2017 Annual Session

2017 Annual Session  |  April 21-25  |  San Diego, California
University of Campania “Luigi Vanvitelli”
Postgraduate Program in Orthodontics
Chairman: Prof. Letizia Perillo

Cleft Lip and Palate:
3D Maxillary Morphology Changes

Letizia Perillo
CLP MAXILLARY MORPHOLOGY: A 3D EVALUATION

outline

#1 Literature Review

#2 3D Evaluation Approach

#3 Maxillary Morphology Comparison: Cleft vs Non-Cleft Subjects

#4 Clinical Cases

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CLP is a craniofacial malformation due to the failure of fusion of the maxillary processes and/or palatal shelves during the 4th - 12th week of embryogenesis.

Mossey et al, 2009
Martinez-Ten et al, 2012
CLP reflects the complexity and diversity of the mechanisms involved at molecular level during embryogenesis.
CLP : 3D MAXILLARY MORPHOLOGY CHANGES

etiology

genetic and environmental factors often act in association

MTHFR 677T allele ⇔ Folic acid deficiency

MTHFR 1298C allele ⇔ Alcohol consumption

Hayes, 2002
Murray, 2002
Czeizel and Bànghidy, 2010
Bezerra et al, 2014
1. CLEFT OF PRIMARY PALATE  
   (lip - alveolus)  

2. CLEFT OF PRIMARY AND SECONDARY PALATE  
   (lip - alveolus - hard - soft palate)  

3. CLEFT OF THE SECONDARY PALATE  
   (hard - soft)
Cleft is the most common craniofacial malformation that an orthodontist will encounter.

**CLP : 3D MAXILLARY MORPHOLOGY CHANGES**

**epidemiology**

1/700 in the rest of the world

1/1000 in Italy

Kawakami et al, 2002

Mossey and Castilla, 2003

Bernheim et al, 2006

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Prevalence:
- Cleft lip: 21.5%
- Cleft palate: 45.5%
- Cleft lip & palate: 33%

Thornton et al., 1996
Rodriguez et al., 2009
CLP : 3D MAXILLARY MORPHOLOGY CHANGES

multidisciplinary approach

from birth until adulthood

necessary to achieve a proper occlusion and better esthetics

Maxillofacial Surgeon
Gynecologist
Sonographer
Neonatologist
Pediatrician
Geneticist
Psychologist
Social Worker
Nutritionist
Otorhinolaryngologist
Speech Therapist
Plastic Surgeon
General Practitioner
Anesthetist
Radiologist
Pedodontist
Orthodontist
Periodontist
Implantologist
Prosthodontist

Christensen et al, 2004
Okada et al, 2014

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...children without smiles
are like a garden without flowers!
CLP: 3D MAXILLARY MORPHOLOGY CHANGES

Problem List

DENTAL
- Class II or III relationship
- Agenetic, rotated, anomalous incisors

SKELETAL
- Class II or III relationship
- Hypo-hyperdivergent pattern

COMMON DENOMINATOR

Anomalous upper arch and palate morphology

ESTHETIC
- Convex or concave profile

FUNCTIONAL
- Speech and/or oral breathing

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aim
using 3D analysis
to compare upper dental arch and palate morphology
in untreated unilateral cleft vs untreated non-cleft
in mixed dentition phase
to examine arch width, palatal area and volume
Anna, 9 yrs and 11 mos

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**CLP : 3D MAXILLARY MORPHOLOGY CHANGES**

