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Marked eburnation among prehispanic individuals from La Gomera (Canary Islands)

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Summary
Marked eburnation among prehispanic individuals from La Gomera (Canary Islands)
Eburnation of the articular surfaces is an advanced feature of osteoarthritis. We here report some striking cases of such a condition in the proximal epiphysis of tibiae of prehispanic inhabitants of La Gomera, in the Canary Archipelago.

Key words
Osteoarthritis; Eburnation; Rheumatic diseases; Prehispanic Canary Islands; paleopathology**.**

Resumen
Marcada eburnación entre individuos prehispánicos de La Gomera (Islas Canarias)
La eburnación de las superficies articular es una característica avanzada de la osteoartritis. Presentamos aquí algunos casos llamativos de tal condición en la epífisis proximal de la tibia de los habitantes prehispánicos de la isla Gomera, en el Archipiélago Canario.

Palabras clave
Artrosis; eburnación; enfermedades reumáticas; Canarias Prehispánicas; paleopatología

Introduction

Osteoarthritis is a multi-factorial disease with a final common pathway of cartilage degeneration and bone eburnation. Articular cartilage and subchondral bone form a functional unit which become early altered during the osteoarthritic process [1,5]. Altered biomechanical forces, macrotrauma or repeated microtrauma are able to induce the release of proteolytic enzymes by chondrocytes, which contribute to destroy normal cartilage. In rare instances, defective cartilage may also become destroyed by normal loading forces.

Although subchondral bone sclerosis may precede detectable changes in articular cartilage [3], eburnation is a late event of the disease. For instance, it was present in the knee in about 40% of individuals undergoing tibial osteotomy and/or replacement [7]. The presence of eburnation in an ancient bone implies that the destruction of the cartilage was complete [9]. Eburnation has been explained as the result of mechanical attrition and polishing of the exposed bony articular surface. However, the mechanisms underlying eburnation are by far more complex. Articular cartilage and subchondral bone respond in a coupled manner to loading forces that ultimately trigger the osteoarthritic process. The same forces which may destroy the cartilage are also involved in an osteosclerotic bone reaction which affects subchondral bone. Recent research supports a role of the Wnt β catenin /SOST system in increased sclerotic bone response [11]. Sclerostin, a protein derived from SOST gene transcription, inhibits bone formation [4,8], counteracting the action of WNT β catenin, which becomes activated in response to mechanical loading, and which is involved in increased bone synthesis. Indeed, some researchers have found that expression of SOST in osteocytes is decreased in osteoarthritic experimental models [10]. In addition, there is a complex response of the articular cartilage itself and the subchondral trabecular bone: a progressive thickening of the transverse trabeculae, together with a thinning of the vertical trabeculae have been described. Articular cartilage calcifies immediately adjacent to subchondral bone, and is then traversed by blood vessels [6]

Description of the cases

We report the cases of two right and one left tibiae probably belonging to adult men, affected by massive eburnation and polishing of the medial part of the proximal tibial epiphysis in two cases, and the lateral one in the third case (Figs. 1-3). As we can see, in the three cases, the tibial epiphyses show eburnated, polished surfaces. Marked osteophyte formation also surround the tibial articular surfaces. The intensity of ostearthritic changes, at least in the two right tibiae, is more marked in the left (medial) epiphyseal plates, suggesting a misbalanced loading force acting on the medial side of the bone.

