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Pabasa, a Limping Priest from Ancient Egypt

Pabasa, um Sacerdote do Antigo Egipto que Coxeava

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Abstract

The mummy of Pabasa, a priest of the god Min, was enclosed in a Twenty-fifth dynasty coffin from the Egyptian collection of the Museu Nacional de Arqueologia (MNA) in Lisbon. It was studied in 2010 by computed radiography (CR) and multi-detector computed tomography (MDCT), as part of the Lisbon Mummy Project (LMP). Images showed a typical left osteochondral talus lesion (OLT). The morphology and radiological appearance is identical to those seen nowadays. This is the first published computed tomography paleopathological OLT description, and the oldest case thus identified in an Egyptian mummy. Highlights: CT studied a late period Egyptian mummy; finding a talar dome injury; the diagnosis was typical of an osteochondral lesion subsequent to an ankle sprain.

Keywords

Egyptian mummies; Osteochondral lesion; Talar dome lesion; Mummy CT evaluation.

Resumo

A múmia de Pabasa, um sacerdote do deus Min num sarcófago da XXV[a] Dinastia, pertence à coleção Egípcia do Museu Nacional de Arqueologia (MNA) de Lisboa. Foi estudada em 2010 por radiografia computorizada (RC) e tomografia computadorizada (TC), no âmbito do Lisbon Mummy Project (LMP). As imagens revelaram lesão osteocondral típica no astrágalo esquerdo. A morfologia e o aspeto radiológico são idênticos aos observados actualmente, sendo esta a primeira descrição paleopatológica numa múmia Egípcia de sequelas de entorse de inversão do tornozelo por tomografia computadorizada e o caso mais antigo.

Palavras-chave

Múmia egípcia; Paleopatologia musculoesquelética; Entorse do tornozelo; Lesão osteocondral do astrágalo.

1. Introduction

Osteochondral lesions of the talus (OLT) are commonly seen nowadays in imaging studies, especially with the general use of MDCT and Magnetic Ressonance Imaging (MRI). OLT is the accepted term for several disorders that include transchondral fracture, osteochondral fracture, osteochondritis dissecans and talar dome fracture. These lesions may involve the medial central or lateral central talar dome, and trauma remains the best accepted etiology (Stoller and Ferkel, 2007).[13] Such lesions can be caused by something as simple as a misstep, a fall, or indeed anything that causes the ankle to twist. No doubt they also occurred frequently in the past, as is attested by the subject of this brief communication, the mummy of the ancient Egyptian priest, named on his coffin as Pabasa.

2. Material and Methods

Three human mummies (Horresnet, Pabasa, and Irtieru) and seven animal mummies are part of the Egyptian collection of the Museu Nacional de Arqueologia (MNA), and have been the focus of the Lisbon Mummy Project (LMP), whose aim is to holistically document and analyse these artefacts. One of the humans is a well-wrapped mummy placed in an anthropomorphic wooden coffin (Fig. 1), dated to the early Twenty-fifth dynasty (early 7th century BC) on the basis of its divisions, scene types, and background colour (Ikram, 2012[8]; Taylor, 2003[15], 1989[14]; Araújo, 1993[2]; Aidan Dodson,

Figure 1 – Pabasa's anthropomorphic wooden coffin with his portrait, showing him with his hands raised in prayer (photograph, courtesy of Museu Nacional de Arqueologia, Lisbon, DDF – Instituto dos Museus e Conservação).

personal communication). Hieroglyphic inscriptions painted on the coffin identified him as a man named Pabasa, who worked as a priest in the cult of the fertility god Min.
This mummy was studied inside its coffin, through computed radiography (CR) and MDCT. For the CR imaging, we used a digital overtable - Iconos with digital radiography in an extended vertebral view and computed radiography segmental anatomic views with Kodak imaging plates, kV 60-80 with automatic exposure. For the MDCT imaging, we used a multidetector scan from Siemens (Somatom Sensation 64 rows, z-sharp technology and an isotropic resolution of 0.33mm). Specially designed protocols were used with 120 kV, mAs ranges between 450 and 700, a tube rotation of 1.5s and the smallest pitch of 0.45.
We analyzed the large volume of radiological data through advanced 2D and 3D processing modes, at a Siemens state-of-the-art workstation, in conjunction with the Osirix Imaging Software, on Apple Mac OS X.

