



WORKING YOUR FINGERS TO THE BONE

AN INTERDISCIPLINARY CONFERENCE ON
IDENTIFYING OCCUPATION FROM THE SKELETON

PROGRAMME ♦ ABSTRACT BOOK



COIMBRA, PORTUGAL

6TH-8TH JULY 2016



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AN INTERDISCIPLINARY CONFERENCE ON
IDENTIFYING OCCUPATION FROM THE SKELETON



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DEPARTMENT OF LIFE SCIENCES
UNIVERSITY OF COIMBRA, PORTUGAL
6TH-8TH JULY

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We would like to welcome you to the International Meeting *“Working Your Fingers to the Bone. An interdisciplinary conference on identifying occupation from the skeleton”*.

In 2009 the University of Coimbra hosted a Workshop in Musculoskeletal Stress Markers (MSM). The present conference expands that topic to look at all ways in which occupation can be inferred from skeletal remains, as well as including presentations based on developments issuing from that 2009 workshop.

The conference combines oral and poster presentations on cutting edge issues related to occupational health, and gathers the most knowledgeable researchers interested in disease, injury and other effects of occupation on the human skeleton to improve the interpretation of these changes in archaeological and forensic contexts. A hands-on workshop for teaching the new Coimbra Method (Henderson et al. 2015) for recording enthesal changes will also run during the conference.

In addition to five invited lectures that cover topics on occupational health ranging from medicine and forensic sciences to bioarchaeology, the conference includes thirty-seven presentations split between oral and poster presentations.

We believe that the presentations will stimulate the interdisciplinary thinking that underlies the study of occupational health in past populations, and in forensic contexts, creating new avenues of research.

We hope you find the programme scheduled for the next three days enlightening and stimulating. We are all looking forward to welcoming you to Coimbra, the UNESCO World Heritage Portuguese “City of Students”.

CONFERENCE COMMITTEES AND VOLUNTEERS

CONFERENCE COMMITTEES AND VOLUNTEERS

HONORARY COMMITTEE

JOÃO GABRIEL MONTEIRO DE CARVALHO E SILVA | Rector of the University of Coimbra, PORTUGAL

LUÍS JOSÉ PROENÇA DE FIGUEIREDO NEVES | Director of the FCTUC (Faculty of Sciences and Technology from the University of Coimbra), PORTUGAL

CRISTINA PADEZ | Subdiretor of DCV (Department of Life Sciences) is standing in for **JORGE CANHOTO**, Director of DCV, PORTUGAL

SCIENTIFIC COMMITTEE

EUGÉNIA CUNHA | University of Coimbra, PORTUGAL

GENEVÈVE PERRÉARD LOPRENO | University of Geneva, SWITZERLAND

ANTÓNIO JOSÉ VILAR QUEIRÓS | University of Coimbra Social Services, PORTUGAL

SÉBASTIEN VILLOTTE | University of Bordeaux, FRANCE

CYNTHIA WILCZAK | San Francisco State University, U.S.A.

And all members of the organizing committee.

ORGANIZING COMMITTEE

CHARLOTTE HENDERSON | CIAS – Research Centre for Anthropology and Health, University of Coimbra, PORTUGAL

ANA LUISA SANTOS | CIAS – Research Centre for Anthropology and Health, Department of Life Sciences, University of Coimbra, PORTUGAL

FRANCISCA ALVES CARDOSO | CRIA – Centre for Research in Anthropology, FCSH, Universidade Nova de Lisboa, PORTUGAL

SANDRA ASSIS | CRIA – Centre for Research in Anthropology, FCSH, Universidade Nova de Lisboa, PORTUGAL, CIAS – Research Centre for Anthropology and Health, University of Coimbra, PORTUGAL

MARIA ALEJANDRA ACOSTA | Laboratory of Forensic Anthropology, Centre for Functional Ecology – CEF, Department of Life Sciences, University of Coimbra, PORTUGAL

VOLUNTEERS

VITÓRIA DUARTE | CIAS - Research Centre for Anthropology and Health, University of Coimbra, PORTUGAL

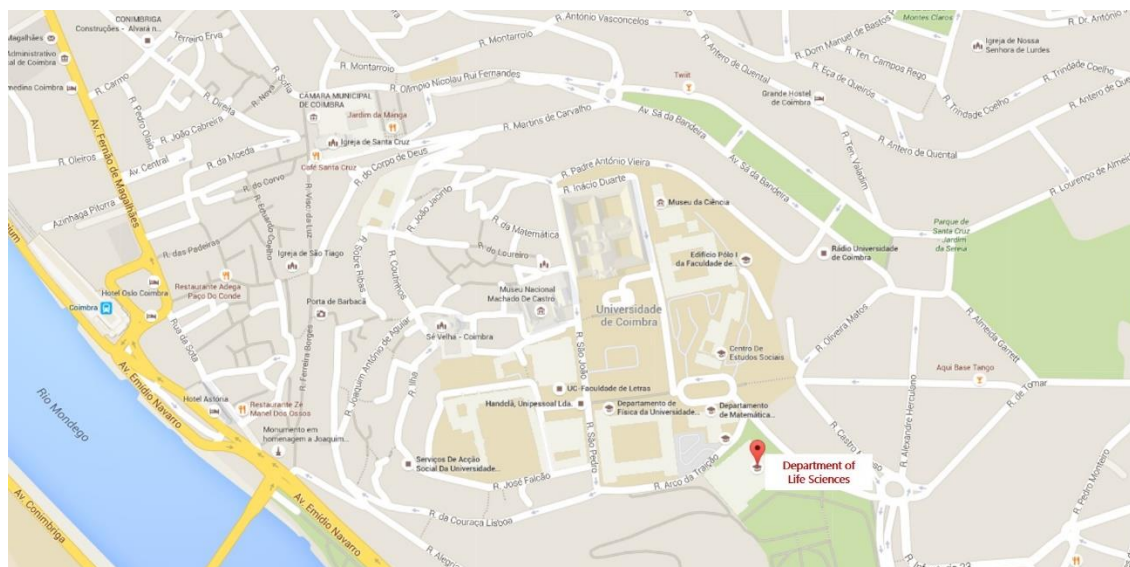
LEONI FAGUNDES | Department of Life Sciences, University of Coimbra, PORTUGAL

ANDREIA MENDES | FCSH, Universidade Nova de Lisboa, PORTUGAL

CATARINA RODRIGUES | Department of Life Sciences, University of Coimbra, PORTUGAL

VENUE INFORMATION AND LOCATION

VENUE INFORMATION AND LOCATION



The conference will be held in the **Department of Life Sciences** (Colégio de São Bento, former *Instituto de Antropologia*) – **Anfiteatro I (1st floor)**, University of Coimbra (Pólo I).

The **workshop** in the **New Coimbra Method** will take place in **Sala 1.2 (1st floor)**.

The **registration desk** opens **08:00** on the **6th of July** on the **1st floor** (up one flight of steps) in the Colégio de São Bento.

For more information about the location of Colégio de São Bento please visit:
<http://www.uc.pt/ruas/inventory/mainbuildings/bento>

Address:

Departamento de Ciências da Vida (Colégio de São Bento)
Faculdade de Ciências e Tecnologia
Universidade de Coimbra
Calçada Martim de Freitas
3000-456 Coimbra
Portugal

GPS: 40°12'25.9"N 8°25'19.1"W

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FULBRIGHT



P O R T U G A L



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University of Coimbra – Alta and Sofia
• inscribed on the World Heritage
• List in 2013



PROGRAMME AND WORKSHOP SCHEDULE

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PROGRAMME

DAY 1 | 6TH OF JULY – ANFITEATRO I

08:00-14:00 **REGISTRATION AND POSTER SET-UP**

14:00-14:20 **WELCOME**

14:20-15:00 **KEYNOTE SPEAKER | CYNTHIA A. WILCZAK**

METHODS IN RECONSTRUCTING PAST ACTIVITIES: CAN THE NEW APPROACHES DELIVER ANY SUBSTANTIAL NEW INSIGHTS?

15:00-15:25 ACTIVITY HISTORY CONSISTING MULTIDIRECTIONAL LOADING AFFECTS STRENGTH BUT NOT SHAPE OF THE FEMUR SHAFT | **S. NIINIMÄKI, N. NARRA, L. HÄRKÖNEN, S. ABE, R. NIKANDER, J. HYTTINEN, C. KNÜSEL, H. SIEVÄNEN**

15:25-15:50 MAHALANOBIS DISTANCES AS A MEANS OF EXPLORING INTER-POPULATION DIFFERENCES IN ENTHESEAL CHANGES | **E. NIKITA, A. RADINI**

15:50-16:15 MOMENTS OF INERTIA IN THE EVALUATION OF BONE FUNCTIONAL ADAPTATION OF THE LOWER LIMBS: A STUDY ON HISTORICAL AND MODERN POPULATIONS | **F. SIMONIT, F. CAVALLI, F. GIUDICI, D. INNOCENTI, L. LUSNIG**

16:15-16:55 **COFFEE BREAK**

16:55-17:20 GENDERED DIVISION OF LABOUR IN A HELLENISTIC-ROMAN POPULATION FROM BOĞAZKÖY, TURKEY: CONSIDERATION OF TRAUMATIC, DEGENERATIVE AND MUSCULOSKELETAL EFFECTS | **H. ÜSTÜNDAĞ**

17:20-17:45 COULD MICRO-CT HELP TO GRASP THE NATURE OF ENTHESEAL CHANGES? EARLY INSIGHT FROM RADIAL TUBEROSITY EXPLORATION | **W. BERTHON, B. TIHANYI, GY. PÁLFI, O. DUTOUR, H. COQUEUGNIOT**

17:45-18:10 COMPARING MICROARCHITECTURE WITH MACROMORPHOLOGY: IS ENTHESEAL CHANGE A MARKER OF ACTIVITY? | **B. MULDER, B. VAN RIETBERGEN, A.L. WATERS-RIST**

18:10-18:35 ANALYSING UNIQUENESS AND SYMMETRICALITY OF ENTHESES: AN APPROACH TO IDENTIFYING INDIVIDUALS IN MASS BURIALS | **M.A. ACOSTA, C.Y. HENDERSON**

18:35-19:00 THE "NEW COIMBRA METHOD" AND THE EFFECT OF AGE | **C.Y. HENDERSON, V. MARIOTTI, C.A. WILCZAK, S. VILLOTTE, F. SANTOS**

19:00 -20:00 **WINE RECEPTION**

DAY 2 | 7TH OF JULY – ANFITEATRO I

09:00-09:40 **KEYNOTE SPEAKER | SÉBASTIEN VILLOTTE**
DIVISION OF LABOUR IN EUROPEAN PREHISTORY

09:40-10:05 STICKS, STONES, AND BROKEN BONES: TRAUMATIC INJURIES AND HOW THEY CONTRIBUTE TO A LIFE COURSE OF ENTHESEAL CHANGES AND ACTIVITY PATTERNS | **E. STEVENS**

10:05-10:30 EXTERNAL AUDITORY EXOSTOSES (EAE) - AN ACTIVITY INDICATOR FOR ACTIVITIES IN THE OR ON THE WATER? | **B. TEBMANN**

10:30-11:15 **COFFEE BREAK | POSTER SESSION A**

1. ENTHESIS SIZE: THE RELATIONSHIP WITH OCCUPATION AND ENTHESEAL CHANGES | **C. Y. HENDERSON**

2. A DIACHRONIC STUDY OF ACTIVITY IN PORTUGAL USING ENTHESEAL CHANGES | **M. S. SALEGA, A.M. SILVA, C.Y. HENDERSON**

3. EXPLORING “WEAR AND TEAR” OF JOINTS AND “MUSCLE FUNCTION” ASSUMPTIONS IN SKELETONS WITH KNOWN OCCUPATION AT DEATH | **F. ALVES-CARDOSO**

4. OCCUPATIONAL ACTIVITY AND BONE MINERAL DENSITY IN MEN: A STUDY FROM THE COIMBRA IDENTIFIED SKELETAL COLLECTION | **F. CURATE, E. CUNHA, I. FERREIRA, A. ALBUQUERQUE**

5. EVIDENCES OF TRAUMA IN AN ENSLAVED AFRICAN INDIVIDUAL FROM LAGOS, PORTUGAL (15TH-17TH CENTURIES) | **M.T. FERREIRA, C. COELHO, E. CUNHA, S.N. WASTERLAIN**

6. DIACHRONIC ANALYSIS OF ‘SQUATTING FACETS’ IN RURAL AND URBAN DUTCH POPULATIONS | **S. INSKIP, J. PALMER, R. SCHATZ**

11:15-11:55 **KEYNOTE SPEAKER | HELENA CANHÃO**
DISEASES OF THE BONES AND JOINTS: WHAT DO THEY TELL US?

