Original Article: Paleopathology

Some paleopathological cases from a Medieval Necropolis of northern Italy

Roberta Fusco

Centre of Research in Osteoarchaeology and Paleopathology, Department of Biotechnology and Life Sciences, University of Insubria, Italy

Abstract

Aim. This article presents some interesting paleopathological cases from the osteological sample of the medieval church of Sant' Agostino in Caravate.

Material and Methods. The building and the adjacent cemetery area were investigated during the excavation campaigns in 1989, 2002-2003, and 2018-2019. The site, dated the 11-12th century, is characterized by a cemetery function of broad chronology. The archaeological investigations made it possible to document a total of twenty-eight structures for funerary use, both primary and secondary. This study included the skeletons of 45 individuals, which allowed us to expand our knowledge of the population of northwestern Lombardy from anthropological and paleopathological points of view.

Results. The tombs 1, 2, 9, 8, and 18 present significant pathological cases: multiple osteomas, biparietal thinning, Legg Calvè Petres, traumas, etc..

Discussion and Conclusion. These cases are important because they increase the series of even rare pathologies such as Legg Calvè Petres and biparietal thinning within the paleopathological literature.

Key words: medieval necropolis, Legg Calvè Perthes, Biparietal thinning, Osteoma, Medieval Age, north Italy

Introduction

The site of Sant'Agostino stands in the center of Caravate, a town in the Valcuvia located in the north of the province of Varese (Lombardy), in an area of intense passage and ancient connection between the Ticino and the Alpine passes.

The historical information relating to the religious building is sparse; it was mentioned for the first time in 712 in the so-called Diploma of Liutfprando, which speaks of the news of the donation of lands in the district to the monastery of Ciel d' Oro of Pavia (Frigerio et al., 1975). Later it appears in a document of 1157 in which Federico Barbarossa confirmed its belonging, together with the church of Santa Maria del Sasso, to the monastery of Pavia, San Pietro in Ciel d Oro. This documentation also appears with the toponym of Calafate or Calevade (Ghidotti & Mariotti, 1989). The whole area of Caravate then belonged to the Pavia monastery of San Pietro in Ciel d'Oro. It passed between the 12th and 13th centuries to the parish church of Cuvio under the diocese of Como. This later conceded the property to a private citizen in exchange for land in Lomellina (Mariotti, 1989). The pastoral visits in the 16th century describe the poor state of conservation and the lack of furnishings. In 1853 a new parish church was built a few hundred meters from the ancient oratory; this led to the definitive abandonment of the building that was surrounded and almost incorporated into subsequent buildings (Ghidotti & Mariotti, 1989).

The small church has been the subject of recent studies and restorations, bringing it back to its ancient medieval splendor, which isolated the building,

finally making it legible and saving it from complete deterioration.

Archaeological campaigns also investigated the church and the adjacent cemetery area from 1989, 2002-2003, and 2018-2019 (Biniaghi, 2002; Mariotti, 1989).

The first archaeological excavation was conducted in 1989 on essential restoration works; the research mainly concerned the internal area, while the area outside the church was investigated in more depth in 2002 and 2003.

New interventions, an integral part of a multi-year project launched by the Department of Biotechnology and Life Sciences of the University of Insubria, were conducted between 2018 and 2019. The previous bioarchaeological investigations have made it possible to outline the conformation of the cemetery more clearly, as it was possible to explore a more significant portion of terracing. A cemetery function of probable broad chronology characterizes the area. The excavations have made it possible to document burials inside and outside the church, which has returned a total of twenty-eight structures for funerary use, both primary and secondary, for a minimum number of 42 individuals.

This article presents some interesting paleopathological cases from the osteological sample recovered during excavations between 2002 and 2019. Paleopathology is the scientific study of the evidence of disease that affected living organisms in the past (Ortner, 2011). It is a discipline that aims to trace a disease's origin, evolution, and history over long periods through pathological changes representing diseases suffered in life and observed in human remains buried at archaeological sites (Buikstra, 2012). Human remains are the primary source of evidence for past diseases, and the paleopathological examination gives an idea of the disease's frequency, dissemination, and seriousness (Roberts & Manchester, 2005). Moreover, the data collected provide additional information about the way of living of the historical populations.

