

The embryology of cleft lip and palate and the effect of growth and development in the management of the cleft patient.

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Objective

- Anatomy
- Development
- Sequence of treatment
- Representative cases

A team for the multidisciplinary treatment of a child with an orofacial cleft includes the following specialists

- Pediatrician
- Plastic surgeon
- Pediatric dentist
- Otolaryngologist
- Geneticist
- Genetic counselor
- Speech pathologist
- Orthodontist
- Maxillofacial surgeon
- Social worker
- Psychologist

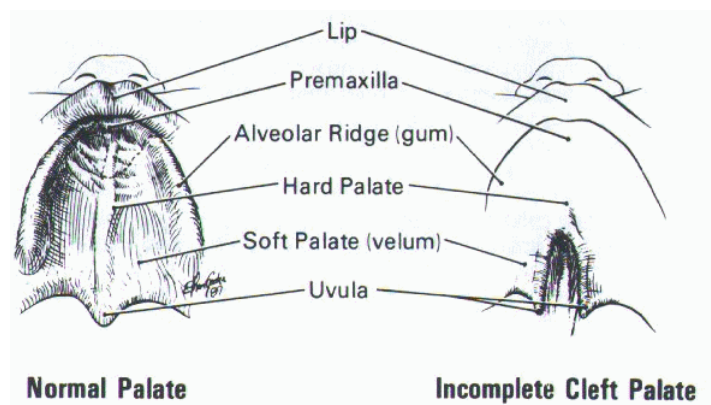
Frequency

- 1 in ~750 live births
- More in males than females
- Racial
 - The lowest rate is for blacks.
 - A high prevalence of CL/P was found for the Asian population.
 - The highest prevalence was found for the North American Indian populations.

Clefts

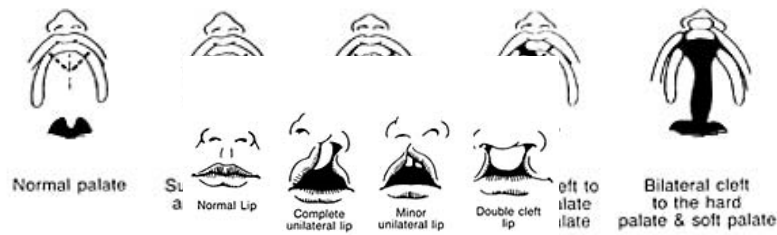
- Clefts of lip or palate occur at different times during development.
 - Lip closure- occurs at 7-9 weeks gestation
 - Palate closure- occurs at 9-11 weeks gestation
- May be different genetic mechanism involved
 - CL with or without CP – more common in males
 - CP only more common in females

Anatomy

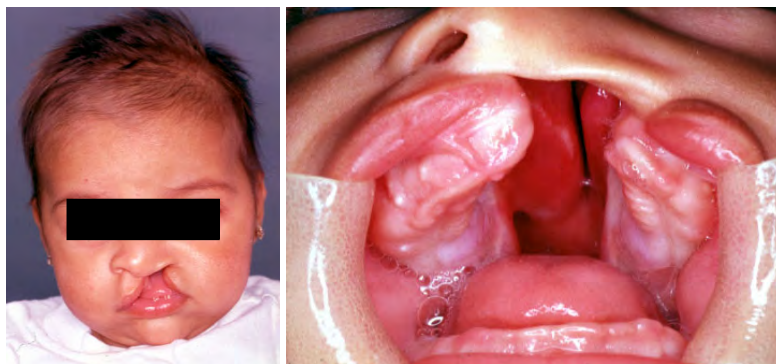


Types

The cleft may affect only the upper lip, or it may extend more deeply into the maxilla and the primary palate.



Unilateral cleft lip and palate



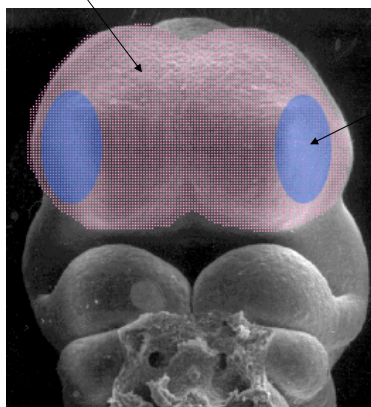
Bilateral cleft lip and palate



Embryology

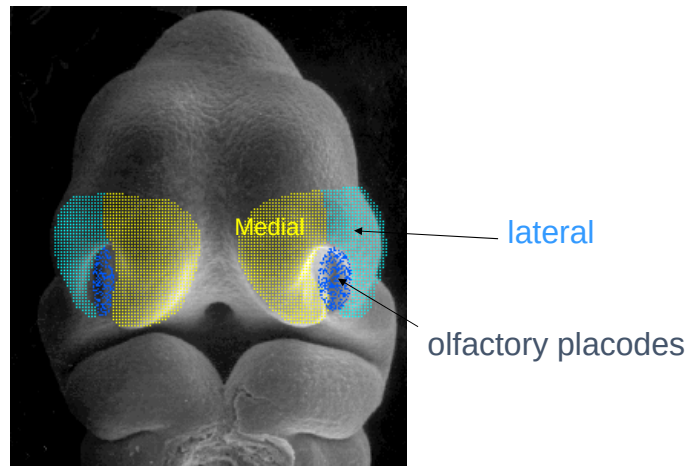
- In facial morphogenesis, **neural crest** cells migrate into the facial region, where they form the skeletal and connective tissue and all dental tissues except the **enamel**.
- The upper lip is derived from *medial nasal and maxillary processes*.
- Failure of merging between the medial nasal and maxillary processes at the fifth week of embryonic development, on one or both sides, results in CL.
- CL usually occurs at the junction between the central and lateral parts of the upper lip on either side.

frontonasal prominence

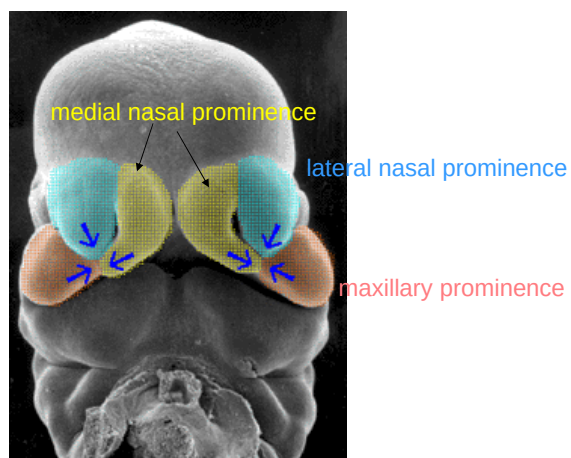


olfactory placodes

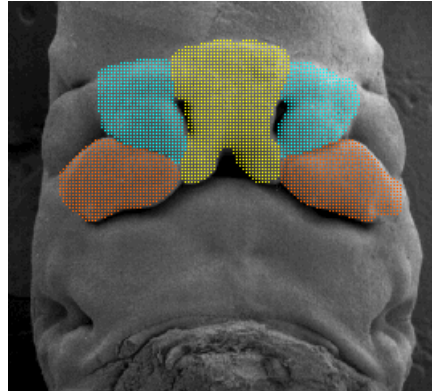
In the fifth week of human gestation, the olfactory placodes line the nasal pits. **Medial** and **lateral** nasal prominences form around the nasal pits.



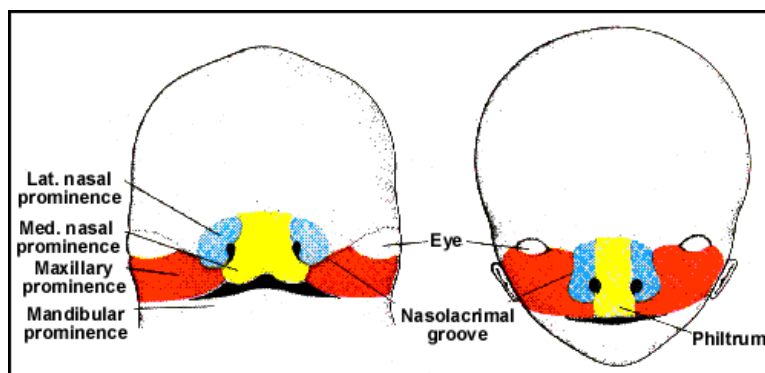
Union of the **medial nasal prominence** with the **lateral nasal prominence** and **maxillary prominence** is required for normal development of the upper lip.



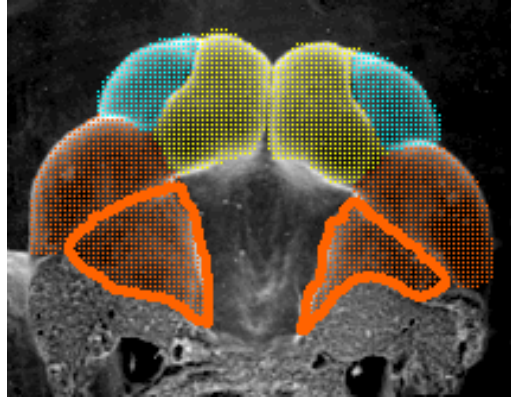
The **medial nasal prominences** merge in the midline to smooth the median furrow.



