertain diagnoses. Basic documentation was performed earlier. All known major types of pathological conditions are represented: traumas, infectious diseases, circulatory disturbances, reticuloendothelial and hemopoietic disorders, endocrine disturbances, metabolic disorders, neuromechanical deformities, development disorders, tumors, affected joints and varia. Some of the paleopathological changes are extraordinary, e.g., hyperostosis generalisata, severe cases of syphilis and hydrocephalus, myositis ossificans, and necrosis of the mandible due to phosphorus intoxication. This collection, despite its enormous academic value, is almost unknown.

VESTIGES OF PATHOLOGICAL CHANGE IN FOSSIL HUMAN BONES

Michael Schultz, University of Göttingen, Germany

Ten selected samples of fossil bones (e.g., *Australopithecus, Homo erectus, Homo sapiens neandertaliensis, Homo sapiens sapiens)* were examined by light microscopy using plane and polarized light. The histomorphological findings show that microscopic research adds a great deal to what can be seen macroscopically or by x-ray techniques. In particular, emphasis was placed on taxonomy, functional anatomy of bone, and causes of some of the diseases of early hominoidea.

CHANGES IN INFANT NUTRITION FROM THE ARCHAIC TO THE LATE PREHISTORIC: ISOTOPIC EVIDENCE FROM THE NORTH AMERICAN MIDWEST

Mark R. Schurr, Notre Dame University and Mary Lucas Powell, University of Kentucky

Stable nitrogen-isotope ratios of collagen extracted from juvenile and adult burials were compared with osteological and demographic measures of health to evaluate theories about changes in infant nutrition and childhood health from the Archaic hunter-gatherer lifeway to the sedentary farming communities of the Late Prehistoric. Bone samples from two Late Archaic and two Mississippian sites in Indiana and Kentucky indicated significant temporal differences in adult and childhood diets. Previous comparisons of age-specific death rates, life expectancy at birth and adolescence, prevalence of infectious disease reaction, anemia, dental pathology, and trauma had revealed significant temporal differences. The isotopic data provide little evidence for differences in weaning time among the foursites. [This research was made possible in part by support from the Institute for Scholarship in the Liberal Arts, College of Arts and Letters, and the Center for Environmental Science and Technology, Notre Dame].

TREPONEMAL DISEASE IN WEST AFRICAN NONHUMAN PRIMATES

Mark Skinner, Simon Fraser University

This study provides osteological and radiological evidence for a treponemal disease, probably yaws, among several species of West African non-human primates. Serological evidence for simian yaws, collected thirty years ago, indicates that human and simian yaws are geographically coincident, but relatively benign in non-human primates. Approximately 20% of both monkeys (23 Colobus, 32 Mangabeys and 3 Mandrills) and apes (57 Chimpanzees and 61 Gorillas) show diaphyseal changes whose anatomical distribution and form are consistent with yaws. There is symmetrical medullary sclerosis often associated with bilateral periostitis of the limb bone shafts accompanied by focal erosions, most commonly affecting the radius and ulna, the tibia, and occasionally other appendicular bones including the hands and feet. There are no sex differences, and no statistically significant differences among affected taxa. It is reasoned that simian yaws is hyperendemic in West Africa where it causes significant disease and discomfort for many non-human primates.

TREPONEMATOSIS IN PREHISPANIC ARICA

Vivien G. Standen, Universidad de Tarapacá and Bernardo T. Arriaza, University of Nevada, Las Vegas

Skeletons of prehispanic fishermen and agropastoral populations from northern Chile were visually and radiographically examined for evidence of treponematosis. The sample (N = 636) consisted of adults and children dated from 3000 BC to AD 1400. All the bones were inspected for an array of pathological signs such as striations, periostitis, osteitis, saber tibias, and caries sicca. It was found that 8.6% (54/636) showed pathognomonic features of treponematosis, most likely yaws. Most individuals were affected on the tibias and cranium, regardless of age, sex, and cultural affiliation. There was a tendency to bilateral involvement and the pathological individual had an average of three pairs of bones affected. Chinchorro fishermen had the highest rate 18.5% (33/178) of bone pathology and agropastoralists had only 4.6% (21/458). Our study is in agreement with previous paleopathological reports that treponematosis was present in this region.