Material and Method

From 2001 to 2019, archaeological investigations conducted in the medieval site of the church of Saint Agostino in Caravate (Varese, north Italy) allowed us to discover a funeral area dated back to the High Middle Ages, exploited approximately from the 11th century.17 Several archaeological phases have been recovered and, until now, 20 structured tombs, 2 reused as a common ossuary, have been brought to light (Licata et al., 2016a, 2016b; Licata et al., 2021; Licata et al., 2020). This study will deal with some of the most interesting paleopathological cases that emerged during the excavation campaigns. We proceeded with the anthropological analysis to reconstruct the skeletons' biological profile. Sex was determined based on the morphological features of the skulls and of the pelvis (Phenice, 1969; Acsádi & Nemeskéri, 1970; Bruzek, 2002). Age-at-death was estimated using degenerative changes of the auricular surface and pubic symphysis (Lovejoy et al., 1985; Brooks & Suchey, 1990), sacrum (Passalacqua, 2009), and of the auricular surface and acetabulum (Rougé-Maillart et al., 2009); moreover, ectocranial suture closure (Meindl & Lovejoy, 1985) and dental wear were considered (Brothwell, 1981; Lovejoy, 1985). Stature was calculated using the formulae for white males by Trotter and Gleser (1958). After macroscopic observation, photographic documentation, and description of the evidence, computed tomography (CT) examinations were conducted on the whole skull. For CT scans, conventional medical radiological equipment was used (GE Healthcare Revolution- GSI 128 Layers). Imaging parameters were as follows: 100 kV, 80 mA. The slice thickness used was 2.00 mm.

Results

We present the most significant pathological cases.

Tomb 8

The skeleton under investigation was in a primary deposition in a burial location, laid inside an anthropomorphic tomb-oriented East-West. The skeleton of tomb 8 belonged to a woman with an estimated age at death of 45 to 55 years and 152 to 155 cm tall (Tonina et al. 2021). The parietal bones display 2 elliptical and symmetrical depressions: the right measured 68.8 x 53.5 mm, and the left measured 73.0 x 57.1 mm. Both lesions

show an anteroposterior direction and are located between the temporal line and the sagittal suture (Fig. 1). The right parietal presents a minimum thickness of the cranial theca of 0.75 mm, whereas the left parietal of 0.79 mm. In the section, the progressive disappearance of the diploe and the exposure of the internal surface were visible. The endocranial surface also presents non-specific multifocal lesions with a serpentine appearance on the frontal and parietals, from the frontal crest continuing along the superior sagittal sinus. The same aspect was also observed at the level of the areas of thinning. Computer tomography allowed us to understand the lesions and detect the progressive loss of the diploe and the external bone table. In contrast, the inner surface appears to be preserved (Fig. 2). Moreover, radiological investigations made it possible to detect alterations in the typical curvature of the parietals (Tonina et al., 2021).

Tomb 18

The skeleton of T. 18 was in a primary deposition in a burial located outside the church, oriented N-S, and, according to the archaeological stratigraphy, dated to the 12th and 13th centuries. The skeleton was well preserved and belonged to a man with an estimated age at death between 40 and 50 years and a stature of about 166 cm.

The individual exhibited bone changes in the right hip involving the femoral head and the acetabulum, which appear to result from a pathological condition. The left hip showed no pathological changes. The right femoral head was flattened superiorly and larger than the left one, with the edges widening into a mushroom shape (Fig. 3). The articular surface showed porosity and exostosis. It could not be stated with certainty whether the fovea capitis was dislocated or resorbed due to the incompleteness of the femoral head. There was no substantial dislocation of the center of the femoral head from the axis of the shortened and thickened femoral neck. The right acetabulum was markedly shallower in comparison to the left. Its borders were hyper-developed, with a diameter of 73 mm (differing from the 51 mm of the left coxal bone and presented important bone neoformation (Fig. 4). The inner surface was also characterized by great porosity. No traces of neo acetabulum in either the proximal or the dorsal direction (Fusco et al., 2022).

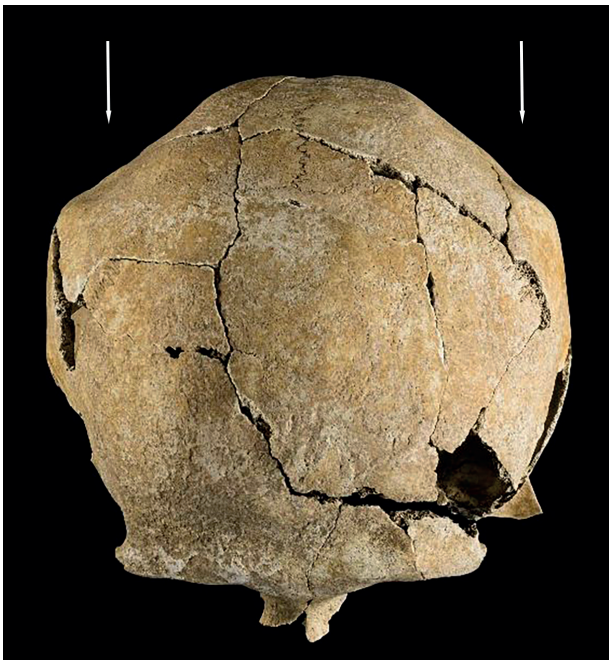

Figure 1. 4 Elliptical and symmetrical depressions located between the temporal line and the sagittal suture of the skull.

