



## Review Article

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## Dwarfism in Imperial Rome: A Case of Skeletal Evidence

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### Abstract

The palaeopathological study of skeletal human remains may contribute to extend the knowledge about ancient diseases and their impact on society. Literary sources about many pathological conditions are scarce, but in some cases they are improved by iconographic representations of diseases in paintings and sculptures from the ancient world in Egyptian, Greek and Roman art. In the same way, the anthropological description and medical diagnosis of pathological skeletons found during archaeological excavations witness the presence of diseases.

This work presents a case of dwarfism in an adult skeleton of the Imperial Age (I-II century A.D.) from Rome. The anthropological study evidenced a very short stature of this individual (ca 134 cm) who showed several centimetres of shortening of the limbs, compared with the osteometric data of the coeval Roman population. The presence of dwarfs in Rome during the Imperial Age is well documented by literary and iconographic sources; they were very appreciated, in particular by elitarian families, and provided for jokes and entertainment purposes.

**Keywords:** Congenital disorder; Dwarfism; Achondroplasia; Roman Imperial Age; Italy

### Introduction

Many aspects of ancient diseases, with particular regard to some genetic conditions, remain unclear, because literary sources are missing or scarce. Investigations on diseases are sometimes possible by studying skeletal remains from archaeological sites, as in the case we are presenting. The skeleton, dated back to the Roman Imperial Age (I-II century A.D.), is affected by a rare growth disorder, and shows very short dimensions due to dwarfism. The skeletal remains were found in the Collatina necropolis, the greatest Roman necropolis (over 2,200 burials) of the Imperial Age, placed only a few kilometres from the centre of Rome, during archaeological excavations directed by the Special Superintendence to the Archaeological Heritage of Rome. The archaeological evidences such as funerary structures and grave goods, in particular the frequent ritual use of coins as Charon's obol, permitted to date the necropolis back to the 1<sup>st</sup>-2<sup>nd</sup> centuries AD [1].

The presence of dwarfs in Rome during this period is testified by historical and iconographical sources, which often depicted these "little people" in ridiculous scenes, with special capabilities or particular attributes. Since the earliest times dwarfism has been the most commonly depicted human physical disorder, found in Egypt, Greece, and in the Roman world, in a large part of the period of Predynastic Egypt (about 3000 BC) until the end of the Roman Empire (V<sup>th</sup> century AD) [2]. However, despite numerous artistic representations, the palaeopathology of dwarfism is scarce. The earliest case of chondrodystrophic dwarfism was found in an Italian Late Upper Paleolithic burial (10,000 BP,) [3] and a few cases have been reported in ancient Egyptian skeletal remains [4-6]; more recent examples of achondroplasia of Medieval Age have been described in Poland, Hungary, and Wales [7-9].

### Description

The skeleton, poorly preserved but in anatomical connection, was found in a simple soil grave, lying on its left side with flexed legs, an uncommon disposition for this period in which the corpses were usually buried in supine position [1]; some *amphora* fragments partially covered the upper part of the body and no grave goods were found

(Figure 1). These elements, alongside the position of the tomb in a part of the necropolis used by urban people belonging to the lower social class, suggest that the individual belonged to the common population, but we have no archaeological data that can help establish whether he was a slave, *libertus* or Roman citizen.

The individual was over 20 years of age, on the basis of complete fusion of the femoral head epiphyses, and younger than 25 years of age, according to the incomplete formation of the root apex of the third molar, probably not yet completely erupted because no occlusal wear facet was visible. Accurate age estimation was difficult, as growth



**Figure 1:** Archaeological excavations: The grave of the pathological individual during excavations.

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Received May 24, 2013; Accepted July 02, 2013; Published July 10, 2013

**Citation:** Minozzi S, Lunardini A, Catalano P, Caramella D, Fornaciari G (2013) Dwarfism in Imperial Rome: A Case of Skeletal Evidence. J Clin Res Bioeth 4: 154. doi:[10.4172/2155-9627.1000154](https://doi.org/10.4172/2155-9627.1000154)

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pathologies are likely to modify the expression criteria currently used for skeletal aging; in fact, dental development may be delayed, as reported in several studies on dwarfs [10]. Sex was not determined because of the missing diagnostic districts.

Unfortunately, skull remains consisted of some fragments and two upper teeth: the second right premolar (rt P2) and the third left molar (lt M3). P2 presented very slight wear and great calculus deposits on the occlusal surface, as a probable consequence of malocclusion. The dental enamel showed some thin hypoplastic bands indicating episodes of stress occurred during childhood the most severe being between 4 and 5 years of age [11]. Severe hypoplastic pits were also diffused over the entire M3 crown surface, indicating stress episodes taking place between 10 and 12 years of age.

