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How did the Qesem Cave people use their teeth? Analysis of dental wear patterns

Rachel Sarig [a, b, *], Avi Gopher [c], Ran Barkai [c], Jordi Rosell [d, e], Ruth Blasco [f], Gerhard W. Weber [g, h], Cinzia Fornai [g], Tatiana Sella-Tunis [b, i], Israel Hershkovitz [a, i]

[a] Dan David Center for Human Evolution and Bio-history, The Steinhardt Museum of Natural History and National Research Center, Tel Aviv University, Israel
[b] The Department of Orthodontics, The Maurice and Gabriela Goldschleger School of Dental Medicine, Israel
[c] Institute of Archaeology, Tel Aviv University, Israel
[d] Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain
[e] IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Marcel.lí Domingo s/n- Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain
[f] Departament de Prehistòria, Universitat Autònoma de Barcelona, Facultat de Lletres-Edifici B, 08193 Bellaterra, Barcelona, Spain
[g] Department of Anthropology, University of Vienna, Austria
[h] University of Vienna, Core Facility for Micro-Computed Tomography, Austria
[i] The Department of Anatomy and Anthropology, The Sackler Faculty of Medicine, Tel Aviv University, Israel

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ABSTRACT

Dental wear pattern is an important source of information regarding dietary habits, food preparation, and human economic behavior. In the current study we present our preliminary analysis of the dental wear patterns of the Middle Pleistocene (420–200 kya) Qesem Cave teeth. Five types of tooth wear were studied: Occlusal wear, interproximal wear, subvertical grooves, buccal microwear and root striations. We found mild to moderate occlusal wear (stage range 2–4), the largest proximal facet on the M_2 medial was 15.3 mm^2, presence of three subvertical grooves on the M_2 distal surface, a variety of microwear scratches (many are >200 mμ long and >5 mμ wide) and two types of root striations. The data obtained suggests that the Qesem Cave people possessed a strong masticatory system producing massive anterior component of force, and used small flints as food choppers.

1. Introduction

Dental wear of occlusal, buccal or proximal surfaces is inevitable, resulting from physiological and pathological factors (Kaidonis, 2008). Both attrition (i.e., movement between adjacent tooth surfaces) and abrasion (i.e., contact between tooth surfaces and food), determine the rate and characteristics of enamel loss (Hillson, 1996; Zhou and Zheng, 2008, p.231). While occlusal attrition is mostly affected by food consistency and muscle strength (Wolpoff, 1971), proximal attrition mainly occurs due to a differential movement of the adjacent teeth (Hinton, 1982) and is therefore associated with different factors including crowding, periodontal diseases and root angulation.

Different etiology is suggested for each attrition type, resulting in unique microwear features of the enamel such as scratches and pits on the occlusal and buccal surfaces, indicating an abrasive diet (Teaford and Tylenda, 1991; Pérez-Pérez et al., 2003; Mahoney, 2006; El-Zaatari, 2010; Romero et al., 2012; Özdemir et al., 2013). Interproximal wear, consisting in a polished, shining surface (Hinton, 1982), results from differential movement between adjacent teeth. Subvertical grooves in the form of small furrows located on the interproximal wear facets, usually display a subvertical orientation radiating from the occlusal surface (Villa and Giacobini, 1995) and are due to high masticatory forces. It is important to note that subvertical grooves differ from interproximal grooves. The latter are the result of tooth picking and are located below the contact area close to the cemento-enamel

* Corresponding author. Dan David Center for Human Evolution and Bio-history, The Steinhardt Museum of Natural History and National Research Center, Tel Aviv University, Israel.
E-mail address: rachel.sarig@gmail.com (R. Sarig).

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junction (Ungar et al., 2001; Martinón-Torres et al., 2011; Gracia-Téllez et al., 2013; Lozano et al., 2013; Sun et al., 2014). Comparisons of dental wear patterns among prehistoric and historic human populations have shown significant correlations between tooth wear pattern, dietary and cultural factors (Molnar, 1971, 1972; Smith, 1984; Frayer and Russell, 1987; Eshed et al., 2006). It is therefore evident that the use of dental wear characteristics of the Qesem Cave teeth may assist in examining the lifestyle Middle Pleistocene (420–200 ka) Levantine inhabitants, as shown for other prehistoric populations (e.g., Fiorenza and Kullmer, 2013). The aim of the present study is to characterize the various types of dental attrition of the Qesem Cave dental remains and interpret them in a broader context.

