COMPARISON OF MANDIBULAR ASYMMETRY BETWEEN CLEFT LIP PALATE AND NORMAL SUBJECTS

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OBJECTIVE: The aim of this study was to compare mandibular vertical asymmetry between cleft lip palate and normal class I occlusion subjects.

METHODOLOGY: The sample for this study consisted of total 64 subjects divided into two groups: Group 1 consisted of 32 non-syndromic repaired cleft lip and palate subjects [further divided into: 16 complete unilateral and 16 complete bilateral cleft lip and palate]. Group 2 consisted of 32 subjects with normal facial morphology and class I occlusion. Both groups included males and females with age 14yr-16yr [mean age cleft group 14.6yr±.73yr, and normal group 14.8yr±.73yr]. Mandibular asymmetry index [condylar, ramal, condylar plus ramal] and gonial angle measurements were calculated on dental panoramic radiograph.

RESULTS: Calculated descriptive statistical measurements between normal subjects and cleft lip and palate group shows statistically significant differences in both condylar and ramal asymmetry index but over all intergroup comparison of condylar plus ramal height asymmetry index did not show any significant result.

CONCLUSION: Mandible in cleft lip and palate subjects was found to be normal. However, in unilateral cleft lip and palate a difference was found in condyle, ramal and gonial angle between cleft and non-cleft side.

KEY WORDS: Mandible asymmetry, Unilateral cleft lip and palate, Bilateral cleft lip and palate.


INTRODUCTION

Craniofacial anomalies include a diverse group of deformities related to development of the head and neck. Their etiology shows complexity like apert syndrome, crouzon syndrome etc. They all are either entirely genetic in origin while some are due to teratogenic influences or may be associated with any other developmental anomalies including cleft lip and palate. Their incoordinated growth behavior evokes craniofacial characteristics which are significantly deviated from normal and most commonly presented as craniofacial asymmetry.

Asymmetry refers to differences in size, shape or relative symmetry between right and left sides. This can affect any part of human body or whole¹. On facial skeleton there is slight difference between right and left side which taken into account as normal and usually it remains unnoticed but deviation from marked proportionality is of great concern esthetically, anatomically and physiologically¹². Studied data shows minor asymmetries with right hemiface wider than the left side with concomitant chin deviated towards left¹. On face, mandibular asymmetries are most commonly noticed. Their causes are divided into four major groups as: developmental, traumatic, pathological and functional. Descriptive data by Profit and Severt reported it as 5% in upper face, 36% in middle third, and 74% in lower third. Their clinical evaluation included lower third of face, dental midline relationship between maxilla /mandible, gonial angle on both sides, mandibular lower border, gingival display both anterior/posterior, open bite, deep-bite, maximal inter-incisal opening and
temporo-mandibular joint symptoms.

Cleft lip and palate clinically represents usually as mid face deficiency, posterior crossbite with class III molar relationship. Available evidence on mandibular asymmetry related to cleft lip and palate is conflicting\(^1\). Morphological differences consistently coexists between unilateral and bilateral cleft lip and palate. In bilateral cleft lip and palate due to forward displacement of premaxilla there is no shortening of total depth of upper jaw. This found in contrary positive in unilateral cleft lip and palate. However, both due to marked backward displacement of maxilla shows maxillary retrusion. The total length of face is increased in bilateral cleft lip and palate with more posterior growth rotation. In unilateral cleft lip and palate the total length of face is decreased in bilateral cleft lip and palate there is more retroinclination of palate with retrusion of mandible\(^2\). It is also being studied that condylar height found to be significant\(^{p<.05}\) in this group which later discussed to be as significant factor related to symmetrical posterior vertical height of mandible. Further, there is more posterior displacement of both zygoma and orbit in this group. Because of increased retrusion of mandible the skeletal profile of bilateral cleft lip and palate is not flattened as compared to unilateral cleft lip palate\(^2\). This is also associated with increase protrusion of premaxilla. Upper incisors are more retroclined in bilateral cleft lip and palate as compared to unilateral cleft lip and palate\(^2\). Overall in unilateral cleft lip and palate asymmetry found to be more on left side than non cleft side.

