3D enamel thickness in Neandertal and *Homo sapiens* permanent lower molars and premolars

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Introduction

Most of the studies on enamel thickness distribution in Neandertals and modern humans have focused on permanent teeth, particularly the molars [1]. Conversely, little attention has been dedicated to the premolars [2] and to compare the various dental classes to understand which tooth class better contributes to discriminate the two human groups. In order to address this issue, here we apply a recent protocol [3] to investigate 3D enamel thickness in a sample of Neandertal and *Homo sapiens* unworn to variously worn lower permanent molars and premolars.

Material

Micro-CT data of Neandertal and modern human molars (n=72) and premolars (n=55) at different wear stages (stages 1-4 based on Molnar, 1971 [4]) were segmented to create 3D digital models of the teeth (Tab.1)

Taxon	Tooth class	*N*	Wear stage
NEA	LM2	9	1-2
	LM1	8	1-2
	P4	11	1-2
	P3	9	1-2
EMH	LM2	3	1-2
	LM1	2	1-2
	P4	2	1-2
	P3	1	1-2
MH	LM2	9	1-2
	LM1	8	1-2
	P4	8	1-2
	P3	11	1-2

Tab.1 List of material NEA=Neandertal; EMH= early modern human; MH= recent modern human

Methods

For each digital model, all components were measured to compute 3D relative enamel thickness (3D RET) index (Fig.1, [3]). Differences in 3D RET index between Neandertals and modern humans were tested using the Mann-Whitney U test (= 0.05; two-tailed) with a Monte Carlo permutation.

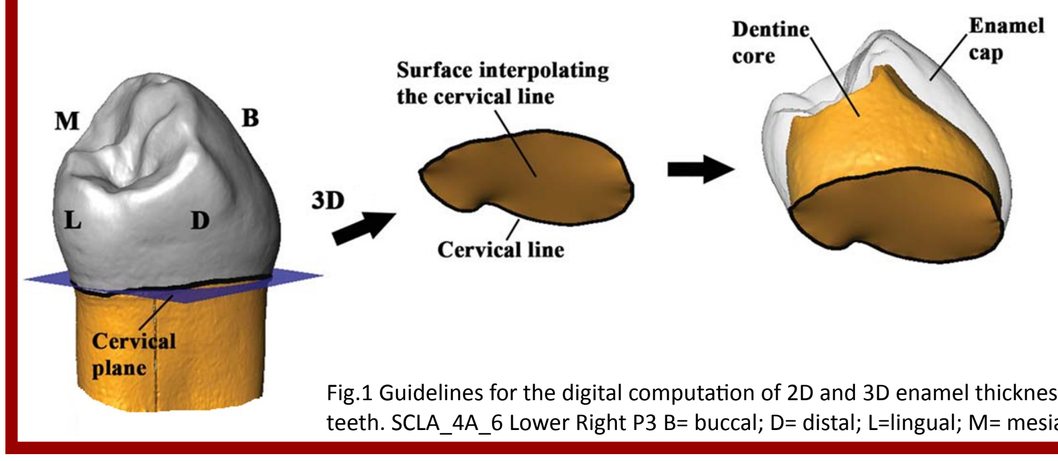

Fig.1 Guidelines for the digital computation of 2D and 3D enamel thickness in hominoid teeth. SCLA_4A_6 Lower Right P3 B= buccal; D= distal; L=lingual; M= mesial [3].

Results

For premolars and M_2s, Neandertals show significantly lower 3D RET index than recent modern humans ($p<0.01$). In particular, the premolars show more significant difference between the two groups, while no significant difference was observed for the M_1s ($p=0.507$). Finally, the 3D RET computed for EMH, even though the small sample size prevents statistical analysis, falls in the range of variation of recent modern humans. (Fig. XX)

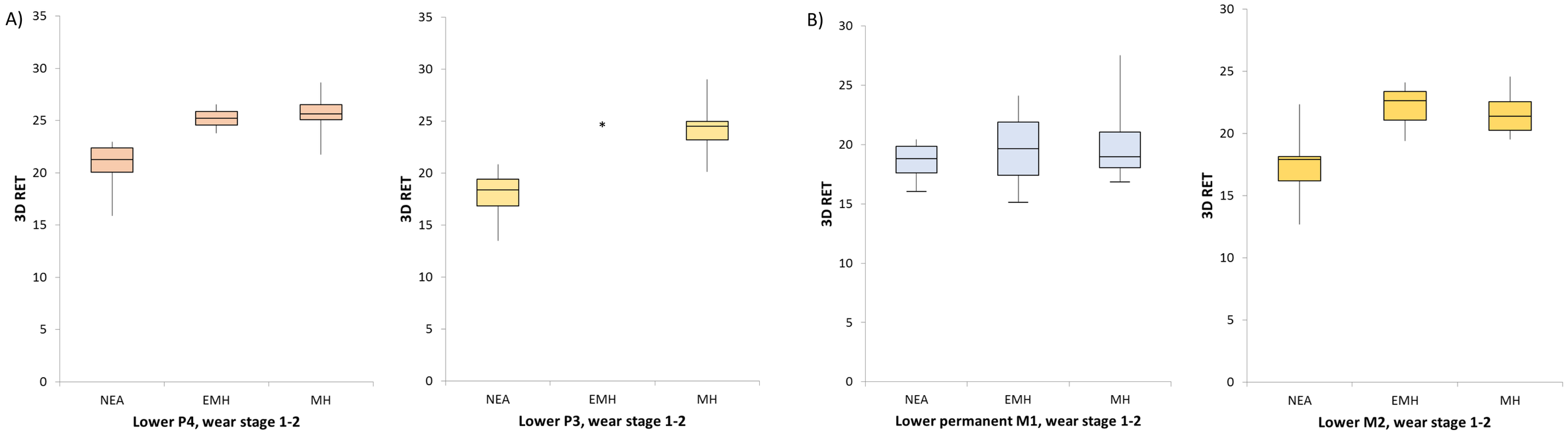

Fig. 2 Box plot RET mean values and standard deviation (Interpolation Quartile method). A) Lower P4, left; lower P3, right; B) Lower M1,left.; lower M2, right. Single individuals are marked by an asterisk.

Discussion and Conclusions

This preliminary study provides additional information on the 3D enamel thickness of Neandertals and modern humans lower premolars and molars. Our first results confirm that Neandertal M_2s have significantly lower RET indices than modern humans [1; 5], but the same does not hold for the M_1s, opposite to our expectations and previous contributions [1; 5]. These results highlight how lower post-canine dentition, and particularly the premolars, are useful tooth classes to discriminate between Neandertals and modern humans.

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