

SHORT COMMUNICATION

Two Possible Cases of Brucellosis from a Clarist Monastery in Alcácer do Sal, Southern Portugal

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ABSTRACT The Convent of Nossa Senhora de Aracoelli was a Clarist monastery located in Alcácer do Sal, southern Portugal, founded at the end of the 16th century and abandoned during the 19th century. This paper considers the presence of brucellosis in two lumbar vertebrae originating from an ossuary recovered at the Chapter House of the Convent. Copyright © 2006 John Wiley & Sons, Ltd.

Key words: brucellosis; Clarist monastery; Alcácer do Sal; Portugal

Introduction

Brucellosis is a typical zoonotic infection caused by gram-negative bacteria of the genus *Brucella* (Silva & Santos, 1990; Capasso, 1999; Ortner, 2003). Although known by Hippocrates since antiquity, it was documented clinically only at the end of the 19th century by Sir David Bruce (Wilkinson, 1993; Nicoletti, 2002). Of the six *Brucella* species known, the variants *Brucella melitensis*, *Brucella suis* and *Brucella abortus* have important consequences for the public health system, since they cause similar infections in humans and animals (Aufderheide & Rodríguez-Martin, 1998; Sá & Dias, 2000). The majority of cases affecting humans are related to *Brucella melitensis* (Wallach *et al.*, 1998), which is widely accepted as the most virulent of the *Brucella* spp. (Shimshony, 1997; Nicoletti, 2002).

Until the 19th century brucellosis was an endemic disease known only in the Mediterranean Basin (Sá & Dias, 2000). Today it is a pathological condition experienced in many

parts of the world, and it is still endemic in all the Mediterranean countries, India, China, Africa (Wilkinson, 1993; McDermott & Arini, 2002), the Middle East (Shimshony, 1997; Geyik *et al.*, 2002), Mexico (Luna-Martinez & Mejia-Terán, 2002), the US (Sauret & Vilissova, 2002), South Africa (Freitas *et al.*, 2001) and the Balkans (Christos *et al.*, 2000).

In the Mediterranean countries and the Middle East, *Brucella melitensis*, whose main animal vector is the goat, is the most widespread of the brucellosis species. In these countries human brucellosis is, above all, due to the close contact with sheep and goats, and to the consumption of dairy products like milk and fresh cheese (Sá & Dias, 2000).

The main purpose of this short communication is to consider the occurrence of brucellosis in two lumbar vertebrae recovered at the Convent of Nossa Senhora de Aracoelli situated in Alcácer do Sal, southern Portugal.

Materials and methods

The Poor Clares Convent of Nossa Senhora de Aracoelli in Alcácer do Sal, southern Portugal, was founded in 1573 by D. Ruy Salema and

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deserted shortly after the extinction of the religious orders in Portugal, which took place in 1832 (Carvalho, 1994).

An archaeological survey was conducted during an extensive overhaul of this monastery. In 1994 a team from the Department of Anthropology, University of Coimbra, participated in the fieldwork. The archaeological intervention focused on the Cloister, the Chapter House, the Choir and the Church. Ossuaries were found with great frequency in the superior levels in all areas that were excavated, while in the inferior stratigraphic levels individual interments prevailed (Cunha *et al.*, 1994). The sample studied, composed of more than 200 individuals, included a predictable majority of females mostly of advanced age (Marrafa, 1996; Carvalho, 1999; Carnim, 2001; Curate, 2001; Araújo, 2002).

The two lumbar vertebrae studied (AS/CA.L.OSS.110 and AS/CA.L.OSS.948) were recovered at the Chapter House, commingled in a sample composed of skeletal elements without any kind of anatomical connection, adjacent to individual burials (Curate, 2001).

The bones affected were examined macroscopically, with the aid of a magnifying glass and also through radiographic analysis, using standard medical radiography procedures (GE Medical Systems equipment; Agfa Blue film).

The pathological specimens

The pathological alterations imputable to brucellosis were confined to two lumbar vertebrae, apparently belonging to different female individuals. Both vertebrae present a lytic lesion in the antero-superior angle of the body (vertebral epiphysitis), adjacent to the *annulus fibrosus*. No other articular or discal surfaces, nor posterior facets, were affected.