According to data from the international perinatal database of typical oral clefts the total prevalence of cleft lip with or without cleft palate is 9.92 per 10,000 live births. This includes cleft lip 3.28 per 10,000. Cleft lip and palate was 6.64 per 10,000. 76.8% were isolated, 15.9% had systemic malformations and 7.3% associated with syndromes\(^4\). Cleft lip and palate not associated with any syndromic conditions are caused by an intrinsic combination of both genetic and environmental factors. This termed to be multifactorial. The developing embryo inherits genes that increases the risk of cleft lip and/or palate; such genes upon exposure to certain environmental factors later develops into cleft\(^4\).

In Pakistan prevalence of cleft lip and palate is 1 per 523 births among which cleft lip is 42%, cleft palate 24%, and combine cleft lip and palate is 34%. Boys predominates with cleft lip and combine lip/palate while girls predominates with cleft palate only\(^6\).

Overall reported cases in our tertiary care hospital includes patients from different regions of country with varying severity of cleft types both syndromic and non-syndromic. Due to growth variability among both unilateral and bilateral cleft lip and palate group there suggestive to be a consistant chance of developing facial asymmetry. Facial asymmetry is majorly evident in lower face skeleton where mandibular anatomy, morphology and position in three dimensional planes plays crucial part which later significantly affects treatment planning, decision and outcome including orthognathic surgical procedures. Therefore, our primary aim is to compare mandibular vertical asymmetry between cleft lip palate and normal subjects.

**OBJECTIVE**

To determine the mean difference in mandibular vertical asymmetry between cleft lip/palate and normal class I occlusion subjects in Pakistani population.

**METHODOLOGY**

Pretreatment panoramic radiograph of subjects were taken attending department of orthodontics at Dr. Ishrat-ul-Ebad Khan Institute Of Oral Health Sciences\[Dow University Of Health Sciences\], a major tertiary care centre in Karachi-Pakistan. The sample for this study consisted of total 64 subjects divided into two groups: Group 1 consisted of 32 subjects with repaired cleft lip and palate\[16 complete unilateral and 16 complete bilateral cleft lip and palate\]. Group 2 consisted of 32 subjects with normal facial morphology and class I occlusion\[both males and females\]. Informed consent was taken from all patients.

Inclusion criteria for cleft lip and palate group was non-syndromic subjects of either gender presenting with repaired unilateral or bilateral cleft lip and palate. Exclusion criteria included Cleft lip and palate subjects with systemic diseases, incomplete repaired palate, open fistulas, developmental or acquired craniofacial muscular deformities, autoimmune conditions, syndromes, endocrine abnormalities, neurological problems, any previous history of orthodontic treatment and signs and symptoms of temporomandibular disorders.

Inclusion criteria for normal class I subjects included skeletal base class I\[ ANB=2°±2°, SNA=82°±2°, SNB=78°±2°\]
permanent dentition with Angle’s molar classification I belonging to either gender.

Exclusion criteria included significant medical history, history of trauma or any previous treatment and surgery, impacted, missing teeth, periodontally involved teeth, subdivision molar classification, skeletal base II and III with molar class I.

Mandibular Asymmetry Index [condylar, ramal, condylar plus ramal] and gonial angle measurements were calculated on dental panoramic radiograph as depicted by Habets et al (figure 1)\(^7\)\(^8\)\(^9\). Condyle and ramus of both right and left side was drawn on cephalometric lead acetate sheets from OPG Land marks were identified as Aline connecting the most lateral point of condylar image 01 and ascending ramus marked as image 02. The distance between both indicated as Ramal height [RH]. Ramal tangent from the superior most point of the condyle image. A perpendicular line drawn from tangent above called B line. Condylar height [CH] measured from B line on A line to the 01 point. Gonial angle [GA] measured as angle formed by lines tangent to the posterior ramus and inferior border of mandible. Asymmetry indices value calculated above 3% were indicated to be as true mandibular posterior vertical asymmetry. Asymmetry indexes were calculated by following formula as:

