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



**THE UNIVERSITY
OF ADELAIDE
AUSTRALIA**

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

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TABLE OF CONTENTS

LIST OF TABLES.....	6
LIST OF FIGURES.....	7
DECLARATION.....	12
ACKNOWLEDGEMENTS.....	13
SUMMARY.....	14
1. INTRODUCTION AND AIMS.....	16
1.1 INTRODUCTION.....	16
1.2 AIMS OF STUDY.....	17
1.3 NULL HYPOTHESES.....	18
2. LITERATURE REVIEW.....	19
2.1 THE PARANASAL SINUSES.....	19
2.1.1 <i>Introduction</i>	19
2.1.2 <i>Normal anatomy</i>	19
2.1.2.1 The maxillary sinuses.....	20
2.1.2.2 The frontal sinuses.....	21
2.1.2.3 The sphenoidal sinuses.....	22
2.1.2.4 The ethmoidal sinuses.....	22
2.1.3 <i>Histology</i>	23
2.1.4 <i>Normal development</i>	23
2.1.4.1 The maxillary sinuses.....	25
2.1.4.2 The frontal sinuses.....	26
2.1.4.3 The sphenoidal sinuses.....	27
2.1.4.4 Ethmoidal air cells.....	28
2.1.5 <i>Paranasal sinus growth in adulthood</i>	29
2.1.6 <i>Anomalies of sinus development</i>	30
2.1.7 <i>Function of the paranasal sinuses</i>	30
2.2 THREE-DIMENSIONAL MEASUREMENT OF THE PARANASAL SINUSES.....	33
2.2.1 <i>Limitations of CT</i>	34
2.3 CLEFT LIP AND PALATE.....	35
2.3.1 <i>Introduction</i>	35
2.3.2 <i>Classification of clefts</i>	35
2.3.3 <i>Embryology of a cleft</i>	38

2.3.3.1	Cleft lip.....	38
2.3.3.2	Cleft palate.....	40
2.3.4	<i>Aetiology of cleft lip and palate.....</i>	<i>40</i>
2.3.5	<i>Morphology of the facial skeleton in CLP.....</i>	<i>42</i>
2.3.6	<i>Paranasal sinuses in cleft lip and palate.....</i>	<i>43</i>
3.	MATERIALS AND METHODS.....	45
3.1	ETHICAL APPROVAL.....	45
3.2	PARTICIPATING UNITS.....	45
3.3	PRELIMINARY/PREVIOUS STUDY.....	45
3.4	PATIENT SAMPLE.....	45
3.4.1	<i>Selection criteria/Exclusion criteria.....</i>	<i>46</i>
3.4.2	<i>Size of study sample.....</i>	<i>48</i>
3.5	PLAN/STUDY DESIGN OVERVIEW.....	49
3.6	CT DATA COLLECTION.....	49
3.7	STEPS OF 3D CT RECONSTRUCTION.....	50
3.7.1	<i>The data processing and visualization workstation.....</i>	<i>50</i>
3.7.2	<i>Transferring digital data to the workstation.....</i>	<i>50</i>
3.7.3	<i>Image generation and display.....</i>	<i>50</i>
3.7.4	<i>Image measurement.....</i>	<i>51</i>
3.8	PERSONA 3D MEDICAL IMAGING AND ANALYSIS.....	51
3.8.1	<i>Method for contour determination.....</i>	<i>66</i>
3.8.2	<i>Protocol for manual identification of sinus bony contour.....</i>	<i>68</i>
3.8.3	<i>Method for landmark determination.....</i>	<i>71</i>
3.9	INDIRECT MEASUREMENT OF SINUS VOLUME USING CT.....	73
3.9.1	<i>The Cavalieri method.....</i>	<i>74</i>
3.10	VALIDATION OF METHOD.....	74
3.12	STATISTICAL ANALYSIS.....	80
3.12.1	<i>Descriptive statistics.....</i>	<i>80</i>
3.12.2	<i>Inferential statistics.....</i>	<i>81</i>
3.12.3	<i>Null hypotheses.....</i>	<i>81</i>
3.12.4	<i>Type I errors.....</i>	<i>81</i>
3.12.5	<i>Type II errors.....</i>	<i>82</i>
3.12.6	<i>Statistical power.....</i>	<i>82</i>
3.12.7	<i>Student's t-test.....</i>	<i>82</i>
3.12.8	<i>F-test.....</i>	<i>83</i>
3.12.9	<i>Pearson's correlation coefficient.....</i>	<i>83</i>
3.12.10	<i>Analysis of variance (ANOVA).....</i>	<i>83</i>
3.13	ERRORS OF MEASUREMENT AND THEIR ANALYSIS.....	85