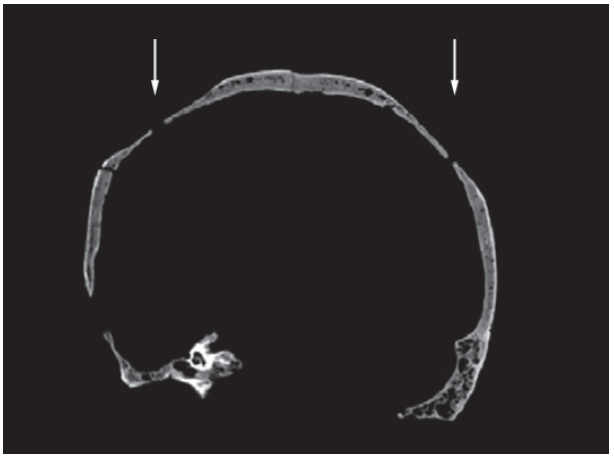

Figure 2. CT coronal vision, symmetrical depression of the parietals whit resorption of the external table and the diploe.

Tomb 1- 2 -9

Tomb 1: The skeleton of tomb 1 belongs to a woman 30-40 years of age. The frontal bone exhibits a partially healed quadrangular lesion on the right, probably due to trauma caused by a pointed weapon with a quadrangular section.

This woman shows twelve osteoblastic lesions at the level of the neurocranium. These are located mainly

Figure 3. Medial view of the flattened right femoral head.

in the sagittal suture and are characterized by well-defined margins, oval shape, with not fully smooth margins, and small dimensions.

Tomb 2: The skeleton belongs to a man of 35-45 years of age. The skull presents a com completely healed depressed trauma on the left parietal bone. The skull of the subject of tomb 2 is characterized by the presence of six osteoblastic lesions located on the frontal, on the right (one of which is near the obelion), and left parietals. They have well-defined margins and circular shapes. The individual has a well-visible oval-shaped bone formation on the dorsal surface of the 3rd proximal phalanx of the left hand (Table 1).

Tomb 9: The skeleton belongs to a male individual of 40-45 years of age. The individual has nine osteoblastic lesions at the level of the neurocranium, located mainly on the frontal and parietal bones, near the sagittal suture, and above the lambda. They are poorly

Figure 4. Right coxae showing pathological alteration of the acetabulum.

Figure 5. Skull of the subject, superior view. The left parietal bone shows many osteomas near the posterior part of the sagittal suture.

detected and are characterized by a circular or ovoid shape with irregular margins (Table 1). Except for the osteoma found at the level of the 3rd proximal phalanx of the left hand, in all cases, the osteoblastic lesions were observed on the cranial vault. The rounded lesions of different sizes present a smooth surface and defined margins (Licata et al., 2022).

Discussion

T. 8

The skeleton shows symmetrical cranial depressions involving both parietal bones in the exact location. As the appearance of this condition respects a symmetrical and bilateral disposition on the parietal bones, our reading of the case refers to a severe state of biparietal thinning. This pathological condition appears to have been present elsewhere in the past and, albeit rarely recorded, is also recognized in today's clinics. Several published palaeopathological cases are documented in Europe, America, Africa, and Australia. Biparietal thinning has been found even in India in a skull from the Bronze Age, representing one of the oldest cases (Dutta, 1969). This pathological condition has been known for a long time. Called by different names: "biparietal senile disease," "senile arthropathy," "biparietal thinning," and "parietal osteodystrophy," with unknown etiology, this pathological condition appeared to usually involve the posterior parasagittal regions (Camp & Nash, 1994). Bruyn and Bots described 2 types of biparietal thinning related to each other: flat or grooved (Bruyn, 1978). Cederlund, in the article published in 1982, reported radiological observational criteria to classify the degree of parietal thinning. In particular, based on the thickness of more affected bone, three stages were proposed: I) thinning is only superficially observed in the parietal region, and in tomographic images, a radiolucent area is highlighted; II) a considerable thinning in anterior and posterior view is recorded, in particular the loss of more than half of the bone substance, even if the diploe is preserved, is observable; III) external surface is affected, and the total loss of the diploe and the outer region is observed (Cederlund et al., 1982).

