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BONE DEFORMITIES AND SKELETAL MALFORMATIONS IN THE ROMAN IMPERIAL AGE

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SUMMARY

BONE DEFORMITIES IN THE ROMAN IMPERIAL AGE

This paper describes some cases of individuals affected by skeletal deformities resulting in "freak" appearance. The skeletal remains were found during large archaeological excavations in the Roman territory, carried out by the Special Superintendence to the Archeological Heritage of Rome in the last years, dated back to the Imperial Age. The first cases reported are referred to two growth disorders with opposite effects: a case of dwarfism and another of gigantism. The former concerns a young man from the Collatina necropolis with very short and malformed limbs, which allowed a diagnosis of acondroplasic dwarfism, a rare congenital disorder that limits height below 130 cm. The latter case comes from the necropolis of Torre Serpentana in Fidenae, and is instead referred to a young person of very high stature, about 204 cm, suffering from Gigantism, a rare condition which in this case seems to have been linked to a hormonal dysfunction due to a pituitary adenoma. A third case regards a joint disease affecting the vertebral column and causing severe deformities. The skeleton was found in the Collatina necropolis and belongs to an old woman, suffering from ankylosing spondylitis. Finally, the last and very peculiar case is related to an individual recovered in the necropolis of Castel Malnome. The skeletal remains belong to an adult man with a complete fusion of the temporo-mandibular joint, which compromised

Key words: Skeletal deformities – Bone diseases – Roman Imperial Age – Palaeopathology

mastication and caused severe deformation of the maxillofacial complex. These cases are described in detail together with the possible implications that these deformities could have on in the social context.

Introduction

In the last decades, the anthropological and paleopathological examination of skeletal materials, found during archaeological excavations carried out by the Special Superintendence to the Archeological Heritage of Rome, permitted to further investigate diseases that affected the Roman population during the Imperial Age. Many diseases were linked to scarce living and health conditions in the crowded Roman metropolis of that time which counted over a million inhabitants and that was unable to ensure adequate hygiene and healthcare, despite the efficiency of water supply and sewerage facilities. Other diseases may have been caused by congenital disorders or by different etiologies. In this paper, the diseases causing serious physical alterations are described and the possible implications of these deformities on the life of the affected individuals are discussed.

The cases described are related to diseases causing opposite growth disorders: gigantism and dwarfism, which affected two young individuals. Another case of deformity concerns an old woman suffering from ankylosing spondylitis, a disease affecting the spine and causing the fusion of the vertebrae with crippling deformities. The last case regards a rare condition, which led to the fusion of the temporomandibular joint and resulted in permanent immobilization of the jaw. These body malformations are likely to have caused psychosocial limitations to the society in which these people lived, and more disabling than physical symptoms, perhaps reducing social participation and emotional health.

The Dwarf from the Collatina Necropolis

Skeletal remains of very short size were found in the great Imperial Age necropolis of Collatina (I-II centuries AD) located to the east

side of Rome. The body was buried in fetal position in a small grave excavated in the tufaceous rock, without funerary goods[1]. The poor preservation of the skull and hip bones did not permit sexual diagnosis, while the age at death was in the range of 20-25 years. All the long bones were reduced in length, in particular the lower limbs (Fig. 1A), where the tibia and femur were about 10 cm shorter compared to the standard length of the Roman coeval population, and the diameter and circumference were inferior as well. The long bones of the upper limbs were short (Figg. 1B, 2), with morphological modifications due to abnormal muscular attachments and alterations of the epiphyses, in particular in the proximal trait of the ulna which showed an enlargement of the ulnar metaphyseal area likely to have caused modifications in elbow articulation. Articular modifications were also observed in the *acetabulum*, which presented irregular shape and osteoarthritic changes, probably the consequence of pelvic inclination and lumbar lordosis. These malformations are frequent findings in achondroplasic dwarfism.

Fig. 1. The Collatina dwarf. A: right femur; B: right humerus.

