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การศึกษาความสมมาตรของขากรรไกรล่างในผู้ป่วยปากแหว่งเพดานโหว่ข้างเดียว ที่ยังมีการเจริญเติบโต

Symmetric Evaluation of Mandible in Growing Patient with Unilateral Cleft Lip and Palate

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บทคัดย่อ

หลักการและเหตุผล : ภาวะปากแหว่งเพดานโหว่ข้างเดียวมีผลต่อความไม่สมมาตรของขากรรไกรบน แต่ไม่ได้มีผลโดยตรงต่อความไม่สมมาตรของขากรรไกรล่าง แต่เนื่องจากขากรรไกรบนมีผลต่อความสมมาตรของขากรรไกรล่างจึงมีการศึกษามากมายที่แสดงให้เห็นถึงความไม่สมมาตรของขากรรไกรล่างในผู้ป่วยปากแหว่งเพดานโหว่ข้างเดียวที่ไม่มีการเจริญเติบโตแล้ว แต่อย่างไรก็ตามยังไม่มีการศึกษาความไม่สมมาตรของขากรรไกรล่างในผู้ป่วยที่ยังมีการเจริญเติบโต

วัตถุประสงค์ : เพื่อศึกษาความสมมาตรของขากรรไกรล่างในกลุ่มเด็กปากเพดานโหว่ข้างเดียวที่ยังมีการเจริญเติบโตอยู่

วิธีการศึกษา : วัดภาพรังสีแพโนรามาโดยวัดค่าดัชนีความไม่สมมาตรของขากรรไกรล่าง จากค่าความสูงของคอนดายล์ ความสูงของขากรรไกรล่างส่วนท้ายฟันกราม มุมโกเนียล ความลึกของรอยบากแอนตี้โกเนียล โดยกลุ่มปากแหว่งเพดานโหว่ข้างเดียวจำนวน 26 คน (ชาย 14 คน หญิง 12 คน อายุเฉลี่ย 8.85 ± 1.69 ปี) กลุ่มควบคุม 26 คน (ชาย 16 คน หญิง 10 คน อายุเฉลี่ย 8.89 ± 1.45 ปี) ทดสอบความแตกต่างระหว่างข้างซ้ายและขวาของขากรรไกรล่างในแต่ละกลุ่ม และทดสอบความแตกต่างระหว่างกลุ่ม ของค่าความสูงของคอนดายล์ ความสูงของขากรรไกรล่างส่วนท้ายฟันกราม มุมโกเนียล ความลึกของรอยบากแอนตี้โกเนียล และค่าดัชนีความไม่สมมาตรของขากรรไกรล่างด้วยสถิติ Mann-Whitney U-test

ผลการศึกษา : ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของขากรรไกรล่างข้างซ้ายและขวาในทั้ง 2 กลุ่ม และไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของดัชนีความไม่สมมาตรของขากรรไกรล่างระหว่างกลุ่มปากแหว่งเพดานโหว่ข้างเดียวและกลุ่มควบคุม

สรุป : ขากรรไกรล่างในผู้ป่วยที่ยังมีการเจริญเติบโตทั้งกลุ่มปากแหว่งเพดานโหว่ข้างเดียวและกลุ่มควบคุมมีความสมมาตร

คำสำคัญ : ความไม่สมมาตรของขากรรไกรล่าง ภาพรังสีแพโนรามา ปากแหว่งเพดานโหว่ข้างเดียว ผู้ป่วยที่ยังมีการเจริญเติบโต

ABSTRACT

Background : Asymmetrical maxillary growth in subjects with unilateral cleft lip and palate (UCLP) is previously well documented in the literature. Mandibular growth in subjects with unilateral cleft lip and palate (UCLP) is not directly affected by the cleft. However, the mandible occludes with maxilla, therefore mandibular asymmetry may exist in adult subjects with UCLP. No studies have mentioned mandibular asymmetry in growing subjects with UCLP.

Objective : to study the effects of sagittal maxillary growth hypoplasia in UCLP patients on mandibular asymmetry.

Methods : Mandibular asymmetry index (condylar, ramal, and condylar plus ramal), gonial angle measurements and depth of the antigonial notch were examined on panoramic radiographs. The study groups comprised 26 UCLP patients (14 males and 12 females; mean age 8.85 ± 1.69 years) and a control group of 26 subjects (16 males and 10 females; mean age 8.89 ± 1.45 years). Mann-Whitney U-test was used to determine statistically significant differences between left and right side among group and between 2 groups for condylar, ramal, and condylar plus ramal asymmetry index, gonial angle, and depth of the antigonial notch measurements at the 95 percent confidence interval.

Results : None of the investigated groups showed statistically significant differences between left and right side (P>0.05). Asymmetry indices were similar, with no statistically significant differences found in any of the groups. The UCLP patients have symmetrical mandibles when compared with a normal occlusion sample.