In our case, we can record the presence of bilateral parietal thinning of the third degree, stating to the classification of Cederlund,3 and referring to the classification of Bruyn and Bots,1 of the groove type.

For more than two centuries, anatomists, physicians, and anthropologists have tried to find the answer to the etiological nature of this condition. Different causes have been associated with the condition by several authors: constant pressure on the bones, developmental dysplasia, congenital dysplasia of the diploe, diabetes, growth defects, post-menopausal osteoporosis, gonadal insufficiency, hormonal changes, inflammatory arthropathy associated with trauma, primary metastatic tumors, gonadal insufficiency, Gorham disease, senile changes of the temporal artery and simple anatomical

Table 1. Osteoma locations and dimensions on the skeletal remains.

	Osteoma location				
	Occipital	**R parietal**	**L parietal**	**Frontal**	**Postcranial**
Tomb 1/2002	1.93 x 2. 32 mm	3.5 x 2.3 mm; 2.32 x 2.03 mm; 1.76 x 1.40 mm; 1.40 x 2.21 mm; 1.65 x 2.66 mm; 2.40 x 1.76 mm	2.07 x 1.76 mm; 2.74 x 3.07 mm; 3.27 x 2.35 mm; 2.82 x 1.96 mm; 1.81 x 1.80 mm	-	-
Tomb 2/2002	-	3.87mm x 3.39mm; 3.98x3.18 mm	4.24 x 3.67 mm; 2,52x3,06 mm, 3,73x3,24 mm	3.4mm x 3.25 mm	3rd proximal phalanx of the left hand 6.4 x 4.6 mm
Tomb 9/009	-	4.37 x 3.52 mm	3.39 x 2.40 mm; 3.70 x 2.99 mm; 2.63 x 2.65 mm; 2.73 x 2.47 mm; 7.06 x 2.0 mm; 7.54 x 4.63 mm	2.58 x 2.25 mm; 1.42 x 1.40 mm	-

variation, osteomyelitis, granulomatous infections, aseptic necrosis, bone aneurysm, cystic angiomatosis of bone and systemic macrocytosis prolonged steroid therapy.

Many researchers linked the biparietal thinning condition to genetic factors, others to vascular causes. Other authors consider the condition age-related (Grainger et al., 2001; Sanati-Mehrizy et al., 2020) or a consequence of postmenopausal (Mallegni, 1976) or senile osteoporosis (Virchow, 1854) and atrophy. Among the most acclaimed hypotheses, senescence is the most convincing. By the clinical cases recorded, the literature informs us that most patients have a minimum average age of 50 for men and over 60 for women (Fusco et al., 2020). It can therefore be suggested that this condition is related to the reduction or cessation of sex hormone activity (Epstein, 1953)

The skull, belonging to a mature female, could support the link to biparietal thinning, postmenopausal osteoporosis, and senile osteodystrophy (Tonina et al., 2021). It is essential to highlight that biparietal thinning is not often considered from a clinical point of view. Usually, it has no pathological significance except for the potential increased risk of fractures. (Fournier et al., 1968).