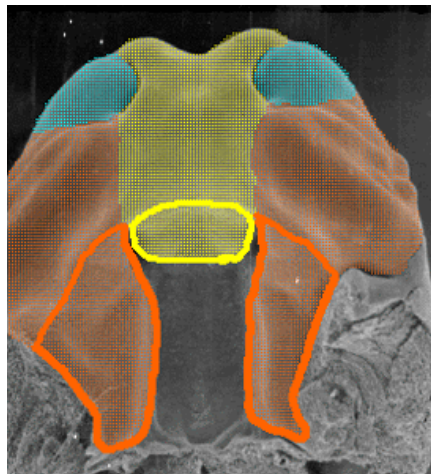
Contribution of each of the prominences to the face is illustrated



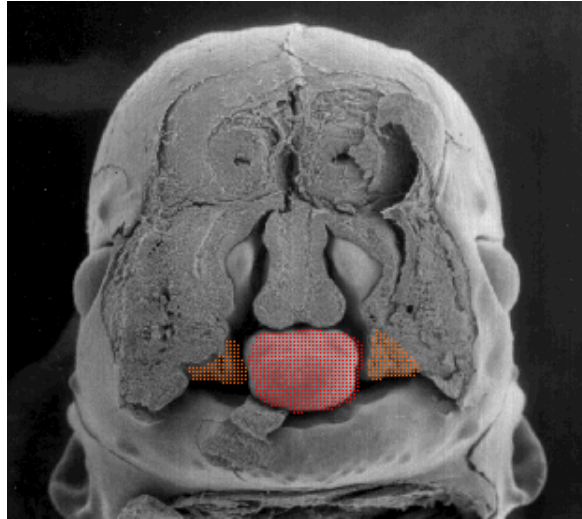
The secondary palatal shelves (outlined) are considered to be part of the **maxillary prominences**.



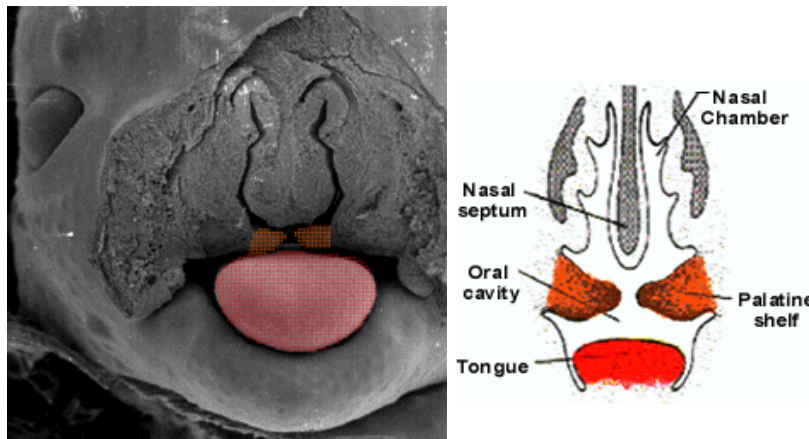
The **medial nasal prominences** contribute the tissues that will form the anterior part of the palate, the primary palate (circled).



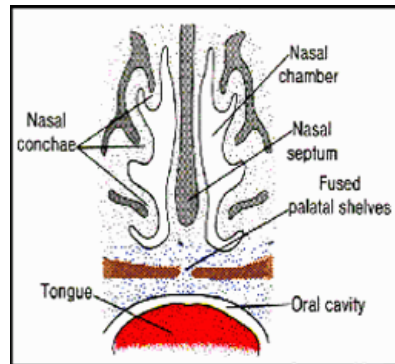
A frontal cut illustrates that the **tongue** is initially interposed between the secondary palatal shelves.



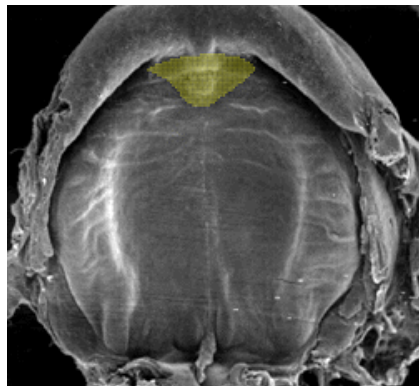
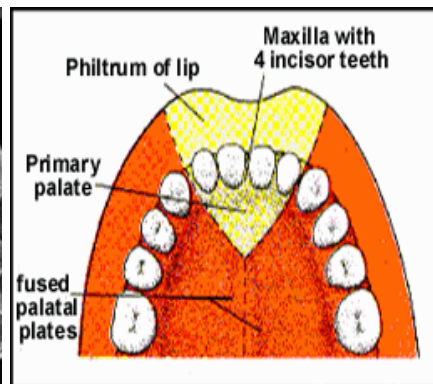
The palatal shelves become positioned above the tongue to allow for fusion in the midline.



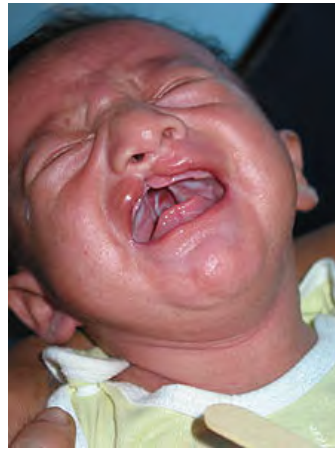
Fusion of the palatal shelves with each other and with the nasal septum separates the nasal cavities from the oral cavity.



The four maxillary incisors develop within the **primary palate**.



Appearance



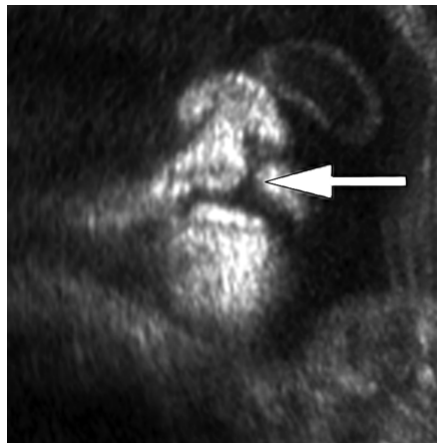
Repair



Below is the most common treatment protocol presently used in most cleft treatment centers

- **Newborn –**
 - diagnostic examination
 - general counseling of parents
 - feeding instructions, palatal obturator (if necessary);
 - genetic evaluation and specification of diagnosis
 - empiric risk of recurrence of cleft calculated
 - recommendation of a protocol for the prevention of a cleft recurrence in the family
- **Age 3-6 months - Repair of CL (and placement of ventilation tubes)**
- **Age 6 months - First speech evaluation**
- **Age 9 months - Speech therapy begins**

Magnetic resonance imaging (MRI)



Can also use sonogram

Treatment protocol

- Age 9-12 months - Repair of CP (placement of ventilation tubes if not done at the time of CL repair)
- Age 7-8 years - Alveolar bone graft
- Older than 8 years - Orthodontic treatment
- Other surgical procedures can be performed in patients with severe clefts as necessary

Summary

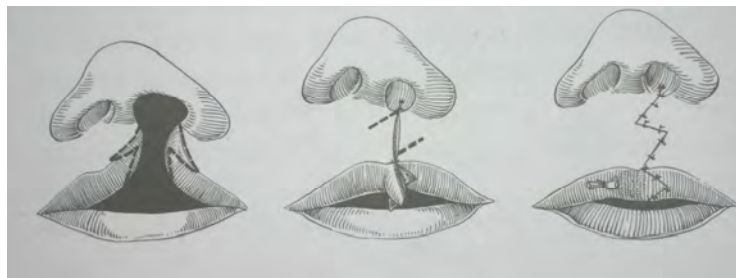
- Primary repair- repaired at approximately 4-6 months
- Palatal repair- repaired at approximately 9-12 months
- Secondary repair- if needed- repaired at approximately 4-6 years
- Alveolar cleft- repaired at 8-10 years
- Final repair- if needed repaired at 14-16 years

Impaired dental and facial growth

- Lip surgery
- Palatal surgery
- Surgical technique
- Age of child at time of palatal surgery
- Different treatment centers
- Technical skill of surgeon

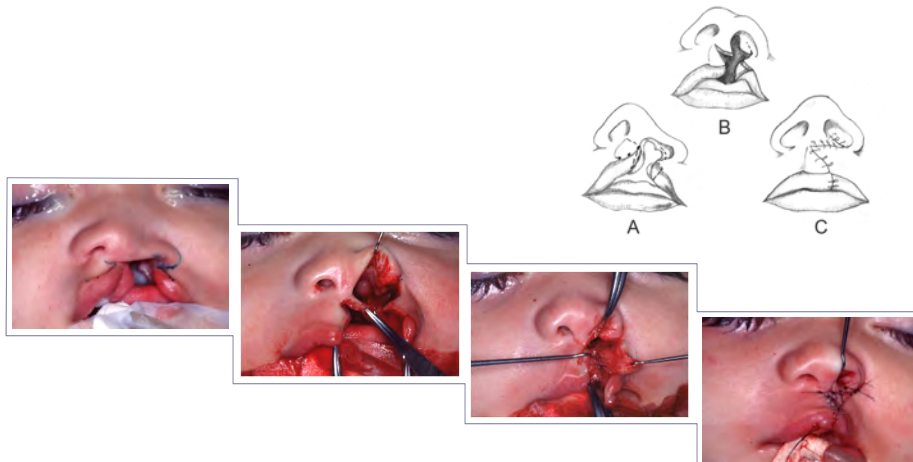
Lip Repair...

