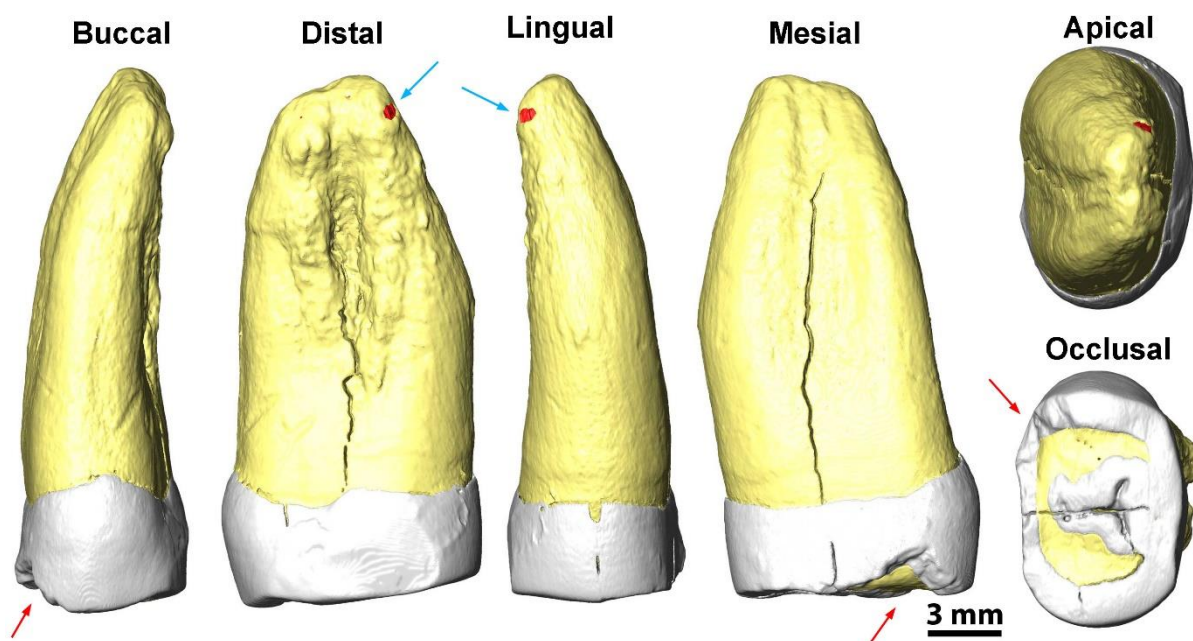
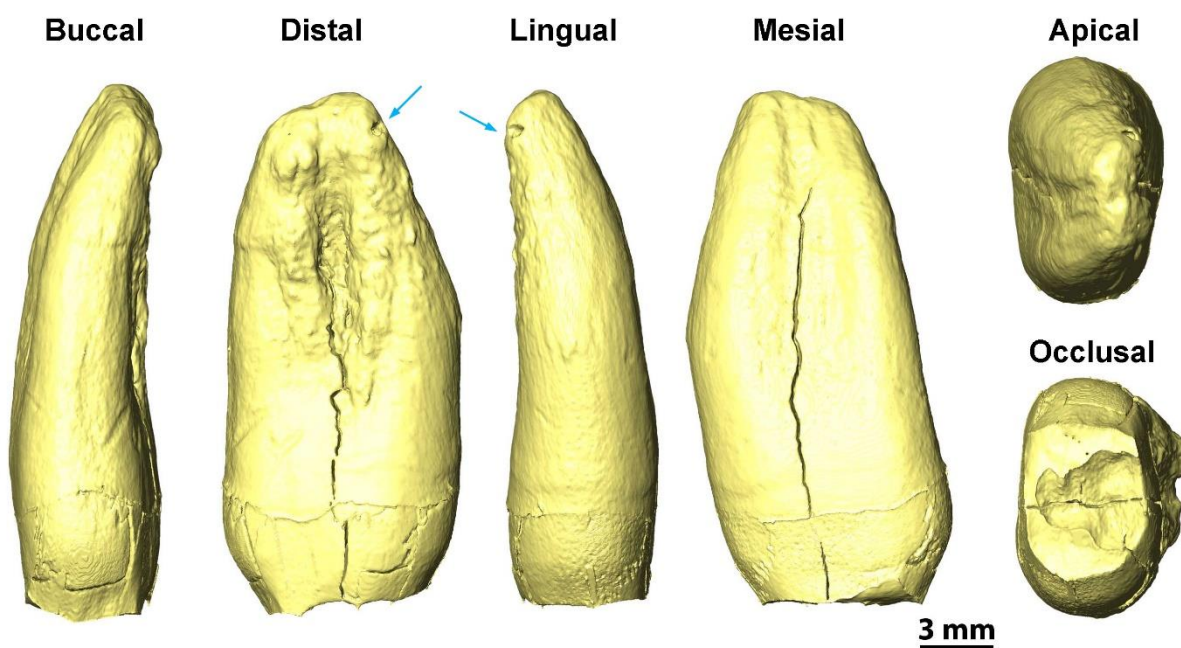


