
Craniofacial morphology characteristics of operated unilateral complete cleft lip and palate patients in mixed dentition

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Objective. The objective of this study was to analyze craniofacial morphologic characteristics at the stage of mixed dentition in Chinese children who had received surgery for unilateral complete cleft lip and palate (UCCLP) compared with the healthy population.

Material and methods. Lateral cephalometric radiographs were taken for 2 groups of individuals: (1) 48 UCCLP patients who had been operated on before 2 years of age, and (2) 60 noncleft peers as controls.

Results. The operated UCCLP groups differed from the control group as follows: reduced cranial base length, less maxillary length, more retrognathic maxilla, retusion of the entire maxilla, more incongruous intermaxillary relation, more concave skeletal profile, and more lingually inclined maxillary and mandibular incisors.

Conclusions. The operated UCCLP children at the mixed dentition stage showed serious craniofacial deformities and the craniofacial growth was influenced (especially in maxilla). (*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;112:e16-e25)

Nonsyndromic cleft lip and palate is one of the most common congenital craniofacial anomalies. The clefts result in dentomaxillofacial deformities that lead to functional, esthetic, and psychosocial disturbances.¹ The optimal management of cleft lip and palate patients from birth to completion of treatment presents a formidable challenge to the plastic surgeon and associated health care system. Infants born with cleft lip and palate are ideally treated by a multidisciplinary team approach, including primary surgery in infancy to repair the defects and treat associated functional problems.^{2,3}

The operated patients with unilateral complete cleft lip and palate (UCCLP) are, however, generally characterized by craniofacial deformities especially in the midface area, such as the retroposition of the maxilla.⁴ The prevention and treatment of craniofacial deformi-

ties in operated UCCLP patients is a critical task. The causes of the growth deviations have been the object of a large number of studies, but no true consensus has been reached at this time.⁵⁻¹⁰ Thus, it is very important to understand the craniofacial growth and morphologic characteristics of operated children with cleft lip and palate so as to provide information about the outcome of primary repair surgery, which has important clinical significance in their orthodontic treatment and further surgery. The aim of our study was to investigate the craniofacial growth and morphologic characteristics of operated UCCLP in mixed dentition.

MATERIAL AND METHODS

Sample

The study sample comprised a total of 108 Chinese children aged between 7 and 11 years divided into an operated and control group. The operated group was composed of 48 children (25 male, 23 female) with UCCLP and no other congenital anomaly or syndrome whose repair operations had been performed by the same surgeon using the same techniques at the West China Hospital of Stomatology, Sichuan University, Chengdu, China, between 2000 and 2004. Lip repair had been performed at 9 months of age using the rotation-advancement technique, and palatoplasty was done at 38 months using the mucoperiosteal pushback technique. None had received any presurgical orthopedic treatment, orthodontics, or dental reconstruction.

The control group was composed of 60 healthy children (30 male, 30 female) without cleft lip and/or palate

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Received for publication Oct 26, 2010; returned for revision Apr 4, 2011; accepted for publication Apr 12, 2011.

1079-2104/\$ - see front matter

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doi:10.1016/j.tripleo.2011.04.011

or any other congenital anomalies of the same age range as the operated group randomly chosen from a local public primary school in Chengdu, China. These children all had normal skeletal relationships, symmetric faces, and normal occlusion and no history of orthodontic treatment or craniofacial surgery. The average age of the operated group was 10 years and 2 months (males) and 10 years and 4 months (females), and the average age of the control group was 10 years and 1 month (males) and 10 years and 2 months (females).

Cephalometric analysis

Lateral cephalometric radiographs were taken for each subject under standardized conditions with the head oriented along Frankfort horizontal plane parallel to the floor. Subjects were asked to relax their lips for them to be in resting position, and place their teeth in centric occlusion. An EASYMTIC 3298-125 Cephalometry X-ray machine (Chemetron Co., Chicago, IL, USA) was used for all subjects. The digital cephalometric radiographs were sent directly from the machine to a computer for analysis. All digital radiographs were analyzed on the same computer. Each subject was assessed by one trained observer (R.L.) without knowing age or gender. Fig. 1 shows the landmarks that were used in the cephalometric analysis. The 37 parameter measurements are shown in Figs. 2 to 6.

Error of method

To determine the error in measurements, 10 radiographs were randomly selected and reassessed after a 4-week interval by the same examiner (R.L.). Method errors were calculated using the formula proposed by Dahlberg,¹¹ $ME = \frac{\sqrt{\sum d^2}}{n}$, where $\sum d^2$ is the sum of the squared differences between the 2 mean values, and n is the number of double measurements. The method errors for angular and linear measurement were not statistically significant with less than 0.8 degrees and 1 mm, respectively.

Statistical analysis

Statistical analysis was done using the Statistical Package for Social Sciences SPSS Version 10.0 for windows. The mean and standard deviation were calculated for every parameter measured in both groups. The Student t test was used to compare the means of the 2 groups for all parameters at 5% and 1% significance levels.

RESULTS

The mean values, standard deviations, and Student t tests of all the variables used in this study are shown in Tables I through X. The level of significance adopted for statistical test was P less than .05.

Cranial base

Descriptive statistical data of the cranial base morphology measurements between operated UCCLP children and healthy children are shown in Tables I and II.

The main difference in the cranial base morphology between the operated and control groups was that posterior cranial base length (S-Ba) and total cranial base length (N-Ba) were significantly more reduced in the operated than control group ($P < .01$). The anterior cranial base length (N-S) was smaller and the cranial base angle (N-S-Ba) was larger in the male UCCLP group ($P < .01$) but not in the female group. There was no obvious difference in SN-FH angle between the operated and control groups.

Maxillary skeleton

Descriptive statistical data of the maxillary skeleton morphology measurements between operated UCCLP children and healthy children are shown in Tables III and IV.

Relative to the healthy controls, the operated UCCLP patients had reduced maxilla length (Ptm-A), retruded point A (N-A, Ptm-A), reduced SNA angle, and S-Ptm ($P < .01$). These suggested that the maxilla must be obviously retrognathic in relation to the cranium and the growth of maxillary to be severely restrained. Palate plane (PP) had an obvious rotation and the PP-SN angle was increased ($P < .01$). Other face height measurements, such as N-ANS/N-Me and S-Ar/S-Go, had similar dimensions in the operated and control groups.

Mandibular skeleton

Descriptive statistical data of the mandibular skeleton morphology measurements between operated UCCLP children and healthy children are shown in Tables V and VI.

Relative to the healthy controls, the operated UCCLP patients had reduced mandible length (Go-Pg) (male, $P < .01$; female, $P < .05$) and increased mandibular angle (Ar-Go-Me) ($P < .01$). Ramus mandibular height (Ar-Go) was smaller in the male UCCLP group ($P < .01$) but not in the female group. Most of the other measurements, such as FH-MP, FH-SGn, ANS-Me/N-Me, Ar-Go/S-Go, N-B (// FH) and N-Pg (// FH), were not significantly different between the operated and control groups.

The relationship of maxilla and mandible

Descriptive statistical data of the relationship of maxilla and mandible between operated UCCLP children and healthy children are shown in Tables VII and VIII.

Relative to the healthy controls, the operated UCCLP patients had smaller ANB angle and reduced Ptm-A/

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