

III MEETING NAZIONALE

Gruppo Italiano di Paleopatologia



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Pisa, Aula Magna della Scuola Medica, via Roma 55

Inaugurazione dell'esposizione dei preparati anatomici del
Museo di Anatomia Patologica dell'Università di Pisa
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Restoration and preservation of the anatomical specimens of the Museum of Pathological Anatomy at the University of Pisa

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The aim of the recently established system of the University Museum of Pisa is to promote and develop the University collections, and to encourage the reorganization of the Museum of Pathological Anatomy, whose precious pieces are provisionally stored in a nearby warehouse. In the last year, the economic support of the “Fondazione Pisa” has allowed to start the process of recovery and restoration of a part of the specimens.

The collection comprises 1500 human and animal pathological specimens of great scientific relevance, some of which dating back to the Granducal period. The remains consist in pathological changes and congenital anomalies detected on human and animal bodies and organs, either dry or preserved in formaldehyde. In particular, the Museum houses a collection of 50 human bladder stones going back to the first half of the 19th century; a collection of malformed human newborns documenting 25 rare congenital malformations of the end of 19th and beginning of 20th century; a collection of animal teratology; a collection of helminthic parasitology. Over the last 30 years, the Museum has been enriched with a collection of pieces from pathological autopsies, such as lung, cardiovascular, renal, and brain diseases.

The recovery was initially aimed at restoring the wet formaldehyde-preserved preparations requiring urgent emergency intervention. In fact, in many cases the evaporation of the liquid has determined the deterioration of the specimens; moreover, alcohol has replaced formalin, formally declared toxic by the new Museum dispositions that require the substitution of dangerous preserving liquids.

A selection of over 100 restored artifacts will be exhibited in the next 2017 GiPaleo Meeting.

Paleopathological study and facial reconstruction of a mummy of Borgo Cerreto, central Italy (XVII century)

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The subject under study is one of the twenty-three natural mummies of Borgo Cerreto (Perugia, central Italy). The burials took place between the second half of the 17th and the half of 19th century. According to the historical and archaeological data, the individual was one of the first burials that took place. Indeed the style of the garment is typical of a member

of the upper class of the Umbrian rural population of the XVII century. The mummy is well preserved. Macroscopic, radiological and CT examination were performed. The anthropological study revealed that the subject was an adult mature male with a stature of 1.69 cm. The macroscopic study had not evidenced any skin lesions or pathological alterations. Tooth examination evidenced an osteolytic lesion of the first upper left molar compatible with a cyst can also be observed. CT examination revealed calcified *lamina tectoria* and neo articulation with *clivus*. The spine showed diffuse spondylosis and osteophytosis with intersomatic bridge. Light lumbar arthrosis, irregularities and sclerosis of pubic symphysis and bilateral gonarthrosis are observable too. CT examination revealed the fracture of 4th right and 10th left ribs, probably as a result of post-mortem effects. A comparison between the cranial structure of the subject and a portrait of Baronio Vincenti (XVII century), *Physicus et Medicus*, the commissioner of the funerary chapel, was performed. Amira System, Programme Face Gen (Singular Inversion) and Photoshop with form 3 D were applied. The results of the anthropological and paleopathological study suggest that the individual was a mature male, as confirmed by the generalized osteoarthritis framework. The good condition of the dental apparatus, in relation to the age of the subject, suggests that he was a member of the upper class. The results of the facial reconstruction and the overlay on the portrait make the identification of the subject with Baronio Vincenzi very likely.

References

- Costantini L, Costantini Biasini L, Fornaciari L, et al. *Baronio Vincenzi e le mummie di Borgo Cerreto in Valnerina*. Spoleto: Speedy Print 2013.
 Ibáñez O, Cavalli F, Campomanes-Álvarez BR, et al. *Ground truth data generation for skull-face overlay*. Int J Legal Med 2014.
 Ibáñez O, Vicente R, Navega D, et al. *MEPROCS framework for craniofacial superimposition: validation study*. Legal Medicine 2016;23:99-108.

A pathographic profile of the composer Antonio Zacara da Teramo (ante 1365-1416)

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Antonius Berardi Andree, commonly known as “Zacara”, was born in Teramo (northern Abruzzo region) shortly before 1365. He was a scribe, illuminator, poet, singer and composer, being in Rome since 1380s. During the next two decades, as a married layman, he worked as a *scriptor litterarum apostolicarum* and Papal Chapel singer under Boniface IX, Innocent VII and Gregory XII. Before the Council of Pisa, in the most turbulent phase of the Great Schism, he left Gregory, and stayed in Florence until 1410. Subsequently, he became Chapel Master to the antipope John XXIII, but when the latter, in June 1413, left the Holy See, Zacara went back in Teramo and probably died here in 1416.

The nickname “Zacara” (scrawl) indicates a thing of little value. An illustration from the XV century Squarcialupi Codex held in Florence, Biblioteca Medicea Laurenziana, displays with merciless realism his physical ailments. Additional information on his health status may be obtained by the analysis of some of his verses dealing with Fortune (*Dime Fortuna, Spesso Fortuna cridote*) and an entry in the *Necrologio Aprutino* (the obituary of the Cathedral of Teramo).

