# A case of elbow synostosis in a child of the ancient hospital of Milan

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*ABSTRACT* *Paleopathology is fundamental in archaeology, as it may provide information concerning the health conditions and the general life quality in a historical context. In order to outline a thorough profile of the subject or the examined population, the comparison with modern clinical literature is essential since it allows one to obtain more details, such as the specific malformations and degree of invalidity due to disease. This study reports a case of left humeroulnar synostosis found in the burial chambers of the ancient hospital of Milan. Clinical literature suggests that the subject may be affected by a congenital synostosis, probably related to a genetic disease such as Pfeiffer and Roberts syndrome. Consequently, the individual suffered from a limitation in movements and possibly from other malformations (alterations of lower limbs and inner viscera) which may have caused invalidity and social disadvantage. The authors report a particular case of a congenital disease in a specific historical context and highlights the importance of a multidisciplinary approach in the study of ancient bones. J Paleopathol 26: 69–72, 2016.*

*KEYWORDS* *Elbow; humeroulnar synostosis; congenital disease; ancient Hospital; commingled remains.*

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## 1. Introduction

Paleopathology plays a crucial role in archaeological studies, since it allows the anthropologists to verify the presence of diseases able to leave signs on the bone structures. The comparison of anthropological data with clinical literature may provide interesting information concerning the signs and symptoms affecting the skeletons examined, with clear advantages for the reconstruction of the manner of life and the historical context.

In the paleopathological scenario, genetic disorders are extremely important since they are usually severe and may cause relevant modifications of life quality, which sometimes may be reconstructed, according to modern clinical literature concerning similar cases. Genetic pathologies in the past have been reported, both from cultural sources (Diamandopoulos et al., 1997) and anthropological analyses of bones (Ortner, 2003). In addition, finding signs of syndromic pathologies within a population suggests that subjects affected by invalidity could take advantage from a sort of social protection: this is the case of the Ospedale Maggiore (Ca' Granda) in Milan, one of the most modern hospitals of the past, which, since its establishment (1456), aimed to provide free medical assistance for the poorer people (Cosmacini, 1999).

The authors present a case of humero-ulnar synostosis found in a burial chamber of the ancient

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hospital of Milan in order to provide a differential diagnosis of the pathology which affected this individual.

## 2. Materials and methods

The burial chambers of the Ospedale Maggiore of Milano contain a great number of commingled human remains (over 2,000,000 bones have been estimated, thus representing a unique biological and historical archive). Indeed, these remains belong to the deceased hospital population from the 17th century onward.

Recovery, restoration and anthropological and paleopathological analyses started in 2013 and are still in progress. In particular, considering the extraordinary historical features of the context, the paleopathological assessment is of crucial interest.

During the preliminary survey in chamber $D_1$ (one of the 12 chambers in toto) a left humerus and a left ulna (sample CG/$D_1$/1) showing synostosis of the elbow were found. Standard anthropological (Baker et al., 2005; Maresh, 1970; Rissech et al., 2013; Scheuer and Black, 2000) and paleopathological analyses (Ortner, 2003; Roberts and Manchester, 1995) were performed in order to provide information concerning the biological profile of the subject and the possible different aetiologies that may have led to such an alteration. In addition, X-ray analyses were performed in order to verify the nature of the elbow synostosis.

## 3. Results and discussion

The two bones were isolated and no other sample could be attributed to the same individual. The elbow articulation was completely obliterated, and the two articular surfaces were completely merged with an angle of 110° circa (Fig. 1). The humeral proximal end of the shaft showed billowing (the corresponding epiphysis was not found during the recovery). The distal portion of the ulna instead was missing due to the complex taphonomy. Also the site of the ulnar articular surface for the proximal radio-ulnar articulation was affected by post mortem damage and could not be thoroughly analysed.

The metaphyseal aspect and the transverse diameter of the proximal end of the humeral shaft indicated that the two bones belong to a subadult aged 13 years circa (12.7 years, standard error: 2.3). Sex could not be diagnosed because of the lack of skeletal areas useful for anthropological analysis. DNA samples were not performed in order to preserve the specimen, at the moment, for future museal exhibition.

No signs of periostitis or osteophytosis were observed at the elbow joint (Fig. 2). Radiological analysis showed an area of osteosclerosis characterized by an increase of the mineral component of the bone. In addition, no fracture lines were present.

