Type I Monteggia fracture-dislocation in a monk from a 17th–18th century necropolis of Valladolid (Spain)

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Abstract This paper reports the study of the osseous remains of an adult male (30–35 years) from a Spanish urban necropolis dating from the pre-industrial age (17th–18th centuries). We have diagnosed the presence of a severe unreduced forearm fracture, which has been classified as a Type I Monteggia fracture in the left arm. Injury occurred by a complete and poorly resolved ulnar fracture in its upper third. As result of this ulna fracture a radial head dislocation also occurred, creating a new articular surface on the humerus. The ulna also underwent two different types of angulation. The purpose of this study is to evaluate the anatomical changes of the elbow joint bones after a Monteggia fracture, assessing the completeness of functionality on the arm of this man. After the fracture, this individual lived the rest of his life with a permanent dislocation of his radius; therefore, loss of the forearm rotation, cubitus valgus, elbow instability and pain were all present. Movement was limited to an intermediate position or semipronative. A detailed description of the pathology is also accompanied by a discussion of the historical-cultural context in which this man lived and the common diseases of the population to which he belonged.

Key words: paleopathology, trauma, pre-industrial age, biomechanics

Introduction

Trauma is conventionally defined as an injury produced in the living tissue that is caused by a force or mechanism extrinsic to the body (Lovell, 1997). There are many classifications of trauma (Steinbock, 1976; Ortner and Putschar, 1981; Knowles, 1983; Merbs, 1989; Roberts and Manchester, 1995; Lovell, 1997), and in all of them fractures, i.e. a complete or incomplete break of bone continuity, are noted as being one of the most frequent lesions. The most common types of fractures arise from a direct or indirect trauma, though less commonly they can also occur as a consequence or stress subsequent to another pathology (Lovell, 1997).

The Monteggia fracture-dislocation

Giovanni Battista Monteggia was the first to describe the fracture that bears his name in the year 1814 (Mostofi, 2005). It involves an ulnar fracture in association with ligamentous failure of the proximal radius, resulting in radial head dislocation (Jupiter et al., 1991). In the following years, many classificatory schemes of the lesion were proposed (Rockwood et al., 2006), but nowadays only the proposal of Jose Luis Bado (1967) is commonly used.

Bado redescribed this injury as a group of traumatic processes that have in common a fracture of the ulna in its upper third which is associated with a dislocation of the radioulnar joint. Bado coined the term “Monteggia’s injury,” and carried out a thorough classification of this injury in terms of four typologies (Table 1, Figure 1) based on the direction of the dislocation of the radial head and the angulation of the fracture of the ulna (Bado, 1967). In recent decades, many authors have contributed to understanding the complexity of this injury, both in adults (Natalio Firpo and Roque Valls, 1969; Rossiter, 1970; Bryan, 1971; Eathiraju et al., 2007; Konrad et al., 2007; Cheung and Yao, 2009; Nakamura et al., 2009) and subadults (Fowles et al., 1983; Letts et al., 1985; Olney and Menelaus, 1989). It is important to note that these types of fractures differ between both age groups in terms of the mechanism and patterns of the injury.

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Monteggia fractures are not common injuries nowadays, representing 5–7% of all fractures in the elbow region of adults and only 2% in children (Givon et al., 1997; Richards, 2003). Even though the conditions for an ulnar fracture to be classified as “Monteggia” are now well established, mislabeling has been reported in some cases, as there are rare pathologies with identical outcomes that can only be discounted through entire radiographs of the forearm and elbow (Ahmad et al., 2007). Thus, reports of definite Monteggia fractures are scarce in the archaeological literature (see Wells, 1964 for an example), and seem in some cases to be mistaken (Fernández Crespo, 2007). Sometimes, anthropological studies only point to the possibility of having found a Monteggia fracture (Grauer and Roberts, 1996; Judd, 2008). In one example of this, Zivanovic (1982) describes an injury in the remains of a Cro-Magnon dated 7738 ± 51 years ago and found in the Padina site of the Iron Gate gorges of the Danube (Romania) which could be a Monteggia fracture, but cannot be properly identified. The interest in identifying these injuries in archaeological contexts lies in the fact that adequate procedures for their treatment were not possible in former times. Therefore, affected human remains, if found, give us an excellent opportunity to study the development and evolution of these lesions.