Conclusions : Normal and UCLP groups indicated a symmetrical mandible in growing patient.

Keywords : Mandibular asymmetry, panoramic radiograph, unilateral cleft lip and palate, growing patient

Background

Asymmetrical maxillary growth is a common finding in individuals with unilateral cleft lip and palate (UCLP).[1-4] The cleft can affect the growth of the upper jaw, leading to differences in size and position between the affected and unaffected sides of the face. Although the cleft itself does not directly affect mandibular growth, the presence of the cleft can indirectly affect the growth and development of the mandible. Mandibular asymmetry is a common finding in individuals with unilateral cleft lip and palate (UCLP). This is because the cleft can affect the growth and development of the maxillomandibular complex, resulting in differences in the size and position of the maxilla and mandible on the affected side compared to the unaffected side.[5-11] Many studies have mentioned mandibular asymmetry among adult subjects with UCLP, but to our knowledge, no study in the literature has

discussed about mandibular asymmetry in growing subjects. Thus, the present study was designed to evaluate the effects of sagittal maxillary growth hypoplasia in UCLP patients on mandibular asymmetry.

Material and methods

This study was approved by Suranaree University of Technology Ethics Committee (EC-62-75) The patients with unilateral and bilateral cleft lip and cleft palate were evaluated in this study and compared to normal participants with skeletal base Class I.

Normal Subjects (Control group)

Inclusion criteria:

- Apparently symmetrical face (no chin deviation found clinically)
- Skeletal base Class I wits = (-3±2)
- Cervical vertebral maturation (CVM) staging[12] in lateral cephalogram showed CS2 and CS3 indicate pre-pubertal atage of maturation

Exclusion criteria:

- History of past orthodontic treatment
- Presence of unilateral and/or bilateral posterior cross-bite
- Any known systemic disease affecting general growth and development

Subjects with Unilateral Cleft Lip and Palate (UCLP group)

Inclusion criteria:

- Completed UCLP
- CVM staging[12] in lateral cephalogram showed CS2 and CS3

Exclusion criteria:

- History of past orthodontic treatment
- Subjects with syndromic cleft lip and palate
- Any known systemic disease affecting general growth and development

A moderate effect size was assumed for power analysis.[9] A total sample size of 26 was required to detect this effect size with 80% power at a 0.05.

The symmetry was assessed between the right and left sides of the panoramic radiograph within a group, and the groups were compared against each other to observe any difference among them.

The panoramic radiographs were exposed with NewTom GiANO (Imola, Italy). All radiographs were taken in a standard manner by the same operator. The outlines of the condyle, the ascending ramus, and corpus of both sides were traced in NNT software. A-line was drawn between the most lateral points of the condylar (O1) and of the ascending ramus (O2) image (Figure 1). To the A-line (the ramus tangent) from the most superior point of the condylar image, a perpendicular B-line was drawn. The vertical distance from this line on the ramus tangent to O 1 projected on the ramus tangent was measured. This distance was termed condylar height (CH) and that between the O 1 and O 2 ramus height. A C-line was constructed as a tangent on the mandibular corpus of each side and the angle between the A- and C-line was measured as the gonial angle (Figure 1). To measure condylar, ramal, and condylar plus ramal asymmetry, the following formula was used:

$$\text{symmetry index: } \left|\frac{CHright-CHleft}{CHright+CHleft}\right| \times 100$$

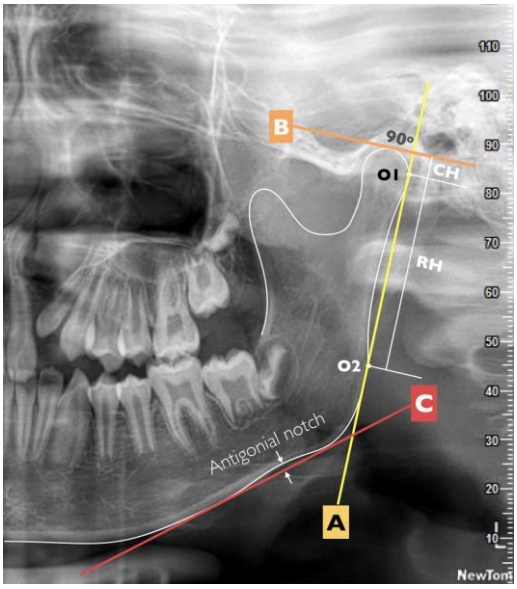

Figure 1. Measurement on the panoramic radiograph, according to Habets et al.[13] O1 and O2, most lateral points of the ramus; A, ramus tangent; B, perpendicular line from A to the most superior part of the condylar image; C, corpus tangent; CH, condylar height; and RH, ramus height.