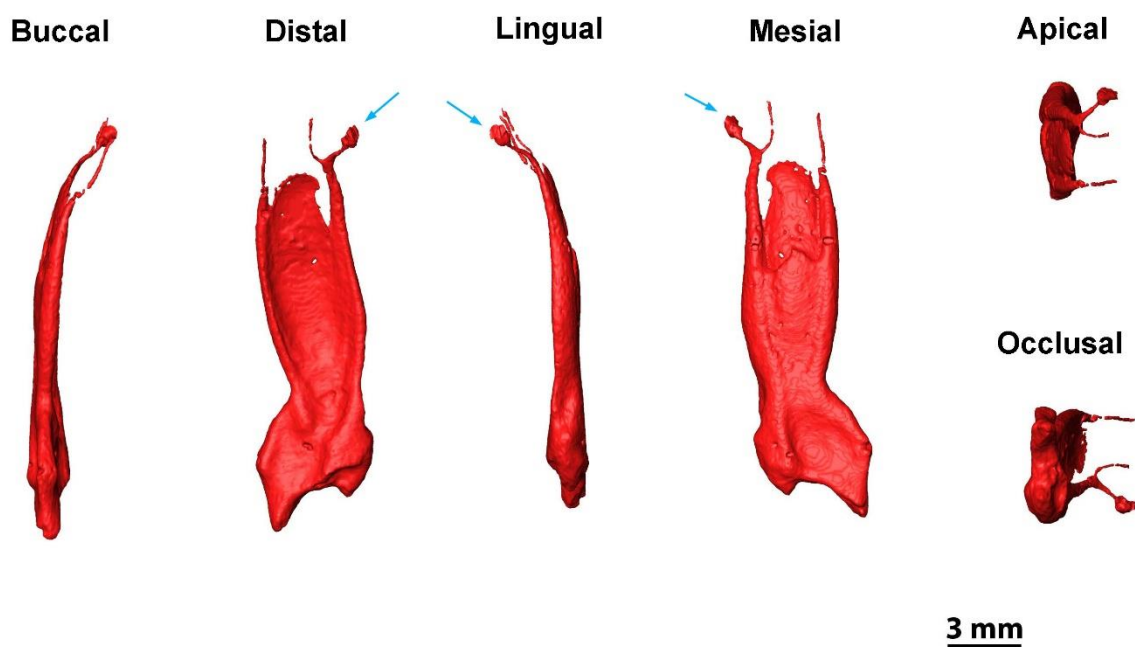
## SUPPLEMENTARY MATERIAL



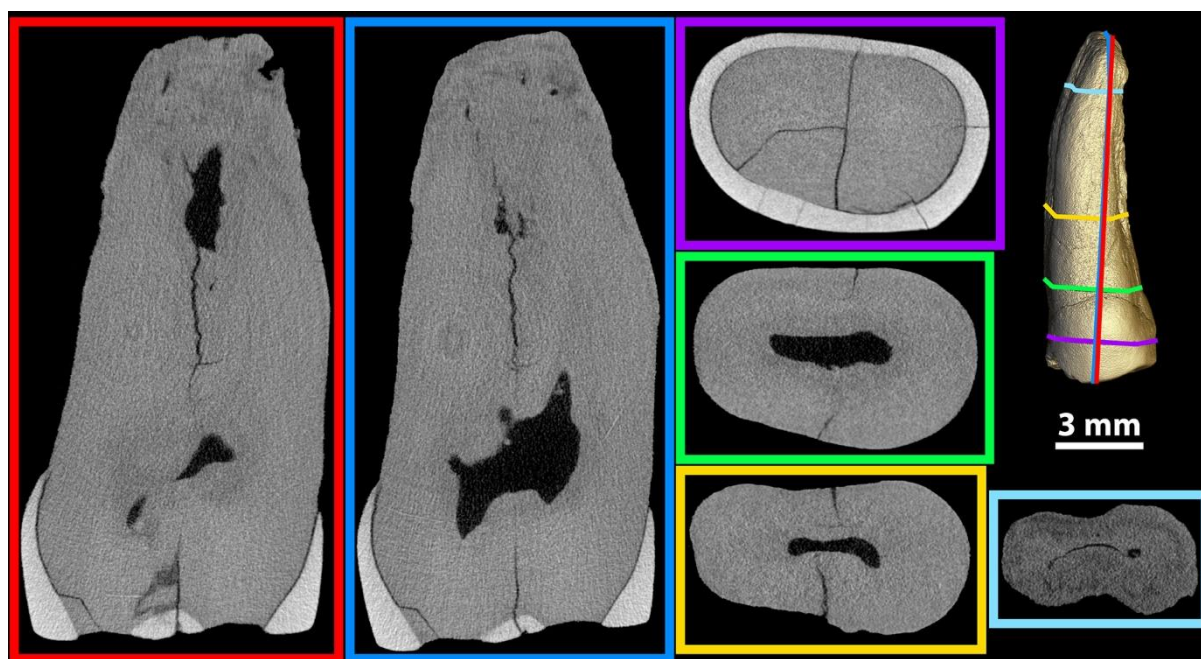
**Sup. Mat. Figure S1.** Three-dimensional model of the Castillo-1466 premolar with the enamel in white, the dentine in light yellow, and the pulp cavity in red. Enamel chipping on the mesiobuccal aspect of the occlusal surface is highlighted by a red arrow, while the lateral opening of the pulp chamber is shown with a blue arrow.



**Sup. Mat. Figure S2.** Three-dimensional model of the enamel dentine-junction of Castillo-1466 premolar. Dentine is light yellow. The lateral opening of the pulp chamber is shown with a blue arrow.



**Sup. Mat. Fig. S3.** Three-dimensional model of the pulp cavity (in red) of Castillo-1466 premolar with the enamel in white, the dentine in light yellow, and the pulp cavity in red. The lateral opening of the pulp chamber is shown with a blue arrow.



**Sup. Mat. Fig. S4.** Virtual 2D sections through Castillo-1466 (see coloured frames on the 2D and their location on the 3D model at the top right), optimized to visualize crown extension (red), root extension (blue), and then several cross-sections from the mid crown (purple), cervix (light green), mid-root (yellow) and root apex (light blue). Note the substantial amount of cementum visible on the root apex and detailed in SOM Fig. S5.