T. 18

To proceed to an accurate differential diagnosis, we considered congenital hip dislocation (CHD), slipped capital femoral epiphysis (SCFE), multiple epiphyseal dysplasias (MED), Gaucher's disease (GD), infantile hypothyroidism, sickle cell disease (SCD) and Legg Calvè Perthes (LCP). All these conditions can produce similar lesions on the femoral head, making diagnosis difficult (Kozlowski et al., 1995; Spranger et al., 2002). CHD can be ruled out since, in this case, a pseudo-acetabulum is absent from accommodating the dislocated femoral head, and the aspect of the original acetabulum suggests its functionality until the individual's death. We also excluded SCFE because, in this condition, the epiphysis is characterized by head center dislocation toward the neck axis, shortening, and thickening of the neck, with the formation of a new acetabulum at the ilium. (Herrerín & Gallarda, 2012; Rosenfeld et al., 2007). We also considered GD, MED, infantile hypothyroidism, and other types of osteonecrosis due to SCD, but they usually involve both hips and other joints, whereas in our case, only one of the hips was affected (Anderso et al., 2010; Manzon, 2017). The mushroom-shaped femoral head is one of the most striking and representative features of Legg-Calvé-Perthes. The increasing size of the femoral head can be explained by several factors, such as the necrosis of the bone, natural remodeling, and the potential adherence of small necrotic fragments that might have been detached from the bone during the pathological process (Roberts & Manchester, 1995). The deformed femoral head has led to modifications of the acetabular shape, inducing a severe degenerative disease on both articular surfaces. Sex determination is also suggestive of the diagnosis of LCPD, as it primarily involves European males (Chaudhry et al., 2014). In conclusion, morphologic examinations of the right hip of the individual buried in T.18 suggest a diagnosis of unilateral LCPD. The aetiology of the disease is still unknown. Still, the role of traumatic, genetic, metabolic, nutritional, environmental, hormonal, and hematologic factors as the potential causes of the changes at the femoral head has been discussed (Thompson & Salter, 1986). One seems the most likely of the proposed etiological theories. There is experimental evidence that the original occlusion of the precarious blood supply to the femoral head may be caused by excessive fluid pressure from an inflammatory or traumatic synovial effusion in the hip. Approximately 5% of children with transient hip synovitis show the complication of Legg-Calvé-Perthes disease. According to some authors, it is likely that multiple factors can combine in a constitutionally vulnerable child and cause the disease (Schwarz, 1986; Nevelos, 1986). When comparing our case with clinical examples, we can hypothesize that the lesions worsened over the individual's life without suitable treatment. In effect, when medical treatment is provided, the complete regeneration of Perthes disease takes 2-5 years. On the other hand, when an individual lives for too long with this disease, the natural remodeling of the bone leads to a permanent mushroom shape of the head with an indiscernible fovea capitis and corresponding ligament attachment. Based on these hypotheses, in the individual of T.18, the first symptoms probably appeared at a very early age, before age 10. The disease encompasses a wide spectrum of manifestations, from mild with no long-term sequelae to severe with permanent degenerative hip joint changes. Occurrences include a deficit in hip abduction and internal rotation nature, along with

Trendelenburg gait in advanced stages (Divi & Bielski, 2016). LCPD can be a self-limiting disease. However, in our case, the appearance of the acetabulum and femoral head suggests the functionality of the right hip until the individual's death.

Tomb 1- 2 -9

An osteoma is a benign bone lesion with no clear pathogenesis, almost exclusive to the craniofacial area. From a histological point of view, it results in a proliferation of either compact or cancellous bones, following endosteal or periosteal surfaces, with many size variations. Osteoma advances mainly in the skull; facial bones and the mandible are the most affected. Instead, the location in the occipital region is rare. Osteoma represents the most common benign tumor of the nasal tract.

Osteoma of the facial bones is a fairly asymptomatic condition. Still, in severe cases, it can alter sinus drainage and sinusitis or even deform the bones of the orbits and expand under the oral mucus (Di Girolamo et al., 2019).

The single osteoma may have no pathological significance. Instead, multiple osteomas may indicate a disease condition and is a less common condition.

According to the literature, the lesions can be produced by congenital anomalies or other chronic inflammation that can originate within the neoplastic proliferation. Another cause of osteoma growth can also be a consequence of trauma or embryogenic alterations. Osteomas because of congenital skin abnormalities are poorly documented. Their development has been suggested from embryonic cell remains as heterotopic formations for these cases. As chronic inflammation, osteomas can lead to chronic mucosal inflammation.

Multiple osteomas may also refer to hereditary adenomatous colic polyposis associated with Gardner syndrome (Dolan et al., 1973). Multiple osteomas may refer to hereditary adenomatous colic polyposis (APC) associated with Gardner syndrome (GS). Some authors consider that the diagnosis can be in the presence of more than three osteomata on the maxillo-facial complex (Chimenos-Küstner, 2005). From an archaeological perspective, GS could be indicated by numerous skeletal osteomas, above all at the cranial level.

Only some cases are attested in the palaeopathological literature. In the Czech Republic, the skull belonging to a female individual 20-25 years old, discovered in an ossuary of the eighteenth century, showed two osteoblastic overgrowths (Strouhal et al., 1996). Another case comes from the Medieval site of Pieve di Pava (Central Italy). The remains belonging to a female 40–50 years old show six osteoblastic lesions on the cranial vault and three similar lesions on post-cranial bones (Giuffra, 2019). Finally, a case comes from an Iron Age site Swiss, represented by a skeleton of a woman 30–50 years old with multiple osteosclerotic lesions to the skull (Moghaddam, 2013).

