Comparison of Intercanine and Intermolar Width Between Cleft Lip Palate and Normal Class I Occlusion Group

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ABSTRACT

Objective: To determine the mean difference of arch dimensions (both intercanine and intermolar width) between cleft lip palate and normal class I occlusion group.

Study Design: Cross-sectional analytic study.

Place and Duration of Study: Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, [Dow University of Health Sciences (DUHS)], Karachi, from March 2012 to April 2013.

Methodology: Group 1 consisted of 32 subjects with complete repaired, non-syndromic unilateral and bilateral cleft lip palate. Group 2 consisted of 32 subjects with normal facial morphology and class I occlusion. Exclusion criteria were cleft lip palate subjects with systemic diseases, any arch expansion procedure, incomplete repaired palate, open fistulas, developmental or acquired craniofacial muscular deformities, autoimmune conditions, syndromes, endocrine abnormalities, neurological problems, or previous history of orthodontic treatment and signs and symptoms of temporomandibular disorders, history of trauma, impacted or missing teeth, periodontally involved teeth, subdivision molar classification, skeletal base II and III with molar class I. The transverse width (intercanine and intermolar width) of dental casts was measured with the help of digital caliper. The intercanine width was measured between cusp tips of the canine while the intermolar width distance was measured between mesiobuccal cusp tips of first molars, and buccal grooves of the mandibular first molars in both cleft lip palate and normal class I occlusion group, respectively.

Results: There were 64 subjects with mean 14.7 ±6.8 years in the cleft palate and 14.7 ±6.3 years in the normal group. There was statistically significant differences found between intercanine and intermolar width in maxillary arch (p < 0.001). In mandibular arch, only intercanine width has showed significant difference (p < 0.001) between cleft and normal occlusion class I group.

Conclusion: Maxillary and mandibular intercanine width was found to be significantly reduced in cleft lip palate group (both unilateral and bilateral) as compared to normal class I occlusion group.

patients referred to dental, orthodontic department for routine orthodontic treatment after surgical lip repair and before comprehensive orthodontic treatment at Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, (DIEKIOHS), [Dow University of Health Sciences (DUHS)], a major tertiary care center in Karachi, Pakistan, from March 2012 to March 2013. Informed consent was taken from all patients. Orthodontic pre-treatment study casts of consecutive subjects were taken, who were attending department of orthodontics. The sample for this cross-sectional study consisted of total 64 subjects with age 14 - 16 years [both cleft and normal mean age group 14.7 ±0.68 years; 50% cleft and 50% normal subjects], divided into two groups: Group 1 consisted of 32 subjects with cleft lip palate [16 complete unilateral and 16 complete bilateral cleft lip palate]. Group 2 consisted of 32 subjects with normal facial morphology and class I occlusion (both males and females). Inclusion criteria for cleft lip palate subjects included: Complete repaired lip palate, non-syndromic unilateral and bilateral cleft lip and palate both males and females with age 14 - 16 years (mean age cleft group 14.7 ±0.68 years).

Exclusion criteria include: Cleft lip palate subjects with systemic diseases, any arch expansion or orthodontic procedure, incomplete repaired palate, open fistulas, developmental or acquired craniofacial muscular deformities, autoimmune conditions, syndromes, endocrine abnormalities, neurological problems, or previous history of orthodontic treatment and signs and symptoms of temporomandibular disorders.

Inclusion criteria for normal class I subjects include: Skeletal base class I [ANB=2°±2°, SNA=82°±2°, SNB=78°±2°]. Angle molar classification I, permanent dentition; both males and females age 14 - 16 years (mean age normal group 14.7 ±0.63 years).

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

The transverse width (intercanine and intermolar width) of dental casts were measured according to Staley et al. with the help of digital caliper to the nearest of 0.01 mm. The intercanine width was measured between cusp tips of the canine while the intermolar width distance was measured between mesiobuccal cusp tips of first molars, and buccal grooves of the mandibular first molars in both cleft lip palate and normal class I occlusion group, respectively.

The collected data was analyzed using SPSS.17 Windows version. Statistical analysis was done by independent sample t-test to find overall mean difference between cleft and normal occlusion class I group. In order to generate p-value (p < 0.001), with confidence interval of 95%, all clinical and cast analyses were measured by researcher herself. To avoid intra-observer measurement errors, study casts were randomly measured after one week. The collection of data was done on data collection sheet.

RESULTS

There were statistically significant differences found for intercanine width in both maxillary and mandibular arch (p < 0.001) between cleft lip palate and normal occlusion class I group. Maxillary arch in cleft lip palate patients was found to be narrow and constricted. While in mandible, only intercanine width shows statistically significant differences (p < 0.001) between both groups. Cleft lip palate group have shown narrow width in mandible at canine area but not at posterior molar site. The results are also shown in Table I.

Table I: Mean difference between intercanine and intermolar width between cleft and normal occlusion class I group.