**Surgery in pre-industrial Spain**

The Renaissance promoted a division in the medical profession across Europe: traditional healers were progressively substituted by surgeons (who had theoretical instruction and varied anatomical and medical knowledge) and barbers (who were untrained traveler-healers). The latter were already the main practitioners of medicine in late medieval Spain, both in urban and rural environments. Other competitors for this privileged position were the professional medics, who were trained by the “Protomedicato,” an institution founded by the Catholic monarchy in 1477. This training gave them a better social standing and more job opportunities, but their numbers were few until the industrial age (Lanning, 1985).

The influence of Renaissance surgery arrived late to Spain, the most noteworthy being that some medics began to specialize as surgeons in different fields, such as battle wounds or fractures and dislocations (López Terrada, 1996). It was common that surgeons attended the more complicated procedures, while barbers healed wounds or dealt with broken bones (Granjel, 1980). The long-time persistence of the division between surgeons and barbers promoted the appearance of many other “professionals” who practiced various medical procedures, such as bleedings, enemas or teeth extraction.

In the 17th century, surgery had not yet fully developed into a science in Europe, and in many places a surgeon had a lower status in society than a medic. Until the middle of the 18th century, Spanish universities did not participate actively in the development of medicine; the Academies and Royal Surgery Colleges were the promoters of scientific progress. After the crowning of the first Bourbon king, Philip V (1713), military surgery underwent a great boost while more traditional institutions were disregarded. Across the whole spectrum of surgery, military surgeons attracted a certain prestige (Lanning, 1985).

In Spain, the most prominent surgeon of those times was Antonio de Gimbernat (1734–1816). In his opus *Formulario Quirúrgico* (*Surgical Form*), he insisted on the need for mandatory anatomical instruction for surgeons, and established the basis for “ruled surgery,” in which the procedures were based on anatomical knowledge. In 1775, two surgeons from Toulouse, Lapujade and Sicre, reported the first internal fixation of a recent fracture: the closing of a broken ulna using copper wires (Granjel, 1980).

**Objectives**

The aim of the current study is to describe a nearly untreated Monteggia fracture-dislocation encountered in an individual found in a Spanish necropolis from the pre-industrial age (late 17th–early 18th centuries). We will also assess the possibility of identifying his bioarchaeological context.

**Location of the Necropolis and historical context**

Historically, it should be noted that in the first years of the 17th century, and for a short time of four months, the city of Valladolid was the capital of Spain. Severe famines and epidemics were common in Spain in that period, and caused a decrease in the population of Valladolid. The city suffered a grave economic crisis, caused mainly by the abandonment of commercial activities (Gutiérrez Alonso, 1989). Both economic and demographic declines were partly mitigated after 1670 with the building of textile workshops which were precursors to the industrialization of the city. During the 18th century, the city slowly recovered from its decline. In 1700,
the population was around 18000 inhabitants, rising to more than 21000 at the end of the century (Benassyar, 1983). Improvements began to appear in the city during the reigns of Charles III (1759–1788) and Charles IV (1788–1808), who protected the existing factories and encouraged the creation of new ones, promoting at the time many social policies, such as sanitation by paving some streets and rationalizing garbage dumps (Gutiérrez Alonso, 1989).

The Monastery of Prado stood northwest of Valladolid, on the right bank of the Pisuerga River (Figure 2), at the site formerly occupied by the church of Our Lady of Prado, which was initially used as a praying place by the monks of the Brotherhood of St Lazarus (Brasas, 1978).

When, in 1441, the Jerome Order of Our Lady de Prado obtained royal patronage, the construction of the monastery began, funded by the Catholic monarchy. Inside this new temple, numerous burials were documented, including those of the Infantas of Granada and other important nobles of the time (Postigo, 1989).

The monastery started to decay with the economic crises of the 17th century. This process was accelerated during the early years of the 19th century, with the invasion of Napoleon’s troops, the Ecclesiastical Confiscation of 1835 and the final eviction of the last monks in 1850 (Brasas, 1978). Later, the monastery was reused as a military prison. In 1899 it was transformed into a psychiatric hospital that operated until halfway through the 20th century. Restoration was then begun, and it became headquarters of the Ministry of Culture and Tourism of the Junta de Castilla y Leon.