Antonio Zacara is depicted as a small man, with asymmetric limbs and girdles, torticollis, reddish cheek and forehead, and evident loss of digits. Some of these elements are also featured in the *Necrologio*, who talks about a short man, with less than 10 digits in hands and feet, but gracefully writing. In some of his verses he charge the Fortune with problems occurred at birth or when he was a young man.

Despite some recent interpretation, we can certainly exclude that Zacara could be affected by leprosy, Sturge-Weber syndrome, LES, osteogenesis imperfecta, and muscular dystrophies. Although we cannot exclude osteomyelitis and bone tuberculosis, we favour a Klippel-Feil syndrome or, more probably, a dysmelia.

A search for the burial of Antonio Zacara is currently in progress, as only a full paleopathologic study on his human remains would be of help in understanding his disease.

References

- Zimei F. *Variazioni sul tema della Fortuna*. In: Zimei F (ed). *Antonio Zacara da Teramo e il suo tempo*. Lucca: Libreria Musicale Italiana 2006; pp. 229-45.
- Cuthbert MS. *Difference, disability, and composition in the late middle ages: Of Antonio "Zacara" da Teramo and Francesco "Il Cieco" da Firenze*. In: Howe B, Jensen-Moulton S, Lerner N, et al. *The Oxford handbook of music and disability studies*. New York: Oxford University Press 2015; chapter 26, pp. 517-28.

Behind Castrato's voice. Paleopathological analysis of the singer Gaspare Pacchierotti

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Up until the end of the 1800s, a gruesome practice was performed on male opera singers to preserve their mezzo-soprano voices. The growing up of modern opera in Italy caused a demand for these particular voices, so the singers were castrated before reaching puberty, allowing their young voices to carry on through adulthood.

Among the castrati, Gaspare Pacchierotti (Fabriano, 1740 - Padua, 1821) was probably one of the most famous. The remains of Pacchierotti were exhumed for the first time in 2013 to reconstruct his biological profile and understand the secret of his sublime voice. The remains were studied in the laboratory of the Museum of Pathological Anatomy at the University of Padua, where CT scans and X-rays were conducted on the bones.

The castrati were often much taller than their unaltered peers, Pacchierotti stood more than 190 cm, with a large barrel-shaped chest, infantile larynx, long, spindly legs. The analysis showed the presence of epiphyseal lines on Pacchierotti's iliac crests, which are typically fused at 23 years old and disappear by the time a man is older than 35. CT scans revealed vertebral fractures and a decrease in bone density, because the hormonal effects of castration led the singer to develop osteoporosis and disorders of the spine. The dental condition was very interesting: there was an extremely advanced dental erosion due to bruxism, that was probably caused by psychic distress from compulsion as it happens in prisoners or people forced to do something.

However, the singer's skeletal anomalies were not only attributed to castration. Pacchierotti's cervical vertebrae were

all strongly eroded with signs of osteophytic lipping in the body, because of osteoporosis and of continuous movements of head and neck during singing exercises. There were also other changes in his body and bones, including modifications in the insertion of three respiratory muscles, which work to elevate certain ribs and assist in breathing. Despite his castration and bone conditions, Pacchierotti died at the age of 81 due to dropsy.

References

- Cavallo P, Savare G, Carpinelli L. *Bruxism and health related quality of life in southern Italy's prison inmates*. *Community Dent Health* 2014;31:117-22.
- McKern TW, Stewart TD. *Skeletal age changes in young American males*. *Am Anthropol* 1958;60:982.
- Zanatta A, Zampieri F, Scattolin G, et al. *Occupational markers and pathology of the castrato singer Gaspare Pacchierotti (1740-1821)*. *Sci Rep* 2016;6:28463.

The survival of an amputated limb without antibiotics: a case study from a Longobard necropolis (VI-VIII centuries AD)

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The Longobard necropolis of Povegliano Veronese located in Veneto; Northern Italy was discovered in 1985. Archaeological evidence tells us the necropolis was used during the VI-VIII centuries AD. Over 240 skeletons have been recovered from the necropolis. Age and sex for each burial has been previously reported. The skeleton of an older Longobard male (aged 40-50 years), an individual of the first generation of Longobards arrived at Povegliano Veronese, shows a unique well-healed amputated right forearm. The focus of this presentation is to discuss the trauma and healing of his right forelimb. The orientation of the forearm fracture suggests an angled cut to the ulna and radius by a single blow. There are several reasons why a forearm from this cultural period might be amputated, loss due to fighting and/or loss due to judicial punishment. As with other amputation cases cited in the bio-archaeological literature, this example exhibits both healing of the fracture and osteophytic growth specific to biomechanical loading. We argue that the osteophytes of this individual comes from the use of a prosthesis. The healing includes a semi-fusion (ankyloses) of the forearm bones and well-healed end-caps for both bones. Additionally, dental modification of right upper second incisor tooth shows considerable wear and smoothing of the occlusal surface. We suggest that this dental defect is the result of tying down a prosthetic device used to protect the forearm stump. Other indications of how this individual adjusted to his amputated condition includes a slight change in the orientation of the right glenoid fossa surface, and the thinning of cortical bone of the right humerus. In conclusion, this case shows us a remarkable situation by which an older male not only survived an amputated limb in a

pre-antibiotic era, but also adjusted very well to his condition with the use of a culturally derived device.