11:55-12:20 SUFFERING A SEA CHANGE- TRAUMA IN THE LATE 18TH TO EARLY 19TH CENTURY BRITISH ROYAL NAVY | **C. BOSTON**

12:20-12:45 PHYSICAL STRESS AND REPETITIVE MOVEMENT IN SEWING: THE USE OF CLINICAL LITERATURE TO INFER ACTIVITY IN SKELETAL REMAINS FROM LATE 19TH TO EARLY 20TH CENTURY | **A.F. MAXIMIANO, A.L. SANTOS, C.Y. HENDERSON**

12:45-13:10 CONFRONTING MARKERS OF OCCUPATIONAL STRESS WITH KNOWN OCCUPATIONAL DATA: CASES FROM PORTUGUESE HUMAN IDENTIFIED COLLECTIONS | **A. MENDES, S. SOARES, F. ALVES-CARDOSO**

13:10-14:00 **LUNCH**

14:00-14:40 **KEYNOTE SPEAKER | DUARTE NUNO VIEIRA**

WORK, SKELETAL CHANGES AND IDENTIFICATION

14:40-15:05 (MIS)INFORMED? IDENTIFIED SKELETAL COLLECTIONS, OCCUPATION, AGE-AT-DEATH AND THE RECONSTRUCTION OF PHYSICAL ACTIVITY | **M. MILELLA, F. ALVES-CARDOSO, S. ASSIS, N. SPEITH**

15:05-15:30 APPEARANCE OF ENDPLATE DEFECTS IN THE THORACO LUMBAR SPINE: AN ONTOGENETIC STUDY | **L. RIOS, H.F. CARDOSO**

15:30-15:55 THE HUNGARIAN CONQUEST PERIOD ARCHERY AND ACTIVITY-INDUCED STRESS MARKERS – ANTHROPOLOGICAL AND ARCHAOMETRICAL STUDIES OF A 10TH C. AD HUNGARIAN SERIES | **B. TIHANYI, L. RÉVÉSZ, W. BERTHON, O. DUTOUR, I. NEPPER, O. SPEKKER, Z. BERECKZI, E. MOLNÁR, GY. PÁLFI**

15:55-16:40 **COFFEE BREAK | POSTER SESSION B**

7. OCCUPATIONAL-RELATED CHANGES IN ORAL STRUCTURES | **I.M. CALDAS, M.L. PEREIRA, A. TEIXEIRA, D. PÉREZ-MONGIOVI**

8. TOOTH WEAR AND EXTRA-MASTICATORY BEHAVIOUR: A PARTICULAR CASE OF A FISHERMAN FROM THE IDENTIFIED SKELETAL COLLECTIONS OF THE UNIVERSITY OF COIMBRA | **S. WASTERLAIN**

9. A RE-ASSESSMENT OF SEX-DIFFERENCES IN EC USING THE COIMBRA METHOD | **J. PALMER, A.L. Waters-Rist, M.L.P. Hoogland**

10. ENTHESEAL CHANGES ON INDIVIDUALS FROM A CEMETERY IN PIRAEUS (GREECE) OF THE 4TH CENTURY B.C | **A. SYROGIANNI**

11. HABITUS, ENTHESEAL DEVELOPMENT, AND GENDER: A BIOARCHAEOLOGICAL INVESTIGATION OF EMBODIMENT IN AN EARLY BRONZE AGE COMMUNITY IN SOUTHEASTERN POLAND | **M.P. TOUSSAINT, P. WŁODARCZAK**

12. ENTHESEAL CHANGES AND THE SEARCH FOR SPECIALISED ARCHERS: A LOOK INTO BELL BEAKER BURIALS | **J. RYAN, J. DESIDERI, M. BESSE**

13. POLLUTANT ACTIVITIES: DETECTING SIGNALS OF MINING AND METALLURGY IN SKELETONS FROM IBERIA AND SCANDINAVIA | **O. LÓPEZ-COSTAS, A. KJELLSTRÖM, J. STORÅ, A. MARTÍNEZ CORTIZAS**

16:40-17:05 RECONSTRUCTION OF HIERARCHY SOCIETY FROM ENTHESEAL CHANGES IN EDO PERIOD, JAPAN | **S. YONEMOTO**

17:05-17:30 ATYPICAL DENTAL WEAR AND ORAL PATHOLOGY IN A SKELETAL SAMPLE EXHUMED FROM ONE MAQBARA OF SHANTARÍN (PORTUGAL) | **A.C. RODRIGUES, A.M. SILVA, A. MATIAS, A.L. SANTOS**

17:30-17:55 OROFACIAL DYSFUNCTION AND DENTAL WEAR: ANALYSING BIOMECHANICS IN AN INDIVIDUAL FROM THE ARCHAEOLOGICAL COLLECTION OF SLAVES FROM LAGOS (PORTUGAL) | **A.L. RUFINO, M.T. FERREIRA, S.N. WASTERLAIN**

DAY 3 | 8TH OF JULY – ANFITEATRO I

08:45-09:25 **KEYNOTE SPEAKER | GENEVIÈVE PERRÉARD LOPRENO**
BONE GEOMETRY AND STRENGTH: ANTHROPOLOGICAL AND MEDICAL APPROACHES TO ASSESS THE INFLUENCE OF OCCUPATIONAL ACTIVITIES ON THE SKELETON

09:25-09:50 RESPIRATORY HEALTH IN PAST POPULATIONS: BONY CHANGES AND RISK FACTORS FOR RESPIRATORY DISEASES OBSERVED IN THE LINEAR POTTERY CULTURE (5500 – 4800 BC) POPULATION FROM WANDERSLEBEN, CENTRAL GERMANY | **S. KLINGNER, M. SCHULTZ**

09:50-10:15 IS OCCUPATION A RISK FACTOR FOR RESPIRATORY DISEASE? AN ESSAY IN THE COIMBRA INTERNATIONAL EXCHANGE SKULL COLLECTION | **B.M. MAGALHÃES, S. MAYS, A.L. SANTOS**

10:15-10:40 WAS OCCUPATION A RISK FACTOR FOR THE DEVELOPMENT OF BONE LESIONS IN LEPROSY PATIENTS BEFORE THE “ANTIBIOTIC ERA”? EVIDENCE FROM THE ARCHIVES OF THE LAST PORTUGUESE LEPROSARIUM | **V.M.J. MATOS**

10:40-11:20 **COFFEE BREAK**

11:20-11:45 ON THE TRACES OF ANCIENT TUBERCULOSIS: POSSIBILITIES OF THE MACROMORPHOLOGICAL DIAGNOSIS OF TUBERCULOSIS IN PREHISTORIC AND HISTORIC OSTEOLOGICAL SERIES – SKELETAL TUBERCULOSIS CASES FROM THE SZEGED ANTHROPOLOGICAL COLLECTION | **O. SPEKKER, E. MOLNÁR, A. MARCSIK, G. LOVÁSZ, M. MASSON, M. MACZEL, A. PÓSA, E. NEPARÁ CZKI, O. VÁRADI, M. SCHULTZ, A. NERLICH, D. MINNIKIN, H. DONOGHUE, F. MAIXNER, A. ZINK, O. DUTOUR, Z. BERE CZKI, L. PAJA, GY. PÁLFI**

11:45-12:10 DYED-IN-THE-WOOL: THE IMPACT OF OCCUPATIONAL BEHAVIOUR AND THE ENVIRONMENT ON SMALL URBAN AND RURAL COMMUNITIES IN FLANDERS, c. 1200-1860 AD. | **M.P.J. VAN CANT**

12:10-12:20 **DISCUSSANT**

12:20-12:50 **OPEN DISCUSSION**

12:50-13:50 **LUNCH**

WORKSHOP SCHEDULE



DATE	START TIME	END TIME	ROOM (SALA)
6TH OF JULY, 2016	09:00	12:00	1.2
8TH OF JULY, 2016	14:30	17:30	1.2
9TH OF JULY, 2016	14:00	17:00	1.2



KEYNOTE SPEAKERS

KEYNOTE SPEAKERS

CYNTHIA A. WILCZAK*, Associate Professor, San Francisco State University

Cynthia Wilczak received her Ph.D. from Cornell University in 1998. She has worked on the development of both quantitative and qualitative methods for recording enthesal changes and coauthored "Atlas of Occupational Markers on Human Remains" with Luigi Capasso and the late Kenneth AR Kennedy. As a member of a methodology working group established at the 2009 workshop on Musculoskeletal Stress Markers held at the University of Coimbra, Portugal, she has collaborated with her colleagues in developing and testing the Coimbra method for recording enthesal changes. Her other research interests are in paleopathology, particularly disease processes that are associated with bone formation. Dr. Wilczak formerly worked in the Repatriation Laboratory at the National Museum of Natural History, Washington D.C. and is currently an associate professor in the Department of Anthropology at San Francisco State University.

Methods in Reconstructing Past Activities: Can the new approaches deliver any substantial new insights?

Wilczak, C.A.
Associate Professor, San Francisco State University
cwilczak@sfsu.edu

The study of "markers of occupational stress" (MOS) in bioarchaeology has its roots in early occupational medicine. In skeletal populations, MOS have been classified as bony changes caused by long-term patterns of activity that result in excessive mechanical forces on the bone, including the formation of flat surfaces (facets) where bone comes in contact with bone; changes at muscle insertions (entheses); patterns of osteoarthritis in joint complexes; cross-sectional geometry of the long bones; as well as stress fractures and other types of traumatic injuries. The pattern of these changes has been used to infer the life history and physical labor of many prehistoric and historic populations yet there are considerable questions surrounding the accuracy and limits of such reconstructions. Some of the problems are methodological while others stem from an incomplete understanding of how bone responds to strain, complicated by other factors, such as age and pathology that can also induce bony changes and have the potential to obscure the biomechanical effects, if any, on bone. Each type of MOS represents a distinct challenge and some of the underlying assumptions about the relationship between activity and skeletal changes have recently received increased scrutiny. After a survey of the history of MOS studies, this presentation will critically examine the clinical and experimental work that might provide support for biomechanical stress as a factor in the etiology of the skeletal changes currently used in activity studies and will then review the most recent advances in methodological approaches in bioarchaeological studies. Finally the limitations of what we can reasonably infer about activity patterns in past populations in light of the most recent advances in skeletal biology and suggestions for future research studies will be presented.

*Visiting Scholar under the Fulbright Specialists Program



SÉBASTIEN VILLOTTE, CNRS Researcher, UMR 5199 PACEA.

Sébastien Villotte is involved in interdisciplinary projects that focus on biological characteristics and burial practices of European Upper Palaeolithic and Mesolithic populations. One strand of his research focuses on the behaviour of past human populations; the main issues addressed being division of labour and workload, human-environment interactions and group mobility.

Division of Labour in European Prehistory

Villotte, S.

CNRS Researcher, UMR 5199 PACEA.

Cultural anthropologists have long recognised that the age and sex of individuals determine the level of participation in activities among human groups cross-culturally. On this basis, it seems legitimate to formulate the hypothesis of a division of tasks within prehistoric European societies as well. In the absence of writing the number of possible approaches to test this hypothesis, however, is quite limited. One can analyse art manifestations depicting everyday activities, artefacts (mostly to discuss the level of experience or specialisation needed for their realisation), grave goods, or human remains themselves. None of these kinds of study is without limitations, but the bioanthropological approach seems the most promising. Based on examples of studies of human remains dated from the Upper Palaeolithic, Mesolithic, and Neolithic, I will attempt to illustrate how to address independently (and thus avoiding circular reasoning so commonly seen in this field) task divisions in European Prehistory. The purpose of this kind of research is twofold: on the one hand it can allow to better understand the structure of these societies; on the other hand it may highlight cultural universals.

DUARTE NUNO VIEIRA, Director and professor at the Faculty of Medicine, University of Coimbra

Duarte Nuno Vieira is visiting professor in several Portuguese, European and South American universities. He is President of the European Council of Legal Medicine, of the Ibero-American Network of Forensic Medicine and Forensic Science Institutions and of the Portuguese Association for Bodily Injury Assessment and Vice-President of the European Confederation of Experts on Evaluation and Repair of Bodily Injury. He is also Chairman of the Forensic Advisory Board of the Prosecutor of the International Criminal. He has been President of the International Academy of Legal Medicine, of the International Association of Forensic Sciences, of the World Association of Police Medical Officers, of the Mediterranean Academy of Forensic Sciences, and of the Latin American Association of Medical Law. He also had been Director of the Institute of Legal Medicine of Coimbra, President of the Portuguese National Institute of Legal Medicine and Forensic Sciences and of the Portuguese Medico-Legal Council and President of the Portuguese Superior Council of Legal Medicine and the College of Forensic Medicine of the Portuguese Medical Association. He is Chairman of the Thematic Federation on Legal and Forensic Medicine of the European Union of Medical Specialists. Coordinator of the Competence in evaluation of Bodily Injury group of the Medical Association. Member of the Executive Committee of the Working Group on Pathology and Forensic Anthropology of Interpol Standing Committee on Identifying Mass Disaster Victims. He works on regular basis as Temporary Forensic Consultant for the United Nations High Commissioner for Human Rights, and he is Member of the Forensic Advisory Board of the International Committee of the Red Cross, Member of the Forensic Expert Group of the International Rehabilitation Council for Torture Victims, among many other functions.