Archaeological intervention

Archaeological intervention was performed by the archaeologist Moratinos Garcia (1992). From his documentation we know that the initial plan of the excavation varied as the actions progressed. The first idea, which was a small-scale intervention in the central nave of the church and the chapels of the Gospel, changed towards a full-scale action in the inside of the temple. The remains presented in this study belong to the fifth campaign of excavations, which was carried out between July and November of 1992. The main focus of this campaign was the so-called sector IV, which covered the entire interior of the church (Excavation Unit C) in which monks were traditionally buried (Figure 3).

In total, 50 tombs were excavated, which provided a total of 51 individuals. Inhumations were indistinct, with the bodies placed in a simple basin-type grave over the earth or in an anthropomorph tomb with an enhanced squared or rounded head. All of them appeared covered with slabs made of conglomerate, limestone or fine sand. Orientation of the tombs was mostly west–east and the corpses were deposited in a supine position, with their arms folded over the waist or breast and both feet side by side. No clothing was found, only the remains of footwear in some cases. Numerous brooches made of bronze were found, which presumably held together the shrouds which wrapped the corpses. The remains were dated between the 17th and the 18th centuries.

Paleodemographic data

The 51 individuals comprised every age class, and one of them did not even exceed the fetal development stage (Table 2). Infant mortality accounted for 17.6% of all deaths, and these were higher during the first stage of infancy (infant I), with a mortality of 11.7%. Only 5.8% of the individuals died during infant II stage. The age group between 21 and 40 years represents more than the 50% of the population, a percentage which diminishes to 17.6% in the mature class. The population older than 60 years (seniles) represents 7.8%.

Paleopathological data

The skeletal series exhumed from the monastery of Prado had been previously analyzed from the morphological and paleopathological viewpoints by one of us (López, 2000). Diseases which were described in this population mainly include those affecting oral health: dental caries, abscesses, ante-mortem tooth loss periodontitis, dental wear, dental calculus, etc. In two infant individuals the presence of cribra orbitalia and dental enamel hypoplasia was diagnosed. In various subjects older than 40 years, general osteoporosis

Figure 2. Location of the archaeological site where the remains were found: the Monastery of Prado. Modified from Moratinos Garcia (1992).
various markers of occupational activity were described, but none could clearly indicate the possible trades of the exhumed population. The only fracture observed in the population is the one that we present in this study.

Analysis of the human remains

Biological sex determination was based on methods which relied on classical morphological parameters of sexual dimorphism, namely morphological features of the pelvis such as the presence of a subpubic concavity, ventral arc and preauricular sulcus, the thickness of the ischiopubic ramus and the greater sciatic notch shape in the pelvis bone (Ferembach et al., 1979; Buikstra and Ubelaker, 1994). In addition, morphological cranial characteristics of the skull, such as the robusticity of the nuchal crest, the size of the mastoid process, the sharpness of the supraorbital margin, the prominence of the glabella and the projection of the mental eminence were also used (Buikstra and Ubelaker, 1994). Age-at-death was determined from the main macroscopic changes of the pelvis with the following criteria: metamorphosis of the pubic symphysis (Brooks and Suchey, 1990; Buikstra and Ubelaker, 1994), changes of the auricular surface of the ilium (Lovejoy et al., 1985a, b; Meindl et al., 1985), and stages of tooth attrition (Lovejoy, 1985; Hillson, 1996). Height determination was performed using the formulae of Nunes de Mendonça (1998, Table 3), which were developed using individuals from Spanish populations as a reference.

Results

Skeletal reconstruction

The human remains identified by the serial number MDP UE 292 B4 belonged to a male who died between 35 and 40 years old.

The skull could be reconstructed for the most part, but the deformity that it acquired due to taphonomic processes made it impossible to join the neurocranium and splanchnocranium. The cephalic index could be calculated (78.57) and is classified as mesocranium. Cephalic capacity was in the euencephalic range (1410 cc).