The stature was estimated to be about 134 cm, using regression formulas[2] applied to the long bone lengths, while the mean stature from the same necropolis was 156 cm in females and 167 in males; the difference indicates a growth disorder, almost sure-

ly achondroplasic dwarfism, a rare genetic defect which in modern times affects 1:10,000 people but represents the most common form of dwarfism. The people affected by this disease generally have normal mental faculties and life expectancy, and many achondroplasic dwarfs can live to mature adulthood[3,4].

Historical and iconographical sources testify the presence of people affected by dwarfism since the earliest times and this disease has probably been the most commonly depicted human physical disorder, found in Egypt, Greece, and in the Roman world, in a large period from Predynastic Egypt (about 3000 BC) to the end of the Roman Empire (Vth century AD). In a few cases, the dwarfs were represented as élite members, or deities such as the Egyptian gods Bes and Ptah, but in most cases they were associated with minor figures often involved in ridiculous scenes, with special capabilities or particular attributes. In any case, these testimonies indicate that the Dwarfs would certainly arouse interest and curiosity, and the historical sources report that they were often object of attraction at parties and games in ancient Rome[5].

The Giant from Fidenae

Skeletal remains affected by a different growth disorder were recovered in the necropolis of Torre Serpentana (I–III centuries AD) in Fidenae, situated about 8 km north of Rome[6]. Contrary to the previous case, this skeleton, complete and well preserved, belonged to a very tall individual, sexed as male and aged 17-20 years.

This individual exhibited very long bones (Fig. 2) and a normally proportioned stature, ranging from 198 to 206 cm calculated on the basis of the long limb bones[7]; some bones did not show complete epiphyseal union, so the stature would probably have been taller had he lived longer.

During the Imperial Age, the average stature in Rome for males was 167 cm, with a difference, compared to the Fidenae individual, of 31-39 cm, indicating an overgrowth disease.

The skeleton presented a skull with normal dimensions and morphology, but the jaw was very large and long with a prominent chin and a prognate maxilla, and a teeth to teeth occlusion (Fig. 3).

All the bones were very long, with regular muscular attachments, indicating low muscle development. Alterations were observed in the coxo-femoral and knee articulations; the pituitary area, only partially preserved, appeared enlarged and depressed, while the skull presented irregular thickness of the frontal and parietal bones, with very thin spots and thicker areas. The most probable cause of bone anomalies observed is Pituitary Gigantism. In particular, the possible alteration of the hypophyseal fossa of the *sella turcica* could be due to a pituitary adenoma producing a dysfunction of the pituitary gland. This caused overproduction of the growth hormone (hGH) during childhood, stimulating cartilaginous activity at the growth plate and increased bone length[8].

Gigantism is a rare growth disease of modern times, affecting 3/1,000,000 individuals but scarcely documented in ancient skeletal remains[9]. Several complications can be associated with this disease which can reduce the life span of the affected people, causing respiratory and muscoloskeletal problems, and cardiovascular and cer-

Fig. 2. Comparison between the upper limbs of the Collatina dwarf and the Fidenae giant.

