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Re-assessing toothpick grooves in fossil hominins: insights from a wild orangutan

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This study reassesses the interpretation of ´toothpick grooves´, non-carious cervical lesions (NCCLs) found commonly on the interproximal regions of posterior teeth in fossil hominins [1-2]. Today, almost universally, these grooves are considered indicative of tool use behaviour, for dental hygiene purposes or for alleviating discomfort associated with oral pathologies, supported by experimental studies [3]. In this study, we describe a wild orangutan (*Pongo pygmaeus*), curated at the Field Museum (Chicago, US), that exhibits a typical 'toothpick' groove on the mesial surface of a lower left second molar. This case provides a novel opportunity to reconsider these dental features not just as products of unique human cultural behaviour, but possibly also as outcomes of natural masticatory behaviours and dietary/environmental influences. Analyses of microscopic features of the orangutan root groove were undertaken, and dental tissue loss was estimated with an intraoral scanner. Comparisons with fossil *Homo* and archaeological human samples were then carried out. This includes NCCLs found in a variety of *Homo* species (*H. sapiens*, *H. neanderthalensis*, *H. heidelbergensis*, *H. erectus*, *H. antecessor* and *H. habilis*), and archaeological human samples from around the world (Americas, Australia, Africa and Eurasia). The orangutan case shows hallmark features of ´toothpick´ grooves, including buccal-lingual fine striations and a tapered profile from the buccal towards the lingual root surface, accompanied by a carious lesion beneath it. However, rather than toothpick-type behaviour to alleviate the discomfort associated with the carious lesion, this NCCL is likely caused by normal masticatory processes, supported by the presence of steep and severe wear on the adjacent first molar and associated periodontal disease. Such observations challenge the automatic attribution of similar grooves in fossil hominins to tool use, since if this tooth was found isolated in the fossil record a ´toothpick´ aetiology would likely have been proposed. Our findings invite a re-evaluation of the conventional understanding of toothpick grooves in fossil hominins, and support some earlier studies that suggested at least some of these interproximal root grooves may have a multifactorial aetiology, that does not always involve tool-use [4].

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