The maxilla preserved the I2, C, P3, P4, M1 and M2 teeth on the right side and the C, M1 and M2 teeth on the left. The degree of dental wear is 3+/4 in the molars (using categories from Brothwell, 1963). No ante-mortem tooth loss

<table>
<thead>
<tr>
<th>Age class</th>
<th>Unknown</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Unborn</td>
<td>1</td>
<td>1.9</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Infant I</td>
<td>6</td>
<td>11.7</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Infant II</td>
<td>3</td>
<td>5.8</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Juvenile</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Adult</td>
<td>14</td>
<td>27.4</td>
<td>12</td>
<td>23.5</td>
</tr>
<tr>
<td>Mature</td>
<td>4</td>
<td>7.8</td>
<td>5</td>
<td>9.8</td>
</tr>
<tr>
<td>Senile</td>
<td>2</td>
<td>3.9</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>19.6</td>
<td>20</td>
<td>39.2</td>
</tr>
</tbody>
</table>

Figure 3. Map of the archaeological intervention showing the excavated tombs. The arrow indicates the individual which is the object of analysis in this article. Modified from Moratinos Garcia (1992).
Table 3. Regression formulae for estimating height (cm) in male remains coming from Spanish populations according to Nunes de Mendonça (1998)

<table>
<thead>
<tr>
<th>Formula</th>
<th>95% Prediction Interval (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height = 59.41 + 0.3269·THL&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Real height ± 8.44</td>
</tr>
<tr>
<td>Height = 47.18 + 0.2663·TFL&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Real height ± 6.90</td>
</tr>
<tr>
<td>Height = 46.89 + 0.2657·PFL&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Real height ± 6.96</td>
</tr>
</tbody>
</table>

1 Total humerus length (mm).
2 Total femur length (mm).
3 Physiological femur length (mm).

existed; thus the dental pieces that do not appear have been lost after death. The presence of dental calculus is slight in the posterior teeth (molars and premolars) and considerable at the incisors (Brothwell, 1987). There was no evidence of caries lesions.

The mandible was complete, and preserved the I<sub>2</sub>, C, P<sub>3</sub>, P<sub>4</sub>, M<sub>2</sub> and M<sub>3</sub> teeth on the right side and the I<sub>2</sub>, P<sub>3</sub>, and M<sub>3</sub> teeth on the left. Ante-mortem tooth loss affected the right M<sub>1</sub> and left M<sub>1</sub> and M<sub>2</sub>. Dental calculus deposits were also slight and no dental caries were found (Brothwell, 1987).

Regarding the postcranial skeleton, it preserved all the upper and lower limbs, except for the proximal epiphyses of both fibulae. A pronounced hernia (a Schmorl’s node) was found in the fifth lumbar vertebrae. Height of the man in life was estimated at between 162 and 166 cm.

Examination of the fracture

The fracture was present in the left forearm. Macroscopic and radiographic inspection of affected bones showed the following characteristic traits.

**Ulna**

Completely fractured in its anteroproximal third, which caused two angulations in the bone (Figure 4, Figure 5). A remarkable fracture callus and a small exostosis can be observed in the posterior face of the bone (Figure 6, Figure 7). Additionally, an osteoarthritic ridge (secondary osteoarthritis) affects the borders of the proximal epiphysis and the trochlear notch (incisura trochlearis). The morphology of the trochlear notch is normal, but the radial notch (incisura radialis) has been altered due to its loss of functionality, and it also presents osteoarthritic ridges (Figure 5). The right non-pathological ulna of this individual had a maximum length of 254 mm, whereas we estimated a shortening in the pathological one of 32 mm. The degree of development and recovery of the wound point towards it having occurred many years prior to the individual’s death.

**Radius**

The head of the radius is totally deformed as a consequence of the ulnar fracture, presenting a mushroom-like shape (Figure 8, Figure 9), which is a characteristic previously described by other authors (Hertel et al., 1991). An osteoarthritic ridge and marginal osteophytes are present throughout its outline. The displacement of the radius towards the supracapitellar region of the humerus produced a small new articular surface, manifested in an eburnation in the radial head. Light periositis is present in the region adjacent to the location of the fracture in the ulna. The radiograph (Figure 9) shows no signs of fractures in this bone.