EVIDENCE OF DEFICIENCY DISEASES IN THREE INFANT POPULATIONS FROM THE MIDDLE AGES

G. Teichmann, K. Kreutz and M. Schultz, Universities of Göttingen (GT, MS) and Giessen (KK)

Evidence of disease was found in the skeletal remains of three infant populations from the Middle Ages excavated in Germany: Grafendobrach (Franconia), Peigen (Lower Bavaria), and Straubing (Lower Bavaria). The skeletons were examined by macroscopic, endoscopic, radiological, light and scanning-electron microscopic techniques. Characteristic changes in the bones caused by vitamin C or vitamin D deficiencies according to Schultz (1989) were discovered in several cases. Each population shows a specific pattern of deficiency diseases resulting from poor nutrition, living conditions and general health status (e.g., chronic infections).

SOME PATHOLOGICAL CASES FROM THE PORTUGUESE MESOLITHIC

Cláudia Umbelino, Eugénia Cunha and Francisca Cardoso, Universidade de Coimbra

The Portuguese Mesolithic is a well known period because of the existence of many skeletons dated from 8000 to 4000 BP. When dealing with the interpretation of past human behavior and understanding the environments in which it developed, paleopathology does play an important role. In this paper, we present pathological cases from the Mesolithic shell middens at Sado and Muge curated at the University of Oporto. In general, cases with severe pathology are absent from these series. Nevertheless we noted the occurrence of vertebral ankylosis, vertebral compressions, osteoarthritis, fractures and maxillary osteitis. Differential diagnoses are given. The low frequency of pathological cases from the Portuguese Mesolithic is discussed. Individuals who were exposed to severe stress would probably die before forming skeletal defects. The cases are discussed within the context of the demographic profile and the diet of these communities.

FOOT AMPUTATION BY THE MOCHE OF NORTHERN COASTAL PERU: TWO NEW CASES

John Verano and Laurel S. Anderson, Tulane University

At the 1996 Paleopathology Association meetings we presented a possible case of bilateral foot amputation in a pre-Hispanic Moche burial from northern coastal Peru. Two additional cases were found during summer fieldwork in 1998. All three cases show a similar pattern of osseous reaction at the distal ends of the tibiae and fibulae. Normal knee joint surfaces and robusticity of the leg bones suggest renewed weight-bearing and locomotion following healing. A literature search revealed a report of the discovery at the turn of the 19th Century at an archaeological site in northern Peru of a footless skeleton with wooden prostheses still in place over the distal tibiae/fibulae. This growing number of skeletal cases, in conjunction with realistic representations of footless individuals in Moche ceramics, provides convincing evidence that the Moche were capable of successful amputations with a technique similar to that developed by Sir James Syme in Scotland in 1842. The motivation for Moche amputation, however, remains uncertain.

A PALEOPATHOLOGIST LOOKS AT NOVEMBER 22, 1963

Michael R. Zimmerman, University of Pennsylvania

In 1998 I was called upon by the National Archives and Records Administration (NARA) and the FBI to participate in a study of the bullet that caused the wound fatal to President John F. Kennedy. Fragments of dark material were noted in the sealed container in which the bullet had been kept. I was asked to rehydrate these 35 year old fragments and determine whether they were human tissue. The specimens consisted of 4 roughly triangular 3 mm. fragments of dark brown material. After histologic processing, microscopic examination revealed the specimens to be human superficial skin and blood, some with postmortem insect invasion and black pigment. DNA studies were to be performed, comparing the results with blood from the President's shirt or possibly a sample from Senator Ted Kennedy. A public report is to be released.