For Condylar Asymmetry Index:
\[
\frac{[CH_{\text{RIGHT}}-CH_{\text{LEFT}}]}{CH_{\text{RIGHT}} + CH_{\text{LEFT}}} \times 100
\]

For Ramal Asymmetry Index:
\[
\frac{[RH_{\text{RIGHT}}-RH_{\text{LEFT}}]}{RH_{\text{RIGHT}} + RH_{\text{LEFT}}} \times 100
\]

For Condylar + Ramal Asymmetry Index:
\[
\frac{[CO+RH]_{\text{RIGHT}}-(CO+RH)_{\text{LEFT}}}{(CO+RH)_{\text{LEFT}}}/(CO+RH)_{\text{LEFT}}/(CO+RH)_{\text{RIGHT}}+(CO+RH)_{\text{LEFT}})\times 100.
\]

For reliability of assessment sufficient care was taken with head positioning to avoid any vertical and angular measurement errors. This signify the limit of head positioning in all direction altogether with occlusal plane not tilted more than 10 degree.

**STATISTICAL METHODS**

Statistical analysis was done by using SPSS for windows version 16. ANOVA and Mann - Whitney U test was used to calculate intergroup comparison. Paired t-test was used to calculate differences between cleft to non cleft side in unilateral cleft lip palate group. All Statistical analysis were calculated at 95% confidence level with significant P-value < .001.

**RESULTS**

Calculated descriptive statistical measurements between normal occlusion and cleft lip and palate group shows significant differences (P < .001) in both condylar and ramal asymmetry index. But over all intergroup comparison for condylar plus ramal height asymmetry Index did not show any significant result (P > .05).

While amongst the unilateral cleft lip and palate this shows both ramal height and gonial angle at cleft side to be statistically significant (P < .001). A statistical measurement shows no significant difference for gender. Results are also shown in tables I, II, and III respectively below:

**DISCUSSION**

Symmetry in mandibular morphology is key to aesthetics which compounds to the whole face both
Asymmetrically developed mandible significantly affects the facial lower third along with the developing nasomaxillary complex. Varying degree of asymmetry was found in cleft lip and palate as described by Laspos, et al, Smahel and Mullerova, et al. Overall world wide data collected on mandibular asymmetry in unilateral and bilateral cleft lip and palate is limited. Mandibular asymmetry in unilateral and bilateral cleft lip palate is inconsistent with cleft type. Developmental growth studies shows variation in relation to the craniofacial development due to differences in patterning, timing and variability factors. Genetical influences encompasses the overall period and hence rendering them unpredictable. This outcome describes physiologically enveloped adaptive mechanism.

Mandible makes up the 95% of lower facial skeleton. Lower face is also under developmental influences of cranial base and temporal fossa. Ishiguro, et al and Athanasiou, et al, described in their study about increase in mandibular breadth. This in turn found to have direct association with mandibular fossa making them both directly proportion to each other. Also Bjork, Skieller, et al. comprehensively discussed about developmental effects related to the cranial base displacement, genoid fossa remodeling, and condylar-ramal relocation with growth. Melnick et al., studied the difference between cleft and non cleft in longitudinal growth study and found no more than 0.5mm of difference. Our study shows over all mean difference in condylar height plus ramal height index not more than 3%.

Both unilateral and bilateral cleft lip and palate have also suggested possible association with number of syndromes like for example: Goldenhar, mandibulofacial dysostosis syndrome, craniosynostosis syndromes; which readily affects both cranial base and temporal region anatomy thus significantly affecting the symmetry of lower face skeleton. On contrary this is not consistent with those who do not have an association with syndromes. In individuals either with unilateral and bilateral left lip palate having no syndromic association there may found to have an associated lower face skeleton asymmetry but not to the statistically marked significant level. Our study also did not find any significant (P<.05) mandibular asymmetry as overall condylar plus ramal asymmetry index between normal and non syndromic cleft lip and palate group shows insignificant results (P>.05). Asymmetry Indices value should be above 3% to be indicated as true mandibular posterior vertical asymmetry.