References

- Brothwell D, Moller-Christensen V. *Medio-historical aspects of a very early case of mutilation*. Danish medical bulletin 1963;10:21-5.
- Mays SA. *Healed limb amputations in human osteoarchaeology and their causes: a case study from Ipswich, UK*. Int J Osteoarchaeol 1996;6:101-13.
- Micarelli I. *La Necropoli Longobarda di Povegliano Veronese (VR, VI-VIII sec.): prime indagini antropologiche e contestualizzazione archeologica*. MA Thesis, Sapienza University of Rome 2015.

Infectious diseases: possible divergence in mortality trend and in pre- and post-antibiotic era

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The study of past infectious diseases increases our knowledge of the presence, impact and spread of pathogens within ancient populations. Many diseases involve the skeleton, but paleopathology occurs in a low percentage of cases. For example in both tuberculosis (TB) and leprosy, the percentage of bone involvement is only about 3-5% of untreated cases. In another pathologies as well the plague the involvement of the skeleton is null. The only approach useful to find ancient individuals with plague are the immunodetection and the biomolecular analysis with high cost for the research. There are other instruments to verify the presence of an epidemic situation in an old population. The first is a good excavation of the cemetery. The contemporary inhumation of many people is an indicators of a catastrophic event. The second (when possible) are the historical sources. The third is the analysis of the mortality curves. This last indicators at this moment shows good information because the mortality trend results different between some infectious diseases. Furthermore this analysis permit us to evaluate the impact of the diseases both in pre- that post-antibiotic era. This last point is an important topic of reflection.

Anatomo-Surgical Practice in 17th and 18th century: the case of the old hospital cemetery in Forlì

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Surgical practices have an enormous importance in the history of medicine; in particular, during the 17th and 18th centuries, medical investigations and demonstrations on cadavers became the most important mean for teaching and learning. In

this study, we analysed the remains of four individuals dated from the 17th and 18th centuries, from the old hospital cemetery of Forlì. Archaeologically excavated during 2014, the cemetery is located near the ancient city hospital. Biological and pathological profiles of the subjects were analysed, and then forensic methods were applied for the observation of the sectioned surfaces. In the attempt to reconstruct the actions made by surgeons and to deduce technical characteristic of the instruments, we made macro and microscopic observations by taking high definition photographs and using stereomicroscope and SEM. In this way, creating a comparison to the treatises of the time, the execution of a craniotomy and three limbs amputations on adults were described. Without damaging the occipital, the craniotomy (individual 2, burial 68) was executed probably from the left to the right side of a male cranium by using a linear hand powered saw with the set of the blade circa 1,3 mm wide. The individual 2, burial 1, a male, shows a bilateral amputation which was probably made by an alternated push saw having a 2 mm distance between the teeth; the operator stood on the lateral side of the limbs. For the other cases of the left femur and humerus amputations, respectively of the individual 1, burial 121 (male) and of the individual 4, burial 24 (indeterminable), we hypothesise that both incisions were made by a pull saw from the medial side of the limbs. Excluding the individual 4, burial 24 which exhibits a sharp force lesion on the ulna, none of the other individuals show bone diseases which could justify surgical practices. In conclusion, we discuss a possible case of post-traumatic intervention and three probable cases of post-mortem incisions.

References

- Bertrandi GAM. *Trattato delle Operazioni di Chirurgia di Ambrogio Bertrandi*. Venezia: Domenico Fracasso 1770, Tomo II.
- Kirkup J. *The evolution of surgical instruments: an illustrated history from ancient times to the twentieth century*. Novato: Historyforscience 2006.
- Symes SA, Chapman EN, Rainwater CW, et al. *Knife and Saw Toolmark Analysis in Bone: A Manual Designed for the Examination of Criminal Mutilation and Dismemberment*. National Institute of Justice 2010; report number: NCJ 232227.

Klippel-Feil syndrome in a Sardinian population of the 16th century

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During the 2009 archaeological excavations conducted in the Alghero cemetery (Sardinia) dating back to the 1582-1583 plague outbreak, sixteen long and narrow graves (trenches), and ten multiple graves were uncovered. A total of 198 skeletons were examined, including the skeletons of two adult males and two subadults, for which the fusion of two cervical vertebrae was identified.

