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Orofacial pathology in *Homo heidelbergensis*: the case of Skull 5 from the Sima de los Huesos site (Atapuerca, Spain)

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FIRST PARAGRAPH: Skull 5 from Sima de los Huesos (Atapuerca) was recovered during the 1992/93/99/2001 field seasons [1-3], and represents one of the most complete skulls on the human fossil record. This condition allows doing a very complete approach to the orofacial pathological signs present in this skull. Some of them were pointed out in previous studies [1,4], but in the present analysis we include a complete revision with new information from CT-scans.

海德堡人的口面病理学：胡瑟裂谷遗址(西班牙阿塔坡卡)的 5 号颅骨病例

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首节：位于阿塔坡卡的胡瑟裂谷遗址的 5 号颅骨获得于 1992/1993/1999/2001 年间的田野调查[1-3]，是记载得最完整的人类颅骨化石之一。这使得我们可以对颅骨口面病理学特征做完整的研究。这些颅骨在以前的一些文献中已经被提到过[1,4]，但现在的分析新采用 CT 扫描获取信息。

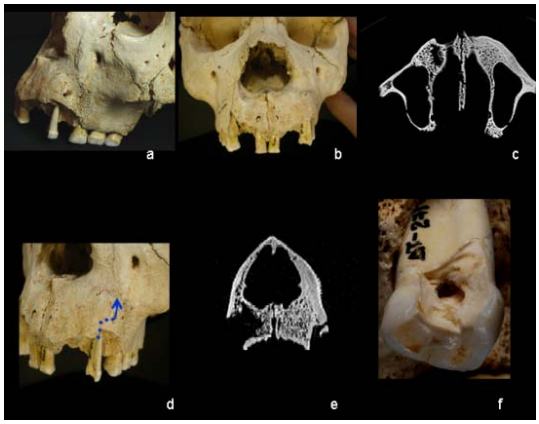

图 1 胡瑟裂谷(西班牙阿塔坡卡)的 5 号颅骨最相关的口面病理学迹象。a)左边的侧面图，显示了上颌骨骨炎的扩散、左边的 P3 和空管开口。b)正面图，显示变形的鼻子边缘，鼻子和眼眶的不正常空管。c)5 号颅骨的 CT 扫描，上面的面部边界，图片的左边。比较左右上颌骨边界，左边的明显要厚些。上颌骨的凹穴处不受影响。右边缺少上颌海绵骨与死后的损伤一致。d) 5 号颅骨的面像显示了这里和空管的綪 3 破裂。e) CT 扫描图片。图片右边的左边。P3 顶点到上颌骨的外部，与较厚的区域交叉。f)左边 P3 的特写。破裂部分暴露了骨髓腔。碎裂的边缘显得要光滑，特别是在顶部。

Fig. 1. Most relevant orofacial pathological signs of Skull 5 from Sima de los Huesos (Atapuerca, Spain). a) Left lateral view, showing the maxillary osteitis extension, the left P3 and the fistular opening. b) Frontal view, showing the deformation of the nasal rim and the anomalous drainage towards the nasal and orbital cavities. c) Parabasal CT-scan slice of Skull 5, facial border at the top, left side on the right of the image. Compare left and right maxillary borders, where the external table of the left side is considerably thickened. Maxillary sinuses remain unaffected. The loss of maxillary spongy bone on the right side corresponds to a post-mortem damage. d) ¾ facial view of Skull 5, showing the broken P3 in place and the fistular drainage canal. e) Paracoronal CT-scan slice. Left side on the right of the image. The fistular canal can be observed from the P3 apex to the external part of the maxilla, crossing the thickened region. f) Close-up view of the left P3. The broken part exposes the pulpar chamber. The borders of the fracture appear smoothly rounded, especially in the crown area.

Skull 5 represents an adult individual according to dental evidence [5], probably a

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male, not senile-there are no suture closure signs-, and displays a number of bone/teeth alterations on its orofacial complex that were active at the time of death (Fig. 1, 2). The aim of this study is to describe and analyze all of them, in order to establish the possible etiological factors that were involved in the lesions and to determine whether they were related or not.