The AS/CA.L.OSS.110 vertebra shows an epiphysitis of the anterior and superior rim, in which the loss of tissue is quite clear and is characterised by a granulomatous appearance (Figure 1). This lumbar vertebra also shows a well-developed bony protrusion which extends through the whole superior margin of the vertebral body, as well some taphonomic changes in the superior plate of the body. The other vertebra (AS/

CA.L.OSS.948) also shows an excavation of the anterior, superior body, with a large osteophyte extending on the left side of the vertebral body (Figure 2). The osteolytic lesion, adjacent to the *annulus fibrosus*, is porous and irregular. It is possible to observe the formation of new bone, with irregular aspect in the anterior portion of the body. The lateral radiography of this vertebra shows a sclerotic halo near the lytic lesion (Figure 3). This vertebra has undergone some diagenetic changes, particularly a small erosion in the inferior plate of the body.

Discussion

The observed lesions on the two lumbar vertebrae recovered at the Convent of Nossa Senhora de Aracoelli seem attributable to brucellosis. Both vertebrae exhibit lytic lesions in the antero-superior portion of the body, similar to the brucellar epiphysitis described by Etxeberria (1993, 1994), Capasso (1999, 2001) and Ortner (2003), which is the most common type of brucellar lesion in the vertebrae. It consists of a small destructive focus in the anterior-posterior margin of the vertebral body, adjacent to the *annulus fibrosus* (Capasso, 2001; Ortner, 2003). The lesions show a porous osseous structure, due to a granulomatous reaction that has become sclerotic.

In both vertebrae, the vertebral lamina opposite to the injured one is not affected. The topographic distribution of the lesions in each vertebral body is, therefore, limited to the anterior portion contiguous to the *annulus fibrosus*, with or without limited involvement of the central part of the body. Another distinguishing feature of this disease is the new bone formation in the anterior surface of the vertebral body (Capasso, 1999, 2001), a feature which is discernible in the AS/CA.L.OSS.948 vertebra.

The Spanish pathologist Agustin Pedro-Pons described, in 1929, epiphysitis of the anterior-superior angle of the lumbar vertebrae as a pathognomonic sign of melitococcia. The radiological expression of brucellar epiphysitis, *Sign of Pedro-Pons*, refers to an erosion of the antero-superior angle of the vertebral body along with a marginal halo of sclerotic bone (Etxeberria,



Figure 1. Vertebral epiphysitis in AS/CA.L.OSS.110 lumbar vertebra (arrowed).



Figure 2. Lytic lesions in the anterior superior body of AS/CA.L.OSS.948 vertebra.