MOLECULAR ANALYSIS OF DNA IN EGYPTIAN MUMMY MATERIAL FOR THE IDENTIFICATION OF PATHOGENIC BACTERIA

Albert Zink, Udo Reischl, Hans Wolf and Andreas G. Nerlich, Ludwig-Maximilians-University, Munich (AC, AG) and University of Regensburg (UR, HW)

The identification of genetic material in ancient tissues provides potential insight into the molecular development of bacterial DNA in pathogens. We analyzed bacterial DNA in ancient Egyptian mummies from the necropolis of Thebes-West (Upper Egypt; approximately 1500 - 1000 BC). Sterile tissue samples were removed from 5 lungs, 1 urinary bladder and 2 lumbar spines and subjected to extraction and purification of the DNA followed by PCR amplification using primer pairs recognizing conserved regions of the eubacterial 16S rRNA gene. The resulting amplification products were analyzed by direct cyclic sequencing. Using this approach, we were able to identify several different bacterial species. We found specimens positive for pathogenic and non-pathogenic bacteria, e.g., *Mycobacterium tuberculosis, Lactobacter thermotolerans,* or *Rhizobium* spp. This provides clear evidence that the molecular analysis of bacterial DNA may potentially indicate distinct infectious diseases in historic populations.

SECTION 3: POSTER PRESENTATIONS

TATTOOS AMONG THE NUBIANS OF SEMNA SOUTH

A. Alvrus, D. Wright and C.F. Merbs, Arizona State University

Tattoos may have cultural or medical significance. Additionally, tattoos may be for beautification purposes. As cultural symbols, tattoos may indicate group membership, status or achievements. In some cultures, tattoos may have been used similarly to branding or cauterization to bring blood flow to or stimulate a painful area. This poster presents five tattoos identified in a collection of human remains from the site of Semna South in Sudanese Nubia. Three tattoos were found on the dorsal surfaces of hands, and one on the dorsal surface of a foot. Another tattoo was located on skin apparently from a lower arm. Tattoos on the hands were examined using infrared photography to enhance visibility. The tattoos are relatively complex designs and may relate to the social status or the group affiliation of the individuals bearing them.

PAGET'S DISEASE OF BONE

Rachel Black and Jennifer Boudreaux, University of Arkansas-Fayetteville

Paget's disease of bone (osteitis deformans) is a chronic disease characterized by both bone resorption and bone formation. Paget's disease most commonly affects the skull, axial skeleton, and the pelvis. The etiology of Paget's disease remains unknown. It usually affects individuals over the age of forty and is primarily seen in individuals of European descent. This poster questions the diagnosis of two cases of Paget's disease in individuals of Native American descent. One is from the McClellan site (16BO236) located in northwest Louisiana, and the other is from the McArther site (3CH49) located in Chico County, Arkansas. We examine the differential diagnoses of Paget's disease and present the pathological lesions of these individuals. We compare our cases with other archaeological cases to demonstrate that these are not Paget's disease.

NON-SPECIFIC INFECTIONS IN A RURAL POPULATION FROM NORTHERN GREECE (10TH-12TH CENTURIES AD)

Chryssi Bourbou, Chania, Greece

Rescue excavations brought to light a Middle Byzantine (10th-12th A.D.) cemetery of a rural population in northern Greece. The examination of 41 individuals revealed some interesting pathological conditions and among them a remarkable frequency of non-specific infections. Six cases of periostitis, two cases of osteomyelitis and one case of maxillary sinusitis are observed. Periostitis is most possibly attributed to minor traumatic lesions on the skin surface caused by the everyday activities (farming, etc.) Dental abscess seem to be the most probable cause for maxillary sinusitis. Finally, the two osteomyelitic cases exhibit two severe and probably fatal paleopathological conditions.

CORTICAL BONE DYNAMICS AND AGE-RELATED FEMUR OSTEOPENIA OF AN ARCHEOLOGICAL SAMPLE FROM THREE LOMBARD GRAVEYARDS OF VICENZA PROVINCE (NORTHEAST ITALY)

Andrea G. Drusini and Simonetta Bredariol, University of Padova

Since the contribution of Brothwell and co-workers in early 1968, few studies have considered the cortical bone involution in European skeletal series of archaeological interest. The present study concerns the involutive mechanisms and the intra- and intersexual variability in 66 femurs of adults

belonging to three graveyards of Lombard age excavated in the Vicenza province (northeast Italy). Cortical thickness and cortical and medullary areas were measured and a correlation matrix was generated for each sex and age class. Intra- and intersexual variability was evaluated by two-tailed t-test and sexual dimorphism index after Hall (1982). The results indicated a considerable difference between the sexes, with females showing an earlier and more marked cortical bone loss, as expected. Moreover, comparing the data with the scarce literature available, some discrepancies in cortical bone involution were found in populations with different patterns of adaptation, suggesting the need for more studies to understand the bone-environment dynamics.

