



New Middle Pleistocene dental remains from Qesem Cave (Israel)



Israel Hershkovitz ^{a, b, *}, Gerhard W. Weber ^c, Cinzia Fornai ^d, Avi Gopher ^e, Ran Barkai ^e, Viviane Slon ^a, Rolf Quam ^{f, g, h}, Yankel Gabet ^a, Rachel Sarig ^{b, i}

^a Department of Anatomy and Anthropology, The Sackler Faculty of Medicine, Tel Aviv University, Israel

^b Dan David Center for Human Evolution and Biohistory, The Steinhardt Museum of Natural History and National Research Center, Tel Aviv University, Israel

^c Department of Anthropology and Core Facility for Micro-Computed Tomography, University of Vienna, Austria

^d Department of Anthropology, University of Vienna, Austria

^e Institute of Archaeology, Tel Aviv University, Israel

^f Department of Anthropology, Binghamton University (SUNY), USA

^g Centro de Investigación UCM-ISCIII sobre la Evolución y Comportamiento Homininos, Spain

^h Division of Anthropology, American Museum of Natural History, USA

ⁱ The Department of Orthodontics, The Maurice and Gabriela Goldschleger School of Dental Medicine, Tel Aviv University, Israel

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ABSTRACT

Ongoing fieldwork at the Middle Pleistocene site of Qesem Cave has resulted in the discovery of several new hominin teeth. These include a right upper deciduous canine (dc¹), a right lower first deciduous molar (dm₁), a right upper third premolar (P³), a right lower second molar (M₂), a left lower third molar (M₃), and an incomplete tooth (represented only by a single root). The teeth come from different stratigraphic layers at the site and may cover a time span of up to 200 ka. These specimens represent different tooth classes than the previously reported teeth from the same site. The current study presents metric and morphological data on the new Qesem Cave teeth as well as a discussion of their taxonomic affinities. The deciduous teeth show some features which, tentatively, seem to depart from the general Neanderthal pattern. The P³ and M₂ show relatively simplified occlusal morphologies and lack “mass-additive” traits. The Qesem Cave permanent teeth seem to largely conform to the recently defined Eurasian dental pattern. The relatively large M₂ shows a clear, continuous midtrigonoid crest, but lacks a hypoconulid. The M₃ shows numerous accessory crests and furrows on the crown surface and also shows a nearly continuous midtrigonoid crest. Thus, like the previously reported teeth from Qesem Cave, the new dental remains show some features that seem more consistent with fossils of early *H. sapiens* from the sites of Qafzeh and Skhul and some features which appear to align them with the Neanderthals. Given the uncertainties regarding the phylogenetic polarity of several of these features, a conclusive taxonomic diagnosis remains elusive and must await the discovery of additional, more complete remains from the site.

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1. Introduction

Qesem Cave is situated on the low western slopes of the Judean Hills some 12 km east of Tel Aviv and the Mediterranean coast. 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 [ka]), postdating the Acheulean of the Lower Paleolithic and predating the Mousterian of the Middle Paleolithic. The rich faunal assemblage shows a predominance of fallow deer (*Dama*), but other species were also present, including auroch (*Bos*), horse (*Equus*), wild pig (*Sus*), tortoise (*Testudo*) and red deer (*Cervus*). Based on the skeletal part representation at the site, it was concluded that animal carcasses were first processed away from the site and only selected parts were brought to the cave. Cut marks have been found on some of the bones and indications of marrow extraction were also recognized (Stiner et al., 2009, 2011).

A large series of ²³⁰Th/²³⁴U dates on speleothems suggests that the occupation of the cave began around 420 ka and terminated

* Corresponding author. Department of Anatomy and Anthropology, The Sackler Faculty of Medicine, Tel Aviv University, Israel.

E-mail address: anatom2@post.tau.ac.il (I. Hershkovitz).

prior to c. 200 ka (Barkai et al., 2003; Gopher et al., 2010; Mercier et al., 2013; Falgueres et al., 2016). The large number of dates available throughout the sequence makes it possible to provide dates to various contexts within the cave and to the individual hominin teeth.

Data on southwest Asian Middle Pleistocene hominins in this time period are very scarce. Specimens from this region prior to the Middle Paleolithic include skull fragments (Tobias, 1966) and isolated teeth from Ubeidiya (Belmaker et al., 2002), femoral diaphyses from Gesher Benot Ya'akov (Geraads and Tchernov, 1983), an isolated and worn lower molar and femoral shaft from Layer E at Tabun (McCown and Keith, 1939), fragments of cranial bones from Hazorea (Anati and Haas, 1967), a parietal bone from Nadaouiye (Jagher et al., 1997), and the partial cranium from the site of Zuttiyeh (Turville-Petre, 1927). The Lower Pleistocene Ubeidiya teeth were tentatively identified as representing *H. ergaster*, while the Tabun Layer E fossils have been described as showing features which align them with archaic members of the genus *Homo* (Trinkaus, 1995). The parietal bone from Nadaouiye was found in association with Acheulean tools and shows features that are generally primitive within the genus *Homo* (Jagher et al., 1997). The taxonomic affinities of the Zuttiyeh specimen have been a matter of considerable debate (Keith, 1927; Rak, 1986; Trinkaus, 1989; Vandermeersch, 1989, 1995; Simmons et al., 1991; Sohn and Wolpoff, 1993), with different re-