Work, skeletal changes and identification

Vieira, D. N.

Director and professor at the Faculty of Medicine, University of Coimbra

One of the general objectives in forensic pathology expertise's is the body identification. It is often one of the most important and, simultaneously, more complex objectives. Among the various factors, which could contribute to this identification, are the changes produced in the body by the occupational activities, most particularly when these activities involve specific requirements in terms of certain body segments, generating changes and disorders, in particular at skeletal level.

If some of these changes are pathognomonic, the majority are however not specific to a particular profession. But even so, they may still be a relevant factor in the identification process, taking into account the limitations that affect this assessment; Indeed, different activities could give rise to similar functional stresses, individuals of the same activity group can perform different tasks with different types and levels of stress and similar biomechanical stresses can have different effects on Individuals owing to human variability.

At the skeletal level such changes are usually those that are already included in the permanent impairment tables for the assessment of disabilities due to work accidents and occupational diseases, because many of these changes end up conditioning, still during life, degenerative limitations generating working incapacity and the right to a compensation according to labour law.

HELENA CANHÃO, Invited Full Professor, Head EpiDoC Unit, NOVA, Universidade Nova de Lisboa

Helena Canhão is an invited Professor, in the field of Epidemiology, of Nova Medical School (Nova University, Lisbon), and since 2016 the Principal Investigator of EpiDoC Unit, CEDOC, hosted by the same University. EpiDoC is an epidemiology and research unit that strives for scientific information of excellence, congregation health and diseases related issues covering clinical, social, economic and human aspects. She is also the National Coordinator of Reuma.pt, the Portuguese Register of Rheumatic Diseases (Portuguese Society of Rheumatology), alongside many other institutional duties as research coordinator, and project leader, also acting as teacher and medical professional in topics related with rheumatic diseases. She was to date been awarded with 10 scientific prizes including the Prémio Bial de Medicina Clínica (2008), and the Senior Clinical Award Harvard Medical School-Portugal Program (2009).

Diseases of the bones and joints: what do they tell us?

Canhão, H.

Invited Full Professor, Head EpiDoC Unit, NOVA, Universidade Nova de Lisboa

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Osteoarthritis is a joint disease characterized by subchondral bone and cartilage failure. It has been reported in humans since Paleolithic times. The disease prevalence increases with age and also with intense physical exercise. The prevalence was very high in the British Isles, documented in remains from Romano-British and Saxon burials suggesting that, whatever genetic factors there may have been, there was an extremely high level of physical activity (WJ MacLennan). The prevalence of the condition has been decreasing in late Medieval times through the 18th and 19th centuries. Currently it is a bit higher than in 19th century not only associated to ageing as well to the promotion of physical activity in modern societies.

By opposite, osteoporosis is characterized by bone fragility and increased risk of fractures. Inactivity and sedentary life habits increase the prevalence of osteoporosis. This justified the reduction in bone density with the change from hunter to agriculture, with lower physical activity. Severe cases of osteoporosis have been identified from individual skeletons dated to the Bronze Age. Osteoporosis is much more frequent in women. But the pattern changed over time. In the Early Medieval period osteoporosis frequency started to raise. Contributing factors were bad nutrition, pregnancies and prolonged lactation (WJ MacLennan). With the increasing of life survival the prevalence of post-menopausal osteoporosis has been progressively increasing through the high levels we are experiencing today.

GENEVIÈVE PERRÉARD LOPRENO, External Collaborator, Laboratory of Prehistoric Archaeology and Anthropology, University of Geneva

Lecturer in prehistoric archeology and anthropology laboratory of the University of Geneva from 2000 to 2012, currently external collaborator of this institution and independent archaeological anthropologist. Research topics: identified skeletons collections (construction, testing and creation of methodological standards), functional adaptation of the skeleton, palaeodemography, bio- cultural environment of medieval and modern regional populations (growth and stature). Member of the working group on the categorization of occupations, resulting from the workshop of Coimbra, 2009. President of the Swiss Society of Anthropology (2010-2015).

Bone geometry and strength: anthropological and medical approaches to assess the influence of occupational activities on the skeleton

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Repeated loading influences bone mass, geometry and/or microstructure. Contributing factors are extensively studied in biomechanics and in the medical field, but in studies without longitudinal design in populations with specific characteristics, e.g. age, sex, disease, sports activities. Whether chronic loading in the frame of professional activity in a life course impacts bone, particularly cortical bone that markedly contributes to bone strength, is poorly documented. This lecture will present results from two original studies, one in the field of anthropology, the other in a medical context (carried out by Dr. E. Biver, Department of Bone Diseases, University of Geneva Hospitals). Based on the same corpus (men from the SIMON collection of identified skeletons with known professions), on identical variables (cross-sectional properties on several sections from humerus, radius and clavicle) as well as similar occupational groups categorisation, each study had a specific aim of research. In an osteoporosis/bone disease context the issue is to understand if occupational activities in a life course contribute positively to bone geometry and strength, so lowering the risk of fracture in old ages. In an anthropological approach, the main question is to know if daily occupational activities influence, in a distinctive way, the bone geometry allowing discrimination of unilateral versus bilateral activities. Results, enhanced by in vivo data (GERICO cohort), demonstrate that repeated loading may positively influence cortical bone strength by two mechanisms: an increase of cross-sectional area in young adulthood followed by slowdown of the age-related endosteal bone loss. It appears further, that agricultural activity, mainly bimanual, led to a gain of symmetry, since both the non-active and specialists groups show a higher asymmetry on the upper limb. Besides these statistical results, some more qualitative results, concerning bilateral asymmetry, handedness, and overall characteristics of bone geometry at an individual as well as population level will also be presented. Finally these findings will briefly be discussed in the context of current research.



ABSTRACTS

ABSTRACTS

Analysing Uniqueness and Symmetrically of Entheses: An approach to identifying individuals in mass burials

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Introduction:

Individualization of human remains in forensic or archaeological contexts in mass burials is one of the first challenges that must be resolved by bone analysis. The *in-situ* characteristics of remains provide the primary evidence that researchers rely upon to achieve individualization. However, some cases require intensive laboratory analysis in which skeletal features are examined for individualization. It has been established that enthesal changes (EC) are related with ageing, sex hormones, body size, and biomechanical load. Except for the latter, all the other factors are systemic. Biomechanical loads, caused by occupation and other activities, could have asymmetrical effects on EC, especially in upper limbs. This study focuses on the analysis of the characteristics of the entheses, namely size and changes, to determine their potential use within the individualization process.

Materials and Methods:

A sample of males from the identified skeletal collection of the University of Antioquia, between 20 and 53 years old at time of death were selected. The maximum length of y-axis and x-axis of 24 fibrocartilaginous entheses were measured to the nearest 0.1 mm. EC were recorded using the new Coimbra method. Size and EC were recorded and analysed to estimate symmetry and likeness between right and left side.

Results:

General trends suggest that biceps brachii, iliopsoas, quadriceps femoris, vastus lateralis and triceps surae show the most symmetric size between right and left side. Triceps brachii, semitendinosus, semimembranosus, iliopsoas, vastus lateralis and triceps surae evidenced the greatest visual similarities between sides.

Discussion and Conclusions:

The aim of this analysis was to test the similarities in size and EC between sides. The evidence demonstrates that iliopsoas, vastus lateralis, and triceps surae are the entheses that show the most similar sizes and morphological characteristics between sides, which could potentially be used in the individualization process.

Keywords:

Individualization; enthesal changes; activity-related changes

Acknowledgements:

We would like to thank Dr. Timisay Monsalve for providing access to the skeletal collection of the University of Antioquia.

Funding:

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Exploring “Wear and Tear” of Joints and “Muscle Function” Assumptions in Skeletons with Known Occupation at Death

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Introduction:

Often in bioarchaeological studies degenerative joint changes (DJC) are believed to be the result of major “wear and tear” of the joints, consequence of repeated strenuous activity, and enthesal changes (EC) resulting from muscle use. However, clinical data has showed that activity does not necessarily imply an increased likelihood of DJC, and that exercise, by improving muscle function, aids in supporting healthy joints.

This paper tests the hypothesis that individuals with continuous repetitive biomechanical efforts (Group1) were more likely to exhibit EC than DJC, and that occupations known to exert strenuous but discontinued efforts (Group2) would, more likely, cause DJC than EC.

Materials and Methods:

A total of 89 males with 5 known occupations were used: shoemakers and carpenters (Group 1) and workers (Group 2). Civil servants and shop assistants were used for additional comparison. Differences between and within occupations were tested for DJC and EC. Detailed description of methodology associated with DJC and EC coding can be found in Alves-Cardoso (2008). Firstly, DJC and EC were tested between occupations, whilst controlling for age. Secondly, DJC and EC correlation was tested within occupation. This provided an overall and occupation-specific approach to DJC and EC. Major upper and lower limbs joints were used.

Results:

The overall approach showed that that age, as a covariant, had a significant impact in DJC and EC development ($p < 0.05$), with occupation being non-significant ($p > .05$) despite variability in mean values of lesions – this forced to reject the hypothesis tested. The occupation-specific approach showed a significant variability of DJC and EC correlations within and between occupations.

Discussion and Conclusions:

The results showed that exploring overall sample/population patterns might disguise occupation-specific joint and muscle use, accentuating age as a major contributor of changes. Conversely, the occupation-specific approach highlighted singularities associated with occupations, allowing for a more informative assessment of strenuous repetitive or discontinuous technical gestures and their impact in skeletal biology.

Keywords:

Degenerative joint changes; enthesal changes; activity.

References:

Alves-Cardoso, F., 2008. *A Portrait of Gender in Two 19th and 20th Century Portuguese Populations: A paleopathological perspective*. Durham: University of Durham.

Funding:

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Could MicroCT Help to Grasp the Nature of Enteseal Changes? Early insight from radial tuberosity exploration

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Introduction:

Enteseal changes (EC) can result from various causes, mechanical stress and Forestier's disease (or DISH) being only two of them. The aim of this preliminary study is to explore the microarchitecture of the radial tuberosity, insertion site of *m. biceps brachii*, in order to explore if specific features resulting either from muscle overuse during the life of the individuals, or from metabolic disorders, can be identified.

Materials and Methods:

For this exploratory investigation, we relied on three pairs of radii, belonging to three male adults: (i) one buried in the Hungarian cemetery of Sárrétudvari-Hízóföld with archery equipment, who was presumably a mounted-archer from the Conquest period (Xth century), and exhibiting EC; (ii) one from the Hungarian cemetery of Bácsalmás-Homokbánya (XVI-XVIIth centuries), without any evidence of archery context, showing enteseal changes associated to a DISH condition; (iii) one from the medieval cemetery of Val-de-Reuil, in Normandy, France, belonging to an apparent "normal" individual with non-changed enteses. Bicipital tuberosities were micro-CT scanned at a resolution of 17µm and several portions were analysed at different height levels of the zone of interest (25, 50 and 75%), in order to virtually differentiate the main microarchitectural bone components and then to reconstruct in 3D the canals and cavities of both medullary and compact bone.

Results:

At this preliminary step of the study, we observed differences in the microarchitectural organisation of the underlying bone of the entesis, that are revealed by the 3D reconstructions of canals and cavities. In particular, microstructural analysis revealed a change in the normal pattern characterised by an irregular widening of the canal network for the metabolic-related EC, and an orientated organisation for the mechanical-related EC, associated with an increased density of canals.

Discussion and Conclusions:

After a possible confirmation from further analyses, this method might allow to distinguish mechanical from metabolic enteseal changes. These preliminary observations are bringing new arguments to discuss the nature of EC and, consequently, to clarify some aspects of lifestyles among past human populations.

Keywords:

Enteses; activity markers; microtomodensitometry.

Funding:

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Suffering a Sea Change – Trauma in the late 18th to early 19th century British Royal Navy

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Introduction:

In Europe today, seafaring involves only a small proportion of the population, but in the recent past vast numbers of men were engaged in a wide range of maritime occupations, including short and long-distance trade and naval warfare. Operating a sailing ship of the late 18th to early 19th century required considerable skill and experience, with sailors commonly going to sea in childhood or adolescence. The physical effects of a maritime lifestyle on the growing body, and the exposure to the specific hazards, lifestyle and living conditions on-board a ship resulted in very different trauma patterning in seamen compared to their land-based contemporaries.

Materials and Methods:

Recent excavation of the burial grounds of three British Royal Navy (R.N.) hospitals (the Royal Hospitals of Haslar, Plymouth and Greenwich) has allowed the opportunity to osteologically explore trauma patterning in 300 skeletons of common seamen and marines, who fought in Britain's numerous wars with European neighbours and erstwhile colony America in the later 18th to early 19th centuries. Fracture types and joint dislocations were categorized using modern medical criteria. Cause of these injuries was explored using modern and forensic medical research and the records of 18th century R.N. sea surgeons.