**Sup. mat. Fig. S5.** Virtual mesio-distal 2D section in Castillo-1466 showing some hypercementosis, with the thickest accumulation of cementum highlighted with light blue arrows, and the cementum-dentine junction with light blue dots.

**Sup. Mat. Tab. S1** - El Castillo cave geochronological data.

Units	Industry	Sample	Wood & al, 2018	Bernaldo de Quirós & al., 2006	Cabrera & al., 1996	Liberda & al., 2010
Unit XIX	Sterile	OxA-21974	... - 45.490 ( <sup>14</sup> C) <sup>b</sup>			
Unit XX	Mousterian	OxA-10187		49.570 – 44.250 ( <sup>14</sup> C) <sup>a,b</sup>		
		OxA-10188		>47.300 ( <sup>14</sup> C) <sup>c</sup>		
		OxA-10327		>45.700 ( <sup>14</sup> C) <sup>c</sup> 49.130 – 43.260 ( <sup>14</sup> C) <sup>a,b</sup>		
		OxA-10233				
		OxA-10328		... - 46.410 ( <sup>14</sup> C) <sup>a,b</sup>		
		OxA-10329		>43.800 ( <sup>14</sup> C) <sup>c</sup>		
Unit XXa/b	Mousterian	GifA-89144			43.005-34.006 ( <sup>14</sup> C) <sup>b</sup> 53.783-36.687 ( <sup>14</sup> C) <sup>b</sup>	
		GifA-92506				
Unit XXc	Mousterian	OxA-22204	65.220-43.660 ( <sup>14</sup> C) <sup>b</sup>			
		OxA-22205	68.300-44.220 ( <sup>14</sup> C) <sup>b</sup>			
		97131-97136				41.914 +/- 9.900 (ESR) <sup>d</sup> 44.200 +/- 7.600 (ESR)
Unit XXd	Mousterian	95480A				
Unit XXe	Mousterian	CST1B				38.600 +/- 5.700 (ESR)
		Average				