2. Materials and methods

2.1. The sample

Qesem Cave is situated on the low western slopes of the Judean Hills some 12 km east of Tel Aviv and the Mediterranean coast (Fig. 1). Although much of the cave was destroyed during construction of a nearby highway, excavations at the site are ongoing since 2001. All archaeological finds at Qesem Cave have been assigned to the Acheulo-Yabrudian Cultural Complex (AYCC) of the late Lower Paleolithic dated to 400–200 thousand years ago [kya]), postdating the Acheulean of the Lower Paleolithic and predating the Mousterian of the Middle Paleolithic. The 13 human teeth (4 deciduous and 9

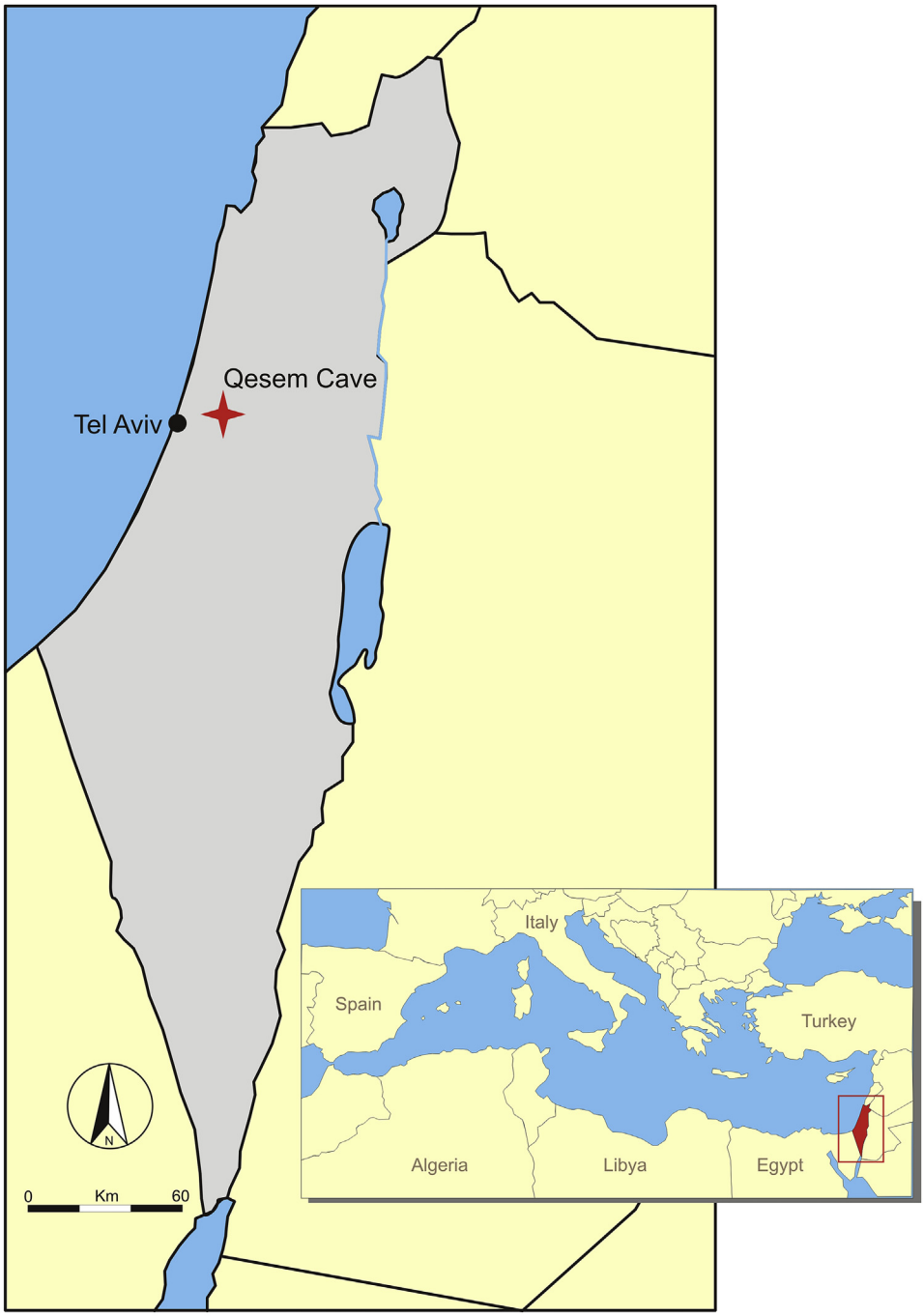

Fig. 1. Geographic location of Qesem Cave.