Data collected from the specimen suggested that the two bones belonged to a young subject affected by a left humero-ulnar synostosis. Furthermore, since the site of the proximal radio-ulnar articular surface could not be observed, agenesia or hypoplasia of the radius could not be excluded.

The comparison of these findings with the existing literature allowed for the exclusion of the hypothesis of an obliteration of the elbow joint due to arthrosis because of the lack of osteophytosis. In addition, an arthritic syndrome was excluded as well because of the lack of signs of inflammation (such as periostitis) and the young age of the subject.

The complete obliteration of the elbow joint is concordant with the hypothesis of a congenital synostosis. Humero-ulnar synostosis is rare and re-

**Figure 1.** General view of the elbow joint.

**Figure 2.** Detail of the skeletal sample: one can observe the lack of osteophytosis or periostitis.

ported by literature as sporadic or linked to specific syndromes (McIntyre and Benson, 2002), in some cases involving also the lower limbs and inner viscera. The most common genetic syndromes possibly linked to the humero-ulnar synostosis are Pfeiffer's syndrome (Vogels and Fryns, 2006) and Roberts' syndrome (Qazi et al., 1979). Pfeiffer's syndrome is a rare autosomal dominantly inherited disorder which causes craniosynostosis with consequent abnormal skull shape, broad thumbs and big toes, and partial syndactyly of hands and feet. Three different forms exist, with variable signs which may include mental retardation, hydronephrosis, upper airway obstruction, and elbow ankylosis as well (Vogels and Fryns, 2006). Roberts' syndrome is a rare autosomal recessive disorder characterized by tetraphocomelia, craniofacial anomalies, growth retardation, mental deficit, cardiac and renal abnormalities (Goh et al., 2010). Qazi et al. described a case of two siblings with Roberts' syndrome, and one of them showed bilateral humero-ulnar and femoro-tibial synostosis (Qazi et al., 1979). Therefore, the subject may have been affected by an isolated limitation of the left upper limb or by a more serious deformation involving also the other limbs, perhaps with neurological alterations (such as mental retardation).

Obviously all these conditions determined a partial invalidity and consequently a limitation in daily and/or work activities of this young individual. Clearly no further information but for the age can be extrapolated; however, the presence of such an individual suggests that he/she probably was poor, and was given free hospital care and assistance. Probably the subject was alone, without relatives or friends who could claim the body after death. From this point of view, the history of disability and the life of subjects with important handicaps in the past is a novel field of research (Schianchi, 2012; Zardin, 1995; Reggiani, 2014). Figures representing such individuals can be found in paintings dating back to XVII and XVIII centuries: an example can be "Lo storpio" by Jusepe de Ribera called Spagnoletto, 1642. As concerns the autonomy of persons, young adolescents were frequently already involved in working activities (D'Amico, 1995). In the presence of physical or psychological impairment one last chance could be beggary, an activity specifically authorized by Milan's general chancellor at the time to persons aged under 25 years only if blind or cripple (Liva, 1995); but normally the poor had the right to free assistance. This condition may justify the presence of this individual in the hospital area.

Further information derives from the classification of poor people in need in 1671, which provided four classes: subjects "completely unable to perform any activity including beggary", who had to be recovered and supported at home, subjects "with defects, healthy, but unable to perform any activity", who

obtained the authorization for beggary, subjects "with defects, but able to perform some activities" who could not become beggars, but had to learn a job, and subjects "healthy, but beggars in order live wandering" who, when aged over 12 years, had to undergo specific professional training (Liva, 1995). In the present case, we cannot reconstruct if the subject belonged to the first or second class. In addition, we have to consider that since 1671 the hospital was also the main local recovery for abandoned children. May our individual be a child adopted by the hospital and who then died in the age of adolescence?

Unfortunately the presence of a single specimen and the impossibility to assign other bones to the same individual because of the specific characteristics of the material in the burial chambers does not allow for a more precise diagnosis and social collocation of the individual. Nevertheless, this finding was able to shed light on the issue of disability and social emargination in the past.

## 4. Conclusions

The extraordinary biological archive of the ancient hospital of Milan is allowing anthropologists to analyse a particular population which includes a heterogeneous sample of patients.

In this case the finding of a humero-ulnar synostosis in a young individual was analysed from a clinical point of view in order to provide a differential diagnosis. The case reported provides an interesting example of a congenital malformation and highlights the importance of a clinical approach in the paleopathological assessment of archaeological and historical bone remains.

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