The aspect of this condition is characteristic, because not only the vertebral bodies, but also all the other parts of the two vertebrae can be involved, including neural arches, spinous processes and zygoapophyseal joints, with absence of osteophytes: the two fused cervical vertebrae appear not only structurally as one, but also function as one. In medical and paleopathological literature, similar features have been attributed to congenital fusion of cervical vertebrae, a congenital synostosis of one or more continuous segments of the cervical spine, resulting from an embryological failure in the normal spinal segmentation. Furthermore, besides this condition, if the fusion of two vertebrae is accompanied by other anomalies, affecting above all the spinal column, a diagnosis of Klippel-Feil syndrome, a rare type of complex congenital condition, can be considered.

Individual 2291, a subadult aged 7-8 years, showed alteration in the morphology of the pars basilaris, a posterior defect of the atlas, fusion of C2-C3, thoracic and lumbar supernumerary vertebrae, lumbar posterior arch defect of L6, spina bifida occulta, and bifurcation of the sternal end of one fragmented rib. The association of these anomalies suggests that the individual was affected by the Klippel-Feil syndrome. Individuals 2284, 2309, 2890, showed fusion of two cervical vertebrae, but no other abnormalities, in part as a consequence of the poor state of preservation of the skeletal remains. In these cases, a diagnosis of Klippel-Feil syndrome is dubitative, and a simple congenital fusion of cervical vertebrae is more likely.

References

- Barnes E. *Developmental defects of the axial skeleton in Paleopathology*. Niwot: University of Colorado Press 1994.
- De Graaff R. *Congenital block vertebrae C2-C3 in patients with cervical myelopathy*. Acta Neurochir 1982;61:111-26.
- Resnick D. *Degenerative disease of the spine*. In: Resnick D (ed). *Diagnosis of Bone and Joint Disorders*. Philadelphia: WB Saunders 2002; pp. 1382-475.

The Bottaro: when the study of acromegaly went beyond the osteology

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Acromegaly is an endocrine-metabolic disease caused by a pituitary gland tumour producing a surplus of growth hormone. Although the etiology has been described in 1909, since the 16th century physicians have been interested in the study of this disease. The "Luigi Cattaneo" Museum of Bologna exhibits the skull, the wax bust and the dry stomach preparation once belonging to Luigi Marchetti, known as *il Bottaro* (i.e. the barrel maker, after his profession). The case is known in literature on acromegaly thanks to a publication of the pathologist Cesare Taruffi in 1877. Mistakenly, however, we could think that this case report was contemporary to Taruffi. In fact, Taruffi's studies are the result of the observation of anatomical specimens made certainly at the beginning of the 19th century at the request of the anatomist Alessandro Moreschi's. Currently, also because of the change of the venue of the museum and some inaccurate cataloging of the anatomical

specimens, many questions remain open. First of all, there was no certainty about Bottaro's precise date of death: Taruffi noted 1808, while on the wax bust it is marked 1811; secondly a giant stomach is also exhibited in the museum but unexpectedly placed in a room distant from the one the skull and the bust of Bottaro are preserved. Our study was born a museological one, to later expand into a full palaeopathological and historico-medical one owing to a careful analysis of Taruffi's writing. The investigations, besides clarifying Bottaro's year of death in 1808, confirmed the retrospective diagnosis of acromegaly. On the basis of the gathered information a review of the scientific literature was conducted: it revealed that cases of acromegaly chronologically preceding the Bottaro's were primarily osteological studies, and Moreschi was actually the first to observe the internal organs and to study them.

References

- Taruffi C. *Scheletro Bolognese con prosopectasia e tredici vertebre dorsali*. Ann Universali Med Chir 1897;247:339-88.
- De Herder W. *Acromegaly and gigantism in the medical literature. Case descriptions in the era before and the early years after the initial publication of Pierre Marie (1886)*. Pituitary 2009;12:236-44.
- Atkinson FR. *Acromegaly*. London: John Bale 1932.

About some cases of vascular pathology belonging to the collection of the "Regio Museo dell'Università di Torino"

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Among the old pathology specimens belonging to the collection of the "Regio Museum dell'Università di Torino" there are many interesting cases of vascular pathology dating back to the beginning of the XX century, notably there are cases of aortic aneurisms and luetic aortitis.

The cases of aortic aneurisms are both dry preparations and fluid-preserved specimens, whereas the cases of aortitis are all fluid-preserved specimens.

The most significant dry preparations of vascular lesions are two cases of "true" aortic aneurisms of luetic origin whose clinical and autopsy data were reported by Dr. G. Gallo in 1821 (Repertorio Medico-Chirurgico 1821;1:241-7).

Other cases were reported by Dr. Ferruccio Vanzetti (Trattato di Anatomia Patologica). The restoration of the dry specimens was recently performed following historical records (cleaning with lye water and with a decoction of Saponaria Officialis and final application of shellac over the surface). The chemical analysis has showed that the dry preparations were fixed in mercuric chloride (corrosive sublimate) with the addition of other chemical reagents (antimonium and chrome). Some of these fluid-preserved specimens have been studied with traditional techniques of Pathology as histological staining with very good result, showing the perfect preservation of the histological details after more than a century.