Results:

Contemporary 18th century R.N. sea surgeon accounts indicate that sailing a fighting ship was an extremely hazardous occupation. This is borne out by osteological analysis of the above skeletons, which display extraordinary rates of bony trauma, including 926 fractures, 11 shoulder dislocations and 18 acetabular flange lesions. Although battle trauma was undoubtedly present, the majority of injuries were probably incurred in the everyday activities aboard ship, including falls, crush injuries and brawling. Bony modification in response to a maritime occupation is seen most clearly in the shoulder and hip joints, flattening of the acetabula, high rates of *os acromiale*, dislocation and tendon damage, and possibly labral tearing (paralabral cysts).

Discussion and Conclusions:

These distinctive and unusual injuries tentatively suggest an occupational trauma patterning peculiar to seafarers in the Age of Sail.

Keywords:

Royal Navy; sailors; maritime; trauma; fractures.

Funding:

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Occupational-Related Changes in Oral Structures

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Introduction:

Modifications in human teeth may be useful for reconstructing a person's life events. Some patterns are decorative, whereas others may relate to socioeconomic status. Both are deliberated and linked with cultural aspects. Conversely, occupational-related (OR) changes are involuntary and non-deliberated. Yet, as with the deliberated changes, these can also be very informative, namely of a person's occupation.

The aim of this work is to provide a general view of the most common OR oral markers.

Materials and Methods:

We've performed a bibliographic review using PubMed, to select cases where OR oral changes have been identified. The following keywords were used: "occupational-related oral changes", "dental modifications", "TMJ modifications".

Results:

OR dental changes occur mainly due to wear by using teeth as tools. Musicians' mouthpieces may damage the anterior teeth, as can hairdressers' hairpins, and fishermen's hooks. These are examples of a mechanical trauma. Other OR dental changes relate to chemical factors, where workers in particular industries, such as chemical factories, may suffer from acid induced erosion. Moreover, although caries is a multifactorial disease, the greater carbohydrate consumption in pastry cooks may also explain the higher caries prevalence in these professionals.

Other oral structures, as the temporomandibular joints (TMJ) and the mandible, may also display OR modifications, namely in musicians and professionals who have a long-term, heavy use of computers.

Discussion and Conclusions:

OR dental changes are non-intentional mechanical or chemical modifications. Mechanical modifications usually produce an indentation pattern useful for determining their aetiology; chemical alterations can pose more problems as they can mimic tooth wear related with food consumption or some pathologies (as bulimia), requiring a complete oral examination to check for common patterns present in these conditions. It is, hence, very important to be familiarized with these conditions and with those which require a differential diagnosis.

Keywords:

Teeth; oral structures; non-deliberated modifications.

Occupational Activity and Bone Mineral Density in Men: A study from the Coimbra Identified Skeletal Collection

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Introduction:

Physical activity exerts a significant impact on bone health, but the effects of work-related physical activity on bone mineral density (BMD) are ambiguous. As such, the purpose of this study is to investigate the influence of occupational activity on BMD at the hip in a sample of male adult individuals from the Coimbra Identified Skeletal Collection (CISC).

Materials and Methods:

The studied sample comprised 128 adult Portuguese males from the CISC, with known profession and cause of death. Occupations were divided in manual (n=108) and non-manual (n=20). BMD at the hip (regions of interest: femoral neck and total hip area) was assessed through osteodensitometry (DXA).

Results:

BMD at the neck and total hip is lower in the manual occupations' group ($BMD_{\text{neck/manual}}: 0.769 [0.16]$ vs. $BMD_{\text{neck/non-manual}}: 0.788 [0.16]$ / $BMD_{\text{total hip/manual}}: 0.887 [0.16]$ vs. $BMD_{\text{total hip/non-manual}}: 0.969 [0.31]$), but the differences are not statistically significant. Total hip area (THA, cm^2), a proxy for bone size, is also similar in both occupational groups ($THA_{\text{manual}}: 43.40 [3.81]$ vs. $THA_{\text{non-manual}}: 42.44 [4.44]$). Univariate analysis of variance suggests that the diagnosis of osteoporosis in this sample is only influenced by age at death and not occupation or cause of death.

Discussion and Conclusions:

In agreement with epidemiological studies, our findings suggest that sedentary work (i.e., non-manual work) does not influence BMD at the hip and, consequently, the diagnosis of osteoporosis. As expected, age is a fundamental risk factor for bone loss. Limitations of this study include a small sample size (particularly in the non-manual occupations' group) and the assortment of different types of manual professions in the same group.

Keywords:

Osteoporosis; sedentary work; activity patterns.

Funding: Fundação para a Ciência e Tecnologia (SFRH/BPD/74015/2010 [FC]).

Evidences of Trauma in an Enslaved African Individual from Lagos, Portugal (15th-17th Centuries)

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Introduction:

In this paper the traumatic injuries observed in the skeletal remains of an individual recovered from the Valle da Gafaria, Lagos (Portugal), are described. Given the provenance of this individual, an urban discard deposit dated from the 15th-17th centuries, and his probable social status, the observed lesions are discussed in light of his life condition as a slave.

Materials and Methods:

The individual here described (no. 66) is an almost complete and well-preserved skeleton. The ancestry was estimated based on cranial morphological characteristics. The sexual diagnosis was made through the metric and morphological analysis of the skull and hipbone. The age-at-death was estimated on the basis of morphologic changes in the pubic symphysis. All lesions were carefully observed and described, and the injured bones radiographed.

Results:

The skeleton belongs to an adult African male. Age was assessed as +30 years. Ante-mortem traumatic injuries were observed in the 5th lumbar vertebra, 2nd right metacarpal, and left humerus. Peri-mortem lesions were recorded in several bones, namely scapulae, sternum, two thoracic vertebrae, eight ribs, fibulae, right intermedial and lateral cuneiforms, and seven metatarsal bones.

Discussion and Conclusions:

The described individual has suffered several traumatic events during life, and probably at the time of death. The ante-mortem lesions occurred several months/years prior to death, since the lesions are fully remodelled. Regarding the peri-mortem lesions, it is not possible to infer if these have been the cause of death based on the osteological evidence alone. The number of traumatic lesions observed is consistent with a hard life. These results are in accordance with the historical sources, which document physical punishments, labour accidents, and hard work since premature ages in slaves' populations. In the present case, we cannot establish if the observed traumatic lesions were related with inter-personal violence, with accidents and/or forced labour. Another study in a sample from an 18th century slave cemetery in Cape Town (South Africa) also has found extensive evidence of trauma, interpreted as indicative of a physically demanding lifestyle.

Keywords:

Slavery; ante and peri-mortem lesions; traumatic injuries.

Funding:

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The “New Coimbra Method” and the Effect of Age

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Introduction:

Activity-patterns, not specifically occupation, have been widely studied using changes to the bony imprints of tendons on bone (entheses). However, it has been demonstrated that ageing has the strongest effect on the presence of these enthesal changes (ECs). In a prior test of the Coimbra method for recording ECs, the clear detection of age effects was problematic due to the small sample size (n=31) and low variability in ECs (Henderson *et al.*, 2013). The method has recently been revised and the aim of this study is to test the effects of age on ECs scored with the “new Coimbra method” (Henderson *et al.*, 2015) using a larger sample.

Materials and Methods:

Labourers, the largest single occupation group represented (n=60) in the Coimbra collection, were recorded using the “new Coimbra method” (*ibid.*). Age ranged from 16 to 96 and all were male. Three entheses were recorded: subscapularis and biceps brachii insertions, and the common extensor origin. Boxplots were used to visualise the data. Asymmetry and the effect of age were calculated (Henderson *et al.*, 2013).

Results:

Mean values of age for each feature score indicate an increase in age for higher scores, except for fine porosity and textural change, which show the opposite trend. Mean ages are more dispersed on the right side, compared to the left. Asymmetry tests for the labourers indicate that the majority have equal scores for features on the right and left sides.

Discussion and Conclusions:

Age is the most important factor in increasing scores for bone formation, erosion and macropores, whereas fine porosity and textural change are most commonly found in younger individuals. Sample size is still small, given the large number of features recorded for each enthesis and lack of variability in the scores. Larger samples are needed to understand the relationship between EC features and age.

Keywords:

Enthesal changes; ageing; new Coimbra method; Coimbra collection.

References:

- Henderson, C. Y.; Mariotti, V.; Pany-Kucera, D.; Villotte, S.; Wilczak, C., 2013. Recording Specific Enthesal Changes of Fibrocartilaginous Enteses: Initial tests using the Coimbra Method. *Int. J. Osteoarchaeol.*, 23:152–162. DOI: 10.1002/oa.2287.
- Henderson, C. Y.; Mariotti, V.; Pany-Kucera, D.; Villotte, S.; Wilczak, C. 2015. The New “Coimbra Method”: A biologically appropriate method for recording specific features of fibrocartilaginous enthesal changes. *Int. J. Osteoarchaeol.* DOI: 10.1002/oa.2477.

Enthesis Size: The relationship with occupation and enthesal changes

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Introduction:

The size of entheses is known to be affected by the presence of enthesal changes (ECs) and bone-forming diseases, e.g. diffuse idiopathic skeletal hyperostosis. The aim of this presentation is to study the relationship between entheses size (as standardised by joint size), EC and occupation. The hypothesis is that heavy manual workers have the largest entheses.

Materials and methods:

All male skeletons from the Coimbra identified skeletal collection were recorded using three recording methods: Villotte (presence and absence), the new Coimbra recording methods and entheses were measured in two axes at 90 degrees to each other. These chords were multiplied together to approximate area and divided by joint size (e.g. vertical humeral head) using the measurement of the joint upon which they act to standardise body size. Occupations were categorised into non-manual, manual, heavy manual and soldiers. Bone-formers were excluded from analysis. Three rotator cuff entheses were recorded.

Results:

Only the left infraspinatus showed differences between occupations when all entheses were included. For entheses with no EC only the right subscapularis supported the hypothesis. Area was typically larger for individuals with erosions, cavitations and bone formation in any zone, but smaller for those with textural change, fine porosity and macropores. These relationships are maintained even when entheses with bone formation in either zone are excluded.

Discussion and Conclusions:

Standardised entheses area was not found to have a relationship with occupation categories. Fibrocartilaginous entheses size seems to match cross-sectional growth trends of muscles during adolescence, but cease to increase in size once local epiphyses have fused. New bone growth around the margins of entheses does increase the footprint size, but this does not explain the size differences for other changes. *In vivo* research is needed to interpret the relationship between soft and hard tissues.

Keywords:

Enthesal changes; new Coimbra method; entheses size.

Diachronic Analysis of “Squatting Facets” in Rural and Urban Dutch Populations

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Introduction:

The presence of so-called “squatting facets” of the tibia and talus has been used by researchers to explore differences in behaviours between populations. Previous research has found significant variation in prevalence between groups of diverse geographical regions and a general decrease in prevalence over time in European groups. However, although frequently recorded in osteological reports, there have been few systematic studies investigating the presence of this feature in diverse groups from a single region.

This research presents the true prevalence rates of “squatting facets” on the tibia and talus in seven Dutch populations from the medieval to post-medieval period, from typographically similar areas. The aim is to explore the relationship between prevalence with time period and living environment.

Materials and Methods:

Squatting facets were recorded in over 400 tibiae and tali based on the method of Finnegan (1978), Barnett (1954) and Boulle (2001). Left and right sides were recorded and the sexes analysed separately. Sites were divided into three time periods (central, late and post-medieval) and each was broadly classified as urban or rural. Comparisons were made over time and between site types.

Results:

The results demonstrated that populations classed as rural generally had a higher prevalence of squatting facets than those classified as urban. However, the prevalence of facets varied over time within the site type, which resulted in overlap between site types of different periods.

Discussion and Conclusions:

While there appeared to be a correlation between site type and the prevalence of squatting facets, the correlation with time was less evident and demonstrates the importance of using contextual information for interpretation.

Keywords:

Squatting facet; the Netherlands; activity.

References:

- Barnett, C. H., 1954. Squatting Facets on the European Talus. *Journal of Anatomy*, 88: 509-513.
Boulle, E., 2001. Osteological Features Associated with Ankle Hyperdorsiflexion. *International Journal of Osteoarchaeology*, 11: 345-349.
Finnegan, M., 1978. Non-metric Variation of the Infracranial Skeleton. *Journal of Anatomy*, 125: 23-27.

Respiratory Health in Past Populations: Bony changes and risk factors for respiratory diseases observed in the Linear Pottery Culture (5500 – 4800 BC) population from Wandersleben, Central Germany

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Introduction:

The respiratory health of past populations was previously studied by observation of the maxillary sinuses and the ribs in association with specific diseases. However, it is necessary to examine all of the bony structures surrounding the respiratory tract (upper and lower), also in association with unspecific respiratory diseases.

Materials and Methods:

The human remains examined for this study are adult skeletons of the people of the Linear Pottery Culture (5500 – 4800 BC), who lived in Wandersleben (Gotha County), Thuringia. The main focus was placed on bones surrounding the respiratory tract. The skulls and/or ribs of 112 individuals were studied paleopathologically and examined macroscopically, by low power microscopy, endoscopically, by X-ray, by light microscopy, by scanning electron microscopy and in some cases by biochemical analyses of extracellular bone matrix proteins. Bony changes were recorded in association with respiratory diseases, also taking possible risk factors into account.

