A longitudinal study of dental arch dimensions in Australian Aboriginals using 2D and 3D digital imaging methods

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Clinical Dentistry (Orthodontics)

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Statement

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Ramya Thiyagarajan
University of Adelaide
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2. Summary

This study investigated arch dimension changes associated with growth and tooth wear in Australian Aboriginals aged from age 8 to 15 years using 2D and 3D digital imaging systems.

Serial dental casts of Australian Aboriginals from Yuendumu were used in the study. The sample comprised 25 females and 24 males for whom casts were available at ages of 8, 12 and 15 years (a total of 294 dental study casts). The primary method of data acquisition involved obtaining digital photographs and digitizing the images using an Apple IIGS computer and customised software program. A subset of 40 dental stone models (5 individuals at ages 8, 12, 15 and 18 years) were duplicated and scanned using the Minolta Vivid 900 laser surface scanner at the DSIRO Laboratories, National University Singapore. The 3-D images were digitised using the Rapidform software package (Inus, technology, Seoul, Korea). Study variables included mesiodistal crown diameters, arch widths, arch depths and arch lengths.

Mesiodistal crown dimensions in males tended to be larger than those in females. All arch dimensions were significantly larger in males than females. Upper and lower Intercanine width increased from age 8 to age 12 years but did not change thereafter. Upper and lower intermolar widths increased with age from 8 years to 15 years while arch depth decreased. No significant reduction in arch lengths was

found from age 12 to 15 years. The two imaging systems were comparable in their measurement reliability, although the 2D method provided consistently larger crown diameters than the 3D method.

Changes in arch dimensions with age in the Aboriginal sample were similar to those reported for other populations. However, no measurable change was detected in arch length over time, even though the Aboriginals had abrasive diets that would be expected to contribute to interproximal wear. It was concluded that the 2D and 3D imaging methods were suitable for clinical use but would require further refinement for research projects aimed at assessing minor changes in arch lengths associated with interproximal wear.