Isotopic signatures and stress markers: evaluation in bone remains from ancient Rome

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Molecular evaluation of bone remains could provide a huge amount of information about health conditions and lifestyle of past populations. Although carbon and nitrogen stable isotope analysis on human skeletal remains is widely performed to investigate dietary patterns¹, proper interpretations could aid in the definition of the individual biological status related to homeostatic/metabolic alterations^{2,3}.

The present research aims to evaluate the isotopic signatures of ancient bone remains pertaining to more than 150 individuals from the Roman territory where specific metabolic disorders and/or non-specific stress indicators have been identified. In particular, the dental and skeletal physiological disruptions related signs that have been taken into account are porotic hyperostosis, periostitis, enamel hypoplasia and caries.

Our evaluation pointed out that the alteration in isotopic values due to the presence of non specific stress markers could be primarily ascribed to nitrogen fractionation. However, the non specificity of the etiological causes involved in the development of the alterations makes not straightforward to ascribe the phenotypic expression of such markers to a sole nutritional reason.

Nevertheless, pathological conditions can significantly alter the isotopic compositions of human tissues and these isotope values could mirror both altered metabolic processes and variations in the diet. These evidence suggest that stable isotope analysis should be carefully applied at all to make inferences about diet, especially to avoid erroneous reconstruction of the nutritional habits of ancient people exposed to nutritional stresses or affected by metabolic diseases.

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References

- Schoeninger M, De Niro M. Nitrogen and carbon isotopic composition of bone collagen from marine and terrestrial animals. *Geochim Cosmochim Acta* 1984;48:625-39.
- Egun GN, Atinmo T. A metabolic nitrogen balance study for 40 d and evaluation of the menstrual cycle on protein requirement in young Nigerian women. *Br J Nutr* 1993;70:449-57.
- Olsen KC, White CD, Longstaffe FJ, et al. Intraskelletal isotopic compositions ($\delta^{13}C$, $\delta^{15}N$) of bone collagen: non pathological and pathological variation. *Am J Phys Anthropol* 2014;153:598-604.

MSCT study of ancient bone remains: investigative protocols

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Aim of the study is evaluate the image optimization in MSCT for studying ancient bones. Despite the experience of many years to the study of small anatomical images such as the auditory ossicles of the middle ear in children. The biggest obstacle for antiquities bones was that all protocols did not consider the absence of soft tissues.

We used for our study two archaeological finds made available by the Soprintendenza Speciale per il Colosseo e l'Area Archeologica Centrale di Roma, pertaining to the imperial necropolis of Castel Malnome and medieval cemetery of San Pancrazio, that have undergone various displays with Toshiba Aquilion 16 layers CT equipment. 5 types of exposure was carried out in order to identify the protocols with variation of acquisition parameters starting proper centering of the find, the FOV, the kV and mA, exposure time, pitch and filter selection.

The reference table of results rather articulate showed that despite having the technical constraints due to the machine you can perform high quality low dose examinations for all equipment MSCT.

The technological approach with CT to skeleton bones requires special parameters to obtain increased spatial resolution and contrast resolution which allows to highlight the details that help to identify the pathologies of the find. Avoiding the use of standard parameters that are not useful to the study.

References

- Cesarani F, Martina MC, Ferraris A, et al. Whole-body three-dimensional multidetector CT of 13 Egyptian human mummies. *Am J Roentgenol* 2003;180:597-606.
- Chhem RK. Paleoradiology: imagining disease in mummies and ancient skeletons. *Skeletal Radiol* 2006;35:803.
- Licata M, Borgo M, Armocida G, et al. New paleoradiological investigations of ancient human remains from North West Lombardy archaeological excavations. *Skeletal Radiol* 2016;45:323-31.

Anthropological and paleopathological investigations of human remains from medieval cemeterial area of San Biagio, Cittiglio (Varese)

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In 2006, the restoration works of the medieval church of San Biagio in Cittiglio (Varese-Northern Italy) brought to light several archaeological findings. Near the current presbytery, excavations allowed to show a very interesting sequence of tombs, probably those of the ruling family members. In particular, two of these tombs are remarkable under the pa-

leopathological point of view. A tomb containing the skeletal remains of a young male showed three important perimortem cuts on the skull. The other tomb contained the bones of a woman with a spearhead at the level of the ribs. We believe that these subjects were killed during a battle; however, other hypotheses regarding the young man, suggested a death for justice. Several elements, from our point of view, let us to assume a “*battle theory*”, but we must verify the presence or absence of other violent deaths.

Another important aspect recorded during this archaeological phase is the conspicuous presence of childhood graves, especially for those younger than three years.

In order to better investigate the paleodemography and paleopathology we needed more bioarchaeological data. Therefore, we focused our attention on the funerary area immediately outside the church. The archaeological excavation started in March 2016 and brought to light several other burials. At the end of the excavation phase, anthropological investigations of skeletal remains were performed. These data confirmed the high infant mortality; we have also recorded the presence of skeletal remains belonging to three fetuses, two of which buried inside of a tile. Moreover, we found other traumatic injuries, in particular on a skull of an adult man presenting, on the parietal bone, the remodeling of an ancient sharp trauma, and an isolated femur with an important post trauma callus.

