CLP MAXILLARY MORPHOLOGY: A 3D EVALUATION

1. Literature Review
2. 3D Evaluation Approach
3. Maxillary Morphology Comparison: Cleft vs Non-Cleft Subjects
4. Clinical Cases

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CLP (Cleft Lip and Palate) is a craniofacial malformation due to the failure of fusion of the maxillary processes or palatal shelves during the 4th to 12th week of embryogenesis.

**Definition and Timing**

Mossey et al., 2009
Martinez-Ten et al., 2012

**Etiology**

CLP reflects the complexity and diversity of the mechanisms involved at the molecular level during embryogenesis.

Hayes, 2002
Murray, 2002
Czeizel and Banhidy, 2010

**Classification**

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

Hayes, 2002
Murray, 2002
Czeizel and Banhidy, 2010
Bezerra et al., 2014

**Epidemiology**

Kawakami et al., 2002
Incidence 1/1000
Prevalence 1/700

Rodriguez et al., 2009
Thornton et al., 1996
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multidisciplinary approach

General Practitioner
Gynecologist
Sonographer
Neonatologist
Pediatrician
Geneticist
Psychologist
Social Worker
Nutritionist
Otorhinolaryngologist

Speech Therapist
Plastic Surgeon
Maxillofacial surgeon
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!

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orthodontic treatment

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orthodontic treatment... If?

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Orthodontic treatment...When?

As soon as the malocclusion is diagnosed

Marco, 6 yrs

As soon as the patient is able to cooperate

Silvia, 7 yrs

To improve facial esthetics

- Treatment does not always improve facial appearance
- Cleft patients are considered less attractive even after treatment
- Patients and parents are more satisfied with the outcome

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Marco, 6 yrs

Silvia, 7 yrs

WHY?

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2. **To improve dental esthetics**

   an interdisciplinary treatment protocol can significantly improve occlusion

3. **To avoid psychological problems**

   CLP children suffer psychosocial consequences due to their facial appearance

   CLP faces are looked at differently

   There is a clear need for psychological support

4. **To improve speech**

   Speech is one of the most important issues for cleft children

5. **To decrease risk of decay**

   Cleft children
   - are more susceptible to caries and periodontal diseases
   - have poor oral hygiene
   - have unmet needs

6. **To make surgery less invasive**

   - major ortho-surgery can generate psychological disorders
   - incerteping early reduces the risk of future major surgery

<table>
<thead>
<tr>
<th>Author</th>
<th>No</th>
<th>Cleft</th>
<th>Age</th>
<th>Treatment</th>
<th>Time (mo)</th>
<th>SNA (°)</th>
<th>ANB (°)</th>
<th>U1 (°)</th>
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orthodontic treatment... Why?

7. To achieve dento-skeletal transversal changes

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<th>Author</th>
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<td>21</td>
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LONG TERM OUTCOME (25%)

| Façanha et al 2014 | 25 | Uni | 10.8 | Haas Hyrax | 6 | 4.8 | 6.7 | 6.1 |
| Figueiredo et al 2014 | 10 | Uni | 11.3 | Fan-type Mini Hyrax | 3 | 4.7 | 6.1 | 3.2 |

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orthodontic treatment... How?

Phase I: Maxillary Expansion + Maxillary Protraction

- Hyrax: Trindade-Suedam et al, 2015
- Inv mini Hyrax + TPA: Figueiredo et al, 2014
- Fan Type + TPA: Figueiredo et al, 2014
- Modified Haas: Trindade-Suedam et al, 2014

Phase II: Fixed appliances

- Class II or III elastics
- Extractions when needed

Phase III: Retention

- Upper lingual arch retainer
- Lower fixed retainer

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orthodontic treatment

How?

Phase I: Maxillary Expansion &
Maxillary protraction or Mandibular growth control

- Bonded expander/Hyrax
- Delaire or chin cup

Phase II: Fixed appliances

- Class II or III elastics
- Extractions when needed

Phase III: Retention

- Upper lingual arch retainer
- Lower fixed retainer

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2D methodology

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Diagnosis

DENTAL
- Anomalous arch form
- Anterior or posterior crossbite
- Delayed upper incisor eruption
- Agenetic, rotated, abnormal incisors
- Class II or III relationship

SKELETAL
- Maxillary deficiency
- Crossbite
- Class II or III relationship
- Hypo-hyperdivergent pattern

ESTHETIC
- Concave, straight or convex profile
- Upper/lower lip retraction

FUNCTIONAL
- Speech
- Oral breathing

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LIMITED TIME-CONSUMING

Athanasiou et al, 1987, 1988
Lewis et al, 2008
Heidbuchel et al, 1998
Garrahy et al, 2005
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3D studies

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3D studies comparison with other 3D studies

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<th>Author</th>
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<th>Untreated NCLP</th>
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aim
To compare maxillary morphology in untreated unilateral cleft vs untreated non-cleft in mixed dentition phase using 3D analysis to examine width, palatal area and volume

UCLP
NCLP

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selection criteria

19 Untreated CLP unilateral cleft
Department of Orthodontics
Second University of Naples

- sex: 9 girls 10 boys
- age: 9.08 ± 1.63
- mixed dentition
- same surgeon and procedures
- high quality dental casts

19 Untreated NCLP non-cleft
Department of Paedodontics
Dental Polyclinic Kranj, Slovenia

- normal occlusion
- high quality dental casts

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method

dental study cast
3D digital image

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cast analysis: maxillary arch

intercanine width
cusp level
intermolar width
gingival level

Primozic et al, 2013
Hayashii et al, 2015

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Cast analysis: palate

2006 software

Gingival plane - Palate boundaries - Distal plane

Primozic et al, 2013

Anna, 9 yrs and 11 mos

Davide, 8 yrs and 6 mos

Netty, 11 yrs and 6 mos

Chiara, 19 yrs and 1 mo

Second University of Naples
Postgraduate Program in Orthodontics
Head and chairman: Prof. Letizia Perillo

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letizia.perillo@unina2.it