A 3D CT Volumetric Analysis of the Maxillary Sinuses of Individuals with Cleft Lip and Palate

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SUB CRUCE LUMEN

A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Doctor of Clinical Dentistry (Orthodontics)

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Summary

This thesis presents the findings of a volumetric assessment of maxillary sinuses in individuals with cleft lip and palate (CLP) based on three–dimensional (3D) computer tomography (CT) data. The study subjects were drawn from two distinct populations. The first population included seven unoperated CLP infants of Malay origin and three matched non-cleft (NC) controls. The second population was of heterogeneous ethnicity and drawn from the Australian Craniofacial Unit (ACFU) data base. It included 15 operated CLP patients ranging in age from 34 to 374 months and 16 matched NC controls. A computer software program was utilised to calculate maxillary sinus volumes across individual data sets and also to measure two linear maxillary dimensions of maxillary height and maxillary width. A subgroup of nine individuals with unilateral cleft lip selected from the ACFU sample was assessed to quantify the extent of left/right asymmetry in maxillary sinus volume.

Qualitative descriptions of early maxillary sinus morphology in the Malay group (CLP and NC) are provided. In addition, quantitative (statistical) analysis, both descriptive and inferential, was undertaken on the ACFU data (CLP and NC) to assess differences within and between groups. Effects of age and gender on maxillary sinus volume were explained, and also relationships of maxillary sinus volume to maxillary linear dimensions. Validation of the method and an error study were undertaken.

The findings indicated a significant effect of age and CLP status on maxillary sinus volume, but no effect of gender or sidedness (left or right).

No demonstrable asymmetry of maxillary sinus volume was evident in unilateral cleft lip (with or without cleft palate) individuals despite the unilateral nature of this orofacial condition.

Maxillary height and width measures demonstrated significant associations with maxillary sinus volume in the CLP individuals but were not significantly associated with maxillary sinus volume in NC individuals.

The sample sizes of the data studied were relatively small but similar to other published studies on maxillary sinus anatomy. The need to take into account the relatively small sample size when interpreting the findings of the statistical analyses in this study is acknowledged.

Results are compared to those reported previously in the literature and new findings highlighted. For example, the finding that mean maxillary sinus volume was significantly smaller in CLP individuals than NC individuals does not appear to have been reported previously.