Spina technique



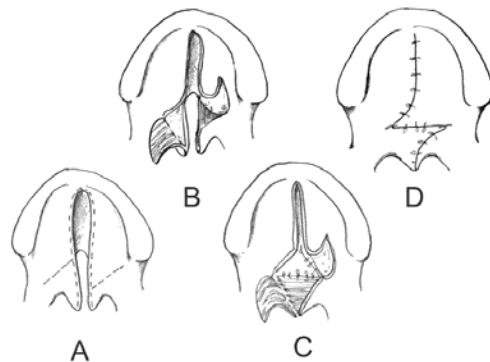
Lip repair...

Millard rotation-advancement



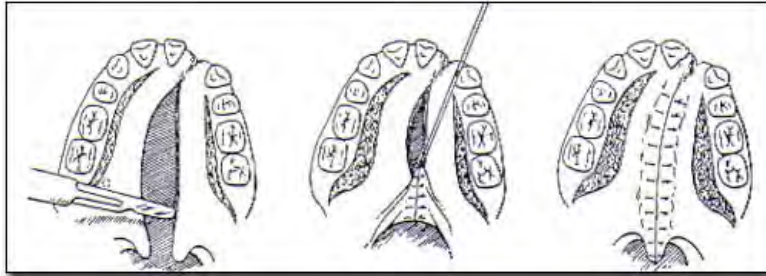
Palate repair

Furlow "double-opposing Z-plasty"



lengthens the soft palate without requiring tissue from,
or lateral relaxing incisions in, the hard palate

Palate repair von Langenbeck



In an attempt to improve velopharyngeal function for speech, the intravelar velarplasty are designed to reposition the palatal muscles for better function.



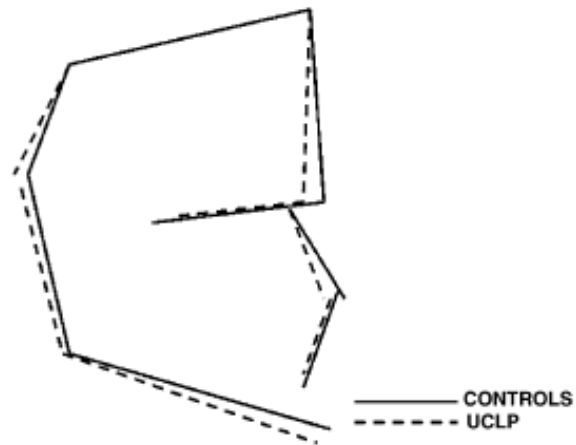
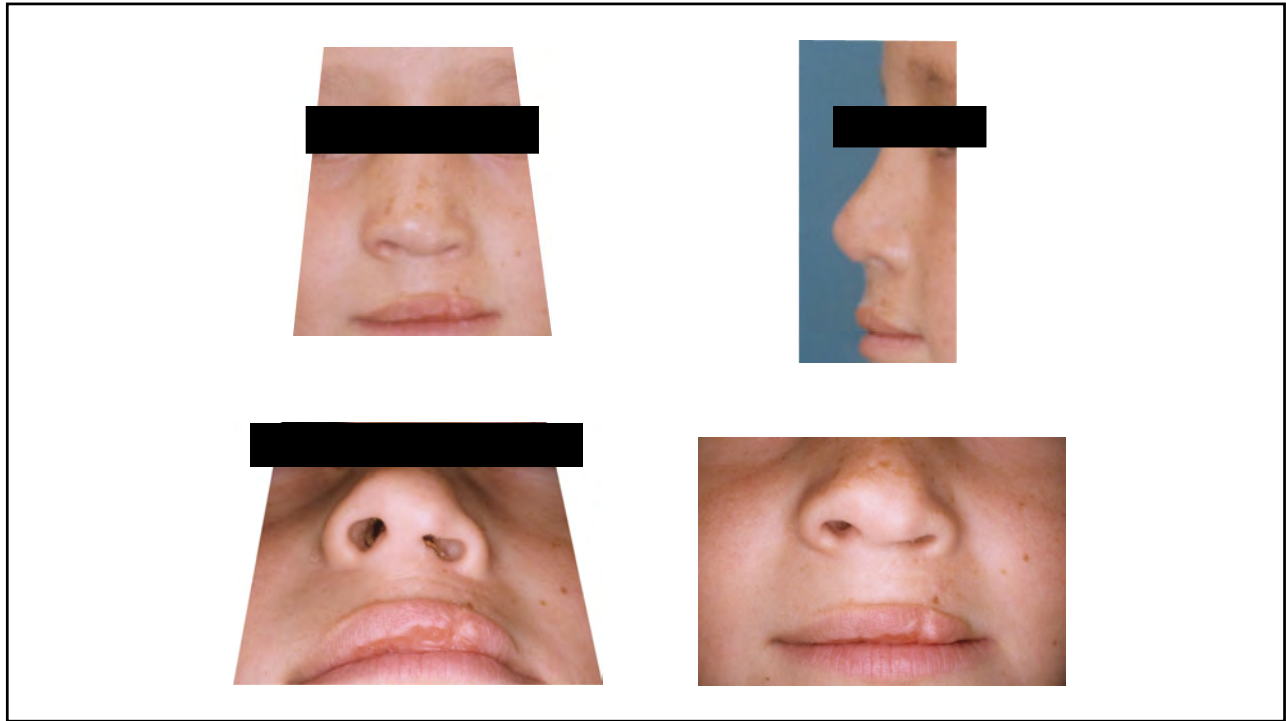
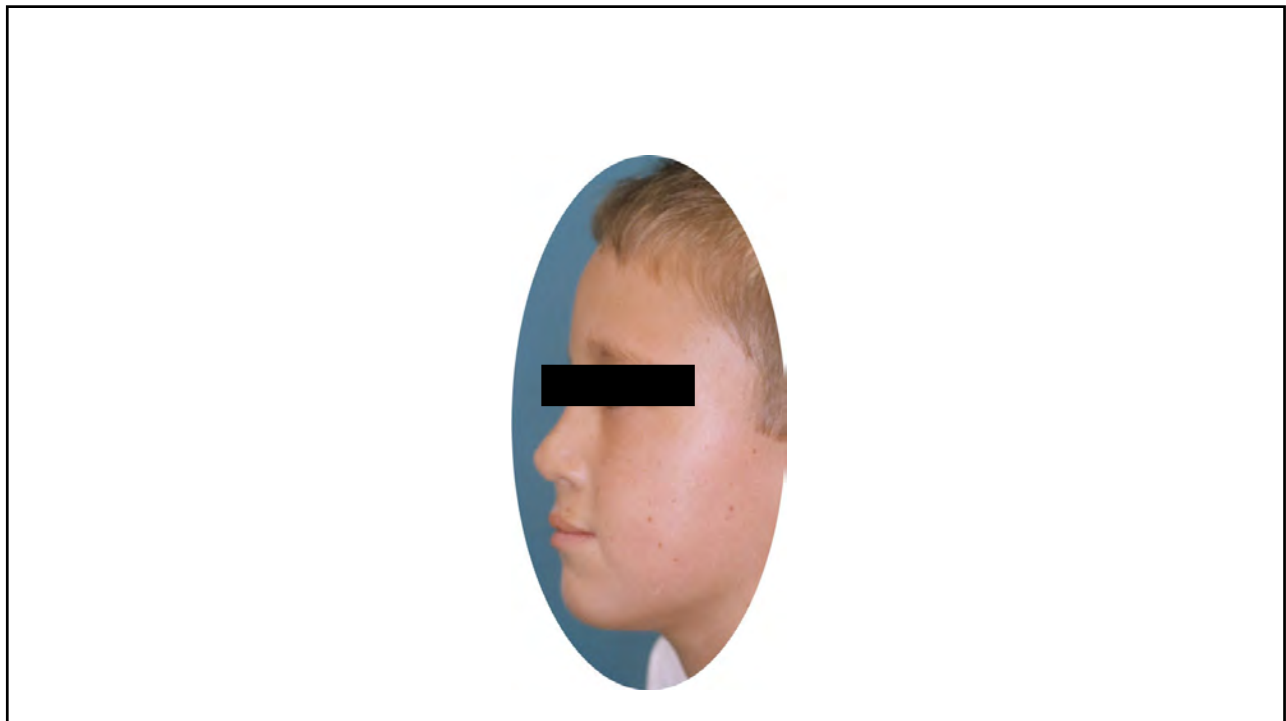
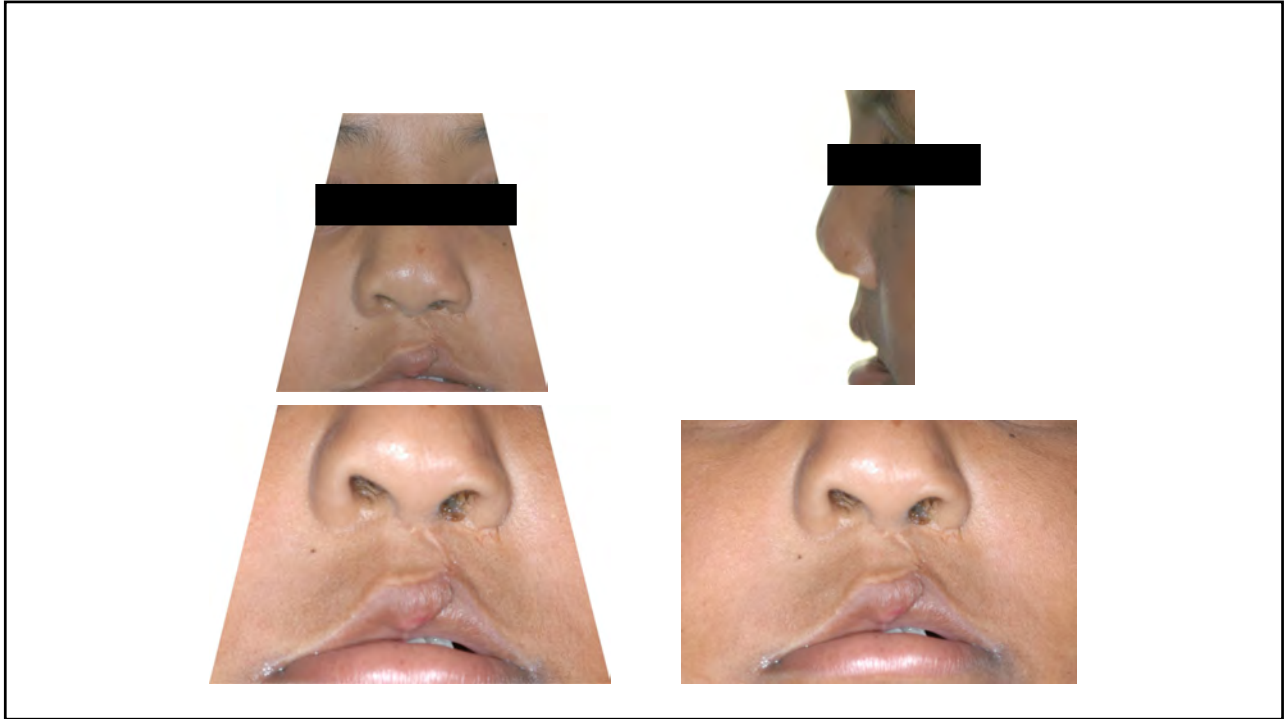
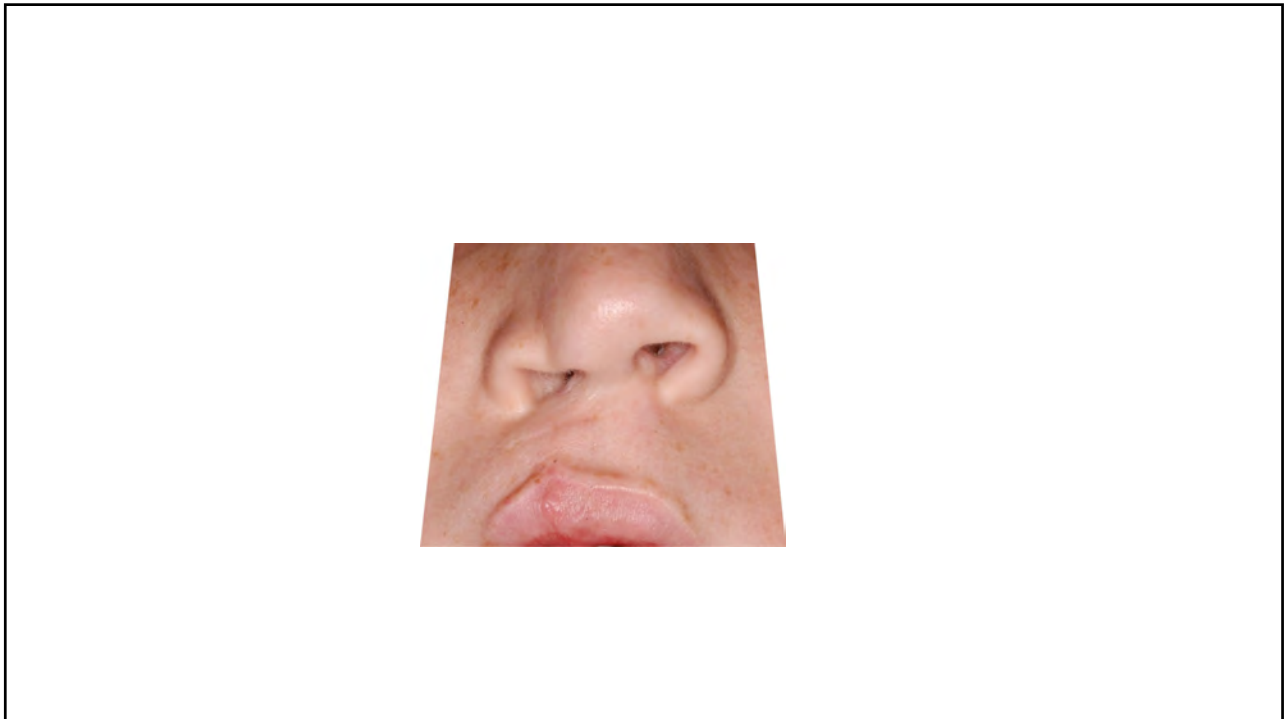