Statistical Analysis

The Shapiro-Wilk test was used to examine the normality of distributions of condylar height, ramus height, gonial angle and antigonial notch. Statistical analysis was performed using R software (The Comprehensive R Archive Network, www. r-project.org). Statistical significance was defined as $P < 0.05$. The Kruskal-Wallis test was applied to determine statistically significant differences within groups, and the Mann-Whitney U-test was used for intergroup comparisons of condylar, ramal, and condylar+ramal asymmetry indices. Reproducibility of measurements was assessed by calculating method error for replicate measurements made at least 4 weeks apart. The measurements showed good reliability (0.94 to 0.97).

Results

The descriptive mandibular asymmetry index for both male and female subjects were calculated separately in the normal occlusion and CLP patient groups to investigate the relationship between genders. Statistical testing revealed no significant differences between the mean values of the male and female subjects. Therefore, data for both genders were pooled for further analyses. There was no statistically significant difference between the two groups with respect to age (8.89 ± 1.45 and 8.85 ± 1.69 years in control and UCLP, respectively).

In both group subjects, all measurements on OPGs were comparable between right and left sides (Table 1), and no significant difference between them was noted.

Table 2 shows intergroup comparison of various asymmetry indices, no significant differences were observed.

Table 1 Statistical comparison of height measurements and gonial angle for right and left sides in control and UCLP groups.

Variables	Control group (n=26)			UCLP group (n=26)		
	Right Side Mean(±SD)	Left Side Mean(±SD)	Comparison p-value	Right Side Mean(±SD)	Left Side Mean(±SD)	Comparison p-value
Condylar (Co) height, mm	7.3 (±1.2)	6.8 (±1.1)	0.158^{NS}	6.2 (±1.1)	6.1 (±0.9)	0.643^{NS}
Ramus (Ra) height, mm	50.3 (±4.2)	49.7 (±4.7)	0.659^{NS}	49.4 (±5.2)	48.6 (±5.6)	0.588^{NS}
Co+Ra height, mm	57.6 (±5.0)	56.6 (±5.0)	0.472^{NS}	55.7 (±5.5)	54.7 (±6.1)	0.557^{NS}
Gonial angle, degrees	127.2 (± 7.5)	125.9 (±6.7)	0.506^{NS}	130.8 (±6.6)	129.5 (±6.2)	0.460^{NS}
Antigonial notch, mm	1.9 (±0.9)	1.9 (±0.9)	0.964^{NS}	1.7 (±0.7)	1.9 (±0.7)	0.362^{NS}

NS, nonsignificant; *p<0.05

Table 2 Measurement of Various Asymmetrical Indices Among 2 Groups of Subjects

Asymmetry index	Control group (n=26)	UCLP group (n=26)	p-value
	Mean(±SD)	Mean (±SD)	
Condylar index (%)	4.5 (±3.0)	4.2 (±3.3)	0.776^{NS}
Ramal index (%)	3.0 (±1.7)	2.1 (±1.65)	0.074^{NS}
Condylar plus ramal index (%)	2.7 (±1.5)	1.8 (±1.7)	0.067^{NS}

NS, nonsignificant; * p<0.05

Discussion

Unilateral cleft lip and palate participants were analyzed in the study compared to normal participants with skeletal base Class I. Panoramic radiography, also known as an orthopantomogram (OPG), is a widely accessible imaging technique that provides a bilateral view of the mandible[13-15] and can be used to measure side-to-side height differences. OPG has been used to evaluate asymmetry of condylar and ramus process and also evaluate vertical differences between both sides; as it shows a bilateral view and provides adequate information on vertical measurements.[9,16,17]

From previous studies, in adult UCLP group, ramus length was shorter on the cleft side.[5,18] Mandibular body length was also shorter on the cleft side than on the noncleft side.[19,20] The difference value of gonial angle (-0.88) was larger on the cleft side than that of the noncleft side.[9,10,20] However, the findings of this study, in growing subjects, showed that no significant differences were observed between the right and the left sides for all the parameters in the control and UCLP groups.

During childhood and adolescence, the jaws and face undergo significant growth and development, and any disruptions in this process can result in asymmetry.[21-24] Unilateral cleft lip and palate can affect its growth and lead to mandibular asymmetry.

From our result, in UCLP subjects, mandibular asymmetry could develop after the peak of growth.[12,25] The subjects in our study are growing patients in the stage of puberty

according to cervical maturation stage, however, mandible may not yet in their maximum growth. The result at least showed that UCLP patients have symmetrical mandibular at early age before asymmetry develop later on. Accordingly, early diagnosis and intervention can help to address these asymmetries and promote optimal growth and development of mandible.

Conclusions

1. No significant differences were observed between the right and left sides for all the parameters in the control and UCLP group in growing subjects

2. No significant differences in mandibular asymmetry were found among control and UCLP group in growing subjects

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