**Humerus**

The humerus shows a remarkable deterioration and deformity of the whole capitular region, and osteoarthritic signs are evident in the margins of the trochlea. An eburnation, which constitutes a “new” surface for the radioulnar joint,
can be seen separated 2 cm from the supracapitular region (Figure 10). Given the maturity of the lesion, it is impossible to determine the age of the subject when the fracture occurred.

A common consequence in this type of fracture is the presence of evident signs of ulnohumeral arthritis (Strauss et al., 2006; Josten and Freitag, 2009). These can be seen in as a marginal osteophyte around the coronoid process of the ulna (Figure 5, Figure 11).

**Discussion**

**Examination of the fracture**

Combining macroscopic and radiological analysis, and taking into account the osseous characteristics that had been previously described, it is evident that this individual suffered a Monteggia fracture-dislocation. This consists of a fracture of the proximal third of the ulna and an anterior dislocation of the proximal epiphysis of the radius. Following Bado’s classification, this injury would be a Monteggia Type I fracture-dislocation produced by a complete fracture of the upper third of the ulna (Figure 1). Consequently, and as usually happens (Grechenig et al., 2007; Rouleau et al., 2010), this bone is deformed with two abnormal angulations: an anteroposterior estimated at 15° and a lateral at 29° (Figure 5, Figure 7). It should be noted that in complete fractures, the most frequent type of curvature is the antecurvature (Trias, 1989), in which a concavity is formed in the posterior part of the bone. Likewise the radial head has suffered an anterior dislocation, which has forced it to abandon the capitellum and become displaced towards an upper anterior position (Figure 11).

Type I is the most common of Monteggia fractures (60% of all cases), and thus is clinically described (Rodgers et al., 1996). Furthermore, in subadult injuries, all of the other types are considered infrequent (Peiro et al., 1977; Wang et al., 1996; Inoue and Shionoya, 1998).

The mechanism of the Monteggia injury is still controversial. Evans (1949) thought that continued pronation would be enough to lever out the radial head in these kinds of fractures, and managed to reproduce the Monteggia injury in post-mortem specimens by the application of an excessive pronation force while the ulna was fixed in a vice. Tompkins (1971) refined the theory, concluding that a fall on an hyperextended arm allowed the pull of the biceps brachii to dislocate the radial head, leaving the ulna to take the body weight alone. Since then, a violent hyperpronation has been classified as the most common mechanism of a Monteggia injury, usually associated with a fall upon the extended hand (Giacobetti and Bowen, 1995). However, these kinds of fractures have also been associated with an exaggerated rotation force or even direct trauma, of which the latter is known as a “parry fracture” (Kramhoft, 1993; Judd, 2008). Thus, when the exact cause of the injury is unknown, it is usually hard to clarify whether ulnar fracture or radial head dislocation occurred first in a Monteggia injury (Tan et al., 2008).

According to Judd (2008), the criteria used to include a trauma in the “parry fracture” category are: absence of radial involvement; transverse fracture line; location below the midshaft (< 0.5 adjusted distance to the lesion center); and either minor misalignment (< 10°) in any plane or horizontal
apposition from the diaphysis (< 50%). Our case does not include any of these four criteria, and this allows us to discard direct trauma and points to a fall with the extended hand as the most probable cause.

The arm dominance of the individual is unknown, but the dimensions of both humerus (longitudes, diameters and perimeters) are bigger in the right than in the left side. This could be a consequence of disuse atrophy, but it is also a common sign of dexterity (Schulte-Ellis, 1980; Steele and Mays, 2005), although this cannot be assured with absolute certainty as some authors have pointed out (e.g. Danforth and Thompson, 2008). Intuition suggests that a right-handed individual would try to break his fall using the right and not the left arm. However, the works of Mortensson and Thonnell (1991) with a group of children that suffered diverse traumas due to falls indicated that these kinds of fractures are twice as common on the left than on the right side. The authors noted that most of the children they observed had the custom of using preferably the left hand to cushion their falls, even if they were right-handed and had both hands free. This produced an increased risk of fracture for the right-handed children with this habit due to the skeletal fragility of their left arm, as in most people the non-dominant arm exhibits less total and cortical mass than the dominant one (Rico et al., 1994).