Fig. 3. Mean facial diagram of the craniofacial morphology of the Turkish children. The broken line is for children with UCCLP and the solid line for the control group. Diagrams are orientated along the S.Na line and recorded at S.

Some look better than others

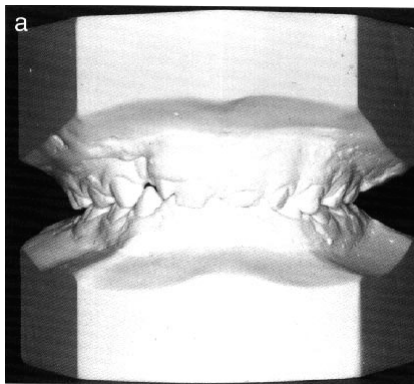
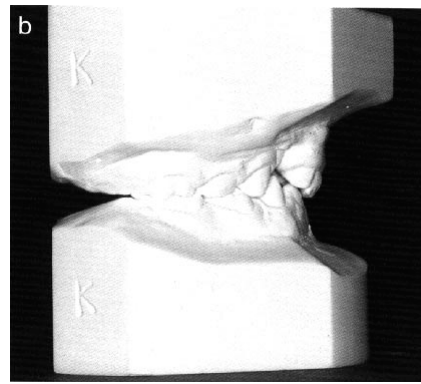




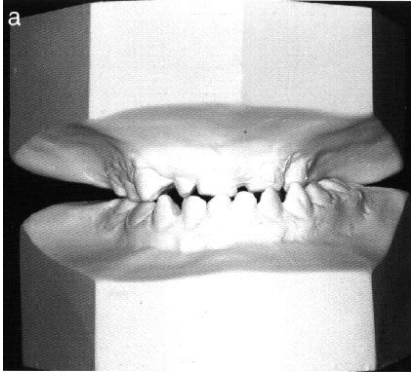
The Atack/Goslon scale

Score	Features	Predicted long-term outcome
1	Positive overjet with good position of incisors No crossbites/openbite Good maxillary arch shape and palatal vault anatomy	Excellent
2	Positive overjet with good position of incisors Unilateral crossbite/crossbite tendency ± Open bite tendency around cleft side	Good
3	Edge-to-edge bite or negative OJ with retroclined incisors Unilateral crossbite ± Open bite tendency around cleft side	Fair
4	Negative OJ Unilateral crossbite ± bilateral crossbite tendency ± Open bite tendency around cleft side	Poor
5	Negative OJ with proclined maxillary incisors Bilateral crossbite Good maxillary arch shape and palatal vault anatomy	Very poor