Although, it is difficult to speculate about these last violent deaths we could be able to verify the “*battle theory*” with the next archaeological investigation, planned for the month of May 2017.

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References

- Mella Pariani R, Lorenzi J. *Cittiglio (VA). Chiesa di San Biagio. Indagine archeologica nella navata*. Notiziario Soprintendenza per i Beni Archeologici della Lombardia 2006;160-3.
- Peregalli G, Ronchini A. *L'archivio della chiesa plebana di San Lorenzo in Cuvio*. Consorzio Archivistico 1989;7:1174-250.

Archeology: a little clay head dating back to the IV-III century b. C. Bell's paralysis

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The finance guard intercepted a clandestine archaeological excavation related to a votive deposit in the locality called Pantanacci, in the year 2012 during the reconnaissance of Lanuvio territory (Rome).

The retrieval of judicial police investigations of the archaeological material at the home of abusive excavators has allowed the Archaeological Superintendence to highlight one of the most interesting votive deposits of the last twenty years in central Italy.

This finding has been well described from an archeological view point, but far less in the history of medicine (given the amount of medical objects) in an article that appeared on multiple names on *Archeologia Viva* in 2013.

Between the medical-pathological material found there is a

small terracotta sculpture dating back to the IV-III sec. a.C. It is a head depicting an adult man with a significant grimace on his face. The small head (6x3 cm) made with a rough dough appears harsh in its execution, but a careful examination of the artifact indicates with great precision the pathology known as Bell's paralysis. This pathology is manifested by the crushing of the nerve of the emi-face, the closure of the omolateral eye, and asymmetries, the deviation of the nose to the right, and the upper lip lowering at the lower right, the bending of the mouth.

Bell's paralysis affects the facial nerve, seventh pair of the cranial nerves. The cause seems to be attributed to a viral agent, but traumas, tumors, degenerative nerve diseases and infections should also be considered. This paralysis seems to be triggered by a sudden drop in temperature. Generally, those that can be healed regress in a short time.

From a comparative point of view, some evidence has been taken into consideration but do not allow an authoritative confirmation of this pathology.

The influence of the Etruscan medical school is evident, however, which since the 7th century b.C. gives us many examples of anatomical and pathological knowledge attested in different parts of central Italy.

References

- Attenni L, Calandra E, Ghini G, et al. *La stipe votiva di Pantanacci*. *Archeologia Viva* 2013;159.
- Reginald F, Basura GJ, Ishii LE, et al. *Clinical Practice Guideline: Bell's Palsy*. *Otolaryngol Head Neck Surg* 2013;149:S1-27.
- Grmek MD, Gourevitch D. *Les maladies dans l'art antique*. Paris: Fayard 1998.
- Baggieri G. *L'antica Anatomia nell'arte dei donaria*. In: *Catalogo Ministero per i Beni e le Attività culturali*. 1997.

A case of therapeutic trepanation from 13th century Tuscany

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During the archaeological excavations carried out in 2007 in the Medieval cemetery of the Church of S. Agostino in Pogibonsi, Tuscany (Italy), a collective tomb was investigated. The large funerary structure, which contained the skeletal remains of 24 individuals, is dated back to the 13th century. A skull, belonging to an adult male, was found among the skeletal remains showing evidences of two head lesions produced by bladed instruments.

The first consists in a linear wound that involved only the outer cranial table of parietal bones; bone remodeling indicates that the individual survived the injury for a long time.

The second is located on the right portion of the frontal squama and involves all the thickness of the bone with clean and well-defined margins; the absence of any traces of reparative processes and signs of healing allows a diagnosis of *peri mortem* lesion. Only the triangular extremities of this injury can be recognized because the central portion of the wound

is obliterated by an oval bone loss, 3x2 cm, characterized by clean cutting-edges along the outer cranial table, whereas the margins of the inner cranial table are irregulars. In order to treat this lesion, the patient was submitted to a surgical intervention, probably performed to clean the wound and remove any bone splinters.

Trepanation performed to treat cranial traumas was described in detail by several medical classic and medieval Authors, whose texts were available in the 13th century. In particular, the surgeon from Poggibonsi had access to the medical literature and he probably followed the prescriptions of the surgical texts, such as that of Albucasis, which was one of the most famous during the Middle Ages. Despite he was skilled in the management of head wounds, the surgical intervention failed and the patient died in surgery or soon afterwards. This case represents a rare direct Middle Ages evidence of neurosurgery practised to treat a bone injury.

References

- Albucasis on surgery and instruments: a definitive edition of the Arabic text*, with English translation and commentary by Spink MS, Lewis GL. London: Wellcome Institute of the History of Medicine 1973; book III, chapter II, pp. 699-711.
- Arnott R, Finger S, Smith CUM (eds). *Trepanation: History, Discovery, Theory*. Lisse: Swets & Zeitlinger Publishers 2003.
- Germanà F, Fornaciari G. *Trapanazioni, craniotomie e traumi cranici in Italia dalla preistoria all'età moderna*. Pisa: Giardini Editori 1992.