Results:

The bony changes on the bone surfaces are different in the upper and the lower respiratory tract. Generally, these changes are nonspecific. All individuals (100%; n=71/71) showed signs of chronic upper respiratory diseases with different causes. For one individual (1.4%; n=1/71), the cause of the chronic disease can be assumed to have been tuberculosis. Signs of nonspecific lower respiratory diseases were seen in 71% (n=49/69) of the individuals. A specific disease, such as pulmonary tuberculosis, can be assumed for 5.8% (n=4/69) of the individuals.

Discussion and Conclusions:

The respiratory diseases in the population of Wandersleben were primarily chronic stages of nonspecific infections, presumably due to the living conditions including, amongst others, climate, general state of health, housing and occupation. The appearance of remnants of specific diseases on bone surfaces can appear to be nonspecific. Therefore it will be necessary to carry out further analyses in various fields (aDNA, ECM) to gather details on the actual frequency of specific respiratory diseases in past populations.

Keywords:

Chronic nonspecific respiratory diseases; tuberculosis; Linear Pottery Culture.

Pollutant Activities: Detecting Signals of Mining and Metallurgy in Skeletons from Iberia and Scandinavia

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Introduction:

Metal mining and metallurgy played a fundamental role in human communities. Since the early metal exploitation, significant quantities were released to the environment polluting the atmosphere, waters and soils. As a result, people were incorporating traceable pollution signals into their tissues. In this investigation we combine elemental composition of bone and multivariate analysis to approach the relationship of two different societies with metals.

Materials and Methods:

A geochemical study of human remains from Roman/post-Roman A Lanzada (30 skeletons, 2nd to 6th centuries AD) in NW Spain and the Viking Age/ Middle Age city of Sigtuna (82 skeletons 10th to 16th centuries AD) in Central-East Sweden is performed. Cortical bone samples were analyzed by XRF and ICP-SFM, the obtained data was transformed to centered log ratios and principal components (PCA) and ANOVA were applied.

Results:

PCA enabled to distinguishing between *pre-mortem* and *post-mortem* signals. Significant higher concentrations of lead were found in Roman individuals from A Lanzada. In Sigtuna, we found important differences in terms of composition among necropolises, specifically elevated concentrations of arsenic and lead in a group of women from Church 1. The statistical analysis points to an incorporation during life on both cases.

Discussion and Conclusions:

Some individuals of the two studied areas seem to have been affected by metal pollution, but probably by different pathways. The widespread presence of lead in Roman Lanzada skeletons, as well as settlement characteristics (rural, trade activities), rules out a direct involvement with metalworking or mining of most of the population. An exposure to higher atmospheric pollution seems a suitable explanation. In Sigtuna, the incorporation of toxic metals seems more related to a particular activity, since it has been detected in a specific group. The fact that women were more affected than men suggests a "gender"-related activity possible related to metals-transformation.

Keywords: Lead; Arsenic; principal components analysis

Funding: OLC is funded by Plan Galego I2C mod.A. Part of the research was funded by the projects 2012-PG108, GPC2014/009 and R2014/001 of Xunta de Galicia.

Is Occupation a Risk Factor for Respiratory Disease? An essay in the Coimbra International Exchange Skull Collection

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Introduction:

Rhinosinusitis is a group of diseases characterized by the inflammation of the paranasal sinuses and is, currently, one of the diseases that most commonly affects the respiratory tract. Paleopathological studies reported frequencies of maxillary rhinosinusitis (MRS) between 17.2-85.3% in different populations. Poor air quality is considered one of the risk factors for MRS, although several studies reported inconsistent results. The aim of this work is to investigate MRS prevalence in a Portuguese sample, and to understand if poor air quality related to occupation can be a risk factor for MRS and respiratory disease.

Materials and Methods:

A sample of 527 identified skulls of the Coimbra International Exchange Collection was observed, 288 (54.6%) with at least one maxillary sinus accessible for macroscopic or videoscopic inspection, 144 from males and 144 from females, and with age at death from 7 to 109. MRS was scored as recommended by Boocock *et al.* (1995). Individuals were divided into indoor/outdoor and lower/higher risk occupations for respiratory disease.

Results:

The presence of MRS was scored in 37.8% (109/288) of the individuals, 33.3% (48/144) of females and 42.4% (61/144) of males, and 26.2% (11/42) of non-adults and 39.8% (98/246) of adults. No significant differences were found between sex ($X^2_{(1)} 2.840$; $p 0.092$) and age groups ($X^2_{(1)} 4.871$; $p 0.301$). Furthermore, no significant association was found between indoor/outdoor occupations and MRS ($X^2_{(1)} 1.296$; $p 0.260$) or pulmonary disease cause of death ($X^2_{(1)} 0.327$; $p 0.567$), neither between higher risk occupations for respiratory disease and MRS ($X^2_{(1)} 2.743$; $p 0.433$); nonetheless, there is a very weak association with pulmonary disease cause of death ($p 0.125$).

Discussion and Conclusions:

The possible association between poor air quality and MRS is still under discussion. This work raises questions on the subject of the significant influence of poor air quality related to occupation and respiratory disease.

Keywords:

Poor air quality; maxillary rhinosinusitis; cause of death.

References:

Boocock, P.; Roberts, C. A.; Manchester, K., 1995. Maxillary Sinusitis in Medieval Chichester, England. *Am. J. Phys. Anthropol.*, 98(4): 483-495.

Funding:

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Was Occupation a Risk Factor for the Development of Bone Lesions in Leprosy Patients Before the “Antibiotic Era”? Evidence from the archives of the last Portuguese leprosarium

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Introduction:

Peripheral neuropathies causing anaesthesia, analgesia, loss of thermal sensation, motor deficit and, secondarily, bone lesions, are common consequences of leprosy. Departing from clinical data of the pre-antibiotic era, this investigation explores to what extent the disabling sequels of this chronic infection, specifically those with skeletal involvement, were aggravated by patients' occupations. This hypothetical association assumes that those patients with professions involving weight-bearing activities or repeated and/or prolonged use of insensitive hands and feet were more prone to develop bone changes.

Materials and Methods:

Three hundred clinical files, 150 of each sex and 150 of each type of leprosy (lepromatous and tuberculoid), were randomly selected from the medical archives of the Rovisco Pais Hospital-Colony (RPHC), Tocha, Portugal. Patients were aged between 4-93 years old and screened between 1947-1985. Occupations were coded following the “National classification of occupations” (1980) published by the National Institute of Statistics – the most suitable for the chronological period and social context under analysis. Direct or indirect evidence of skeletal lesions were compiled during the systematic reading of the clinical files' content.

Results:

The overall prevalence of skeletal lesions in the RPHC sample was 13.0% (39/300). Farmers/rural workers (11.1% [13/117]) and housewives/housemaids (16.3% [15/92]) were the most affected occupational groups. Logistic regression reveals that, when controlling for age, sex and type of leprosy, occupation is not a significant risk factor ($p < 0.05$) for skeletal involvement.

Discussion and Conclusions:

This investigation suggests that occupation was not a risk factor for the development of bone lesions in leprosy patients before the “antibiotic era”.

Keywords:

Hansen's disease; Rovisco Pais Hospital-Colony; Palaeopathology.

Funding:

This research was financed by national funds through the FCT – Fundação para a Ciência e Tecnologia: project references UID/ANT/00283/2013 and IF/00186/2014.

Physical Stress and Repetitive Movement in Sewing: The use of clinical literature to infer activity in skeletal remains from late 19th to early 20th century

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Introduction:

Jurmain (1999) proposed that models should be created to test the relationship between activities and their skeletal markers. The aim of this study was to use a model generated from clinical literature contemporaneous to the sample and to test its associations with skeletal changes. For this purpose, the activity tested was sewing.

Materials and Methods:

The sample (n=21), selected from the Coimbra identified skeletal collection, consists of seamstresses, shoemakers and tailors, and an age and sex matched control sample of equal number. The indicators recorded were enthesal changes, degenerative joint changes, markers of occupational stress (MOS) and robusticity index (RI). The model suggests changes in the dominant side related to repetitive circular and pedalling movements associated with sewing, alongside changes associated with a hunched posture. Descriptive and inferential statistics were used to analyse bilateral asymmetry (Wilcoxon test) and the association of the indicators with occupation, age at death, sex and RI (Fisher's exact test).

Results:

Little association was found between occupation and the indicators, rather age at death and sex was more important. Bilateral asymmetry was rarely found. Specific MOS related to sewing were found in the control sample, thus the model is not supported. There was an almost non-existent association between the indicators and RI.

Discussion and Conclusions:

No clear association was found between occupation and the indicators, contradicting the model. Age had a stronger association, suggesting that occupation itself is not a determining factor, whereas age and sex are. The model created is not effective or viable, since few differences were found between the samples. The use of both left and right sides in the tasks performed could explain the results of bilateral asymmetry. Similar studies, applied to a larger sample size, are needed to better understand the occupation factor in the development of the indicators.

Keywords:

Occupational stress markers; enthesal changes; degenerative joint changes.

References:

Jurmain, R. D., 1999. *Stories From the Skeleton: Behavioral reconstruction in human osteology*. Taylor & Francis, London.

Confronting Markers of Occupational Stress with Known Occupational Data: Cases from Portuguese human identified collections

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Introduction:

In bioarchaeology several osteological changes have been used as markers of occupational stress (MOS), and utilized when attempting the reconstruction of past human behaviour. These have included trauma, non-specific periostitis of tibiae and fibulae, and vertebral lesions known as Schmorl's nodes and spondylolysis (Capasso *et al.*, 1998; Larsen, 1997). This paper will compare MOS in individuals with known occupations at death and test associations.

Materials and Methods:

The 603 adult individuals, 300 males and 303 females, were selected from the Coimbra (n=299) and Lisbon (n=304) Identified Skeletal Collections. Individuals were categorized into seven occupational groups (OG): Government administration/Services, Commerce/Transport, Skilled workers/Artisans, Farmers/Servants, Unskilled workers, Army/Navy, Housewives (see Cardoso, 2008, for criteria description). The methodology used in data collection was described in Cardoso (2008): MOS mentioned were recorded as present or absent per individuals.

Results:

The probability of having a specific MOS varied between OG. Significant association was found for spondylolysis (p=0.021) and Schmorl's nodes (SN). However, such significance disappears if Housewives OG is excluded from the analysis. Other results showed that the probability of trauma was higher in the OG of people working in commerce/transport, artisans/skilled workers; dislocations would affect artisans/skilled workers, farmers/servants more; whilst spondylolysis was more present in farmers/servants and unskilled workers. On the other hand, the probability of periostitis and SN occurring was similar throughout all occupational groups, with the exception of housewives, which showed the lowest frequency of cases.

Discussion and Conclusions:

Despite the fact that some MOS had significant association with OG, it was clear that group size influenced the results. Hence, to infer a simple and straightforward association between MOS and occupation would be to overlook additional contributing factors. Also, some changes such as trauma were completely remodelled at death, being impossible to predict when they occurred and if individuals had the same occupation as registered at death. Research on the subject needs to continue, preferably with well-documented clinical and associated osteological data, before unambiguous associations of MOS and occupation can be confirmed.

Keywords:

MOS; identified skeletal collection; occupational groups.

References:

Alves-Cardoso, F., 2008. *A Portrait of Gender in Two 19th and 20th Century Portuguese Populations: A paleopathological perspective*. Durham: University of Durham. | Capasso, L.; Kennedy, K. A. R. and Wilczak, C.A., 1998. *Atlas of Occupational Markers on Human Remains*. Teramo, Edigrafital S.P.A. | Larsen, C. S., 1997. *Bioarchaeology. Interpreting behaviour from the human skeleton*. Cambridge, Cambridge University Press.

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(Mis)informed? Identified skeletal collections, occupation, age-at-death and the reconstruction of physical activity

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Introduction:

This paper expands on recent research by Milella *et al.* (2015) on the classification of documented occupations in the studies of enthesal changes (EC) addressing the following questions: can EC variability be used as classification criterion of occupations and, by proxy, assess physical activity? Which analytical protocols are more suitable when trying to control for the effect of age?

Materials and Methods:

Both bivariate (linear regression - LR) and multivariate (nonlinear principal component analysis – NLP and hierarchical cluster analysis - HCA) statistical protocols were used on a dataset (n=372, male individuals, 20-88 y.o.) of postcranial entheses from three contemporary Italian and Portuguese identified skeletal collections (ISC). The study focused on enthesal robusticity (ER) (i.e. relative surface roughness), on laterality separately and together, and on levels of asymmetry. Variance in robusticity was calculated after NLP for each occupation. Age-at-death was controlled using the residuals obtained after regressing each dimension obtained from NLPC with age and exploring possible groupings of occupation by means of HCA.

Results:

Robusticity variance showed a complex picture characterized by an overall separation between “high variable” and “low variable” occupations, which in some cases is consistent with specific exposures to distinct biomechanical patterns. Clusters of occupations based on residuals revealed a subdivision in three main classes as observed in Milella *et al.* (2015). The occurrence of problematic associations traces a more complex picture in which inherent sample biases, incomplete documentation and poor reliability of the EC investigated may have played their part.