Attack score of 1

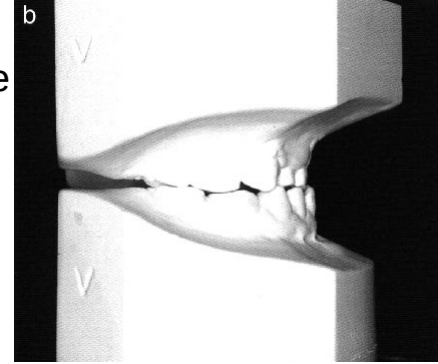


Attack score of 4

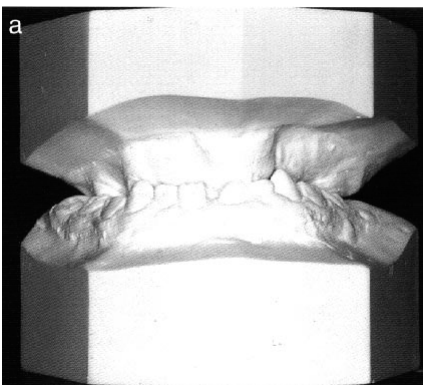


Unilateral crossbite

Negative OJ

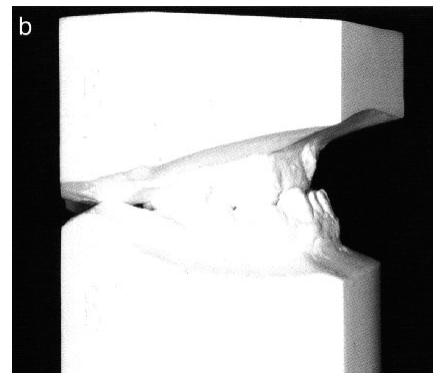


Attack score of 5



Bilateral crossbite

Negative OJ



RESEARCH ARTICLE

Predictive validity of the GOSLON Yardstick index in patients with unilateral cleft lip and palate: A systematic review

Cindy Buj-Acosta¹, Vanessa Paredes-Gallardo^{1*}, José María Montiel-Company², Alberto Albaladejo³, Carlos Bellot-Arcís¹

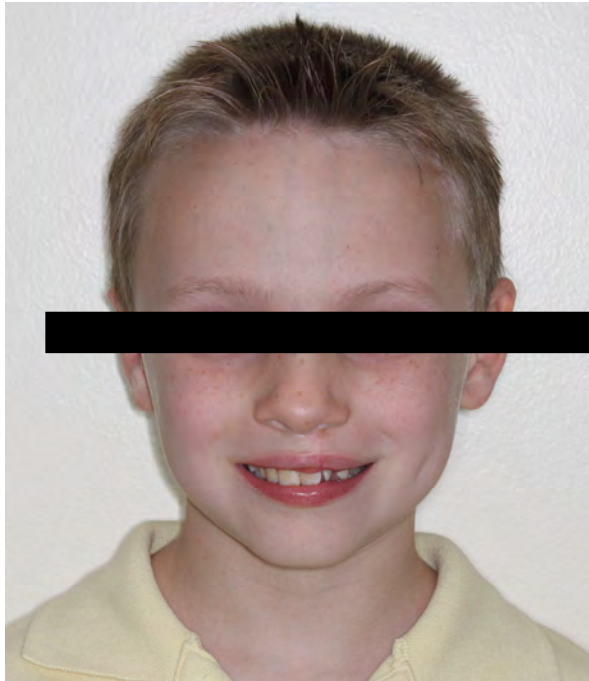
1 Orthodontics Teaching Unit, Department of Dental Medicine, Faculty of Medicine and Dentistry, University of Valencia, Valencia, Spain, **2** Preventive Teaching Unit, Department of Dental Medicine, Faculty of Medicine and Dentistry, University of Valencia, Valencia, Spain, **3** Orthodontics Department, Faculty of Dentistry, University of Salamanca, Salamanca, Spain

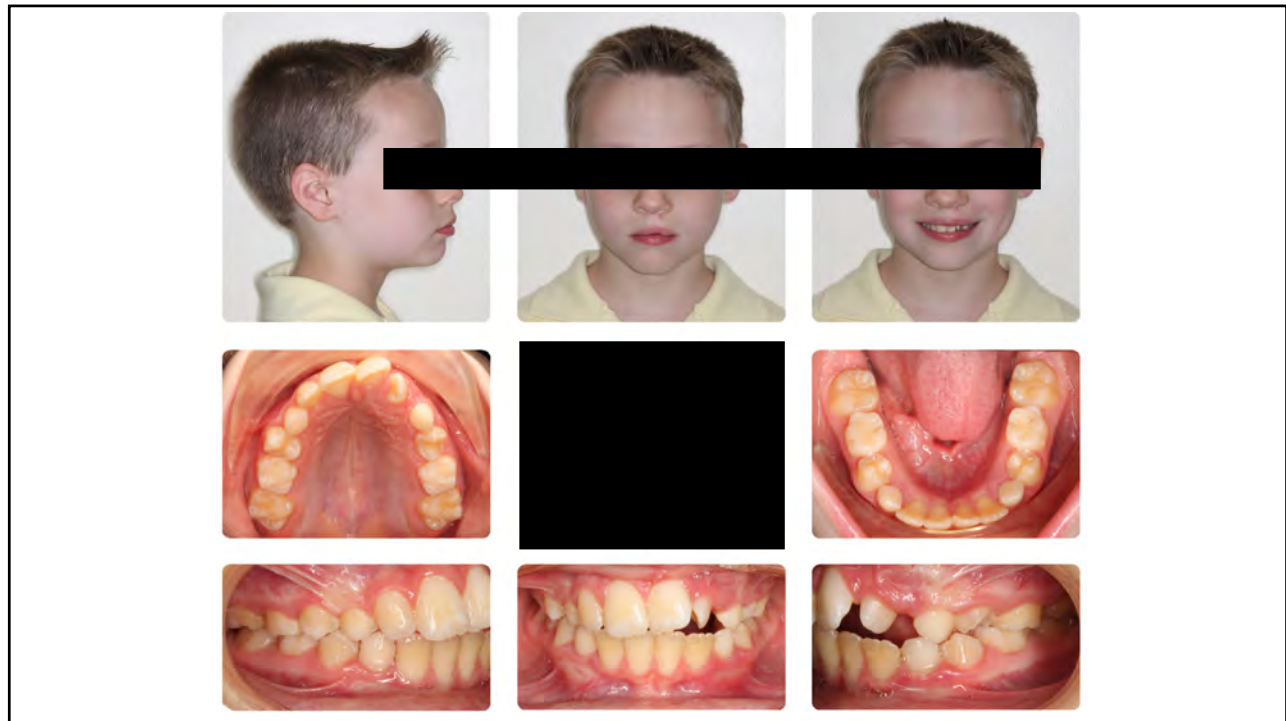
June 1, 2017

Qualitative synthesis

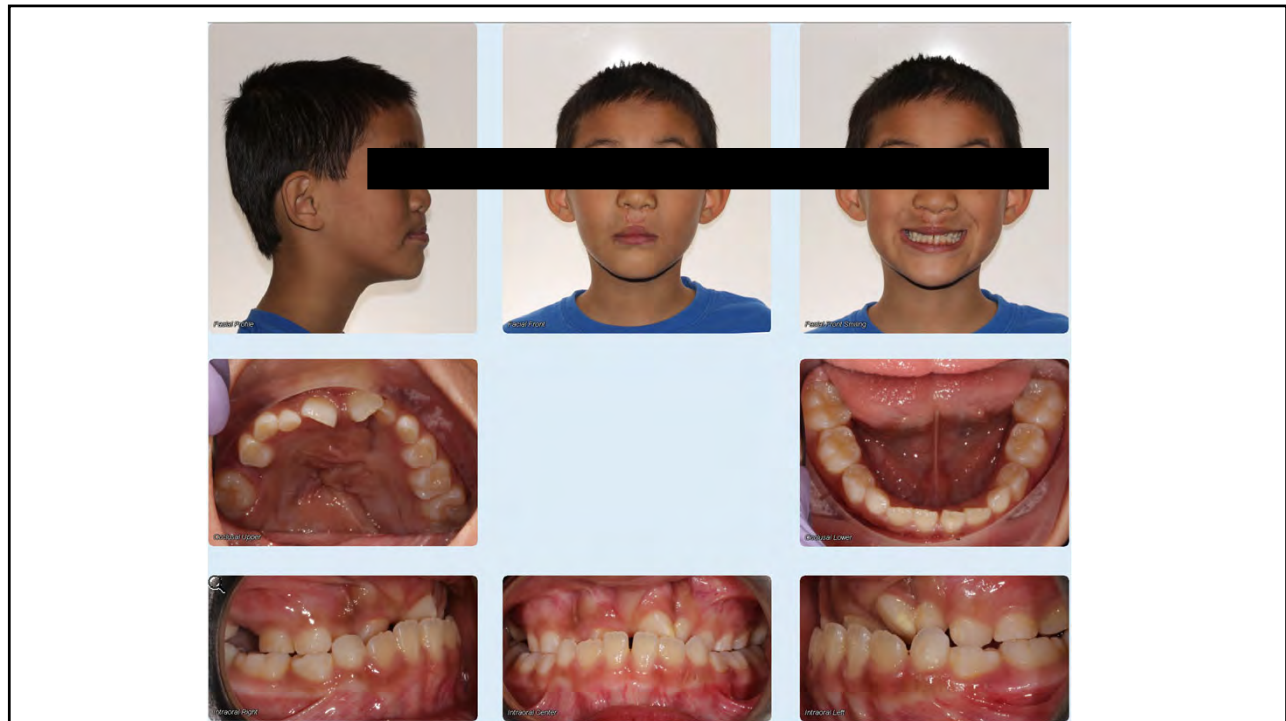
- The different studies found different levels of predictive validity for the GOSLON Yardstick index ranging from **42.4% to 64.7%**.
 - Sinko *et al.* found that 60% of patients maintained the same categorization, 12.7% worsen, and 27.3% improved in GOSLON Yardstick scores.
 - Jones *et al.* found that over 10 years, **64.7%** of patients remained in the same, 17.6% improved, and 17.6% worsened.
 - Suzuki *et al.* found that over 10 years **42.4%** of patients remained the same, 35.3% improved, and 22.3% worsened.