3.13.1	<i>Introduction</i>	85
3.13.2	<i>Statistical analysis of error</i>	85
3.13.3	<i>Error analysis in this study</i>	87
3.14	QUALITATIVE ANALYSIS.....	87
4.	RESULTS	88
4.1	MALAY INFANTS.....	88
4.1.1	<i>Malay Infant CLP</i>	89
4.1.2	<i>Malay infant Non-Cleft (NC)</i>	90
4.1.3	<i>Malay Infant CLP, description of cross-sectional views</i>	91
4.1.4	<i>Malay infant Non-cleft (NC), description of cross-sectional views</i>	99
4.2	AUSTRALIAN CRANIOFACIAL UNIT (ACFU) SAMPLE.....	108
4.2.1	<i>Reliability study</i>	108
4.2.2	<i>Validity study</i>	110
4.2.3	<i>CLP group</i>	111
4.2.3.1	Unilateral clefts, ipsilateral versus contralateral maxillary sinus volume.....	115
4.2.4	<i>Non-cleft (NC) ACFU Group</i>	117
4.2.5	<i>ACFU CLP versus ACFU NC</i>	122
4.2.5.1	General linear modelling, a repeated measures ANOVA for sinus volume.....	122
5.	DISCUSSION	125
5.1	RELIABILITY STUDY.....	125
5.2	VALIDITY STUDY.....	126
5.3	SAMPLE DEMOGRAPHICS.....	127
5.4	MAXILLARY SINUS VOLUMES.....	128
5.5	MAXILLARY SINUS VOLUMES IN THE ACFU GROUPS (CLP AND NC).....	130
5.6	IPSI LATERAL VERSUS CONTRALATERAL MAXILLARY SINUS VOLUME IN UNILATERAL CLEFT LIP INDIVIDUALS.....	131
5.7	MAXILLARY SINUS VOLUME AND MAXILLARY DIMENSION.....	132
5.8	EFFECTS OF SURGERY.....	133
5.9	EFFECTS OF FETAL ALCOHOL SYNDROME ON MAXILLARY SINUS VOLUME.....	134
5.10	EXAMINER BIAS.....	134
5.11	CLINICAL SIGNIFICANCE.....	135
6.	PRINCIPAL FINDINGS	136
7.	REFERENCES	138
8.	APPENDICES	144
8.1	ETHICAL APPROVAL, WOMEN'S AND CHILDREN'S HOSPITAL, NO. REC1721/6/08.....	144
8.2	ETHICAL APPROVAL FROM THE UNIVERSITI SAINS MALAYSIA.....	145

8.3	DEFINITION OF LANDMARKS FOR LINEAR MEASURES.....	147
8.4	RAW STATISTICAL OUTPUT, "THE SAS SYSTEM"	148
8.4.1	<i>The "full" SAS analysis (Repeated Measures ANOVA for sinus volume).....</i>	<i>148</i>
8.4.2	<i>"Reduced" SAS analysis (Repeated Measures ANOVA for sinus volume (gender removed from model).....</i>	<i>160</i>
8.4.3	<i>Final SAS analysis (gender removed, sinus side removed, sinus side data left/right side averaged).....</i>	<i>167</i>
8.5	VALIDITY STUDY STATISTICS.....	170
8.6	IPSILATERAL VERSUS CONTRALATERAL STATISTICAL WORKINGS.....	171
8.7	MULTI MEDIA COMPACT DISC OF IMAGES	171

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.