Discussion and Conclusions:

Our results demonstrate that: (1) variability of ER is an interesting approach when studying subdivisions of documented occupation; (2) regression residuals are useful for controlling the effect of age on ER; and (3) the correlation between EC and specific behavioural patterns may be problematic (i.e. lack of homogeneity and documentation characterizing ISC).

Keywords:

Degenerative joint changes; enthesal changes; activity.

References:

Milella, M.; Cardoso, F. A.; Assis, S.; Lopreno, G. P. and Speith, N., 2015. Exploring the Relationship Between Enteseal Changes and Physical Activity: A multivariate study. *Am. J. Phys. Anthropol.*, 156: 215–223. DOI: 10.1002/ajpa.22640.

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Comparing Microarchitecture with Macromorphology: Is enthesal change a marker of activity?

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Introduction:

Muscle attachment sites (entheses) with altered morphology are considered to be markers of enhanced muscular activity. This idea follows "Wolff's Law", which states that bone adapts to mechanical loading. However, this idea of bone adaptation has only been sufficiently validated on a microarchitectural level, while its effects on macromorphology – like enthesal change (EC) – are not entirely clear. Therefore, this study attempts to validate EC theory by comparing microarchitectural parameters with the associated macromorphological scores.

Materials and Methods:

Fifty right calcanei of early young (18-25 years), late young (26-35 years), and middle (36-49 years) adults from post medieval Middenbeemster, the Netherlands, were selected. The degree of EC was determined by scoring robusticity (RO), osteophytic growth (OF), and their composite (CO), following the protocol developed by Mariotti *et al.* (2004, 2007). No osteolytic lesions were present. Microarchitecture of a cylindrical volume of 5.25x8.94 mm below the enthesal surface was assessed by μ CT at an isotropic resolution of 30 microns.

Results:

There were no significant differences between the parametric values of the different levels of either RO, OF or CO, as measured by Welch's ANOVA. There was not even a score-dependent trend in the parametric values. EC scores consistently increased with age, with the Mann Whitney U yielding significant results for both RO and CO between early young (n=10) and middle (n=23) adults.

Discussion and Conclusions:

These results imply that successive stages of EC do not represent successive stages of activity, as represented by the underlying microstructure. To be decisive, the study must be repeated for multiple anatomical sites and on multiple skeletal collections. This study once again demonstrates the relationship between an increase of EC and an advance in age. Combined with a lack of EC-validating studies, these results urge for caution in applying EC as a marker of activity.

Keywords:

MicroCT; bone microstructure; functional adaptation.

References:

Mariotti, V.; Facchini, F.; Giovanna-Belcastro, M., 2004. Enthesopathies – Proposal of a standardized scoring method and applications. *Coll. Antropol.*, 28: 145-159. Mariotti, V.; Facchini, F.; Giovanna-Belcastro, M., 2007. The Study of Entheses: Proposal of a standardised scoring method for twenty-three entheses of the postcranial skeleton. *Coll. Antropol.*, 31: 291-313.

Activity History Consisting Multidirectional Loading Affects Strength but not Shape of the Femur Shaft

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Introduction:

Biomechanical properties of long bones are used in reconstructions of physical activity. These properties include bone bending and torsional strength (J), cortical area (CA), direction of major axis (theta angle) and circularity (element shape ratio), determined from cross-sections of standardized bone length. Our aim is to investigate the relationship between these bone properties and activity history. Furthermore, we assess the applicability of anatomically-determined cross-sections for activity reconstructions.

Materials and Methods:

Our material consists of hip and proximal thigh magnetic resonance images of Finnish female athletes (n=91) engaged in high-jump, triple-jump, endurance running, swimming, power-lifting, and playing soccer and squash with a group of active non-athlete individuals (n=20). Size effects were removed using a regression analysis, and the extracted residual values were then used to compare bone properties between the groups.

Results:

We found that triple-jumpers and soccer and squash players had greatest values in CA and J, whereas swimmers and non-athletes had the smallest. High-jumpers, power-lifters and endurance runners exhibited values in between. The same results were obtained regardless whether standardized length or anatomically-determined cross-sections were used. No between-the-group differences in element shape ratios or theta angles were found.

Discussion and Conclusions:

Unpredictable direction of loading (triple-jump, soccer and squash) necessitates a more robust skeleton compared to non-loading (swimmers and non-athletes) and directionally consistent loading (high-jump, power-lift, and endurance run), likely through torque resistance requirement. However, differences were statistically significant only between activities involving unpredictable direction of loading and non-loading. Furthermore, we did not find significant differences in bone shape based on activity history. Thus, greater variation in activity is required to result in differences in femur shape. We conclude that information gained about physical activity using bone properties is limited. Accounting for the limitations, the method is applicable on fragmented skeletal material as anatomically-determined cross-sections can be used.

Keywords:

Physical activity; activity reconstruction; bone biomechanics.

Funding: Alfred Kordelin Foundation.

Mahalanobis Distances as a Means of Exploring Inter-Population Differences in Enteseal Changes

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Introduction:

This presentation proposes the use of Mahalanobis distances for the examination of inter-group patterns in the expression of enteseal changes. Mahalanobis distances have been employed extensively in bioarchaeological studies for the calculation of biodistances based on continuous data, binary data and, more recently, ordinal data. Despite the broad use of these distance measures in the context of biodistance analyses, there is no inherent reason why they could not be adopted for other types of data, such as activity markers.

Materials and Methods:

Enteseal changes were recorded on the long bones of the upper and lower limbs of Early and Late Medieval samples from Leicestershire, UK. Both an ordinal and a binary system were used for this purpose. In addition, cross-sectional geometric properties were calculated using a non-destructive method based on periosteal moulds. Subsequently, Mahalanobis distances were estimated based on the continuous cross-sectional data, Tetrachoric Mahalanobis Distances based on the binary enteseal variables, and Ordinal Mahalanobis Distances using the ordinality recorded enteseal changes. The correlation of the different distance matrices was tested using Mantel tests.

Results:

Our results revealed interesting patterns of intercorrelation between the three distance matrices, and highlighted the need for further refinement of current methods for recording enteseal changes.

Discussion and Conclusions:

The use of Mahalanobis distances allows the overall pattern of differentiation between groups with regard to enteseal data to be explored employing multiple enteses simultaneously. Such an approach can complement existing statistical methods that examine the effect of individual enteses and can contribute to a more thorough examination of past activity patterns by providing a different level of resolution.

Keywords:

Activity patterns; statistical analysis; cross-sectional geometry.

A Re-Assessment of Sex-Differences in Enteseal Changes Using the Coimbra Method

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Introduction:

This research analyses skeletal remains for intra-population differences in enteseal changes. In a previous study (Palmer *et al.*, 2016), undertaken on the same population using the Mariotti *et al.* (2007) method for enteseal change recording, a sex difference in upper limb enteseal changes was found. The current study re-assessed enteseal changes in this population to evaluate this sex-difference.

Materials and Methods:

Upper limb enteseal changes in individuals from a post-medieval farming community from Middenbeemster (the Netherlands) were analysed using the Coimbra method (2015). Enteses included in the study were the subscapularis, supra and infraspinatus, teres minor, and common flexor and extensor sites on the humerus, triceps brachii and brachialis on the ulna, and biceps brachii and brachioradialis on the radius. Adult individuals aged 25 to 50 were used.

Results:

Analysis of the data shows congruent results between both methods, with a consistent sex-difference in the enteseal changes. Males scored higher for nearly all enteseal changes. However, females show higher enteseal change scores in the triceps brachii. There is more evidence of asymmetry in the male upper limb.

Discussion and Conclusions:

Although further research is necessary over the possible biological explanation of these sex-differences, they could point to a gendered division of labour. This study provides tantalizing insights into the changes muscles and muscle use inflict on the human skeleton, as well as highlighting the consistency and potential comparability of results between enteseal changes observed with a previous recording method and those recorded with the new biologically appropriate method.

Keywords:

Enteseal change; Coimbra method; gendered division of labour.

References:

- Henderson, C.; Mariotti, V.; Pany-Kucera, D.; Villotte, S.; Wilczak, C.A., 2015. The New "Coimbra Method": A biologically appropriate method for recording specific features of fibrocartilaginous enteseal changes. *International Journal of Osteoarchaeology*, published online 14 august 2015. DOI 10.1002/oa.2477.
- Mariotti, V.; Facchini, F.; Belcastro, M. G., 2007. The Study of Enteses: Proposal of a standardised scoring method for twenty-three enteses of the postcranial skeleton. *Collegium Antropologicum*, 31: 291–313.
- Palmer, J. L. A.; Waters-Rist, A. L.; Hoogland, M. L. P., 2016. Activity Reconstruction of Post-Medieval Dutch Rural Villagers from Upper Limb Osteoarthritis and Enteseal Changes. *International Journal of Osteoarchaeology*, 26: 78-92.

Appearance of Endplate Defects in the Thoracolumbar Spine: An ontogenetic study

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Introduction:

The presence and distribution of two different types of defects at the vertebral endplates have been discussed as related to occupation and to intrinsic biomechanical conditions along the spine (i.e. range of motion). We present a study of these defects from an ontogenetic perspective.

Materials and Methods:

Documented sub-adult and young adult skeletons from the Museu Nacional de História Natural, Lisbon. Age ranged from 11 to 30 years old (52 females, 46 males). Skeletons were grouped in two age groups: 11-18 (22 females, 21 males) and 19-30 (30 females, 25 males) years. Defects were scored at the superior and inferior endplates from T1 to L5.

Results:

The earliest age of appearance of any defect at the superior endplate ranges from 16 to 17 years (segment T7-L11), and from 17 to 21 (segment L2-L5). For the inferior endplate, it ranges from 14 to 19 years (segment T7-L11), and from 15 to 23 years (segment L2-L4). The chronology of appearance is similar for both sexes. The most significant change associated to age was a clear increase in frequency of defects in the superior endplate of the female lumbar segment. With regard to sex, a different pattern was observed. For males, a clear ascending-descending pattern from T6 to L5, peaking at T9-T11, was observed for the superior endplate, and from T4 to L4, peaking at T9, for the inferior endplate. For females, an ascending pattern from T7 to L4 was observed for the superior endplate, with an ascending-descending pattern from T7 to L11 for the inferior endplate.

Discussion and Conclusions:

The first defects are observed in the chronology corresponding to late adolescence. A different pattern of defects is observed between the superior and inferior endplates and between sexes. An increase in frequency of the defects is observed with age especially at the female lumbar segment. These findings are discussed in the context of pathology related to biomechanics and occupation.

Keywords:

Vertebra; biomechanics; young adult.

Atypical Dental Wear and Oral Pathology in a Skeletal Sample Exhumed from one *Maqbara* of *Shantarîn* (Portugal)

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Introduction:

During the analyses of human skeletons teeth are relevant sources of information about individuals' life, including its use for non-masticatory activities. This study aims to document dental conditions in an Islamic population.

Materials and Methods:

The sample consists of 45 adult skeletons (14 females, 28 males and 3 undetermined) exhumed from one of the *maqbara* of Santarém (Portugal), dated from the 8th-9th-12th centuries AD. The dentition was macroscopically observed with the aid of magnifying lens. To investigate the dental condition standardized methods were applied. The data were analysed in Microsoft Excel and SPSS.

Results:

From the 1440 expected teeth, 1137 (1137/1440=79%) teeth/alveoli are present, 779 of which (779/1137=68.51%) are observable. The occlusal wear degree 3 has the higher frequency (182/752=24,20%). Notching was recorded in 3.34% (25/749) of the teeth while chipping is recorded in 13.08% (98/749). Chipping is associated with severe lingual wear in 12 individuals (12/43=28%) and mesiodistal occlusal depressions in 5 individuals (5/43=11.62%). And in two individuals were identified interproximal depressions. Thirty percent (236/779) of the teeth and 91.1% individuals have caries. Similar chipping was identified in a medieval sample from Norway while the severe lingual wear might be related with the consumption of abrasive food with higher carbon hydrates.

Discussion and Conclusions:

Chipping might be related to the consumption of dry seeds, as well quotidian/craft activities, such is the seamstress, cobblers, carpenters, etc, by use of lines and pins. Mesiodistal occlusal depressions were also identified ethnographically, consisting of the use of a yarn wool/cotton between the anterior dentition for moisten, but can be also associated with the fibre processing of plants to make clothing laces, houses and boats. The interproximal depressions could be caused by continued mastication of *miswak*. The Arabian medicine of the time had knowledge and a treatment for dentition affliction. Nevertheless, the familiarity with *miswak* and the toothpick didn't seem to prevent the presence of caries and ante mortem teeth loss.

Keywords:

Extra masticatory patterns; medieval Islamic; oral paleopathology; diet.