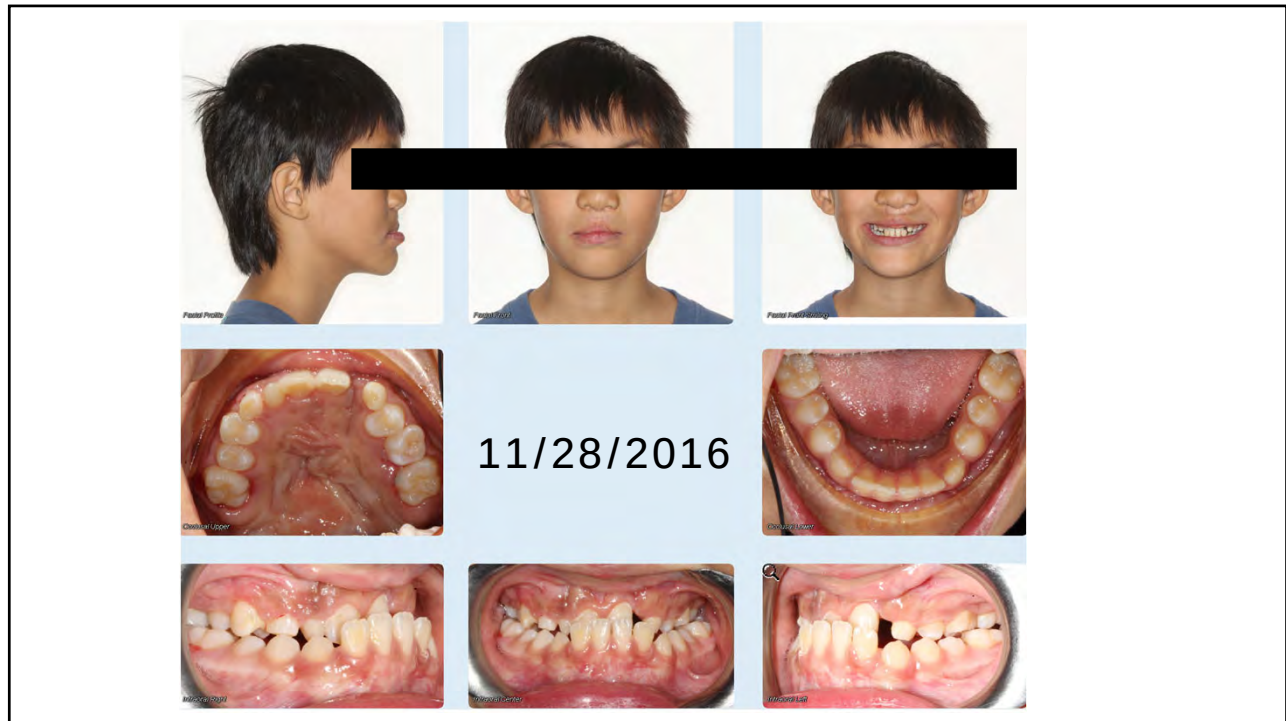
Unilateral Cleft Lip Attack 1





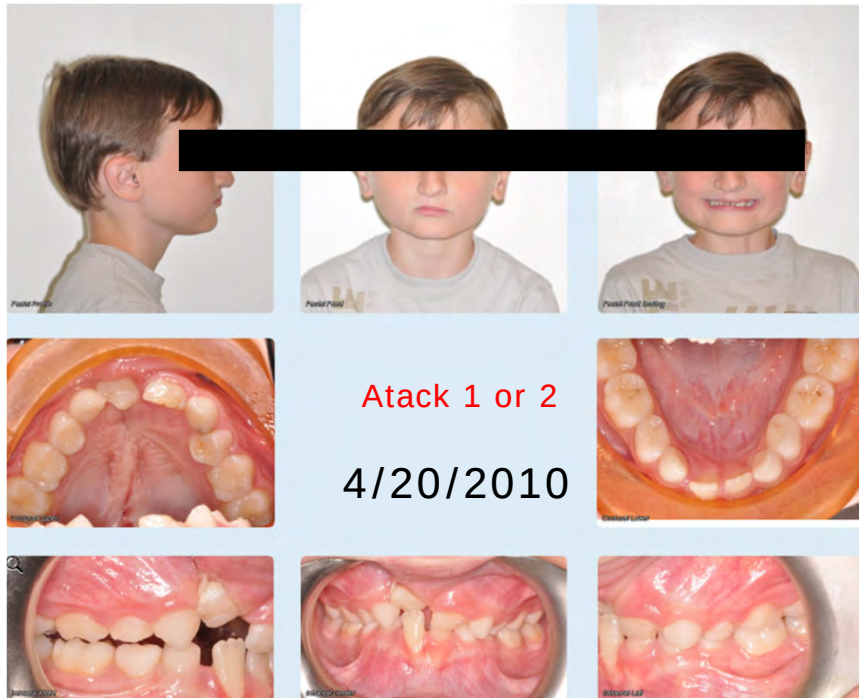
Bilateral Cleft Lip
Attack 5

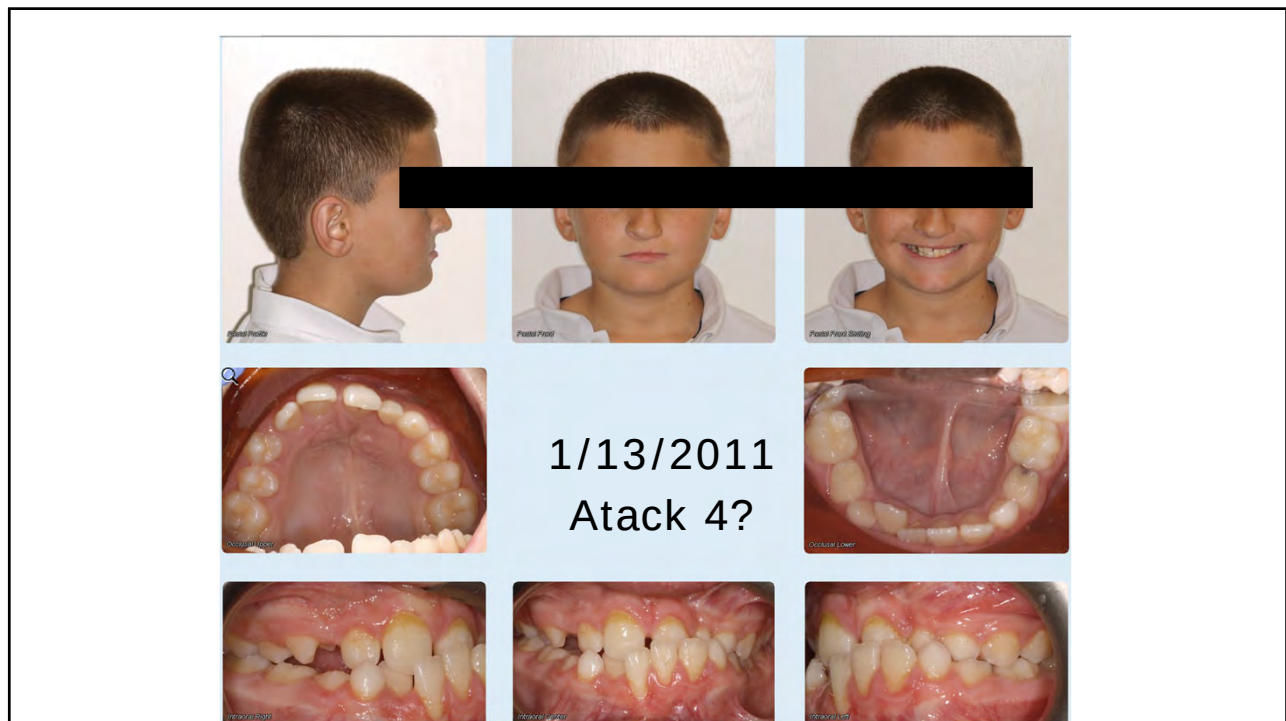