Unit XXh	Mousterian	90CST1+2				
Unit XXIII	Sterile	90-101 to 90-109				

14C: radiocarbon; ESR: Electron Spin Resonance; U/Th: uranium series. a: Calibrated date (cal BP, 95.4% probability range) against IntCal13 (Reimer et al., 2013) in OxCal v4.2 (Ramsey, 2009). b: Date may extend beyond calibration curve. c: Uncalibrated date (BP or years +/- 1 $\sigma$ ). d: Average of several samples.

**Sup. Mat. Tab. S2 – Upper Paleolithic fossils used in Figure 5**

<b>Fossil specimens</b>	<b>Material culture</b>	<b>Reference</b>	<b>M-D diameter (M81) Martin &amp; Saller, 1957</b>	<b>B-L diameter (M81(1)) Martin &amp; Saller, 1957</b>	<b>Number Figure</b>
Arene Candide 01	Gravettian	Paoli et al. 1980 ; Sparacello et al. 2018	7.30	10.80	<b>1</b>
Arene Candide 02	Late Epigravettian	Paoli et al. 1980 ; Sparacello et al. 2018	6.40	9.80	<b>2</b>
Arene Candide 04	Late Epigravettian	Paoli et al. 1980 ; Sparacello et al. 2018	6.90	9.80	<b>3</b>
Arene Candide 05	Late Epigravettian	Paoli et al. 1980 ; Sparacello et al. 2018	6.50	9.90	<b>4</b>
Arene Candide 03	Epigravettian	Sparacello et al. 2018	6.6	9.4	<b>5</b>
Arene Candide 10	Epigravettian	Sparacello et al. 2018	6.50	9.30	<b>6</b>
Arene Candide 12	Epigravettian	Sparacello et al. 2018	7.00	10.00	<b>7</b>
Arene Candide 16	Epigravettian	Sparacello et al. 2018	6.29	9.75	<b>8</b>
Badegoule -W 7	Solutrean	Sparacello et al. 2018	6.80	9.00	<b>9</b>
Cap-Blanc	Magdalenian	von Bonin 1935	6.00	9.20	<b>10</b>
Dolni Vestonice 03	Gravettian	Sladek et al. 2000	6.60	9.00	<b>11</b>

Dolni Vestonice 14	Gravettian	Sladek et al. 2000	7.20	10.30	<b>12</b>
Dolni Vestonice 15	Gravettian	Sladek et al. 2000	7.20	9.90	<b>13</b>
Les Rois 8 ou R50	Early Aurignacian	Vallois 1958; Ramirez Rozzi et al. 2009	6.30	9.30	<b>14</b>
Pataud 1	Gravettian	Legoux 1972	7.20	10.20	<b>15</b>
Predmost 01	Gravettian	Matiegka 1934	7.00	9.50	<b>16</b>
Predmost 04	Gravettian	Matiegka 1934	6.40	9.00	<b>17</b>
Predmost 05	Gravettian	Matiegka 1934	6.70	9.40	<b>18</b>
Predmost 09	Gravettian	Matiegka 1934	7.40	10.00	<b>19</b>
Predmost 10	Gravettian	Matiegka 1934	7.40	10.00	<b>20</b>
Predmost 14	Gravettian	Matiegka 1934	6.30	9.00	<b>21</b>
Romito 2	Late Epigravettian	Fabrizi and Mallegni 1988	6.30	9.60	<b>22</b>
Saint-Germain L. R. 1	Middle Magdalenian	Gambier and Lenoir 1991	6.00	9.50	<b>23</b>
Vaddo all'Arancio	Epigravettian	Pardini and Pardini 1981	6.50	10.50	<b>24</b>

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