According to some authors, multiple osteomas may also be due to traumatic aetiology. Kim et al. l consider a combination of trauma and muscle traction as a possible cause, where subperiosteal bleeding from trauma combined with elevated muscle traction force can cause an osteogenic reaction. This aetiology may cause numerous smaller lesions than a single larger one (Kim et al., 2017). Some authors point out that the irregular bony overgrowth of the cranial vault due to reactive post-traumatic events is histologically characterized by rich vascular channels, a lack of laminated structure, and numerous osteocytes and the Haversian system (Eshed et al., 2007). Moreover, the distinction between the lesion and the ectocranial table needs to be better defined. Thus, these characteristics distinguish this type of lesion from "button osteoma." In our sample, all skulls present a healed trauma condition; therefore, it is possible to consider the association of multiple osteomas with traumatic injuries, as has been advanced in the literature. Since osteomas are mainly located in the parietal districts in our skulls, the hypothesis that this condition is linked to muscle stress cannot be excluded (Licata et al., 2022).

Conclusion

This study presented evidence of Legg Calvè Petres, biparietal thinning, and multiple osteoma conditions. The utility of case studies of single or small groups of individuals in paleopathology has been examined repeatedly over the past two decades, and some scholars have recently argued that they serve as essential additions to population-level analysis (Bradbury

et al., 2016; Buikstra & DeWitte, 2019; Grauer et al., 2016). Furthermore, analyzing these pathological cases helps to implement a limited list of archaeological cases, expanding our knowledge on the onset of these conditions thanks to the continuous development of bioarcheological sciences and the excavations of other necropolises. Additionally, the advanced observational methodologies applied to ancient human remains will allow the discovery of hitherto unknown pathological signs of the past and enrich the diagnostic analysis in the clinical experience.

Finally, it is essential to add that a museum project is underway on the site of S. Agostino, which also includes the sites of S. Biagio in Cittiglio and the Crypt of S. Eusebio di Azzio; the project involves the creation of a bioarcheological archive in which the skeletal remains of the three sites will converge. This archive and the studies conducted will further expand our knowledge of the population of north-western Lombardy.

References

Anderso, L. A., Erickson, J. A., Severson, E., & Peters, C. L. (2010). Sequelae of Perthes disease treatment with surgical hip dislocation and relative femoral neck lengthening. *Journal of Pediatric Orthopaedics*, *30*(8), 758–766. https://doi.org/10.1097/bpo.0b013e3181fcbaaf

Acsadi, G., & Nemeskeri, J. (1970). *History of human life span and mortality*. Akademiai Kiado, Budapest.

Binaghi, M. A. (2001-2002). Caravate (Va), ex chiesa di S. Agostino. Indagini archeologiche, *NSAL,* 206–208.

Brooks, S. T., & Suchey, J. M. (1990). Skeletal age determination based on the os pubis: comparison of the Ascádi-Nemeskéri and Suchey-Brooks methods. *Journal of Human Evolution 5*, 227–238. https://doi.org/10.1007/BF02437238

Bruyn, G. W. (1978). Biparietal osteodystrophy. *Clinical Neurology and Neurosurgery*, *80*(3), 125–148. https://doi.org/10.1016/S0303-8467(78)80035-3

Bruzek, J. (2002). A method for visual determination of sex using the human hip bone. *American Journal of Physical Anthropology 17*(2), 157–168.10.1002/ajpa.10012. PMID: 11815949

Buikstra, J. E., & Roberts, C. A. (2012). *The Global History of Paleopathology: Pioneers and Prospects*. Oxford University Press.

Camp, J. D., & Nash, L. A. (1994). Developmental thinness of the parietal bones. *Radiology 42*(1), 42–47.

Chaudhry, S., Phillips, D., & Feldman, D. (2014). Legg–Calvé–Perthes disease an overview with recent literature. *Bulletin of the NYU Hospital for Joint Diseases72(*1), 18–27.

Chimenos-Küstner, E., Pascual, M., Blanco, I., & Finestres, F. (2005) Hereditary familial polyposis and Gardner's syndrome: contribution of the odonto-stomatology examination in its diagnosis and a case description. *Medicina Oral, Patologia Oral, Cirugia Bucal* , *10(*5), 402–409.

Cederlund, C.G., Andrén, L., & Olivecrona, H. (1982). Progressive bilateral thinning of the parietal bones. *Skeletal Radiology 8*(1), 29– 33. https://doi.org/10.1007/BF00361365

Di Girolamo, S., Flora, B., Passali, FM, Di Mauro, R., Martino, F., Fuccillo, E., & Giacomini, P. G. (2019). Is there any association between Nasal Polyposis and Osteoma? A retrospective analysis of the incidence of Paranasal Sinus Osteoma among 600 patients treated for Nasal Polyposis. *Archives of Oto-Rhino-Laryngology 35*(9). https://dx.doi.org/10.17352/2455-1759.000093

Dolan, K. D., Seibert, J, & Seibert, R. W. (1973). Gardner's syndrome. A model for correlative radiology. *The American Journal of Roentgenology Radium Therapy and Nuclear Medicine, 119*(2), 359–364

Dutta, P. C. (1969). Bilateral parietal thinning in bronze age skull. *British Medical Journal, 4*,1(5635), 55.