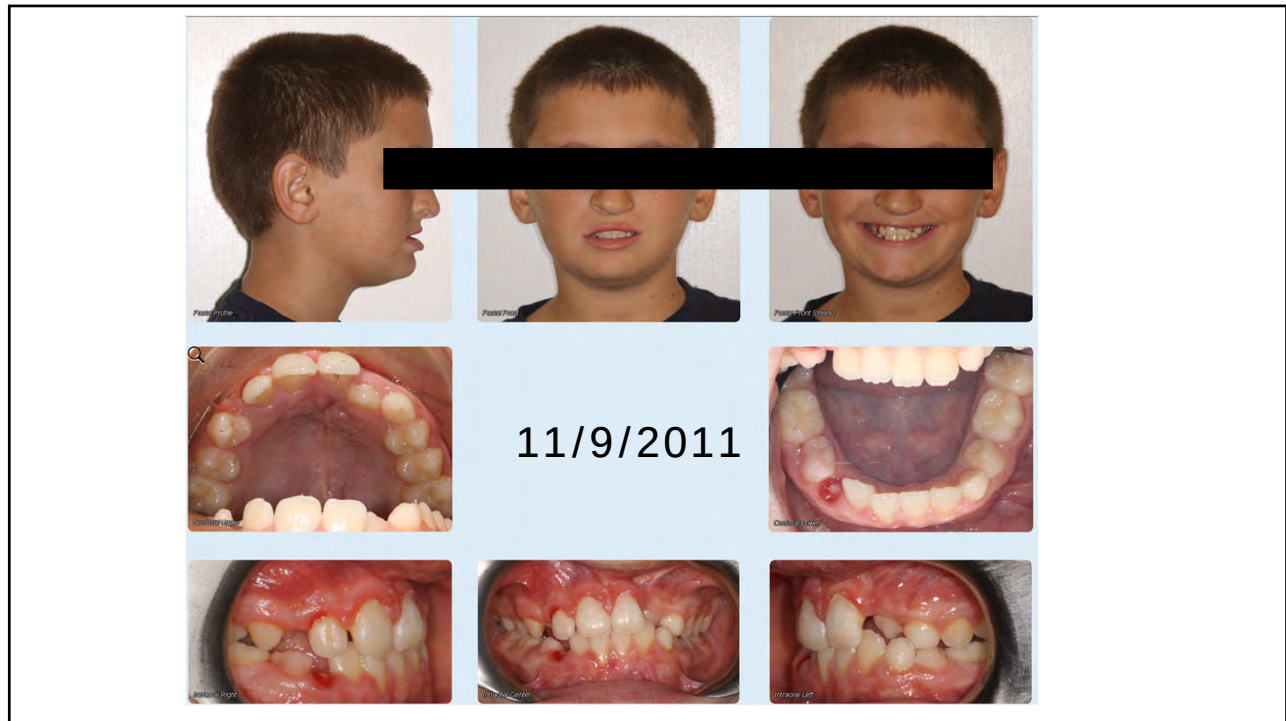


What about growth?

Prediction



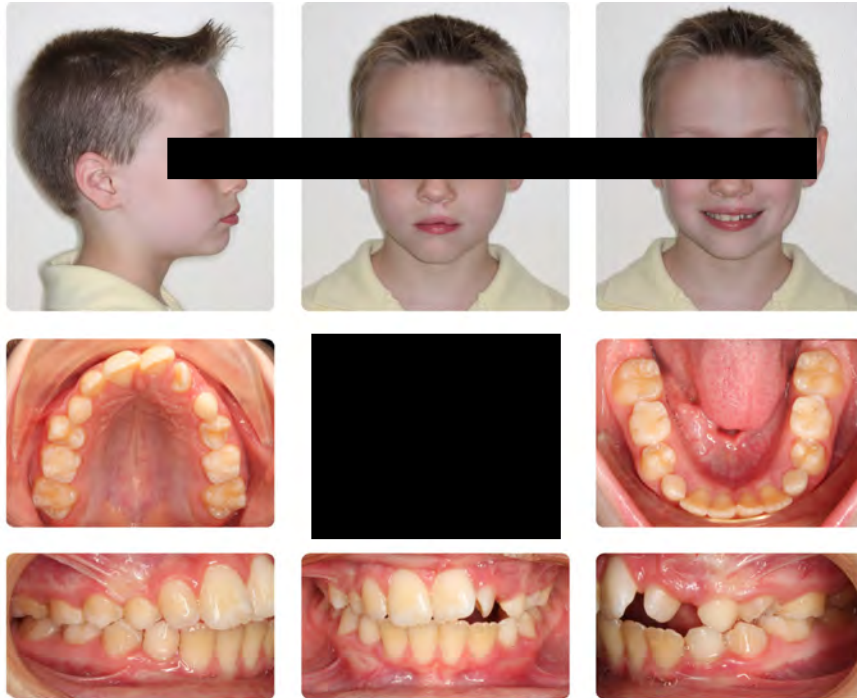






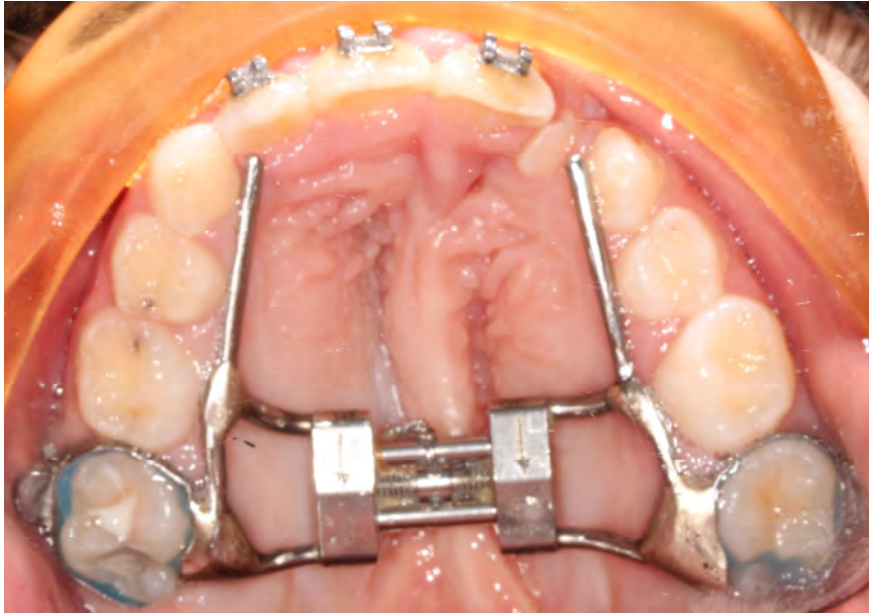
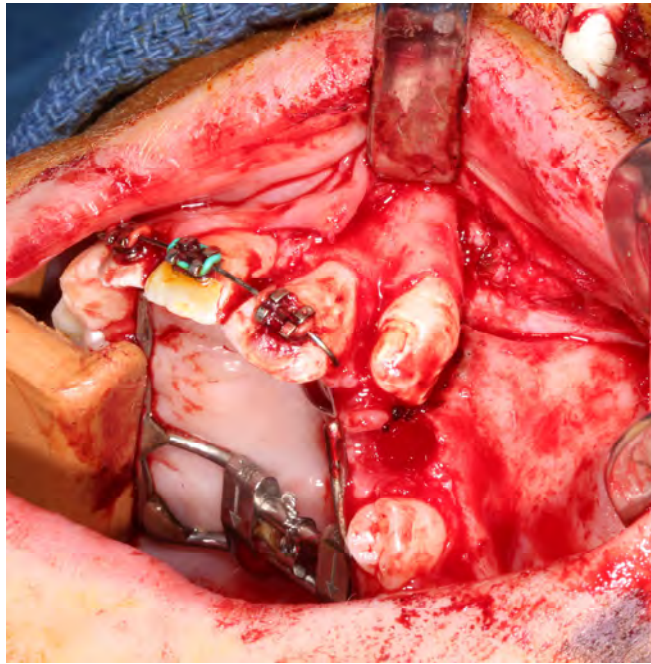