LYTIC LESIONS INDICATING POSSIBLE METASTATIC CANCER IN A PRE-COLUMBIAN SKELETON FROM CANYON DE CHELLY, ARIZONA

S. Hanson, R. McGurk and A.L. Grauer, Loyola University Chicago

A preColumbian 35-45 year old male skeleton from Canyon de Chelly, Arizona (ca AD 900-1300) displays lytic lesions in several bones. Through the use of macroscopic, radiological, and archaeological analyses, differential diagnosis is employed to determine the etiology of the lesions. Preliminary analyses suggest that the individual suffered from a neoplastic condition, perhaps metastatic carcinoma.

PEDAL SYMPHALANGISM IN SKELETONS FROM JAPAN AND THE UNITED STATES

Jill Heilman and Troy Case, Arizona State University

Pedal symphalangism is a developmental condition defined as ankylosis of the intermediate and distal phalanges of one or more toes. It results from failure of a joint cavity to form between the two phalanges during early fetal development. Affected individuals always exhibit involvement of at least one fifth toe. However, in some individuals, both the fourth and fifth toes may be involved, and in very rare cases, three or even all four lateral toes are affected. The trait has a high degree of bilateral expression. Reported frequencies of pedal symphalangism range from a low of 37% in 19th Century Germans to a high of 80% in modern Japanese. We present a discussion of the current state of knowledge concerning the trait, as well as new frequency information gathered from Japanese, Black and White American, and American Indian skeletons.

A POSSIBLE CASE OF TUBERCULOSIS ON A MEDIEVAL FARM IN CORROIOS, PORTUGAL

Celia Lopes, Ana Luisa Santos and Eugénia Cunha, Universidade de Coimbra

The paleobiological study of 42 individuals (adults and subadults) recovered in 1996 from the cemetery of a medieval farming community (Camara Municipal do Seixal) revealed several pathological conditions. This paper reports on a young adult female skeleton (S.16) in a good state of preservation, despite some damage due to plant roots. The skeleton presents a series of pathological alterations, both macroscopic and radiological. The most striking changes occurred in the ribs: new bone formation on the visceral surfaces of ribs 3 through 9 (out of 10 preserved) on the right side and 4 out of 10 on the left side. The lesions were more severe in thickness and extent on the left side, at both the sternal and vertebral ends. Both tibiae present slight periosteal reaction along the shafts, and the tarsals and metatarsals display woven bone. The differential diagnoses for this case, which most probably represents tuberculosis, are discussed.

A CASE OF PAGET'S DISEASE OF BONE WITH COMPLICATIONS FROM A BRITISH MEDIAEVAL SITE

Simon Mays, English Heritage

A skeleton of an elderly male excavated from a British Mediaeval site shows indications of Paget's disease of bone. Several fractures are present and represent secondary complications. Some joints show unusually severe osteoarthritic changes that may also be secondary to the Pagetic process.

A POSSIBLE NEOPLASTIC CONDITION IN A WOODLAND PERIOD CRANIUM FROM NEBRASKA

Elizabeth Miller and Tara Guidry, California State University - Los Angeles

Cranial fragments recovered from the purported Woodland Period site (2000 - 1000 BP) of 25DO4 (Mound 3) exhibit changes consistent with a neoplastic condition. The sex of the individual cannot be determined because of the lack of postcranial elements and the fragmentary nature of the calvarium. The individual was an adult. Several large and small lesions are visible on the endocranial surface and perforating the outer table. Radiological examination also indicates an endocranial origin for these lesions. The lesions appear as oval defects; however, both bone formation (complex spiculated periosteal reaction) and destruction are visible. Differential diagnoses include meningioma, osteosarcoma, metastatic carcinoma, hemangioma, and several potential infectious causes. The case is presented and the most likely diagnosis discussed.