All the long bones were very short: the upper limbs presented moderate robustness with alterations of muscular attachments and diaphyseal morphology, while the proximal end of the ulna showed enlargement of metaphyses likely to have modified the movement of the elbow (Figure 2). 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 (Figure 3). The *acetabulum*, the only preserved fragment of the hip, presented irregular shape and osteoarthritic changes.

Selected postcranial measurements [12] of the skeleton were compared with the average dimensions of the same necropolis (Table 1). The stature was calculated on the basis of the long bone lengths using Sjøvold's regression formulas [13]. These can be applied independently of the sex of the subject, as in this case where sexual assessment was not possible. Stature estimation was about 134 cm, with a shortening of 22 cm compared to mean stature of the women, and of 33 cm compared to mean stature of the men from the same necropolis.

Radiological examination of the long bones showed normal conditions of the cortical bone and medullar cavity (Figure 4).



Figure 2: The upper limb: comparison between the humerus, ulna, and radius of the dwarf (on the right) and a normal individual (on the left).



Figure 3: The lower limb: comparison between the femur and tibia of the dwarf (on the right) and a normal individual (on the left).



Figure 4: Radiological examination: X-rays of the long bones of the dwarf; from the left: femur, tibia, ulna, humerus, and on the bottom, radius.

## Differential Diagnosis

Several growth disorders are known by the term 'dwarfism', resulting in abnormal short stature, usually not more than 140 cm, with different aetiology: genetic defects, hormonal deficits, metabolic and nutritional disorders, which may develop numerous identified pathologies characterized by a variety of skeletal anomalies [14].

In this case poor conservation and fragmentation of the diagnostic districts limited differential diagnosis. This process was performed taking into account the forms of dwarfism characterized by micromegalia and morphological alteration of the limbs that allow to reach adult age [2,14-16].

*Achondroplasia* is a congenital and hereditary disorder, characterized by shortened extremities with a normal-sized trunk. The skeletal alterations of the limbs consist in proximal segments that are shorter than the distal ones, and in the enlargement of metaphyses with normal epiphyses. Articulation of the shoulder and the elbow are often limited. The affected individuals have normal intelligence and almost normal life expectancy; the maximum stature is 140 cm.

*Metatrophic dysplasia* is a recessive hereditary disease resulting in shortened limbs and strong enlargement of the "trumpet-like" metaphysis, as well as deformed and widened epiphyses. The individuals affected by this disease have low life expectancy.

MEASUREMENTS (mm)	Dwarf	mean male	Range	difference with M (mm)	mean female	range	difference with F (mm)
HUMERUS: maximum length (1)	245*	320.3 (n=18)	299-345	75.3	295.7 (n=19)	266-342	50.7
HUMERUS: midshaft diameter (5)	24	23.9 (n=41)	20-29	-0.1	20.2 (n=50)	18-24	-3.8
ULNA: maximum length (1)	195*	258.4 (n=13)	237-279	63.4	234.2 (n=5)	216-253	39.2
ULNA: minimum circumference (3)	43	38.7 (n=29)	33-46	-4.3	32.9 (n=28)	28-39	-10.1
FEMUR: maximum length (1)	320*	435.1 (n=22)	117-512	115.1	406.1 (n=23)	362-437	86.1
FEMUR: midshaft circumference (8)	66	89.4 (n=43)	73-100	23.4	78.1 (n=49)	70-92	12.1
TIBIA: maximum length (1)	240*	363.9 (n=17)	328-435	123.9	321.5 (n=22)	217-358	81.5
TIBIA: nutrient a-p diameter (8a)	24	36.2 (n=36)	30-44	12.2	30.5 (n=43)	26-37	6.5
<b>MEAN STATURE (cm)</b>	<b>134</b>	<b>167</b>		<b>33</b>	<b>156</b>		<b>22</b>

\*approximate measurement for incompleteness of the bone

**Table 1: Osteometry:** Selected postcranial measurements of the pathological individual (dwarf) compared to the average of the Collatina necropolis. Range and differences between males/females and the dwarf (M/F size - Dwarf size) are reported - Martin's numbers [12] in brackets. Dwarf stature (resulting from maximum length of different long bones) compared with male and female average of the period.

*Chondrodysplasia punctata* is a hereditary pathology of unknown aetiology often characterized by asymmetrical and radiological granular epiphyses of the limbs. Its main features are cataract, mental, cardiac, and visceral abnormalities.

*Dyschondrosteosis* is a dominant hereditary disorder causing shortened extremities, dislocation of the distal ulna, *coxa valga* and ankle deformities. This pathology usually appears in early childhood and is more severe in females. The stature is less than 150 cm.

*Acromesomelic dwarfism* is a recessive hereditary disorder characterized by shortened extremities (in particular the upper limbs), bowed radio and ulna, deformation of the epiphysis and metaphysis. Intelligence is normal and the stature is about 120 cm.

*Hypopituitarism* is a form of proportioned dwarfism that involves the entire skeleton. Individuals lacking in growth hormone (STH) are shorter than normal, but are in normal proportion without morphological alterations of long bones.