The Gout of Duke Frederick of Montefeltro (1422 - 1482): historical sources and osteological evidence

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Frederick of Montefeltro (1422-1482), Duke of Urbino, is one of the foremost warlords and patron of the arts of the whole Italian Renaissance. He died in Ferrara in the autumn of 1482 after contracting an infectious disease during his last military campaign in Northern Italy. His body was taken to Urbino and after solemn funerals it was embalmed. The corpse remained in a wooden coffin hung to the wall, to the right of the main altar, in the church of San Bernardini until 1620, when it was placed in a burial chamber under the floor of the church. The remains were exhumed twice: in 1824 and in 1938. On both occasions they were found in a rather poor state of preservation. The last exhumation in 2000 confirmed the extremely poor preservation status of his skeletal remains. However it was possible to note a marked development of the muscular attachments of the upper limbs and of the pelvic bone, especially of the iliac crest, that are the result of considerable physical activity, unmistakably linked to his extensive practice of horse riding. The most remarkable find is the first metatarsal bone of the right foot, fortunately still well preserved. The metatarsal, showing a deep erosion at the medial side, has subsequently undergone radiological analysis (conventional X-ray and CT scan) which clearly demonstrated the typical morphology of a gouty lesion, exhibiting a periarticular lytic lesion with an excavated appearance and foci of reactive bone

deposition and sclerosis around the margins. Various historical sources report that Federico of Montefeltro suffered from a severe form of gout, but an outstanding primary source is a handwritten private letter sent by the Duke to his physician Battidero da Mercatello in 1461, that clarifies the gouty nature of his ailments. The study shows how an alliance between historical, documental and paleopathological methods may increase the precision of retrospective diagnoses, thus helping to shed clearer light onto the antiquity and evolution of diseases.

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References

- Fornaciari A. *L'esplorazione della tomba di Federico II da Montefeltro: notizie preliminari*. *Archeologia Postmedievale* 2000;4:211-8.
- Baldi B. *Vita e Fatti di Federigo da Montefeltro, Duca di Urbino*. Roma: Salvioni 1824.
- Fornaciari A, Giuffra V, Armocida E, et al. *The Antiquity of Gout: novel insights from the notable case of the Renaissance Duke Federico of Montefeltro (1422-1482)*. *Clin Exp Rheumatol* 2017; in press.

A case of multiple osteochondromatosis from the Nunnery of Montescudaio (Pisa, XII-XIV century)

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Osteochondroma is a relatively common benign cartilaginous tumor (35% to 40% of all benign bone tumors) characterized by a cartilage-capped bony projections or outgrowth on the surface of bones. When there is the development of two or more bony outgrowths, the disorder is called Multiple Osteochondromas (MO), a hereditary autosomal dominant disease. Paleopathological researches have demonstrated the presence of MO in a very broad geographical and chronological distribution, from the Middle Bronze Age (1700 b.C.) to the 19th century, even if only 18 cases are reported in the previous literature.

The archaeological survey in Montescudaio, Cecina Valley (Pisa), between 2005 and 2010, discovered the Nunnery of Santa Maria, founded in the late 11th century by the Counts of Gherardesca. The archaeologists investigated many burials from 10th to 16th century. One of the skeletons, a 35-40-year-old male dated between the 12-14th centuries, showed two voluminous multiple exostoses, located on the lateral part of the left clavicle and on the proximal left femur metaphysis. Anthropological observations and radiographic analysis of affected bones suggested a diagnosis of MO.

The differential diagnosis of multiple osteochondromatosis includes malignant (osteosarcoma, chondrosarcoma) and benign diseases (e.g. multiple enchondromas, metachondromatosis, chondroblastoma, and ossifying myositis), so radiographic analysis are needed. The symptomatic presentation of MO

is either due to mechanical effects of the lesion, malignant transformation and fractures, which typically occur through the neck of the pedunculated lesions. Mechanical symptoms include impingement upon nearby structures (nerve compression, vascular compression, and reactive myositis), palpable lump, bursal formation and bursitis.

This study reports the first case of MO from an archaeological site in Italy, adding new data to the MO knowledge and distribution in paleopathology.

References

- Antunes-Ferreira N, Cunha E, Marques C. *Multiple osteochondromas in a 16th–19th century individual from Setúbal (Portugal)*. *Anthropological Science* 2014;122:157-63.
- Baldassarri M. *Montescudaio dai paesaggi storici alle indagini archeologiche*. Pisa: Pacini Editore 2015.
- Murphy EM, McKenzie CJ. *Multiple osteochondromas in the archaeological record: a global review*. *Journal of Archaeological Science* 2010;37:2255-64.
- Stieber JR, Dormans JP. *Manifestations of hereditary multiple exostoses*. *J Am Acad Orthop Surg* 2005;13:110-20.