Orofacial Dysfunction and Dental Wear: Analysing biomechanics in an individual from the archaeological collection of slaves from Lagos (Portugal)

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Introduction:

The aim of this study is to propose a biomechanical explanation to the abnormal tooth wear observed in the skeletal remains of an individual recovered from the Lagos's sample of African slaves, dated from the beginning of the transatlantic trade (15th-17th centuries).

Materials and Methods:

The individual here described (no. 66) is an almost complete and well-preserved skeleton. The ancestry was estimated based on cranial morphological characteristics. The sexual assessment was made through the metric and morphological analysis of the skull and hipbone. The age-at-death was estimated on the basis of morphological changes in the pubic symphysis. All teeth were examined macroscopically under good lighting conditions, and the pattern of wear and occlusion registered.

Results:

The skeleton belongs to an adult African male. Age was assessed as +30 years. This individual presents an unequal degree of tooth wear between the left and right first molars, both in upper and lower arches, with the teeth from the left side more worn out. The permanent upper right canine is ectopic, with palatal location. Malocclusion characterized by cross bite in this region is observed.

Discussion and Conclusions:

The dental wear is a physiological process that occurs throughout life. However, in some circumstances, pathological conditions may change this natural process. An incorrect relation between the upper and lower teeth, or malocclusion, can originate alterations in the pattern of mastication and subsequent deviations from the normal wear process. Besides, a correct articulation of the upper and lower canines is essential to canine guidance in laterotrusive movements. It is proposed that biomechanical factors were in the origin of the abnormal dental wear observed in this individual, in which a malfunction of the craniofacial complex due to tooth malposition led to changes in the pattern of mastication.

Keywords:

Tooth wear; masticatory pattern; ectopic canine.

Funding:

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Enteseal Changes and the Search for Specialised Archers: A look into Bell Beaker burials

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Introduction:

Certain archaeological contexts from inhumations of the Bell Beaker period indicate an individual's association with archery. This study explores the possibility of further identifying these individuals as archers based on enteseal changes (EC) corresponding to the biomechanics of archery.

Materials and Methods:

This study first examines a control group of 30 individuals from a known context from the Mary Rose collection in Portsmouth (England). Next, a collection of 27 Bell Beaker individuals from Bohemia (Czech Republic) was analysed. When applicable, both males and females were examined, and no individuals were estimated to have been over the age group of 40-50 years. Both collections included suspected and non-suspected archers, and the select entheses associated with archery biomechanics were scored using the methods of Villotte (2006) and Mariotti *et al.* (2007).

Results:

The control group served two primary purposes: to compare likely archers with non-likely archers from the same known context, and to use the likely archers as a comparative group for the Bell Beaker individuals. This control group therefore allowed for observations of EC, as well as robusticity and other diseases, particularly those of the joints, related to archers. These parameters were then applied to the Bell Beaker collection, contributing to, and supporting, the identification of suspected archers.

Discussion and Conclusions:

This was a preliminary study, successfully working to identify a specialised activity. And while this remains a first step, the results remain promising for continued studies of enteseal changes as indicators of specialisation.

Keywords:

Biomechanics; enthesopathies; Neolithic.

References:

Mariotti, V.; Facchini, F.; Belcastro, M.G., 2007. The Study of Entheses: Proposal of a standardised scoring method for twenty-three entheses of the postcranial skeleton. *Collegium antropologicum*, 31: 219-313.
Villotte, S., 2006. Connaissances Médicales Actuelles, Cotation des Enthésopathies: Nouvelle méthode. *Bulletins et Mémoires de la Société d'Anthropologie de Paris*, 18: 65-85.

Funding:

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A Diachronic Study of Activity in Portugal Using Enteseal Changes

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Introduction:

The aim of this work is to study the changes in enteseal change frequency through time in Portugal to assess the effect of increased urbanisation and industrialisation. Previous research has found that agriculturalists have the lowest frequency of enteseal changes in the past, with hunter-gatherers the second highest and those living in an industrial setting having the highest frequencies. However, this study was a meta-analysis of previously published papers and was subject to several limiting factors, such as inter-observer error. But more seriously, the method used to record enteseal changes was not biologically appropriate. This study therefore aims to address these issues by using a newly devised biologically appropriate recording method, and using one observer to record all enteseal changes.

Materials and Methods:

To achieve this aim one researcher recorded eleven enteses (upper and lower limb), in right and left sides, using the new Coimbra method for recording enteses (Henderson *et al.*, 2015). Eight archaeological sites were recorded; these were predominantly medieval (due to preservation issues), different socio-economic status sites, and with different economic practices.

Results:

The results show that different sites have very different profiles of frequencies of each feature. Trends in the upper limb are more disparate than in the lower limb, with the triceps surae entesis having the most consistent pattern of changes between sites.

Discussion and Conclusions:

Activity is not the only explanatory factor in these results, different age and sex profiles contributing to the different trends. Small sample sizes in the individual sites also contribute to high frequencies of some changes. However, this approach is vital to understand temporal trends in enteseal changes.

Keywords:

Enteses; new Coimbra method; temporal trends.

References:

Henderson, C. Y.; Mariotti, V.; Pany-Kucera, D.; Villotte, S.; Wilczak, C., 2015. The New "Coimbra Method": A biologically appropriate method for recording specific features of fibrocartilaginous enteseal changes. *Int. J. Osteoarchaeol.* DOI: 10.1002/oa.2477.

Moments of Inertia in the Evaluation of Bone Functional Adaptation of the Lower Limbs: A study on historical and modern populations

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Introduction:

Cross section geometric (CSG) properties of the diaphysis of bones enable quantitative evaluations of bone functional adaptation. Several studies have previously analysed the effects of the division of labour, nutritional aspects, the ruggedness of the terrain, sexual dimorphism and of other factors affecting bone modelling and remodelling. The aim of this study is to evaluate the bone functional adaptation of the lower limbs through the analysis of the moments of inertia along the three axes x, y, z of bone cylindroids, and to compare the outcomes with the average values of the CSG properties (areas and second moments of area).

Materials and Methods:

Three historical populations and a group of modern individuals from "historical" Friuli Venezia Giulia (North-East of Italy and Slovenia) land are studied. Populations are composed by adult individuals, subdivided by sex, in variable number. The activity patterns of the populations are known because of previous studies. Bones have been scanned using multidetector computed tomography (MDCT) and 5 cm high bone cylindroids have been obtained through a process of segmentation of the images. Bone cylindroids have been analysed for the mid-shaft femur and the tibia at the nutrient foramen.

Results:

CSG properties and moments of inertia have been both able to differentiate the samples. However, the outcomes of these two kinds of indexes are different in respect of the populations and don't seem to be correlated.

Discussion and Conclusions:

An important sensitivity of moments of inertia in differentiating the samples has been highlighted. Moreover, a good correlation with osteological data and historical sources exists. The biomechanical meaning of these properties is clearly different from CSG properties, most likely by the bone mass influence. This technique might represent a non-destructive and operator-independent method in evaluating bone functional adaptation in historical and modern individuals.

Keywords:

Volumetric analysis; tibia; femur.

On the Traces of Ancient Tuberculosis: Possibilities of the macromorphological diagnosis of tuberculosis in prehistoric and historic osteological series – skeletal tuberculosis cases from the Szeged Anthropological Collection

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Introduction:

The aim of our study is to summarise the results of the tuberculosis (TB) paleopathology research in the Szeged Anthropological Collection, focusing on the distribution of different types of TB-related skeletal lesions. We also intend to draw attention to the importance of uniform application of classical and atypical TB-related traits in the diagnosis of skeletal tuberculosis and to the importance of molecular biological confirmation of the suspected cases. As an example, we would also like to show how TB could influence the daily activities, especially the ability to work, of affected people in past Hungarian populations.

Materials and Methods:

The skeletal material for this study derives from 44 archaeological sites from the Neolithic period to the Late Middle Ages, totalling 3906 individuals. The macromorphological investigation was based upon the detection of both classical and atypical TB changes. In several selected cases, the macromorphological diagnosis of skeletal TB was supported by molecular biological methods (ancient DNA and lipid biomarkers).

Results:

During the macromorphological analysis of the skeletal material, 497 cases of probable skeletal TB were detected. Classical TB lesions were observed in 28 cases, while atypical TB alterations were registered in a further 469 cases. Out of the total 101 cases, 45 skeletal TB cases furnished positive aDNA and/or lipid biomarker results.

Discussion and Conclusions:

On the basis of our results, TB could be a major infectious disease in past Hungarian populations and could considerably influence the ability to work of affected specimens, especially in the Medieval period, where the ratio of affected individuals was the highest. Besides, our data contribute to strengthen the importance of uniform application of classical and atypical traits and underline the complementarity of morphological and molecular biological analyses in the diagnosis of ancient TB infections. Our results also provide a promising basis to carry on with this research direction.

Keywords:

Classical TB-related skeletal lesions; atypical TB-associated skeletal alterations; influence of TB on the ability to work; Hungary .

Sticks, Stones, and Broken Bones: Traumatic injuries and how they contribute to a life course of enthesal changes and activity patterns

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Introduction:

Enthesal changes have provided anthropologists with the ability to reconstruct past behaviors and activities from the skeleton. Although some believe that these changes are not caused by major traumatic injuries, there are still those specific fractures that we need to consider when enthesal changes are taken into account. Avulsion fractures, burst fractures, and stress fractures are just a few. These types of injuries that can occur during the life course are just as informative of past activities and behaviors as those of enthesal changes.

Materials and Methods:

The American Journal of Physical Anthropology and *The International Journal of Osteoarchaeology* were hand searched for articles published from 2000 to the present day. These provide more recent studies and information about activity patterns and their relationship to traumatic injuries. Anthropological articles included within the review pertain to peer-reviewed studies that focus on enthesopathies, musculoskeletal stress markers, and overall enthesal changes.

Results:

This review yields information as to those fractures that can and have occurred with enthesal changes. Stress fractures are perhaps the greatest risk of injury that accompanies these specific changes within the skeleton. Causes of age-accumulated microdamage at the bony level support this conclusion.

Discussion and Conclusions:

The gathered information within the review is able to expand on the relationship between injuries and the enthesal changes seen in the skeleton. This close relationship with one another proves to be informative of the life course of the studied individuals. From this life course approach we can conclude that as individuals' age, which is the major causative factor for enthesal changes, they also accumulate microdamage that can lead to greater risk of fractures. An accumulation of both enthesal changes and traumatic microdamage can provide social and cultural meaning to those past habitual activities of the studied populations.

Keywords:

Trauma, fractures, life course.

Funding:

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Enteseal Changes on Individuals from a Cemetery in Piraeus (Greece), of the 4th century B.C.

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Introduction:

In the broader area of Piraeus (Greece's biggest harbour), part of a cemetery of Hellenistic era (4th century B.C - 2nd century A.C) was excavated by the Greek Archaeological Service; 93 graves came to light and 88 skeletons were macroscopically examined.

Materials and Methods:

Macroscopic examination: The aim of the study, was the search of information concerning first of all the level of health and disease of the people of the era. All the emerged data at the end of the anthropological study were combined with the cultural considerations of the Hellenistic period.

Results:

Among the other skeletal findings, enteseal changes (both of osteophytic and osteolytic form) were observed on 19 individuals (14 males - 5 females), and in many cases co-existed with porotic hyperostosis and cribra orbitalia (the two indicators for dietary deficiencies and pathogenic environment)

Discussion and Conclusions:

The presence of enteseal changes, their kind and the distribution of the lesions on the skeleton, is of great importance to be related to the burial customs of the period: It is worth mentioning the fact that 10 out of 19 individuals, (52.63%) were buried with little offerings (*kterismata*) or without offerings at all. Plus, on 13 skeletons out of 19 (68,42%) – apart from the enteseal changes –, porotic hyperostosis, cribra orbitalia and/or enamel hypoplasia were also observed. All the skeletal findings seem to be consistent with the fact that the individuals of the cemetery of Piraeus were – without doubt – unprivileged people of a lower social rank, struggling with everyday life.

Keywords:

Hellenistic cemetery; enteseal changes; low social status.

References:

- Jurmain, R.;Vilotte, S., 2010, Terminology. Entheses in medical literature and physical anthropology. A brief review. Document published online on February 4th, following the Workshop in Musculoskeletal Stress Markers (MSM): *Limitations and Achievements in the Reconstruction of Past Activity Patterns*, University of Coimbra, July 2-3, 2009. Coimbra, CIAS – Centro de Investigação em Antropologia e Saúde. [Consulted in June 25th, 2010]. Available from: http://www.uc.pt/en/cia/msm/MSM_terminology3.
- Mariotti, V.; Facchini, F.; Belcastro, M. G., 2004. Enthesopathies - Proposal of a Standardized Method and Applications. *Collegium Anthropologicum*, 28, 1: 145-159.
- Syrogiani, A., 2015. *Human Skeletal Remains from Piraeus of Hellenistic Era: The cultural considerations*. Unpublished Doctoral Thesis, University of Athens.

External Auditory Exostoses (EAE) – An activity indicator for activities in the, or on the water?