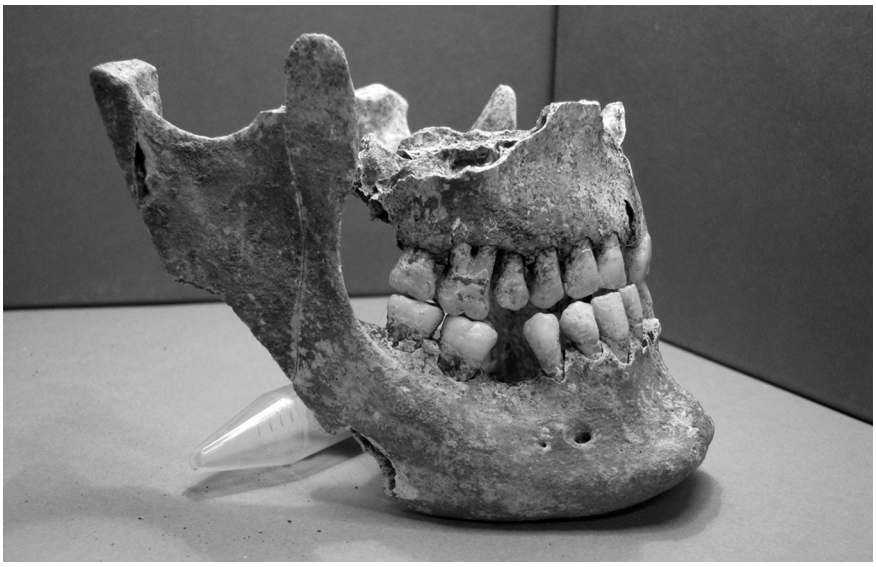

Fig. 3. Large maxilla and mandible with teeth-to-teeth occlusion of the Fidenae giant.

ebrovascular diseases, which are the most frequent causes of death generally before age 30 years[10].

In the past, the presence of giants was often reported by the ancient literary sources: legendary individuals such as Polyphemus defeated by Ulysses, Titan narrated in Greek mythology, or Goliath and other giants in the Bible, and the myth of gigantic and fantastic creatures in many ancient cultures. In the Roman world during the Imperial Age we have no reports about cases of gigantism, with the exception of the Emperor Maximinus the Thrax (235-238 AD), described as a giant in literary sources[11], but we have no information about their impact on society and whether or not they were treated differently from others. We can only observe that the tomb of the "giant of Fidenae" belongs to a group of simple fossa graves with no funerary goods, but did not reveal any peculiar differences from the other tombs in the necropolis. However, literary sources report that the

members of the high society developed a pronounced taste for entertainers with evident physical malformations, such as hunchbacks and dwarfs, so even a giant must have been an element of curiosity in Roman society[12].

A Case of Severe Body Deformity

The skeleton of an aged woman (over 50 years old) affected by a spinal disease causing body deformity was found in the Collatina necropolis (Fig. 4A)[13]. Her bones showed many pathological altera-

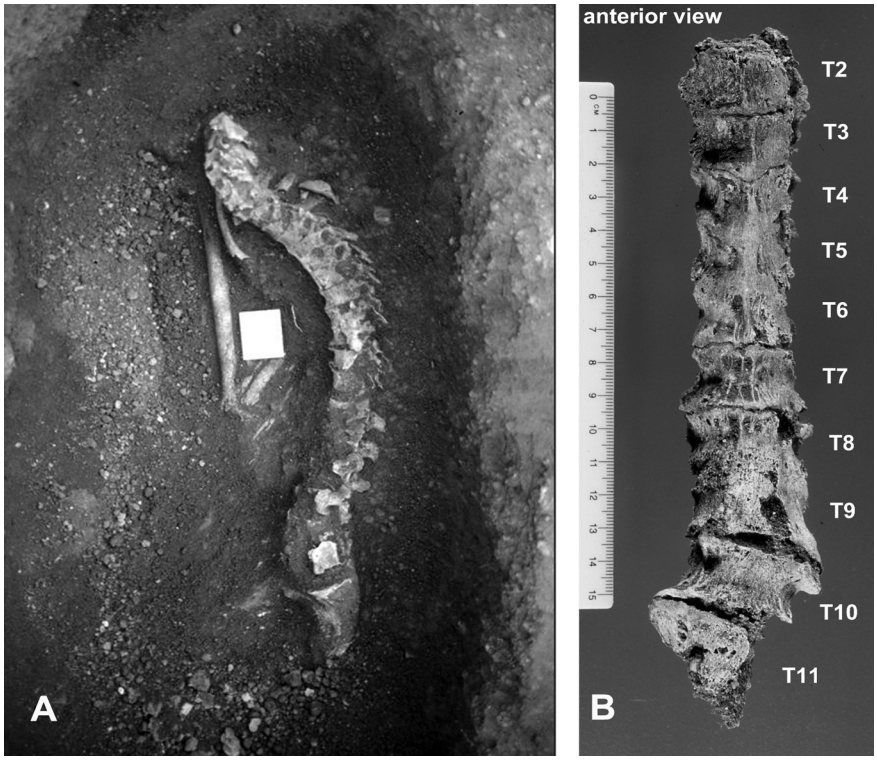

Fig. 4. A: The pathological spine, still in situ, during the archaeological excavation. B: Ossification of the vertebral bodies in the thoracic spine tract resulting in "bamboo spine" pattern.