Consequences of the fracture

The early recognition with anatomical reduction and stable internal fixation is nowadays the most important procedure for the successful management of Monteggia fractures (Ring et al., 1998a, b). In spite of advances in surgical procedures and a better understanding of its biomechanical principles, a Monteggia fracture is still frequently associated with multiple long-term complications, poor functional results and the need for several operations (Boyd and Boals, 1969; Ring et al., 1998a; Egol et al., 2005).

Proper fixation of these fractures is necessary to avoid potential complications, such as forearm deformity (Goh, 2008), elbow stiffness (Ring et al., 2006) and nerve palsies (Ruchelsman et al., 2009). Furthermore, persistent radial head dislocations associated with Monteggia fracture-dislocations have been described in the past as being caused by a relative malalignment of the ulna (Cheung and Yao, 2009) which causes entrapment of structures such as the annular ligament, anterior capsule, biceps tendon, and radial and median nerve.

In our case, it is evident that the fracture received no effective treatment and was not properly reduced, in light of the multiple signs of the severity of the morphological aspect of the elbow joint described above and the biomechanical consequences that can be inferred from the new joint structure. As a consequence of the fracture of the ulna, a dislocation of the radius occurred due to a sudden contraction of the biceps. Even though everything points to an initial immobilization of the arm, lack of adequate treatment resulted in a persisting radioulnar dislocation, which after a Monteggia fracture can lead to loss of forearm rotation, cubitus valgus, elbow instability and constant pain (Dormans and Rang, 1990). Nowadays, the dislocation-related actions of the arm’s muscles can be surgically treated with a surgical reconstruction of the annular ligament (Kapandji, 1987; Tan et al., 2008).

The state of the elbow joint reveals that the individual suffered a motor dysfunction which consisted of a pronosupinative disery, a condition that limits the arm movement to an intermediate position or semipronative. Pronation cannot be executed by the shoulder and has to be substituted by abduction, while extension and flexion of the elbow are also incomplete. These are the same alterations in the biomechanics of the arm that can also be observed in patients after surgery (Rodgers et al., 1996). Therefore, this individual would not only have suffered pain throughout his life, but also impairment of his left arm function.

A long-term dislocation of the radial head such as the one that we present here poses a treatment challenge, and outcome may be poor even after the most invasive surgery (Hui et al., 2005; Wang and Chang, 2006). Although some authors have an optimistic attitude, the results of late reconstruction are at best unpredictable. In fact, the keys to good results are early recognition of the injury and a stable reduction of the proximal radioulnar joint, which requires a sound, anatomical reduction of the ulnar fracture (Ring and Waters, 1996).

At the time in which this individual lived not only were many of the aforementioned procedures described not possible, but many non-qualified people such as barbers used to treat these kinds of injuries. Despite their effectiveness in some cases (Granjel, 1980), it would be impossible even for the most trained of the professionals of that period to successfully resolve a fracture of this kind.

Conclusions

The study of trauma in skeletal populations from the past can provide information about their activities and professions, interpersonal relationships, funeral practices, common accidents, subsistence and injury treatment. Thus, the main objectives of the majority of studies about trauma in archaeological populations are to situate injuries in the bioarchaeological context of populations and to try to determine if the study population took part in any type of activity which could predispose it to suffering the observed traumas (Smith, 2009; Crowe et al., 2010). An important consideration is that to perform these kinds of studies it is important to have a population which fulfills a series of criteria that make it representative of contemporaneous society as a whole. An “ideal” representative population should be large; with good degree of preservation that makes radiographs possible; with a limited and defined burial time for all individuals and with different socioeconomic strata identifiable (Hutton, 2009). In any case, the incidence of trauma should be big enough to allow a study, and traumatic happenings are infrequent in the populations, exceptions apart (see Stirland, 2001 for an example).

This is not the case for the exhumed population from the Monastery of Prado, because, as was commented before, it does not fit with the concept of a representative population for a study of traumas at a population level. However, we do not have knowledge of another reported case of a Monteggia fracture-dislocation from an archaeological population which was so well preserved, and which allowed the biological and biomechanical modifications produced by the fracture and its non-existent treatment bone-to-bone to be described.
Acknowledgments

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