Eshed, V., Latimer. B., Greenwald, C. M., Jellema, L. M., Rothschild, B. M., Wish-Baratz, & S., Hershkovitz I. (2007). Button osteoma: its etiology and pathophysiology. *American Journal of Physical Anthropology, 18*(3), 217–230. https://doi.org/10.1002/ajpa.10087

Epstein, B. S. (1953). The concurrence of parietal thinness with postmenopausal, senile, or idiopathic osteoporosis. *Radiology 60*(1), 29–35. https://doi.org/10.1148/60.1.29

Frigerio, S., Mazza, S., & Pisoni, P. (1975). Il vasso Eremberto e la donazione a S. Primo di Leggiuno. *Rivista della società storica Varesina* XII, 51–84.

Fournier, A. M., Vague, P., & Lafon, J. (1968) L'auto-re´sorption en bande syme´trique du diploe´ parie´tal (malum biparietale). *Journal Radiol È lectr, 49*, 347–356.

Fusco, R., Licata, M., Larentis, O., Cermesoni, B., Ravagnan, A., Ciliberti, R., Pinto, A., & Tesi, C. (2020). "Mummies outside their closets". Paleoradiological investigation of Egyptian mummified remains. *Foresic Imaging, 22*, https://doi.org/10.1016/j.fri.2020.200397

Fusco, R., Omar, L., & Tesi, C. (2022). Paleopathological evidence of Legg-Calve'-Perthes from the medieval cemetery of St. Agostino in Caravate, Northwestern Italy. *Medicina Historica 5*(3), e2021025.

Ghidotti, F., & Mariotti, V. (1988-1989). Caravate (VA). Chiesa di Sant'Agostino. *Notiziario della Soprintendenza archeologica della Lombardia,* 313–315.

Giuffra, V, Minozzi, S., Riccomi, G., Naccarato, A. G., Castagna, M., Lencioni, R., Chericoni, S., Mongelli, V., & Felici, C. (2019). Multiple osteomata from medieval Tuscany, Italy (ca. 10th-12th AD). *International Journal of Paleopathology 25*, 56–61. https://doi.org/10.1016/j.ijpp.2019.04.003

Grainger, R. G., Allison, D.J., Adam, A., Gillard, J., & Schaefer-Prokop, C. (2021). *Diagnostic Radiology: A Textbook of Medical Imaging*. Churchill Livingstone.

Sanati-Mehrizy, P., Graziano, F. D., Naidich, T., & Taub, P. J. (2020). Characterization of Bilateral Parietal Thinning *Journal of Craniofacial Surgery*, *31*(3), e288–e291.

Herrerín, J., & Gallarda, M.D. (2012). Legg–Calvé–Perthes disease and unifocal eosinophilic granuloma in a Visigoth from the Duratón necropolis (Segovia, Spain*). International Journal of Osteoarchaeology, 22*(1), 86–97. https://doi.org/10.1002/oa.1189

Kim, Y., Triolo, M., & Hood, D. A. (2017). *Impact of Aging and Exercise on Mitochondrial Quality Control in Skeletal Muscle*. Oxid Med Cell Longev.

Kozlowski, K., & Beighton, P. (1995). *Gamut index of Skeletal Dysplasias: An Aid to Radiodiagnosis*. 2nd Ed. Springer Verlag.

Licata, M., Tonina, E., Ciliberti, R., Fusco, R., Tesi, C., & Larentis, O. (2022). Could the study of ancient human remains help the modern clinic? Interpreting multiple osteomas, a difficult challenge. *Medicina Historica*, *6*(S1), e2022030.

Licata, M., Larentis, O. Tesi, C., Fusco, R., & Ciliberti, R. (2021). Tourism in the Time of Coronavirus. The fruition of the "Minor Heritage" through the Development of Bioarchaeological Sites. A Proposal. *Heritage, 4*(2), 759–774. https://doi.org/10.3390/heritage4020042

Licata, M., Larentis, O., Badino, P., Fusco, R. & Tesi, C. (2020). Toward the valorization of our anthropological and paleopathological heritage. The musealization of the osteoarchaeological contexts. *Medicina Historica*, *4*(1), 45–46.

Licata, M., Borgo, M., Armocida, G., Nicosia, L., & Ferioli, E. (2016). Diagnosis of multiple osteomas in an ancient skeleton discovered in the necropolis of Caravate - Northern Italy. *European Journal of Oncology, 21*(4), 238–242.