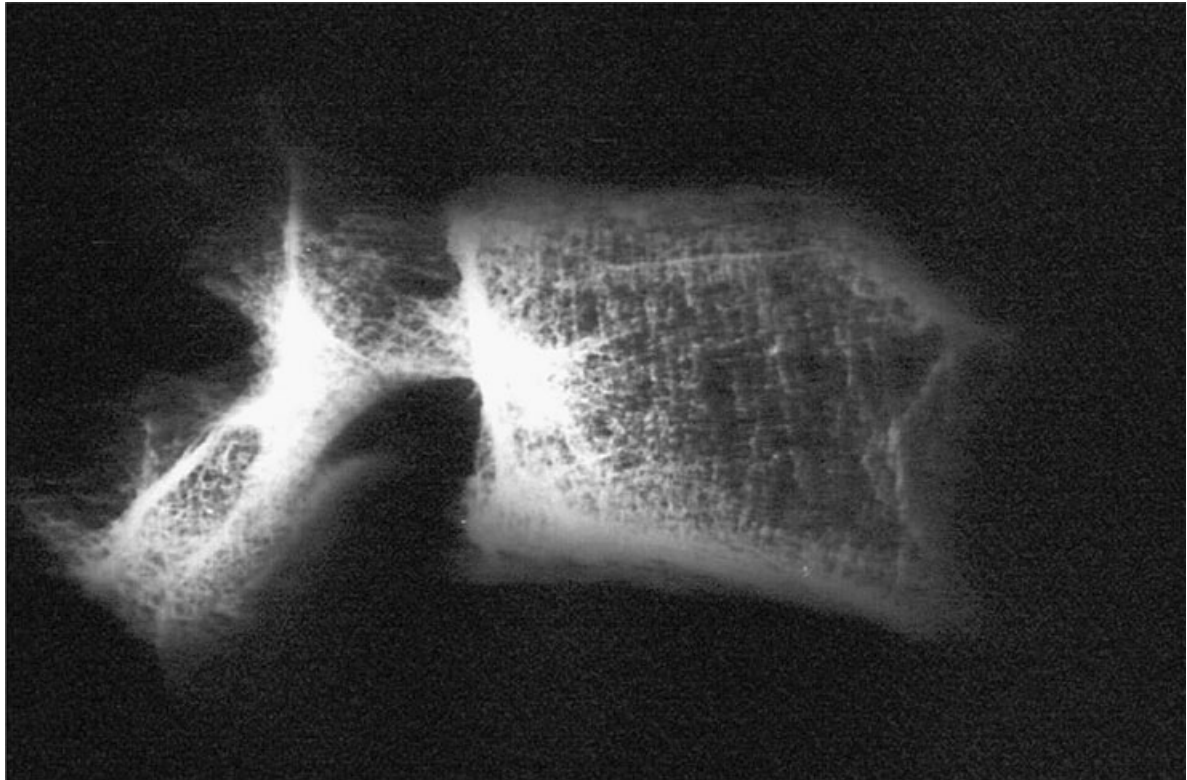


Figure 3. The *Sign of Pedro-Pons* (lateral radiograph of AS/CA.L.OSS.948 vertebra).

1994; Capasso, 2001). In the radiograph of the AS/CA.L.OSS.948 vertebra (Figure 3) the *Sign of Pedro-Pons* is clearly visible. It is important to note that the two affected bones are lumbar vertebrae and that brucellar epiphysitis tends to strike primarily the lumbar segment of the spine (Etxeberria, 1994).

It is worth noting that the Clarist nuns in the Convent of Nossa Senhora de Aracoelli raised sheep and goats (Curate, 2001), the main animal vectors of the disease (Sá & Dias, 2000). Several epidemiological studies (e.g. Fox & Kauffman, 1977; Malik, 1997; Sánchez *et al.*, 1998; Freitas *et al.*, 2001) have demonstrated that contact with affected animals is the leading risk factor in the transmission of the disease.

Other diagnostic options exist for these lesions, including osteoarthritis, tuberculosis and vertebral osteochondrosis. It is likely that a proportion of 'early' brucellosis lesions are actually early vertebral osteoarthritis (Aubin, 2004). Nevertheless, the observed lesions are highly developed and appear to be long-term lesions.

Besides that, the lateral radiography of the AS/CA.L.OSS.948 vertebra shows a sclerotic area adjacent to the lesion, which is unusual in osteoarthritis cases but can occur in early-stage tuberculosis. Nevertheless, the pattern and type of the lesions are atypical of tuberculosis (Ortner, 2003), which is a more destructive pathological condition (Aufderheide & Rodríguez-Martín, 1998) and less circumscribed with regard to the distribution of the lesions caused in the vertebrae (Etxeberria, 1993, 1994). The shapes of the lesions are incompatible with the diagnosis of vertebral osteochondrosis, which is a pathological condition characterised by the development of lesions with a falciform appearance in the antero-superior portion of the vertebral body (Kelley, 1982).

Conclusion

In the past brucellosis was probably endemic in some regions of the Mediterranean Basin, in-

cluding Portugal (Sá & Dias, 2000). In the palaeopathological record this disease has been known in Portugal since at least the 13th century (Curate, 2003/2004).

The palaeopathological analysis of two lumbar vertebrae recovered at the Convent of Nossa Senhora de Aracoelli (16th to 19th centuries) provides more evidence for the claim that brucellosis was endemic in Portugal relatively far back in the historical record.