## Discussion and Conclusions

The anomalies observed in the skeleton agree with the most probable diagnosis of achondroplasia, although the missing of more diagnostic districts, such as the skull and spine, precludes a certain diagnosis. Macroscopic examination of the pathological skeleton revealed shortening of the long bones without diaphysis bowing, moderate robustness of the upper limbs with morphological changes of the muscular attachments. The enlargement of the ulnar metaphyseal area probably limited elbow articulation, as reported in achondroplasia. The epiphyses of the lower limbs were not affected by evident alterations. In addition, the irregular shape and osteoarthritic changes in the *acetabulum* may have been a consequence of pelvic inclination and lumbar lordosis, typical of achondroplasia. Unfortunately, the skull remains are represented only by a few fragments of cranial bones and two teeth, but dental malocclusion, suggested by calculus on the premolar occlusal surface, and the hypoplastic events on the third molar are compatible with achondroplasia. The modifications in the lower limbs, essentially limited to shortened long bones, suggest a light form of the disease.

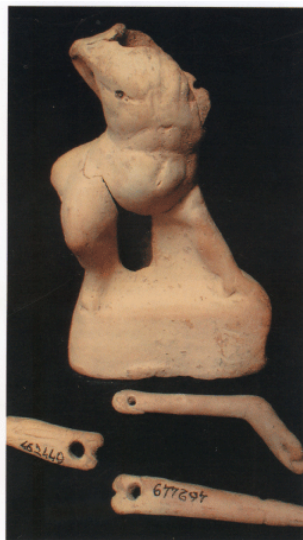
Any attempts at extracting DNA to search for mutations in the FGFR3 gene, which is diagnostic for achondroplasia, were impossible because of the poor conservation of the bones. Furthermore, recent researches have reported that PCR amplification provides false-positive

results and that the molecular typing of ancient bone for this disease is unreliable [17].

Achondroplasia is currently the most common form of dwarfism (1 case in 10,000) and this was probably the case also in the antiquity, as testified by the figurative arts from ancient Egypt to the Italian Renaissance [18]. In a few cases, the dwarfs were represented as elitarian members, or deities like the Egyptian Bes and Ptah; in most cases, however, they were associated with minor figures often involved in ridiculous scenes, with special capabilities or particular attributes. In Imperial Rome, the presence of dwarfs in the historical sources is related to their role as dancers, music comedians, clowns and jugglers, because the members of the high society developed a pronounced taste for entertainers with evident physical or mental malformations, such as cretins, hunchbacks and dwarfs. The dwarfs were also appreciated as personal attendants, for example the emperors Tiberius, Alexandrus Severus and Marcus Aurelius retained achondroplastic dwarfs as precious counselors [2,18].

The Law of the Twelve Tables, drawn up during the Republican Age (V century BC), reported that the *pater familias* could "expose" the malformed newborns: "IV. 1: A dreadfully deformed child shall be killed." (Tito Livio, *Ab urbe condita libri*, III, 31). After five or six centuries, during the Imperial Age, the customs changed and some malformations, such as dwarfism, were appreciated. The dwarfs would certainly arouse interest and curiosity, as testified by some archaeological discoveries like a dwarf-shaped puppet found as funerary equipment in a child's burial (I-II century AD) from the necropolis of Osteria del Curato in Rome (Figure 5) [19]. Despite the possible large presence of dwarfs in the Roman Imperial Age suggested by historical sources, the anthropological records are very poor. At the current state of research none of the over 2200 individuals excavated in the same necropolis of Collatina displayed evidence of this congenital and hereditary disease, excluding a case of proportionate dwarfism [20,21].

Towards the end of the Empire, the interest in dwarfs declined and the spread of Christianity contributed to a radical change of social attitude towards them (and the relationship with "freaks" changed in a religious sense). Although the Christian morality imposed assistance and charity towards the weakest, the disease was considered a form of divine punishment, and during the Middle Ages dwarfs, as well as prostitutes, fools, and lepers, were excluded from society. Finally, in the Renaissance the dwarfs returned to receiving consideration as a manifestation of social prestige and started to be an attraction at the Courts, where they were used as advisors and confidants [22,23]. In



**Figure 5:** Dwarfism in pottery: dwarf-shaped puppet found in a child's grave (I-II cen. AD) from the Osteria del Curato necropolis (Rome) [19].

modern times the discussion about dwarfism is related to the ethical debate on the identification of malformations during gestation and the consequent possibility to abort.

#### Acknowledgements

We wish to thank Dr. Mario Sabato for his collaboration and the anonymous reviewer for the suggestions. Research grant by the Italian Ministry for University and Scientific Research (MURST Cofin. 2000).

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This article was originally published in a special issue, [Case Reports in Bioethics](#) handled by Editor. Azetsop J, Department of Medical Ethics, South Africa