<table>
<thead>
<tr>
<th></th>
<th>Cleft</th>
<th>Normal</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxillary intercanine width</td>
<td>26.3 ±4.0</td>
<td>36.3 ±0.73</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Maxillary intermolar width</td>
<td>40.9 ±3.7</td>
<td>44.2 ±1.7</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Mandibular intercanine width</td>
<td>24.5 ±1.9</td>
<td>35.5 ±0.84</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Mandibular intermolar width</td>
<td>41.6 ±1.1</td>
<td>42.0 ±0.89</td>
<td>0.15</td>
</tr>
</tbody>
</table>

* P < 0.05 is significant.

DISCUSSION

Cleft lip palate manifests themselves with varying group of anomalies and syndromes. These include eye, ear, maxilla, mandible and general body organ system, commonly cardiac and neurogenic problems. Their characteristics, facial features include midface deficiency, transverse, antero-posterior arch collapse, and cross bite both in anterior and posterior segments.1-4 Their occlusal characteristics showed constant changes as compared to normal control group. Arch dimensions tend to be reduced in both unilateral and bilateral cleft lip palate. This was found to be more significant at intercanine level.5-8 Orthodontic treatment is provided to correct occlusal dysfunction and disharmony. Both removable and fixed expansion appliances are significant part of their treatment planning.

Garrathy et al. showed in his early assessment of unilateral cleft lip palate subjects that there was reduced maxillary intercanine width as compared to intermolar width, while mandibular arch width did not show any significant arch width change.8 Our results have also showed reduced maxillary intercanine width in unilateral cleft lip palate (p < 0.001); but mandibular intermolar width did not show any significant value (p > 0.05). Bishara et al. in their growth developmental study reported that more increase in arch length and width presented at 2 years of age.9,10 Intercanine width continued till 13 years in maxillary arch and 8 years in mandibular arch. Deteriorating factors associated with
anterior arch dimension include early cheiloplasty and for posterior segment push back palatoplasty.11 Yamanishi et al. studied the effect of early two-stage palatoplasty with modified furlow technique associated with increase antero-posterior palatal length with catch-up growth later.12 This was not found to be with the Wardill-Kilner push back palatoplasty. Our collected data included repaired unilateral and bilateral cleft lip and palate having no prior orthodontic expansion or fixed appliance therapy. They showed significant reduction in both intercanine and intermolar width related to two-stage palatoplasty and surgical lip repair. This might indicate that cleft type and severity vary from individual to individual so that surgical procedures and modification required constant evaluation in this regard. Athanasiou et al. in his longitudinal study studied that maxillary intercanine width is significantly reduced in unilateral cleft lip palate, while mandibular arch did not significantly showed any overall change in dimension.13 Our results have no significant difference relating to intermolar width in mandible of cleft lip palate group (p > 0.05). The detailed studies of cleft lip palate above 12 years of age discussed that they have significantly reduced arch dimensions which included both intercanine and intermolar width in both arches.8,14,15

Among unilateral and bilateral cleft lip palate group, bilateral cleft lip palate presents with more severe deficiency in midface region, negative over jet, posterior cross bites, maxillary tooth agenesis, maxillary incisor palatoverision, and mesiopalatal rotation of maxillary molar. Heidbuchel in longitudinal study of bilateral cleft lip palate has shown mean arch dimensions significantly reduced in maxillary arch while in mandibular arch, smaller differences were found at intermolar area for age 12 years.7-9 Our unilateral cleft lip and palate group had significant mean reduction in both intermolar and intercanine width (p < 0.001), except intermolar width in bilateral cleft lip and palate group. This might indicative of severe occlusal disharmony developed later due to midfacial deficiency and limited sample size. Orthodontic maxillary arch expansion is reported to be a common part of treatment in both unilateral and bilateral cleft lip palate group. But this is also found to be more associated with relapse. There are significant factors related to it. These factors included cleft type, cleft severity, arch narrowness, alveolar bone graft done or not, early lip surgeries, palate repair, scar tissue, retention type and duration etc.10,11 Intercanine width is found to be associated more as compared to intermolar width.15-17 Further, Da Silva et al. in his study have briefly explained that gender did not affect arch dimensions rather this was related more towards cleft and its morphology.18

Currently available research data presents with significant limitations. There is a significant need of longitudinal analysis which describes differences between arch dimensions both at pre-treatment and post-treatment stages. The studies show limited sample and inconsistent age groups, as controls are not of the same age. Further, there is no long-term data available with adequate follow-ups both in unilateral and bilateral cleft lip palate groups. This is related to surgical procedures employed, modified, detailing or comparison for both pre-treatment and post-treatment linked to arch dimensions. This study also show limitations related to sample size, and three dimensional views at each stage of treatment and their long-term outcomes among the treated groups.

CONCLUSION

Maxillary arch is significantly narrower in both unilateral and bilateral cleft lip palate as compared to normal occlusion class I group. Both maxillary intercanine and intermolar width was found to be significantly reduced in both unilateral and bilateral cleft lip palate group as compared to normal class I occlusion group. which is suggestive of narrow and deficient maxilla due to deficient fusion of maxillary process. In mandibular arch, only intercanine width was found to be reduced significantly (p < 0.001) in both unilateral and bilateral cleft lip palate group as compared to normal class I occlusion group. This is mostly indicative of subsequent adaptation with anteriorly deficient cleft maxilla.

REFERENCES