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Fig. 1

Fig. 2

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Fig.3

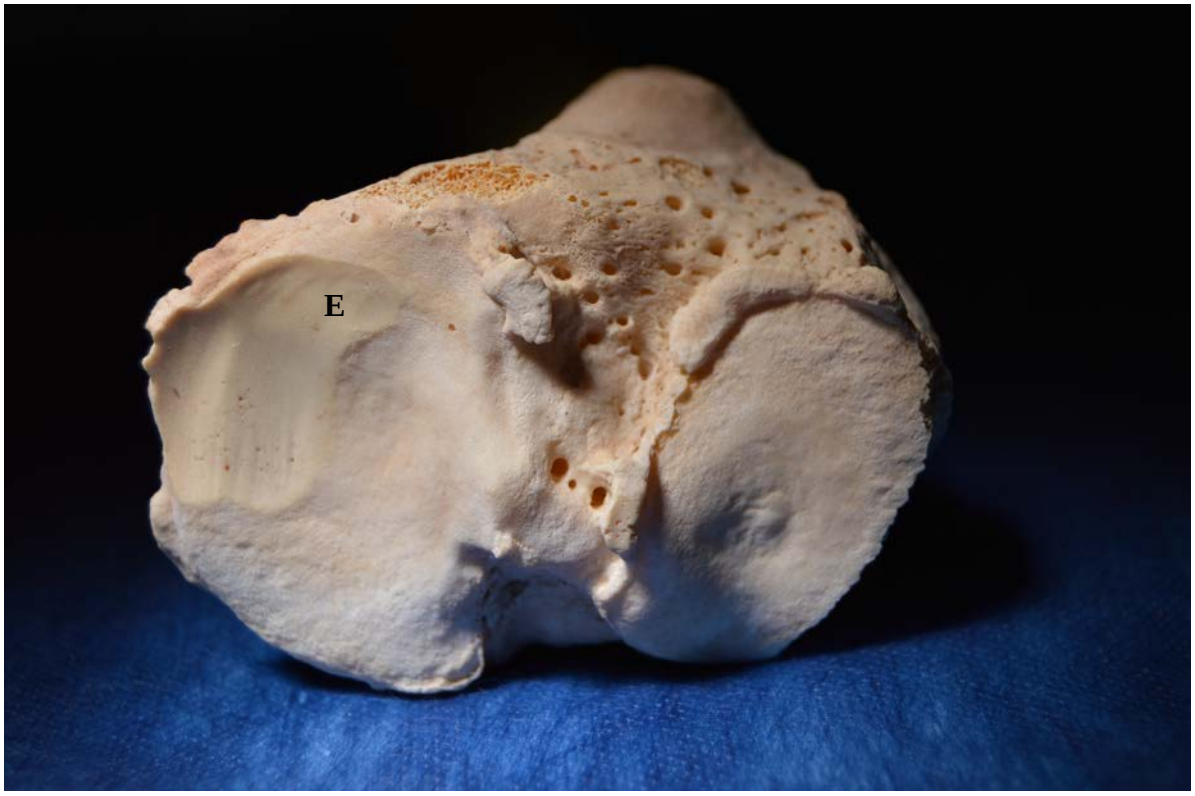

Fig.1,2,3: Cranial view of affected tibiae, showing the polished areas of eburnation (E). Intense osteophyte formation is also evident in the three cases.

Possibly, these individuals suffered genu varum deformity. The bones belong to prehispanic individual of La Gomera, and are preserved at the Museo Insular del Cabildo de San Sebastian (the capital of the island). Antiquity and precise burial sites are not known, but C14 dating of other samples from La Gomera shave yielded antiquity ranging 1000-1500 years BP [2].

Discussion

We here report some advanced cases of tibial osteoarthritis in prehispanic inhabitants of La Gomera. This island is the second smallest (373 km2) of the seven "big " islands of the Canary Archipelago, and was inhabited by people of North African origin, who arrived about 2500 years ago. The island, volcanic in origin, is round shaped, and in its central part there are remains of ancient volcanoes; indeed, no eruptions have happened in the last three millions years. All the central part, at an altitude over 800 m, is covered by dense forest, partly due to the contribution of the moisty north eastern winds which continuously blow during late spring and summer, converting the usually hot and dry months in moisty and mild ones. The economy of the inhabitants of the island was based on consumption of some forest species, coastal fishing, and goat herding [2]. Probably the population had to climb the marked slopes of the island, ande perhaps this activity contributed to the intense ostearthritic changes. In any case, inspection of other bone remains suggest that osteoarthritis was a common disease among these individuals, and, in some cases, it was very intense, as illustrated in this report.

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