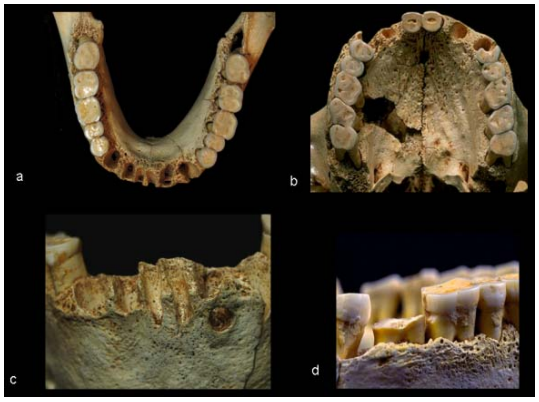

图 2 胡瑟裂谷(西班牙阿塔坡卡)5 号颅骨的其他口面病理迹象。 a)严重的牙齿磨损，较短的牙齿。注意所有齿冠的压力和广泛的齿间连接。b)严重的磨损，较高的牙齿牙齿。c)颚中心孔的特写。左边 I2 顶点可看见顶尖有许多砂眼，中心门齿的前小孔壁也有病理损耗，中间门齿的边缘和齿槽有萎缩。d)右边磨牙的侧面图，显示齿槽的萎缩和 M2 齿颈末梢边的剔齿的痕迹。

Fig. 2. Other orofacial pathologies of Skull 5 from Sima de los Huesos (Atapuerca, Spain). a) Heavy dental wear, lower dentition. Note the exposure of dentine in all the crowns, as well as the extensive interproximal wear facets. b) Heavy dental wear, upper dentition. Note the exposure of pulpar cavities on central incisors, as well as the presence of secondary dentine inside. c) Close-up of the mandibular central sockets. Apical porous drainage abscess is seen at the apex of left I2, and there is also pathological loss of the anterior alveolar wall of both central incisors, with rounded borders and alveolar resorption. d) Lateral view of the right mandibular molars, showing alveolar resoption and a tooh-pick mark at the distal side of the M2 tooth neck.

The preserved teeth show a very heavy wear pattern (Fig. 2a, 2b), expressed as dental crown wear and a forward displacement of the complete postcanine dental row. There are signs of periodontitis, reflected both on the alveolar bone resorption and on the teeth, where clear tooth-pick marks are present (Fig. 2d).

The most conspicuous pathological sign is an alteration of the left maxillary bone above the canine-premolar roots (Fig. 1a, 1b, 1c, 1e), a maxillary osteitis, which extends up to the orbit, laterally to the lower left nasal border and affects the complete alveolar bone in that region. The bone is considerably thickened (Fig. 1c, 1e), and the nasal border and the maxilla are deformed (1a, 1b), showing a fistular drainage canal (Fig. 1a, 1d, 1e) and other anomalous drainage patterns towards the nasal and orbital cavities (Fig. 1a). An associated premolar, which fits into the left P3 tooth socket, was subsequently recovered from the site (Fig. 1a, 1b, 1d, 1f). This tooth is broken and the pulp cavity is exposed. An active dental infection sign is clearly shown at bottom of the the corresponding alveolus (Fig. 1d, 1e).

There are other periapical abcesses present (Fig. 2a, 2b) in other regions of the maxillae thus, pathology affected both the maxillar and mandibular dentition.

Taking into account all the present evidence, the differential diagnosis led us to discard a neoplastic formation and other infectious diseases such as yaws. Thus, we conclude that the pathological bony evidence present in Skull 5 is only a slight reflection of a hard damage suffered by the surrounding soft tissues, probably caused by a heavy impact, pointing to an important chronic infection that might have been responsible for a septicaemia and, thus, of the death of this individual.

依据牙齿显示的证据，5 号颅骨来自一个成年个体[5]，很可能是个男性，并且是年轻个体，因为没有缝合的迹象，口面复合物显示了大量的骨头/牙齿的变形，这些口面复合物在个体死的时候还是活跃的。本项研究的目的是描述和分析这些特征，确定其

是否是损伤的致病因素，这些因素是否相关。

这些保存的牙齿显示了严重牙齿磨损的模式(图 2a, 2b)，如齿冠的磨损和完整的那排后犬齿的向前错位。齿槽骨的萎缩和剔齿痕迹显示了牙周炎的迹象(图 2d)。

最明显的病理学特征是犬齿-前臼齿根部上面的左边上颌骨的改变(图 1a,1b,1c,1e)—上颌骨炎延伸到了边缘，侧面比鼻边缘要低并影响了该区域整个齿槽骨。骨头明显加厚(图 1c,1e)，鼻的边界和上颌骨已经变形了(图 1a, 1b)，显示了一个空管和其它近鼻和边缘腔的不正常的管口模式(图 1a)。一个连接的前臼齿和左边的 P3 牙管吻合(图 1a, 1b, 1d,1f)。这个牙齿破损了，齿髓腔暴露。对应的小孔底部有一个活跃的牙齿感染迹象(图 1d,1e)。

上颌骨的其他区域显示了根尖周的孔穴(图 2a,2b)，病原已经影响到了牙齿的上颌骨和颚的齿系。

考虑所有的证据，各种诊断让我们排除了肿瘤和雅司病等其他感染疾病。因此，我们下结论 5 号颅骨的骨骼病理方面的证据只是外周组织损伤导致的轻微痕迹，可能由严重撞击导致，并引发了严重的慢性感染，进而可能导致了败血症，最终导致该个体的死亡。(袁媛 译)

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