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References

- Araújo M. 2002. *Retrato do Convento de Aracoelli (séc. XVII-XIX): contributo para uma reconstituição osteoarqueológica*. Unpublished report. Department of Anthropology: Coimbra.
- Aubin M. 2004. Brucellosis in Ancient Nubia: identification, differential diagnosis and implications for morbidity. *Supplement to Paleopathology Newsletter* **126**: 9–10.
- Aufderheide A, Rodríguez-Martín C. 1998. *Cambridge Encyclopedia of Human Paleopathology*. Cambridge University Press: Cambridge.
- Capasso L. 1999. Brucellosis at Herculaneum (79 AD). *International Journal of Osteoarchaeology* **9**: 277–288.
- Capasso L. 2001. *I Fuggiaschi di Ercolano: Paleobiologia delle Vittime dell'Eruzione Vesuviana del 79 d.C.* L'Erma di Bretschneider: Rome.
- Carnim G. 2001. *O quotidiano numa comunidade religiosa*. Unpublished report. Department of Anthropology: Coimbra.
- Carvalho C. 1994. Clarisses, Clarissas ou Claritas. *Munda* **27**: 3–9.
- Carvalho C. 1999. *Estudo Paleodemográfico e Paleopatológico de uma Amostra Antropológica do Convento de Aracoelli- Séc. XVII–XIX*. Unpublished report. Department of Anthropology: Coimbra.
- Christos H, Popa M, Afsar O, Vasileios D, Pirounaki M. 2000. Surveillance of communicable diseases in the Balkans. *The Lancet* **355**: 1–3.
- Cunha E, Santos AL, Silva AM, Umbelino C. 1994. *Relatórios da Escavação no Convento de N.ª Sr.ª de Aracoelli em Alcácer do Sal*. Unpublished report. Department of Anthropology: Coimbra.
- Curate F. 2001. *Ad memoriam custodiam ossium: osteobiografia de uma amostra esquelética proveniente do Convento de N.ª Sr.ª de Aracoelli (Alcácer do Sal)*. Unpublished report. Department of Anthropology: Coimbra.
- Curate F. 2003/2004. A brucelose em paleopatologia: um estudo de caso proveniente da necrópole Cristã de Cacula Velha. *Antropologia Portuguesa* **20–21**: 209–235.
- Etxeberria F. 1993. Epifisitis brucelar: identificación del signo de Pedro Pons en el tejido óseo desvitalizado. *Actas del II Congreso Nacional de Paleopatología*: 121–127.
- Etxeberria F. 1994. Vertebral epiphysitis: early signs of Brucellar disease. *Journal of Paleopathology* **6**: 41–49.
- Fox M, Kauffman F. 1977. Brucellosis in the United States, 1965–1974. *Journal of Infectious Diseases* **136**: 312–316.
- Freitas J, Galindo G, Santos E, Sarraf K, Oliveira J. 2001. Risco de brucelose zoonótica associado a suínos de abate clandestino. *Revista de Saúde Pública* **35**: 1–4.
- Geyik M, Gür A, Nas K, Çevik R, Saraç J, Dikici B, Ayaz C. 2002. Musculoskeletal involvement in Brucellosis in different age groups: a study of 195 cases. *Swiss Medical Weekly* **132**: 98–105.
- Kelley M. 1982. Intervertebral osteochondrosis in ancient and modern populations. *American Journal of Physical Anthropology* **59**: 271–279.
- Luna-Martinez J, Mejía-Terán C. 2002. Brucellosis in México: current status and trends. *Veterinary Microbiology* **90**: 19–30.
- Malik G. 1997. A clinical study of brucellosis in adults in the Asir region of Southern Saudi Arabia. *American Journal of Tropical Medicine Hygiene* **56**: 375–377.
- Marrafa L. 1996. *Vida e Morte no Convento de Aracoelli (Alcácer do Sal) Séc. XVII–XIX*. MSc dissertation. Instituto de Ciências Sociais da Universidade do Minho: Braga.
- McDermott J, Arini S. 2002. Brucellosis in sub-Saharan Africa: epidemiology, control and impact. *Veterinary Microbiology* **90**: 111–134.
- Nicoletti P. 2002. A short history of brucellosis. *Veterinary Microbiology* **90**: 5–9.
- Ortner D. 2003. *Identification of Pathological Conditions in Human Skeletal Remains*. Academic Press: San Diego.
- Sá M, Dias M. 2000. Brucella. In *Microbiologia*, Ferreira W, Sousa J (eds). Lidel: Lisbon; 151–160.
- Sánchez L, Cepeda R, Morano T. 1998. Analisis de un brote epidemiológico de Brucellosis en trabajadores

- de un matadero. *Revista Española de Salud Pública* 72: 137–146.
- Sauret J, Vilissova N. 2002. Human brucellosis. *Journal of the American Board of Family Practice* 15: 401–406.
- Shimshony A. 1997. Epidemiology of emerging zoonoses in Israel. *Emerging Infectious Diseases* 3: 229–238.
- Silva M, Santos P. 1990. Brucelose: problemas diagnósticos e terapêuticos. *O Médico* 123: 585–588.
- Wallach J, Samartino L, Efron A, Baldi P. 1998. Human infection by *Brucella melitensis*: an outbreak attributed to contact with infected goats. *FEMS Immunology and Medical Microbiology* 19: 315–321.
- Wilkinson L. 1993. Brucellosis. In *The Cambridge World History of Human Disease*, Kiple K (ed.). Cambridge University Press: Cambridge; 625–628.