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Introduction:

Auditory exostoses are bone anomalies located in the external auditory canal. The size of either singularly or bilaterally occurring auditory exostoses ranges from very small, to a few millimetres, to large enough to close the ear canal. Auditory exostoses show clear differences from tumours in the ear. There are different opinions about the aetiology. In addition to genetic factors, today in particular, environmental conditions are discussed. It is commonly assumed that auditory exostoses occur through contact with cold water.

Materials and Methods:

In the Rudolf-Virchow-Skull-Collection in Berlin there are almost 200 skulls from the location of Ancon, in Peru, which dated from the first Millennium BC to 1500 AD. Since this location is by the sea, activities for foraging in or near water are presumed to have been undertaken. Since auditory exostoses occur very rarely in children and adolescents, only skulls from adult individuals were investigated. In order to determine possible sex differences in the activities carried out, these skulls were investigated according to the recommendations of the Working Group of European Anthropologists from 1979.

Discussion and Conclusions:

In a few skulls from Ancon auditory exostoses occur. There is a direct association with contact with water, and consequently evidence for using marine resources. Auditory exostoses virtually all over the world were discovered in prehistoric and historical skeletal series. At the present time, this phenomenon is mainly found in those undertaking active water sports, such as swimmers, surfers and divers. Thus, auditory exostoses are indicators for certain activities, which are made on, or in the water. The absence of surfer's ear does not mean that there were no activities in, or near water. People in cold regions protect their ears by caps and around the equator it is too warm for the formation of auditory exostoses.

Keywords:

Surfer's ear; Rudolf-Virchow-Skull-Collection; Ancon.

The Hungarian Conquest Period Archery and Activity-Induced Stress Markers – Anthropological and archaeometrical studies of a 10th c. AD Hungarian series

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Introduction:

The known written sources and grave findings clearly state that the 10th century Hungarian army was based on mounted archers. Although archaeological and experimental investigations of the topic have been started in the mid-20th century, we know little about the practice of Hungarian-type archery. It is clear that the analysis of archery-related grave goods alone cannot answer the question, but with combined archaeological and anthropological methods we may get closer to the solution. Therefore we have started the complex anthropological and archaeological investigation of the iconic Hungarian Conquest Period cemetery Sárrétudvari–Hízóföld. Since it is a well-published material, archaeological evaluation of the archery-related items and the comparison with anthropological and paleopathological data could also be accomplished.

Materials and Methods:

According to the archaeological data, the bow was a common grave artefact in this population in every age-group from children to the elderly males: out of the total 262 graves, 58 contained archery equipment. Our main question is whether anthropological data reflect frequent archery related activities, or not. We focused on entheseal changes that occur on the skeleton as a result of physical stress. Macroscopic analysis was performed on the scapulas, clavicles, humeri, radiuses and ulnas of the "archer" graves, and the unarmed adult male graves. We relied on age at death and sex data of earlier anthropological investigations on the population. In total, 49 of the 58 "archers", and 32 of the 40 unarmed individuals, were sufficiently preserved to be evaluated.

Discussion and Conclusions:

We found hypertrophy at the attachment of a wide scale of muscles of the upper body and a few of them – such as m. deltoideus, m. pectoralis major, m. latissimus dorsi, m. brachialis and m. biceps brachii – appear in high frequency. As a preliminary result we can state that the anthropological and archaeological data do support each other concerning the application of archery in the population in question.

Keywords:

Bioarchaeology; activity-related skeletal markers; archery; 10th century AD; Hungarian Conquest Period.

Habitus, Enteseal Development, and Gender: A bioarchaeological Investigation of embodiment in an Early Bronze Age community in South-eastern Poland

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Introduction:

The social world is structured by hierarchies of power, modes of subsistence, and gender. This structure becomes embodied as differential health outcomes, but also as different stresses and demands placed on the musculoskeletal system. This study engages with such themes through an analysis of enteseal changes in individuals from an Early Bronze Age cemetery in South-eastern Poland (Szarbia, gm. Koniusza, Małopolska). The partially excavated cemetery yielded 45 individuals from the Mierzanowice Culture. The working hypothesis is that overall variation in enteseal development will show characteristic differences between groups of adults due to the embodiment of gender constructs.

Materials and Methods:

Several entheses (21 left, 21 right) of the upper and lower body from a subsample (two adult male and female individuals) of the population were scored using the methods of Mariotti *et al.* (2007). The new "Coimbra Method" (Henderson *et al.*, 2015) will also be used on the remaining individuals of the population, where the degree of skeletal preservation allows.

Results:

Preliminary results of this pilot study ($n=2$) conducted in January 2016, show similar development of all but 3 entheses (of 21 present and analysed in both individuals): *M. supinator*, *M. gluteus maximus*, and the costoclavicular ligament. The female individual showed greater development of the right costoclavicular ligament, while the male showed greater development of *M. supinator* and *M. gluteus maximus*. Both individuals were estimated to be between 40 and 50 years of age.

Discussion and Conclusions:

These results are based on the study of just two individuals of the collection. The remainder of adult individuals ($n\approx 18$) will be analysed in May and June. After controlling for age, the data will be investigated through principal coordinates analysis, in order to ascertain whether overall patterns of differential bodily use cluster strongly by sex (or gender).

Keywords:

Osteoarchaeology; occupation; Mierzanowice.

References:

Henderson, C.Y.; Mariotti, V.; Pany-Kucera, D.; Villotte, S.; Wilczak, C., 2015. The New "Coimbra Method": A biologically appropriate method for recording specific features of fibrocartilaginous enteseal changes. *Int. J. Osteoarchaeol.* DOI: 10.1002/oa.2477.

Mariotti, V.; Facchini, F.; Belcastro, M. G., 2007. The Study of Entheses: Proposal of a standardised scoring method for twenty-three entheses of the postcranial skeleton. *Coll. Antropol.*, 31: 291–313.

Gendered Division of Labour in a Hellenistic-Roman Population from Boğazköy, Turkey: Consideration of traumatic, degenerative and musculoskeletal effects

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Introduction:

The aim of this study is to provide insights into gendered division of labour at a rural settlement in central Turkey.

Materials and Methods:

The study sample is a Hellenistic and Roman population from Boğazköy, which is well known as the Hittite capital Hattuša. It is located near modern Çorum, in north-central Turkey. The material includes skeletal remains of 59 adults.

This presentation focuses on the prevalence of degenerative joint changes, enthesal changes, and skeletal trauma in upper and lower limbs, and Schmorl's nodes among males and females in the sample. All these markers have been used as indicators of activity-related stress on the human skeleton.

Results:

Males were more involved than females by degenerative joint changes, enthesal changes, skeletal trauma, and Schmorl's nodes.

Discussion and Conclusions:

The results indicate that males may have participated more frequently in labour-intensive farming activities. It seems as though males had a more strenuous and hazardous life than females at Boğazköy.

Keywords:

Trauma, degenerative changes, enthesal changes.

Dyed-in-the-Wool: The impact of occupational behaviour and the environment on small urban and rural communities in Flanders, c. 1200-1860 AD

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Introduction:

Recently, a biocultural approach of bioarchaeological studies means that a mere descriptive conceptualization of paleodemographic data is surpassed by the integration of socioeconomic conditions, burial practices and investigation of health and lifestyle of past communities. Therefore it is necessary to consider the study of skeletal individuals within its historical as well as archaeological framework, as the human body is influenced both biologically and culturally.

Materials and Methods:

Different social status groups from Belgium (c.1200-1860 AD) were analysed osteologically, including enthesal changes (EC). This was done in conjunction with historical and archaeological sources: the small urban population of Deinze (96 individuals), and 4 rural sites: Moorsel (103), Slijpe (77), Vichte (62) and Oosterweel (68 high status individuals).

Results:

The data reveal inter and intra-population differences, and elucidate the effects on health when living in a town or countryside. It is indeed suggested that urban contexts have an impact on stature and immunity, and thus culminating in a mortality increase. In Deinze, the high mortality of sub-adults does not contradict the historically indicated peak in infant death. Here, a significant exposure to environmental stress was seen in the prevalence of linear enamel hypoplasia (LEH) and also tuberculosis (TB), which might have affected the female height, in contrast to the rural groups.

Preliminary results of EC suggest more EC in lower class communities as compared to the socially higher ranked women from Oosterweel, who have fewer stress markers.

Discussion and Conclusions:

The occurrence of respiratory diseases may have been caused by the textile related occupations of the Deinze inhabitants, which is suggested to imply a susceptibility to acquire TB bacilli. Additionally, the process of retting flax in the adjacent Leie River, resulting in polluted water, might have contributed too to the spread of pulmonary infections. Similar patterns are observed in 19th-century rural Vichte, that endured a typhus outbreak in 1847 caused by poor sanitation. Fewer infectious diseases, on the other hand, are noticed in rural Moorsel, Slijpe and Oosterweel. However, a high prevalence of healed trauma and EC were observed for both sexes in Deinze and Moorsel, and might be due to heavier physical labour.

Keywords:

Enthesal changes; infections; textiles.

Funding:

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Tooth Wear and Extra-Masticatory Behaviour: A particular case of a fisherman from the Identified Skeletal Collections of the University of Coimbra

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Introduction:

This paper presents the unusual dental wear in the anterior dentition of an individual belonging to the collection of identified skulls "Escolas Médicas" (19th-20th centuries), from the University of Coimbra. The possible scenarios that led to such alterations will be discussed, considering also the known profession (fisherman) of the individual.

Materials and Methods:

The analysed skull belongs to a 75 year-old male from Lavos (Figueira da Foz). All teeth (n=20) were examined macroscopically under good lighting conditions, and the tooth wear registered according to Smith (1984). The tooth nomenclature of the "Fédération Dentaire Internationale" was adopted.

Results:

Ten teeth (48, 46, 45, 36, 38, 18, 24, 25, 27, and 28) were lost ante-mortem. Only two teeth (13 and 22) were lost post-mortem. Of the remaining teeth, two (17 and 23) were affected by gross carious lesions. Tooth wear was more severe in the anterior (6.78 ± 0.667) than in the posterior teeth (4.78 ± 0.833). The upper central incisors had symmetrical and strongly oblique wear facets, exposing secondary dentine in the lingual surfaces. These ascended from the mesial margin to the incisal edge, forming an inverted V. The lower anterior teeth were severely worn, but more evenly.

Discussion and Conclusions:

Considering the location and symmetry of the lesions, the diet (foods consumed and its preparation) and any therapeutic attempts were excluded as possible causes. The intentional modification of teeth for aesthetic or cultural reasons was considered unlikely since the pattern of wear is quite distinct: the facet is softer and less delimited, involving a considerable part of the lingual surface of the teeth. Besides, there isn't any historical reference to such practice in the Central region of Portugal at that time. According to the "Escolas Médicas" collection's files this individual was a fisherman. A brief ethnographic research revealed that in the past some fishermen used their teeth to hold the lines when sewing the fishing nets. Therefore, it is possible that this man used his teeth as a "third hand" during the practice of mending fishing nets. This study corroborates the value of dental records in reconstructing the habits of occupational, personal or cultural nature from skeletal remains, which is of major importance in bioarchaeological and forensic studies.

Keywords:

Dental attrition; third-hand activity; paramasticatory function.

References:

Smith, B. H., 1984. Patterns of Molar Wear in Hunter-Gatherers and Agriculturalists. *Am. J. Phys. Anthropol.*, 63: 39-56.

Funding:

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Reconstruction of the Hierarchy of Society from Enteseal Changes in Edo Period, Japan

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Introduction:

This study tried to reconstruct life-style of ordinary Samurai that belong to upper hierarchy from enteseal changes (EC) in Edo Period. There is fairly general agreement that in Edo Period the aristocratic cranial traits of Daimyo and Shogun were formed by differences of lifestyle, such as eating habit and heredity promoted by selective marriage causing selective breeding. However, the part affected by the lifestyle is not only the cranial traits. In addition, lifestyles of ordinary Samurai may be also different from common people in Edo city. But no studies have ever examined other traits of ordinary Samurai. In this research, the hypothesis is that most of Samurai may be different, in lifestyles, from common people.

Materials and Methods:

This study is intended as a reconstruction of Samurai's life-style based on archaeological view using EC. EC graded by the severity of morphological changes observed on 16 different parts of both upper and lower limbs were examined. In this research, Samurai who were buried in Tokoname Jar and multiple structural burials and common people who were buried in circular and square wooden coffin were used.

Results:

Using the EC data, Cluster analysis and Principal component analysis was performed based on the prediction that EC of the status of Samurai are similar for specificity of their life-style. As results, people who were buried Jar and multiple structural burials are relatively similar. Particularly, the EC patterns show similarities in attachment sites on lower limbs.

Discussion and Conclusions:

The most likely explanation for similarities is connected to walking habit, swordsmanship, archery, horse-riding and some other habitual practices uniquely conducted by the Samurai warrior class. Thus, social status and occupational status of the Edo Period lead to different activities and behaviour patterns of the Edo people. This finding may indicate that the influence of the hierarchy appears definitely in EC.

Keywords:

Lifestyle of ordinary Samurai; hierarchy difference; Edo city.

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