features in the skull and teeth (Martinón-Torres et al., 2012; Arsuaga et al., 2014). Given these evolutionary developments in nearby geographic regions, the taxonomic identity of the Qesem Cave hominins takes on added importance. By Middle Paleolithic times, fossils attributed to both Neanderthals (e.g. Tabun, Kebara, Amud) and early *H. sapiens* (e.g. Skhul, Qafzeh) are present in southwest Asia. Given the chronology of Qesem Cave, it is clear that fossils from this site hold the key to the question of who predated *H. sapiens* and Neanderthals in the Levant. Here we report several new hominin teeth recovered during controlled excavations at the site (Table 1). All of the specimens date to the period between 400 and 200 ka.

2. Materials and methods

2.1. The teeth

The 13 hominin teeth (4 deciduous and 9 permanent) found at Qesem Cave belong to at least three different archaeological contexts (Table 1), suggesting a temporal span of c. 200 ka between the oldest and the youngest tooth. Eight teeth have been published previously (Hershkovitz et al., 2011), and here we report on five additional teeth (2 deciduous and 3 permanent) and one isolated tooth root.

Table 1
Inventory, archaeological association, and chronology of the hominin teeth found at Qesem Cave.

	Catalog number	Side	Excavation square	Depth (cm)	Lithic industry	Chronology (kyr)
<i>Deciduous teeth</i>						
Lower di2 ^a	di ₂ -QC1	L	M-13d	360–365	Amudian	<300
Lower dm2 ^a	dm ₂ -QC2	L	I-12a	560–565	Amudian	~300
Lower dm1	dm ₁ -QC3	R	I-J/12	600	Amudian	~300
Upper dc	dc ¹ -QC4	R	I-14c	575–585	Amudian	>300
<i>Permanent teeth</i>						
Upper I2 ^a	I ² -QC5	L	O-8c	170–175	Amudian	<250
Upper M3 ^a	M ³ -QC6	L	M-13d	360–370	Amudian?	<250
Upper C ^a	C ¹ -QC7	R	G-9b	520–525	Yabrudian	>300
Lower C ^a	C ₁ -QC8	L	G-22	685–690	Amudian with Spheroids	>300
Lower P3 ^a	P ₃ -QC9	L	G-22	705–710	Amudian with Spheroids	>300
Lower P4 ^a	P ₄ -QC10	L	G-22	685–690	Amudian with Spheroids	>300
Upper P3	P ³ -QC11	R	I-15d	580–585	Amudian	>300
Lower M2	M ₂ -QC12	R	J-15	540–550	Amudian	~300
Lower M3	M ₃ -QC13	L	G-6a	705–710	Amudian	>300
Incomplete root of a lower molar	M _x -QC14		F-9c	705–710	Amudian	>300

^a Described in Hershkovitz et al. (2011).

searchers seeing close resemblances to early *H. sapiens*, Neanderthals or archaic members of the genus *Homo*. A recent analysis of the specimen (Freidline et al., 2012) found somewhat closer affinities with Neanderthals and some European Middle Pleistocene specimens. Similarly, Hershkovitz et al. (2011) described several Middle Pleistocene teeth from Qesem Cave recovered in the first years of excavation at the site, but did not assign the hominin group they represent to any taxa.

Nevertheless, the time period between 400 and 200 ka is a crucial period in hominin evolution. It is widely accepted that *H. sapiens* emerged during this time span in Africa, with the earliest *H. sapiens* fossils dating to around 200 ka in eastern Africa (White et al., 2003; McDougall et al., 2005). In Europe, the emergence of the Neanderthal clade has been documented early in the Middle Pleistocene (Arsuaga et al., 1997, 2014). The revised chronology for the Sima de los Huesos (SH) hominins from northern Spain (ca. 430 ka) indicates that during the time of existence of the Qesem Cave hominins, the Neanderthal clade was already established in Europe, with fossils from this region showing derived Neanderthal

All of the newly-discovered teeth are isolated and not in association to each other, as suggested by their spatial distribution and placement within the stratigraphy at the site. In this contribution we provide specimen numbers for all of the Qesem Cave teeth, including those reported previously in Hershkovitz et al. (2011).

2.2. Methods

Descriptions of the morphological features in the Qesem Cave permanent teeth mainly focused on traits included in the Arizona State University Dental Anthropology System (ASUDAS). Scoring of dental features in the ASUDAS has been carried out using the standard reference plaques and published descriptions of the scoring criteria (Turner et al., 1991; Scott and Turner, 1997). Additional features that have been argued to distinguish Neanderthals from *H. sapiens* teeth are also considered (Bailey, 2002, 2006). The morphology of the deciduous teeth was compared with other Pleistocene *Homo* specimens as well as recent hominins.

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