BENIGN OSTEOCHONDROMA OF THE VERTEBRA IN A JUVENILE INDIVIDUAL FROM ANCIENT EGYPT

Andreas G. Nerlich and Albert Zink, Ludwig-Maximilians University, Munich, Germany

During recent excavations at the necropolis of Thebes-West (Upper Egypt, approx. 1500 - 1000 BC), we identified two adjacent vertebral bodies from an adolescent individual with still open epiphyseal plates, showing at one vertebra an osteochrondroma of the left vertebral arch of 26 x 21 x 14 mm. The tumor was covered by a tiny bone plate such as those seen at the epiphyseal growth plate of the growing skeleton. This bone plate is a characteristic feature of osteochondroma. In addition, the affected vertebral body revealed a difference in its height of 15 mm of the right side versus 20 mm of the left side. In consequence, the vertebral axis seemed to show some left-convex scoliotic deformation which may have disabled the affected individual or produced unusual clinical symptoms.

POSTGRADUATE SHORT STUDY PROGRAMS IN PALEOPATHOLOGY: A VISIONARY EXAMPLE FROM GERMANY

F. Rühli, University of Zurich, Switzerland and A. Schilitz, University of Potsdam, Germany

The aim of this study is to present a remarkable course in paleopathology and to formulate criteria guaranteeing successful similar projectse. The 'summer academy' (supervised by M. Schultz) organised by the German Society for Anthropology was held in June 1998 at the University of Göttingen. During two weeks, young multidisciplinary scientists from different countries had the opportunity to learn a variety of examination methods used in paleopathology. Furthermore the participants were introduced to different techniques (e.g., producing bone ground sections) and their analyses. The demonstration of their own studies and a literature survey were also part of the schedule. Besides personal academic benefit, another result of this program was the initiation of several ongoing international research projects. Major student needs have been evaluated and summarised for this rare form of postgraduate education.

A FORENSIC CASE WITH POSSIBLE LEPROSY

Maryna Steyn, University of Pretoria, South Africa

In December 1996 a human skeleton was discovered in northern Cape Province, South Africa. The 50 year old male skeleton was relatively complete, and only the hand bones, most ribs and some vertebrae were absent. Dimensions of the skull indicated a Negroid origin, although the absence of subnasal

prognathism also suggests so-called 'Cape Coloured' admixture. Some of the upper teeth were lost antemortem. Partly healed erosions of the bone were found in both medial walls of the orbits, extending into the upper part of the nose and the ethmoid sinuses. The left nasal bone was fractured antemortem, and the right nasal bone was eroded away. Both femora and tibiae were bent, and the right clavicle thickened. This combination of features, especially the upper tooth loss and accompanying alveolar resorption, suggests leprosy. The unaffected foot bones may argue against this diagnosis. No positive identification has, as yet, been made in this case.

PSEUDO-PATHOLOGY: MORPHOLOGICAL CHANGES OF FETAL BONE RELATED TO THE TAPHONOMIC EFFECTS OF RODENT URINE

Nancy E. Tatarek and Kathi S. Tron, Ohio State University

Fetal remains were discovered in the crawl space of an old house dating to the late 1800s. Approximately 90% of the skeleton, aged at 30-36 weeks, was present. A small portion was covered with mummified tissue. Those areas of bone not protected by tissue had an eroded surface texture that resembled a 'sea sponge', an effect mirrored on the remaining soft tissue covering the bone. Initial analysis of the bony erosion suggested a skeletal disorder, but the presence of the same effect on the soft tissue precluded this as a final diagnosis. Based on chemical analysis, microscopic examination, radiological studies, and physical inspection, a conclusion of taphonomic processes was drawn. There is little information about the effects on the human skeleton of long term exposure to urine, and this poster will examine morphological changes due to rodent urine.