<table>
<thead>
<tr>
<th>ARCH WIDTH (mm)</th>
<th>ANNA Values</th>
<th>CONTROL M ± SD</th>
<th>DIFFERENCE</th>
</tr>
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<tbody>
<tr>
<td>Intercanine cusp</td>
<td>25</td>
<td>33.0 ± 2.3</td>
<td>-8</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>24.2%</td>
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<tr>
<td>Intercanine ging</td>
<td>20</td>
<td>25.5 ± 1.8</td>
<td>-5.5</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>21.5%</td>
</tr>
<tr>
<td>Intermolar cusp</td>
<td>46</td>
<td>48.0 ± 11.8</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>4.1%</td>
</tr>
<tr>
<td>Intermolar ging</td>
<td>30</td>
<td>32.8 ± 8.2</td>
<td>-2.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.5%</td>
</tr>
<tr>
<td>PALATAL AREA (mm²)</td>
<td>753</td>
<td>776.9 ± 163.7</td>
<td>-23.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>PALATAL VOLUME (mm³)</td>
<td>2694</td>
<td>2871.4 ± 898.7</td>
<td>-177.4</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>6.1%</td>
</tr>
</tbody>
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[Graphical representations of measurements]
Anna,
9 yrs and 11 mos before...

Anna,
14 yrs and 1 mo ...after
CLP : 3D MAXILLARY MORPHOLOGY CHANGES

before and after treatment

<table>
<thead>
<tr>
<th>DIFFERENCE</th>
<th>Values</th>
<th>%</th>
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<td>ARCH WIDTH (mm)</td>
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<td>Intercanine cusp</td>
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<td>35</td>
</tr>
<tr>
<td>Intercanine ging</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>Intermolar cusp</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>Intermolar ging</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>PALATAL AREA (mm²)</td>
<td>753</td>
<td>992</td>
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<tr>
<td>PALATAL VOLUME (mm³)</td>
<td>2694</td>
<td>4563</td>
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</tbody>
</table>

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Anna, 16 yrs and 1 mo

2 yrs after treatment

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Anna, today
Hetty, 11 yrs and 6 mos

Inter-disciplinary approach of a patient with an unilateral cleft lip and palate
Perillo L, Vitale M, d’Apuzzo F, Isola G, Nucera R, Matarese G
AJODO-D-16-0066R1
<table>
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<th>HETTY Values</th>
<th>CONTROL M ± SD</th>
<th>DIFFERENCE Values</th>
<th>%</th>
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<tr>
<td><strong>ARCH WIDTH (mm)</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intercanine cusp</td>
<td>24</td>
<td>33.0 ± 2.3</td>
<td>-9</td>
<td>27.2%</td>
</tr>
<tr>
<td>Intercanine ging</td>
<td>18</td>
<td>25.5 ± 1.8</td>
<td>-7.5</td>
<td>29.4%</td>
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<tr>
<td>Intermolar cusp</td>
<td>46</td>
<td>48.0 ± 11.8</td>
<td>-2</td>
<td>4.1%</td>
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<tr>
<td>Intermolar ging</td>
<td>30</td>
<td>32.8 ± 8.2</td>
<td>-2.8</td>
<td>8.5%</td>
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<tr>
<td><strong>PALATAL AREA (mm²)</strong></td>
<td>700</td>
<td>776.9 ± 163.7</td>
<td>-76.9</td>
<td>9.8%</td>
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<tr>
<td><strong>PALATAL VOLUME (mm³)</strong></td>
<td>2586</td>
<td>2871.4 ± 898.7</td>
<td>-285.4</td>
<td>9.9%</td>
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</table>
Hetty,
11 yrs and 6 mos before...

Hetty,
14 yrs and 6 mos ...

...after

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### CLP : 3D MAXILLARY MORPHOLOGY CHANGES

**before and after treatment**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Before</th>
<th>After</th>
<th>Difference</th>
<th>%</th>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intercanine cusp</td>
<td>24</td>
<td>24</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Intercanine ging</td>
<td>18</td>
<td>18</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Intermolar cusp</td>
<td>46.5</td>
<td>49.5</td>
<td>+3</td>
<td>6.5%</td>
</tr>
<tr>
<td>Intermolar ging</td>
<td>30</td>
<td>33.5</td>
<td>+3.5</td>
<td>11.7%</td>
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<tr>
<td><strong>PALATAL AREA (mm²)</strong></td>
<td>700</td>
<td>700</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>PALATAL VOLUME (mm³)</strong></td>
<td>2586</td>
<td>3160</td>
<td>574</td>
<td>22.2%</td>
</tr>
</tbody>
</table>

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Hetty, today

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