Licata, M., Borgo, M., Nicosia, L., & Iorio, S. (2016). Case study: The complexity of confirming the diagnoses of Gardner Syndrome in a medieval woman. *Radiography, 22*(4), 269–270.

Lovejoy, C. O., Meindl, R. S., Pryzbeck, T. R., & Mensforth, R. P. (1985). Chronological metamorphosis of the auricular surface of the ilium: a new method for the determination of adult skeletal age at death. *American Journal of Physical Anthropology, 68*, (1), 15–28. https://doi.org/10.1002/ajpa.1330680103

Mallegni, F. (1976). Un caso di assottigliamento biparietale simmetrico in un calvario della necropoli eneolitica del Gaudo. *Atti della Società Toscana di Scienze Naturali, 83*, 31–41.

Manzon, V. S., Ferrante, Z., Giganti, M., & Gualdi-Russo, E. (2017). On the antiquity of Legg–Calvé–Perthes disease: Skeletal evidence in Iron Age Italy. *Homo*, *68*(1), 10–17. https://doi.org/10.1016/j.jchb.2016.11.002

Mariotti, V. (2001). Chiese rurali dell'area varesina. *Scavi archeologici 1988-1993*, RA Como, 18, 89–119.

Nevelos, A. B. (1986). Perthes' disease: the family tree. *Clinical Orthopaedics and Related Research, 209*, 13–22.

Ortner, D. J. (2011). Human skeletal paleopathology. *International Journal of Paleopathology*, *1*(1), 4-11. https://doi.org/10.1016/j.ijpp.2011.01.002

Passalacqua, N. V., (2009). Forensic age-at-death estimation from the human sacrum *Journal of Forensic Science 54*(2), 255–262. https://doi.org/10.1111/j.1556-4029.2008.00977.x

Phenice, T. W. (1969). A newly developed visual method of sexing the os pubis. *American Journal of Physical Anthropology, 30*(2),297–301. https://doi.org/10.1002/ajpa.1330300214

Phillips, R. C. (2007). Cranial anomaly, pathology, or normal variant? Thin parietal bones in ancient Egyptian human remains. Dissertations available from ProQuest. Paper AAI3292064.

Rawcliffe, C. (2006). *Leprosy in Medieval England*. Boydell Press.

Roberts, C. A., & Manchester, K. (2005). *The Archaeology of Disease*. Sutton Publishing, Stroud.

Rosenfeld, S. B., Herring, J. A., & Chao, J. C. (2007). Legg–Calvé–Perthes disease: a review of cases with onset before six years of age. *Journal of Bone & Joint Surgery*, *89*(12), 2712–2722.

Rougé-Maillart, C., Vielle, B., Jousset, N., Chappard, D., Telmon, N., & Cunha, E. (2009). Development of a method to estimate skeletal age at death in adults using the acetabulum and the auricular surface on a Portuguese population. *Forensic Science International*, *188*(1-3), 91–95. https://doi.org/10.1016/j.forsciint.2009.03.019

Schwarz, E. (1986). A typical disease of the upper femoral epiphysis. *Clinical Orthopaedics and Related Research*, *209*, 5–12.

Spranger, J. W., Brill, P. W., & Posnanski, A. K. (2002). *Bone Dysplasias: An Atlas of Genetic Disorders of Skeletal Development*. Oxford University Press, Oxford.

Strouhal, E., Vyhnanek, L., Horackova, L., Benesova, L., & Nemeckova, A. (1996). Malign Tumours of the People from the 8 Ossuary at Krtiny (Czech Republic). *International Journal of Paleopathology 8*, 5–24.

Thompson, G. H., & Salter, R. B. (1986). Legg–Calve–Perthes Disease. *Clinical Symposia, 38*(2).

Tonina, E., Larentis, O., Tesi, C., Fusco., Campagnolo M., & Licata, M. (2021). A severe case of biparietal thinning in a medieval skull from a northern Italy necropolis. *The Journal of Craniofacial Surgery 33* (1), 70–75.

Trotter, M., & Gleser, G. C. (1952). Corrigenda to the estimation of stature from long bones of American whites and Negroes. *American Journal of Physical Anthropology*, *47*, 355–356.

Virchow, R. (1854). Uber die Involutionskrankheit (Malum senile) der platen Knochen. *Verh Phys Med Ges Wu¨rzburg*, *4*, 333–354.

Correspondence:
Roberta Fusco
Centre of Research in Osteoarchaeology and Paleopathology, Department of Biotechnology and Life Sciences, University of Insubria, Italy
Email: roberta.fusco@uninsubria.it