tions, involving especially the spine which was almost completely fused. The fusion interested vertebral bodies with ossification of the intervertebral spaces, and neural arches (spinous processes and articular facets); in the thoracic tract, the ossification of the common anterior ligament produced bony bridges, with the typical 'bamboo spine' appearance (Fig. 4B). This ankylosis abnormally marked cervical lordosis and thoracic kyphosis, and was complicated by leftward scoliosis of the thoracic tract. Osteoarthritis affected most of the joint surfaces of the long bones. This is an advanced case of ankylosing spondylitis, a chronic and usually progressive rheumatic disease of unknown etiology (with a partial genetic component), principally affecting, as in this severe case, the vertebral column with the ossification of ligaments (syndesmophytes)[15]. The spinal alterations by ankylosing spondylitis caused a very unnatural posture in this woman, which is likely to have been similar to that we can suppose in Figure 5[16]. This body deformation, associated with the loss of almost all her teeth, puny bones and short stature (about 150 cm), as well as some possible symptomatic manifestations connected to the disease (such as anorexia, red eye,

Fig. 5. A man affected by ankylosing spondilitis showing body deformities due to the disease[14].

photophobia, lachrymation, and skin rash) certainly worsened the sinister appearance of this old woman[17].

The link between repugnant aspect and anomalous burial of this woman leads to hypotheses that can be interpreted on the basis of a common feeling, but which may differ from the sensitivity of that time. We can only observe the atypical funerary context and the presence of traumatism on the skull; in fact she was buried in a small oval ditch in tightly flexed right-hand side position and the body was forced into the ditch and directly covered by the soil. On the skull, a slight deformation of the left parietal bone and a fracture of the right side were observed, suggesting a *peri mortem* event; probably the cause of death or the result of a strong compression during burial.

Grave 132

The last case refers to a burial recovered in the necropolis of Castel Malnome: grave 132[18]. The burial consisted in a simple pit covered with cappuccina-style tiles, in which a 30/35-year-old male was buried, who showed a streaking pathological condition of the maxillar complex (Fig. 6A).

The necropolis of Castel Malnome, dated between the 1st and 2nd centuries AD, covered about 3000 square metres near Ponte Galeria, along the Via Portuense. This excavation has returned a total of around 300 skeletons, almost all buried.

The anthropological analysis on skeletal remains showed high frequencies (about 70%) of stress markers and traumas, suggesting that the population was probably employed as manpower in the nearby and recently discovered salt mine[19].

This hypothesis is supported by the sex ratio of the sample, mainly composed by adult males, suitable for hard quarry work and transportation of heavy loads.

As concerns the physical constitution, the individual under study seems to have been quite strong with an estimated stature of 153 cm,

