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Introduction: Exact symmetry and perfect balance between opposite jaw halves, as well as between antagonistic teeth, is not frequently observed in natural masticatory systems. Research results show that asymmetry in our body, skull, and jaws is often related to genetic, epigenetic, environmental and individual ontogenetic factors. Our study aims to provide evidence for a significant link between masticatory asymmetry and occlusal contact between antagonist teeth by testing the hypothesis that tooth inclination is one of the mechanisms driving distribution of wear in masticatory phases in addition to dietary and cultural habits.

Materials and Methods: The present work investigates the relationship between dental macrowear patterns and tooth inclinations on a sample of complete maxillary and mandibular 3D models of dental arches from 19 young and adult Yuendumu Aboriginal individuals. The analysis was carried out on first molars (M1) from all quadrants. Occlusal Fingerprint Analysis was used for the quantification of macrowear patterns, and 2D cross-sectional geometric analysis was carried out to investigate asymmetry in dental arches (Figure 1).

![Figure 1. Identification of the Occlusal reference plane.](image)

Results: The asymmetry is highly variable on both arches, and it is associated with differences in the inclination of upper M1 crowns. Each molar has variable inclination (buccal/lingual) which influence tooth to tooth contact, producing greater or lesser variation in wear pattern (Figure 2). The only significant relationship emerges between tooth inclinations of opposite sides of the upper (ρ = 0.55, p-value = 0.016) and lower (ρ = 0.76, p-value = 0.00016) dental arch respectively. The coefficient of determination (R2) obtained through OLS regression for the same cases, (Table 1), suggest that variability in tooth inclination is one of the mechanisms driving the distribution of wear in masticatory phases, and the significance of the obtained values suggests that these results may be also generalized in a broader sample. Tooth inclination values exhibit a high degree of inter-individual variability when considering the whole of the sample. Subadults exhibit a more pronounced mandibular variability, while adults tend to vary more in the inclination of maxillary teeth (Figure 3).

Conclusions: Our results suggest that overall asymmetry in the masticatory apparatus in modern humans affects occlusal contact areas between antagonist teeth influencing macrowear and chewing efficiency during ontogeny.

Acknowledgements
This study was supported by the Faculty of Medicine, Nursing and Health Sciences at Monash University through the Strategic Grant Scheme 2016 (Grant SOS16-0344) and by the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation programme (grant agreement No 724046 – SUCCESS and grant agreement no 639286, HIDDEN FOODS); [http://www.erc-success.eu/](http://www.erc-success.eu/) and [www.hiddenfoods.eu](http://www.hiddenfoods.eu).