3. Results

From all the data collected, it became clear that Pabasa was a male (mummified penis identified on CT, also with a male pelvis and male markers on the head) who died at an estimated age of 40-50 years, based on tooth-wear, epiphysial fusion, bone density and suture closure (Buikstra and Ubelaker, 1994; multiple authors, 1980[10]). The analysis and multiplanar CT reconstructions of the left ankle revealed a lytic multilocular lesion with sclerotic borders, measuring 15 x 11 x 8 mm (APxTxCC), located on the medial surface of the talar dome (Fig. 2). The cortical articular surface was irregular with a 3 mm focal fraPabasacture, partially depressed (Fig. 3). The adjacent tibia showed no disease. No missing bone fragments were detected.
The anteroposterior CR image of the distal coffin showed multiple superimpositions at the feet, namely the dense gypsum fillings of the wooden coffin, which hindered the recognition of bone and articular pathology. However, using the CT data as a guide, we were able to identify a very slight contour defect at the medial talar dome, due to the OLT lesion on the CR as well (Fig.4).

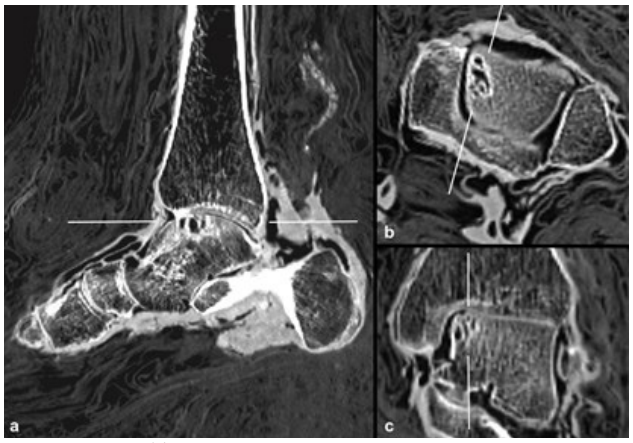

Figure 2 – MDCT sagital (a), axial (b) and coronal (c) oblique reformated planes of the talar dome, with the lytic multilocular lesion with sclerotic borders, located on the medial surface.

4. Discussion

Osteochondral lesion of the talar dome are seen in 6.5% of ankle sprains nowadays (Chew et al., 2008)[3]. This was first described as an injury to the articular cartilage and subchondral bone in 1922 (O'Loughlin et al., 2010[11]; Kappis,

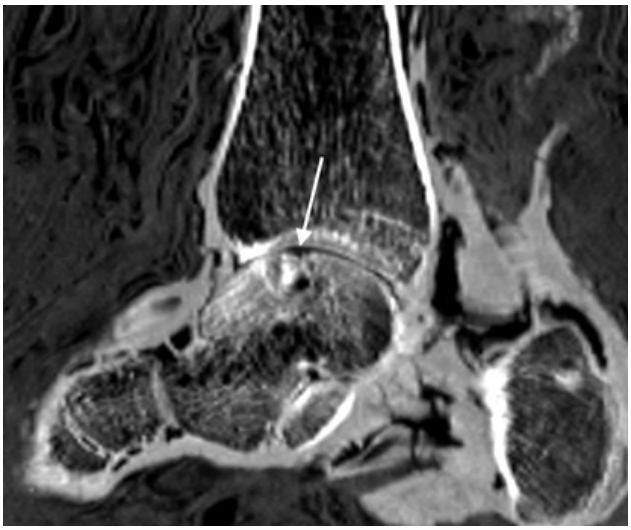
Figure 3 – MDCT sagital oblique reformated plane of the left ankle detailing the irregularity of the cortical articular surface with a locally depressed cortical fracture (arrow) on the medial aspect of the talar dome.

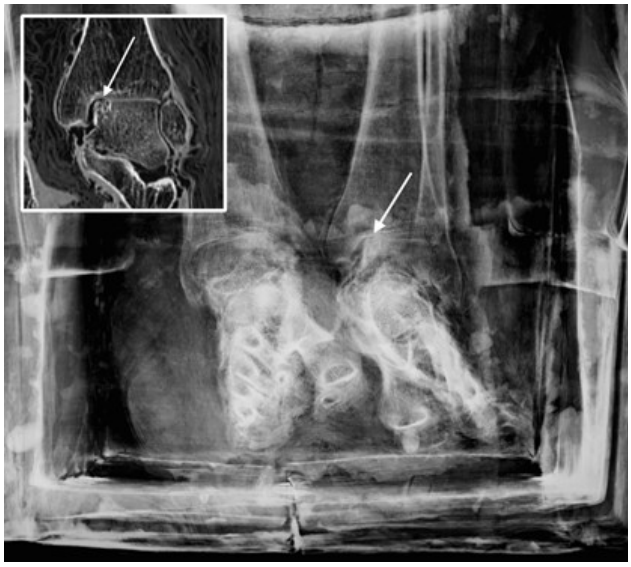
Figure 4 – Anteroposterior computed radiography images of the feet, showing superimposition of dense coffin and embalming materials over both talar domes, preventing a clear detection of the left ankle lesion. Well shown on the coronal CT view (insert).