SURVIVAL OF WILD BOAR (SUS SCROFA) FOLLOWING GUNSHOT WOUND TO THE LEFT MAXILLA

W.-R. Teegen, Universität Góttingen, J. Wussow and R. Müller, Universität Halle (Germany)

The skull of a young adult wild boar was studied from a paleopathological point of view. The following dental diseases were found: dental calculus, periodontitis, tooth pockets, apical process of the right upper M2, bilateral hypoplasia of the upper M3. The animal was hit by a Brennecke bullet, with the entrance hole in the right maxillary sinus. The bullet passed the cavum nasi(?) and remained in the left maxillary sinus, but the kinetic energy caused damage to the bony wall of the sinus (exit hole). The bullet caused a chronic inflammation of the sinus and adjacent areas with new bone formation and bone remodelling. The sutures blowed up(?), but the boar survived for a long period. On the right frontal bone there is a scar with periosteal reaction, the result of an injury. It is not clear whether this was caused by another boar or by man. The animal was later killed by a hunter with a regular shot and macerated for scientific purposes.

SURVIVAL OF AN AMPUTATION IN SECOND CENTURY ROME

David S. Weaver and G.H. Perry, Wake Forest University, Roberto
Macchiarelli and L. Bondioli, Museo Nazionale Preistorico Ethnographico L. Pigorini, Rome

In an ossuary collection from the necropolis of Isola Sacra, a 2nd-3rd century site near Rome, we found the upper midshaft portion of a right femur showing clear signs of intentional amputation of the leg below the midshaft. The femur shows both typical bone remodeling and chronic osteomyelitis related to the amputation. Both conditions imply a considerable survival time, although the individual probably suffered at least increased morbidity due to the sequelae of the amputation. This case represents an early Roman example of intentional amputation and survival that adds to the literature on early surgical practices in the ancient world.

POSTER SYMPOSIUM: NONDESTRUCTIVE ANALYSIS OF MUMMIFIED AND SKELETAL REMAINS VIA IMAGING TECHNIQUES

1. ENDOSCOPIC EVIDENCE OF LYMPHADENOPATHY IN A MUMMIFIED PERUVIAN WOMAN FROM PACHACAMAC

Ronald G. Beckett, Quinnipiac College, Michael McNamee, New Britain General Hospital and Janet Monge, University of Pennsylvania

A mummified Peruvian woman from the Pachacamac area underwent standard radiography, endoscopy, helical computed tomography, and magnetic resonance imaging. One of the endoscopic procedures used was a standard bronchoscopic approach. A posterio-lateral narrowing was seen at the level of the tenth through thirteenth tracheal rings. Normal tracheal architecture was apparent proximal and distal to the narrowing. The endoscopic appearance was compared to endoscopic images of modern lymphadenopathies. Without biopsy, the specific process cannot be named. It is important to note that the standard radiography and helical computed tomography did not demonstrate the tracheal narrowing. There was a lesion suggestive of Pott's disease in the body of the tenth thoracic vertebra, which may explain the lymphadenopathy. Finding evidence of Pott's by helical computed tomography, various fractures and arthritic changes by standard radiography, and lymphadenopathy by endoscopy demonstrates the value of using multiple modalities in the nondestructive analysis of mummified individuals.

2. ENDOSCOPIC EVALUATION OF SEGMENTED STERNUM WITH RADIOGRAPHIC CORRELATION IN A PERUVIAN INFANT: IMPLICATIONS FOR AGING OF THE INDIVIDUAL

Ronald G. Beckett and Gerald Conlogue, Quinnipiac College and Roger Colten, Yale University

A Peruvian infant mummy was examined via standard radiography and endoscopy. Radiographic views included AP and Lateral projections. Endoscopy included the thoracic, oral/pharyngeal, and endocranial cavities. Radiographic images and endoscopy identified a segmented sternum. Using a segmented sternum alone to age an individual is not recommended due to the wide variance in segmental fusing seen between the ages of 6 months and 6 years. However, using the segmented sternum in correlation with other skeletal information may be useful. Correlation with radiographic images of teeth and analysis of long bone epiphyses used in conjunction with the segmented sternum aids in a more accurate age determination. If only a torso is available without long bones or an intact cranium, the segmented sternum viewed endoscopically may be helpful in age estimations.