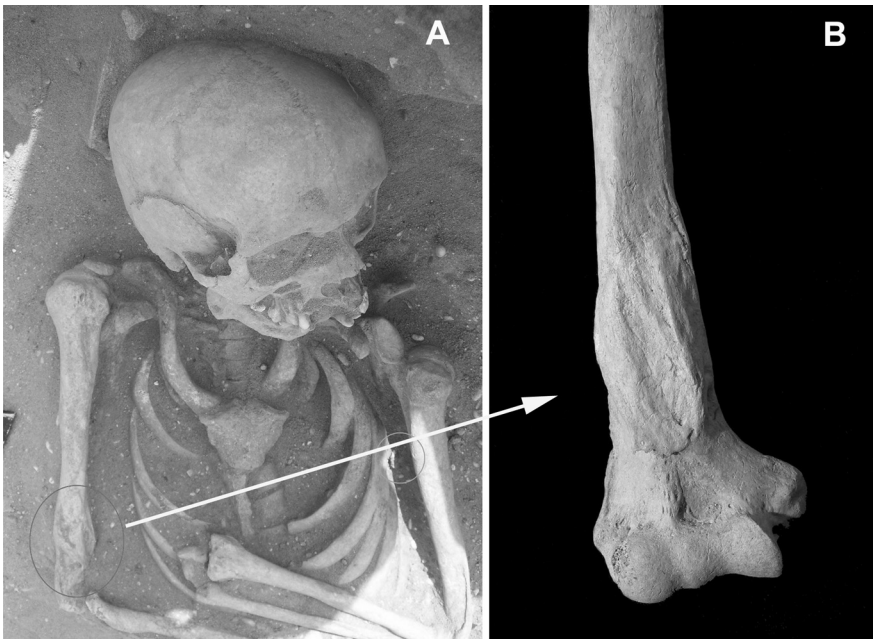

Fig. 6. A. Grave 132 from the Castel Malnome necropolis during the archaeological excavation. B. The fracture on the right humerus.

resulting lesser than the coeval average[20], and this might have been related to a limited expressiveness of the genotype, due to malnutrition and/or illnesses suffered by the individual during growth[21].
Traces of microtrauma and the muscle markers on the upper and lower limbs indicated an intensive workload: these alterations seem to suggest a perfect integration of the individual in the social community to which he belonged.
In tomb 132, of particular interest was the alteration detected on the splanchnocranium, identified as temporomandibular joint ankylosis, which is the bone fusion of the joint with complete immobilization of the jaw (Fig.7). The reason for the pathological expression might be related to a traumatic event, which probably occurred before he was 14

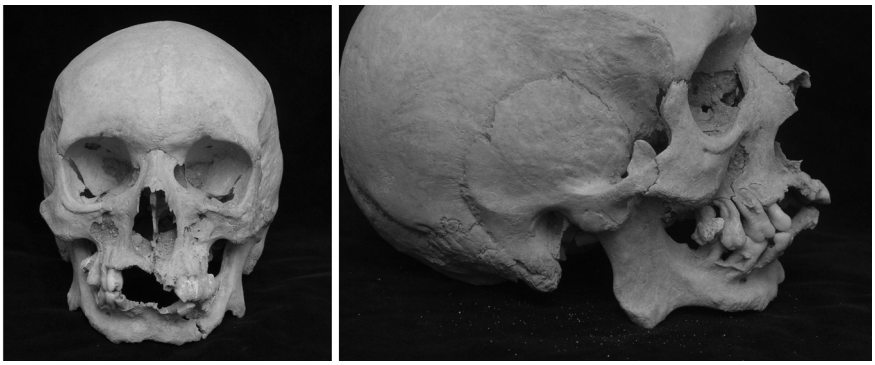

Fig. 7. The skull of individual T.132 with temporomandibular joint ankylosis.

years old, between the growth peak and the full development of the skeleton, and perhaps also causing the fracture of the right humerus (Fig. 6B) (the diagnosis[22] was carried out by Prof. Giorgio Iannetti, Director of the Maxillofacial Surgery Clinic of the University "Sapienza" of Rome). In any case, a congenital etiology might not be excluded.
The examination of the skull revealed the presence of an edentulous area of the front, both top and bottom, which was probably necessary for nutrition of the subject, unable to open his mouth because of ankylosis. The examination of oral pathology revealed caries of different severity and a large amount of calculus in almost all the teeth (especially on the left maxillary elements), with signs of marked alveolar retraction. Several teeth were lost *intra vitam* and the first right mandibular molar was affected by an apical abscess.
Tooth extraction might have been voluntary to ensure the opportunity to feed an individual who otherwise would have died in sub-adult age: it reveals a particular interest in his survival on the part of the community he belonged to, although no indications are available on the ways in which the work was carried out. However, this dysfunction allowed the subject to reach full adulthood to perform a tiring and demanding job for a long time.

Conclusions

It is difficult to understand exactly which feelings freak people may have aroused in the Roman society, perhaps, curiosity, disdain or compassion as in modern times. However, the legend according to which children born with defects were thrown from the Tarpeia rock does not seem consistent with archaeological evidence.

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Acknowledgements

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