1922[9]). Most of such lesions occur at distinct locations on the posteromedial and anterolateral aspects of the talar dome (Elias, 2007[5]; Stoller and Ferkel, 2007[13]).
Both trauma and ischemic factors contribute to this type of lesions. In individuals predisposed to talar dome ischemia, direct trauma or repetitive microtrauma may contribute to the development of this lesion. That is the reason why the term OLT, as stated in the introduction, comprises a group of lesions previously recognized as different entities, such as osteochondritis dissecans (OD), transchondral fracture, osteochondral fracture, and talar dome fracture. OD occurs in patients who are still growing, and recent histological studies claim the importance of vascular immaturity, which in the presence of trauma (acute and severe or repetitive and minor) leads to subchondral bone necrosis and subsequent bone detachment. (Zanon, 2014)[16]. The others might result from an acute episode of a severe trauma that immediately causes cartilage and bone lesion that takes time to heal, if it heals at all, depending on its severity, leaving long-term sequelae, particularly without surgical treatment. Otherwise, following the first episode and the ensuing instability, several

subsequent sprains induce a chronic progression to the osteochondral disease.

The mechanism of trauma, in the particular case that we are studying, with the lesion located on the medial surface of the talar dome, is an inversion injury to the ankle with the foot in plantar flexion and lateral rotation of the tibia on the talus (Flick, 1985).[7]

Radiologically, these lesions may remain undetected until the necrotic focus is observed (Stoller and Ferkel, 2007).[13] Quality radiographs can usually delineate the site of injury. An "ill-defined" radiolucency at the talar dome is the most common appearance of non-displaced OLTs (Dheer, 2012).[4] Other presentations may be quite subtle and consist of a minor irregularity of the articular surface, slight cavity sometimes surrounded by bone sclerosis or small fracture bone fragments (Resnick and Goergen, 2005).[12]

Initial stage lesions may be painless. Radiographs, and even CT studies (which cannot evaluate the cartilage surface) may show nothing (Stoller and Ferkel, 2007[13]; Anderson, 1989[1]). Subsequently, however, the lesions are symptomatic and painful. Ferkel developed a classification system for these lesions based on CT findings (Ferkel, 1993-1994)[6]:

- Stage I: a cystic lesion of the talar dome with an intact roof.
- Stage IIA: a cystic lesion with communication to the talar dome surface.
- Stage IIB: An open articular surface lesion with an overlying non-displaced fragment
- Stage III: A non-displaced lesion with lucency.
- Stage IV: a displaced fragment.

Using this classification, Pabasa's lesion is a stage IIB, since it is a multicystic lesion, with a locally depressed cortical talar dome surface fracture with a non-displaced fragment.

Depending on the severity of the lesions, without modern treatment, particularly in cases with displaced fragments, deep ankle pain, impaired function and limitations of weight bearing is expected (Zengerink, 2010).[17] Therefore, Pabasa inevitably suffered ankle pain and we may confidently assume that he limped.

Once recognized in imaging techniques, these lesions have no differential, and we can only theorize upon the mechanism that originated them.

Nowadays this type of injury is quite common and is frequently associated with lateral ligament rupture and ankle instability, which we can assume that Pabasa suffered from, although the scant maleolar mummified tissues do not allow proper evaluation. Taking into account Pabasa's age, and the lack of more significant associated degenerative arthritis in the tibio-talar joint, it is very unlikely that this particular case could have been the result of osteochondritis dissecans occurring in the priest when he was younger.

The MDCT made it possible to diagnose this lesion quite easily, reporting it for the first time in a wrapped, coffin enclosed Egyptian mummy, although at Deir el Bersha, Tosha Dupras and Lana Williams have noted talar lesions in bone remains, due to probable eversion sprains (personal communication). This emphasizes the significance of CT paleopathological studies, especially in inacessible cases as encoffin and wrapped specimens.

5. Conclusion

Pabasa's left talar osteochondral lesion is typical and allows a confident diagnosis. We can also assume an ankle sprain as its cause. Due to ankle pain this ancient priest limped. To our knowledge, this is the first and oldest, published CT description of OLT in an Egyptian mummy. Additionally, the CT versus the CR results emphasise the importance of using CT technology in studying mummies.

Ethical Disclosure / Divulgações Éticas

Conflicts of interest: The authors have no conflicts of interest to declare.

Conflitos de interesse: Os autores declaram não possuir conflitos de interesse.

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Confidentiality of data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.

Confidencialidade dos dados: Os autores declaram ter seguido os protocolos do seu centro de trabalho acerca da publicação dos dados de doentes.

Protection of human and animal subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Protecção de pessoas e animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pelos responsáveis da Comissão de Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

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