3. WHAT HAPPENED TO THE 'COOK'? A RADIOGRAPHIC STUDY OF AN EGYPTIAN MUMMY

Terry Stockman, Kari Rigg and John Vitale, Quinnipiac College and Roger Colten, Yale University

A radiographic examination of an Egyptian mummy from the Ptolemaic era, informally known as 'the cook of Ra', at the Peabody Museum at Yale University revealed what appeared to be a fracture in the occipital region of the skull. The study became a practical exercise for a student radiographer to obtain the best projection to demonstrate the questionable fracture. Two pathology assistant students applied their knowledge of forensics to determine the possible circumstances that produced the anomalies noted on the radiographs.

4. DEVELOPING STANDARDIZED TOTAL BODY RADIOGRAPHIC PROJECTIONS OF MUMMIFIED PERUVIAN REMAINS

William Hennessy and Gerald Conlogue, Quinnipiac College

Mummified Peruvian remains are frequently recovered with the body in a flexed position under layers of textiles. Without knowing the relative position of the body within a textile bundle, radiographs of the remains 'as is' are inadequate for a thorough evaluation. However, from these initial images, radiographers familiar with the manipulation of the x-ray tube, film, and exposure factors can produce a standard set of projections that are currently used to evaluate patients. A standardized series of radiographs, comprising a total body survey, would facilitate the image evaluation by specialists such as radiographers and orthopaedists.

5. A PRELIMINARY STUDY TO DETERMINE THE MOST SUITABLE RADIOGRAPHIC PROJECTIONS TO DOCUMENT INTENTIONAL CRANIAL DEFORMATION

Andrew Nelson, University of Western Ontario, Gerald Conlogue and William Hennessy, Quinnipiac College and Suellen Gauld, Santa Monica College

Intentional cranial deformation has been classified according to the type of apparatus employed to create the deformity and external vault morphology. Several studies utilized lateral radiographs to describe more quantitatively changes in the shape of the skull. The craniometrics employed a number of planes, including the Frankfort Horizontal Plane, and the angles formed by the planes in the analysis. Since a radiograph is a two-dimensional representation of a three-dimensional object, these measurements only describe changes in the longitudinal or sagittal plane. In an effort to document changes in the coronal and/or axial planes, a number of radiographs were taken using the Frankfort Horizontal Plane and several of the reference lines that form the basis for conventional medical diagnostic skull projections and anthropometric orientations. The poster evaluates the additional projections as applied to a group of crania recovered from San Jose de Moro, Peru.

6. FIELD RADIOGRAPHY OF MUMMIFIED PERUVIAN REMAINS

Gerald Conlogue, Quinnipiac College, Sonia Guillén and Joe Salazar, The Bioanthropology Foundation (Centro Mallqui)

The poster outlines the establishment of two field x-ray facilities and the value of a large-scale radiographic evaluation of bundled and unbundled Chachapoya and Chiribaya remains. Problems encountered at the two very different villages, Leymebamba in the Amazonian jungle and Algorrobal in the coastal region of southern Peru, are considered. The value of radiography as a means of examining the bundles to determine contents, relative position of remains, age at the time of death, paleopathology, and funerary practices is discussed.

7. MAGNETIC RESONANCE EVALUATION OF MUMMIFIED REMAINS WITH COMPUTED TOMOGRAPHY CORRELATION

John Posh, Muhlenberg Hospital and Janet Monge, University of Pennsylvania

Magnetic resonance (MR) has been recognized as a superior imaging modality to evaluate pathology in clinical medicine and to a limited degree as an adjunct to conventional autopsy. MR has been attempted with only minimal success to image mummified remains. Researchers theorized that the desiccated tissue would not contain sufficient free hydrogen to create an image. This poster uses computed tomographic images to verify that MR signal can be detected and could provide a useful, specialized, non-invasive tool for the examination of mummified remains.

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ISSN 0148-4737