Two unusual cases of complex atlanto-axial malformation and the controversy about the etiology of the "os odontoideum"

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The os odontoideum is a rare anomaly of the atlo-axial complex in which the normal odontoid process of axis is replaced with an ossicle with smooth circumferential cortical margins that have no osseous continuity with the body of the axis and articulates with the anterior arch of the atlas. The pathogenesis of this lesion remains controversial with arguments for both acquired and congenital causes postulated in the literature

In 1883 Guglielmo Romiti, director of the Anatomical Museum of Siena, described the case of the axis of an elderly man with the odontoid apophysis detached from the body in the shape of triangular pyramid and fully adherent to the median portion of the rear face of the anterior arch of the atlas. Its lower facet, moreover, was articulated to the residue of the odontoid through a facet joint of the same size.

This description is the first published evidence of an anterior fusion of an os odontoideum, rare eventuality of which only very few cases have been reported. The purpose of this communication is to present a similar case coming from a medieval burial, namely a fusion of an os odontoideum with C1 anterior arc, studied by MDCT and CBCT. This type of variation, which can be ascribed both to the atlo-axial fusions and to the os odontoideum can contribute to the debate on the etiology of this anomaly. For this purpose this case will be compared to another complex case of os odontoideum arrived to our attention a few years ago during a medico-legal post-mortem CT examination.

References

- Pang D, Thompson DN. *Embryology and bony malformations of the craniovertebral junction*. *Child's Nervous System* 2011;27:523-64.
- Romiti G, Lachi P. *Catalogo ragionato del museo anatomico della R.*

Università di Siena, preceduto da una introduzione storica per Guglielmo Romiti. Siena: Bargellini 1886; n. 132, p. 164.

Cave AJE. *On fusion of the atlas and axis vertebrae*. *Journal of Anatomy* 1930;64:337-43.

A monostotic form of Paget from a Northern Italy Medieval Necropolis

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An excavation conducted in 2002 by the Lombardy Archaeological Heritage in the St. Giulio Church (Cassano Magnago-Northern Italy) brought to light a burial dated between VIII-IXth century, presenting a complete skeleton in anatomical position, belonged to a male, near 50 years old and 177 cm tall. The left femur presents an important alteration: it is longer than the contralateral and exhibits a swelling of the entire diaphysis; the surface is coarsened and porous. In cross section, all the cortical bone has been converted into cancellous bone, with porosity alternating with calcified areas (porotic hyperostosis).

Radiological investigations (X-ray and CT scan) were performed and revealed a cotton-wool appearance, with thinned cortical bone because of an expanded and subverted structure of lamellar bone.

Microscopic slides were performed by a resin embedding technique and a stain with Haematoxylin and Eosin and Goldner's Trichrome. Microscopic analysis revealed a cortical constituted by a more compact external part and an internal section characterized by incomplete osteons, narrowing of the bone marrow and a thickened and disorganized trabecular pattern with thick cement lines, an appearance referred to a mosaic pattern. These characteristics are typical of the mixed phase (osteoblast and osteoclast activity) of Paget's disease.

Macroscopic, radiographic and microscopic alterations are suggestive of monostotic form of Paget's disease, a chronic disorder, characterized by focal areas of excessive osteoclastic bone resorption followed by secondary increase in osteoblastic bone formation. This pathology can involve one bone (monostotic form) or more bones (polyostotic form): the most commonly affected sites are pelvis, vertebral spine, femur, skull and tibia.

Moreover, other pathological conditions were evaluated in differential diagnosis: fibrous dysplasia, sclerosis osteomyelitis of Garré, osteitis ilii condensans, lymphoma.

Supracondylar process of the humerus in children. Cases from the 15th-18th century in Settimo Vittone (Piedmont)

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Six single burials and several dislocated bones dated to the period between the 15th and the 18th century were discovered under the floor of the Baptistery of San Giovanni Battista (Settimo Vittone, Turin) during an archaeological excavation undertaken by the Soprintendenza Archeologica, Belle Arti e Paesaggio per la Città Metropolitana di Torino in 2014. The minimum number of individuals recovered is 81 (55 non adults, 26 adults).

In the present study we describe and discuss 5 cases of

supracondylar process in infant and perinatal humeri. The supracondylar processes, either prominent (5 mm long) or extremely rudimentary (1 mm long) appear as a hook-like bony spine of variable size that project distally from the anteromedial surface of the humerus. The outgrowth of bone is oriented towards the distal end above the medial epicondyle. Only in one case the process occurs bilaterally.

In the scientific literature this lesion, also called supra-epitrochlear process, epicondylar process, epicondylic process or supratrochlear spur, is considered a normal anatomical variation.

The high occurrence of the process is striking and it may suggest a family relationship among the individuals buried.

References

- Lordan J, Rauh P, Spinner RJ. *The Clinical Anatomy of the Supracondylar Spur and the Ligament of Struthers*. Clinical Anatomy 2005;18:548-51.
- Mann WR, Hunt DR. *Photographic regional atlas of bone disease*. Springfield: Charles C Thomas Publisher 2005.
- Shivaleela C, Suresh BS, Kumar GV, et al. *Morphological study of the supracondylar process of the humerus and its clinical implications*. J Clin Diagn Res 2014;8:1-3.