It has been described variably that mandibular growth is majorly influenced by pterygoid muscle trauma due to surgery, inhibited maxillary growth and affected functional changes. But this had later found to be unaffected. Omar et al., in his 204 patient sample comparative study including complete unilateral cleft lip palate, complete unilateral lip and alveolus, and isolated palate reported no statistically significant changes related to mandibular growth.

Dental panoramic radiograph has remained the method to evaluate mandibular asymmetry as explained by Habets et al, Miller and Smidt, Kurt, et al and Uysal, et al. In descriptive study of unilateral cleft lip palate by

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<th>TABLE I: ANOVA SHOWS MEAN DIFFERENCE OF MANDIBULAR ASYMMETRY INDEX BETWEEN NORMAL AND CLEFT LIP AND PALATE GROUP:</th>
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<td>GoniAng(degree)</td>
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*P value<.05 is insignificant for both condylar plus ramal and GoniAng angle between cleft and normal group.

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<th>TABLE II: MANN -WHITNEY U TEST-SHOWS MEAN DIFFERENCE OF MANDIBULAR ASYMMETRY INDEX BETWEEN NORMAL AND CLEFT LIP AND PALATE GROUP:</th>
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*P value<.001 is significant. *P value<.05 is insignificant for both condylar plus ramal and GoniAng angle between cleft and normal group.

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<th>TABLE III: T-TEST SHOWS MEAN DIFFERENCE OF MANDIBULAR ASYMMETRY INDEX AMONG UNILATERAL CLEFT LIP AND PALATE GROUP:</th>
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*P value<.001 is significant for both ramal height and GoniAng angle between cleft and non cleft side among unilateral cleft lip and palate group.
kyrkanides and Richter et al., the degree of antigonial notching is significant factor found in mandibular and lower facial asymmetry (P<0.001)⁷,⁸,¹⁷. Jena et al; explained in their unilateral cleft lip and palate subjects that with less severe maxillary sagittal hypoplasia there found to have a statistically significant differences in both ramal and condylar plus ramal height. Further gonial angle was also significantly increased. In our study dental panoramic radiograph was taken with caution without altering head position and occlusal plane.¹⁷,¹⁸,¹⁹,²⁰,²¹,²²,²³. It shows that both the ramal height and gonial angle found to be increased with cleft side among unilateral cleft lip and palate group. This is indicative of glenoid fossa remodeling, condylar-ramal relocation and growth. Comparative study between cleft and non cleft side among unilateral cleft lip and palate by Horswell, Levent.. also concluded statistical significant difference (P<.05) in gonial angle. It was found to be increased on cleft side which later explained to be a compensatory mechanism of mandible on cleft side.²⁴,²⁵.

Our findings found to be inconsistent to this. Laspos, et al., described in their study on PA Cephalometry that asymmetry of ramal height in unilateral cleft lip and palate was significant¹⁰. Their mean differences shows no significance (p>.05) between the non cleft and cleft group. Our study also shows similar findings in this regard.

Altogether both cranial base and temporal region anomalies may involved in lower face skeleton asymmetry. Descriptive study by kurt et al., found only difference in condylar height which was statistically significant (P<.05) in bilateral cleft lip palate group.²⁷. This might suggestive of variation in one unit condylar -ramal relocation along with the developmental distinct pattern of both bone and muscles in bilateral cleft lip and palate group.

**CONCLUSION**

Mandible in both non syndromic unilateral and bilateral cleft lip/palate subjects was found to be similar to normal subjects. However there was a difference in condyle, ramus and gonial angle between cleft and non-cleft side in unilateral cleft lip and palate subjects.

**REFERENCES**