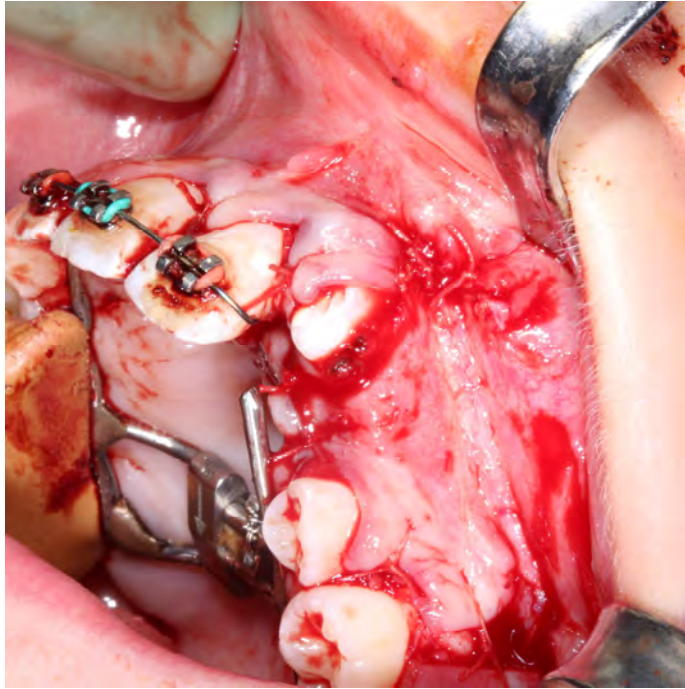
Unilateral Cleft lip

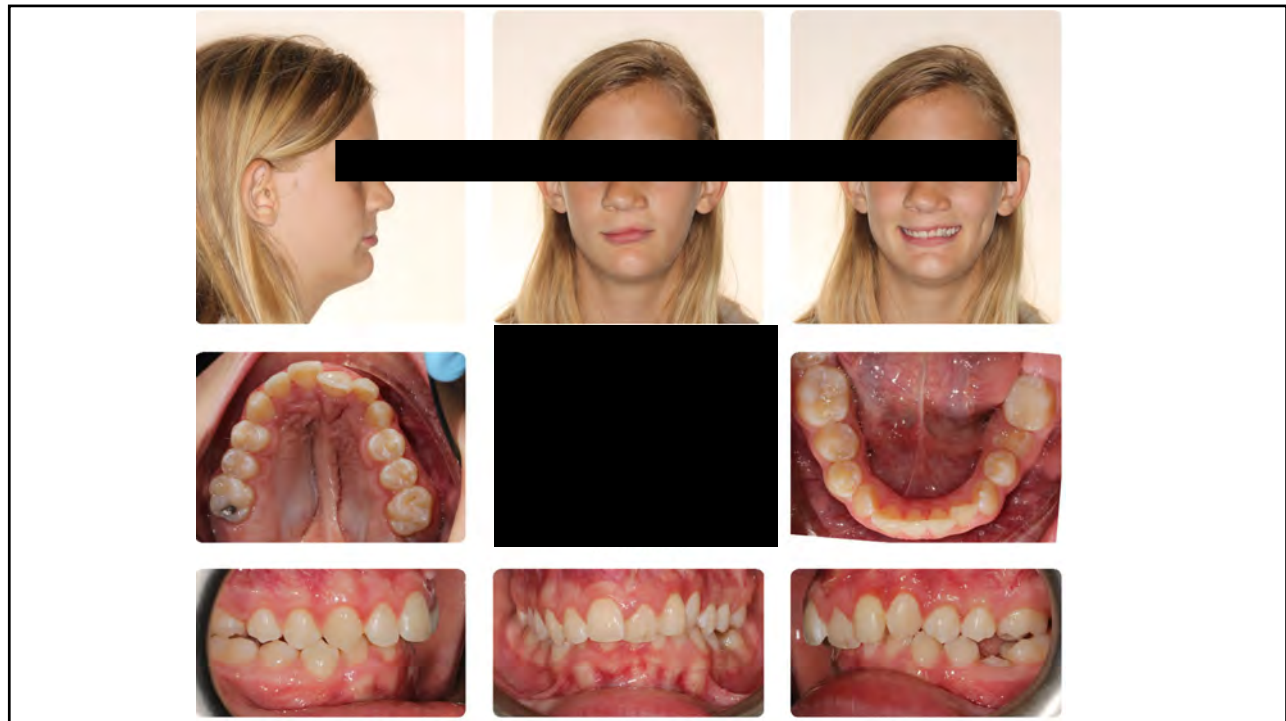


Unilateral Cleft lip and palate

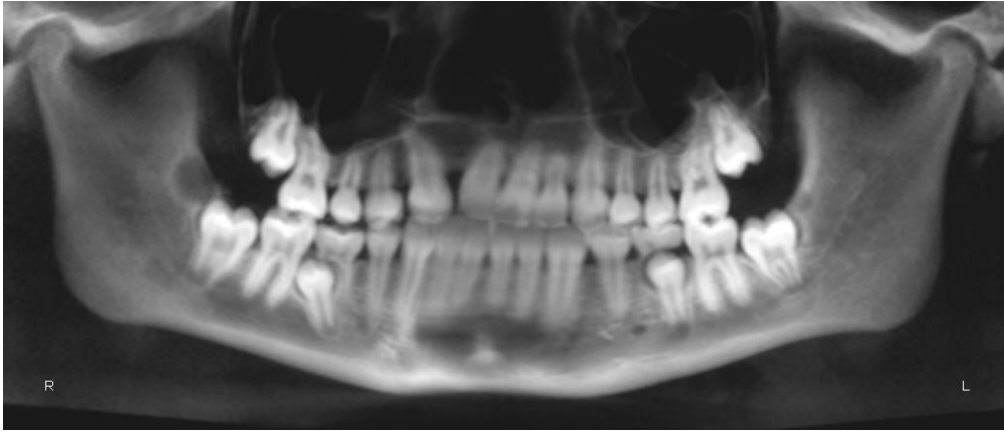
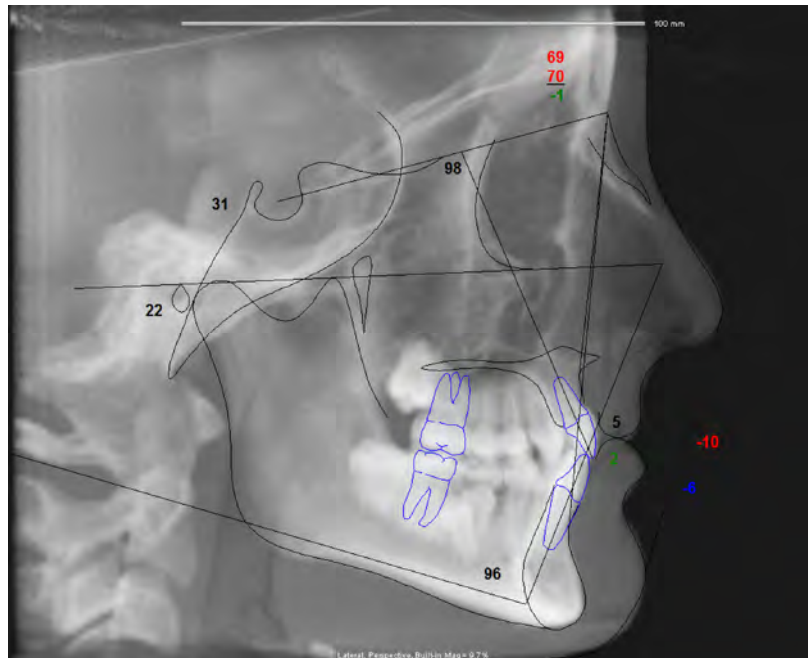


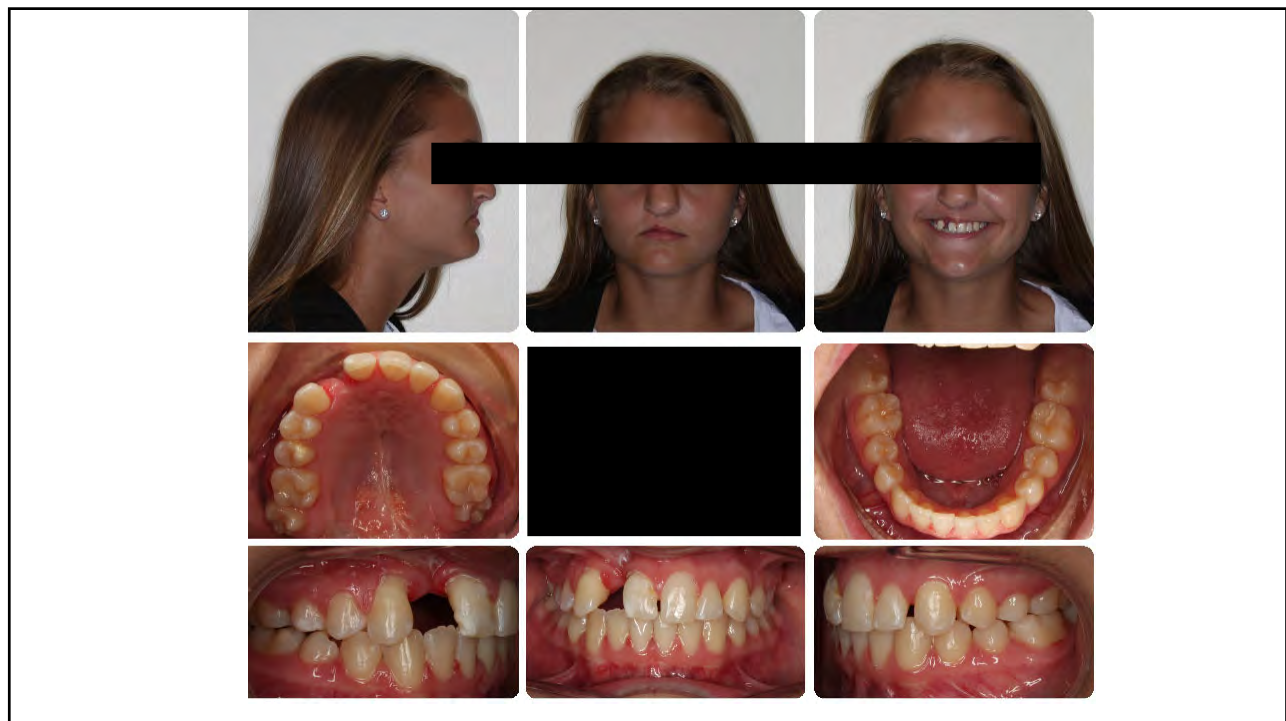


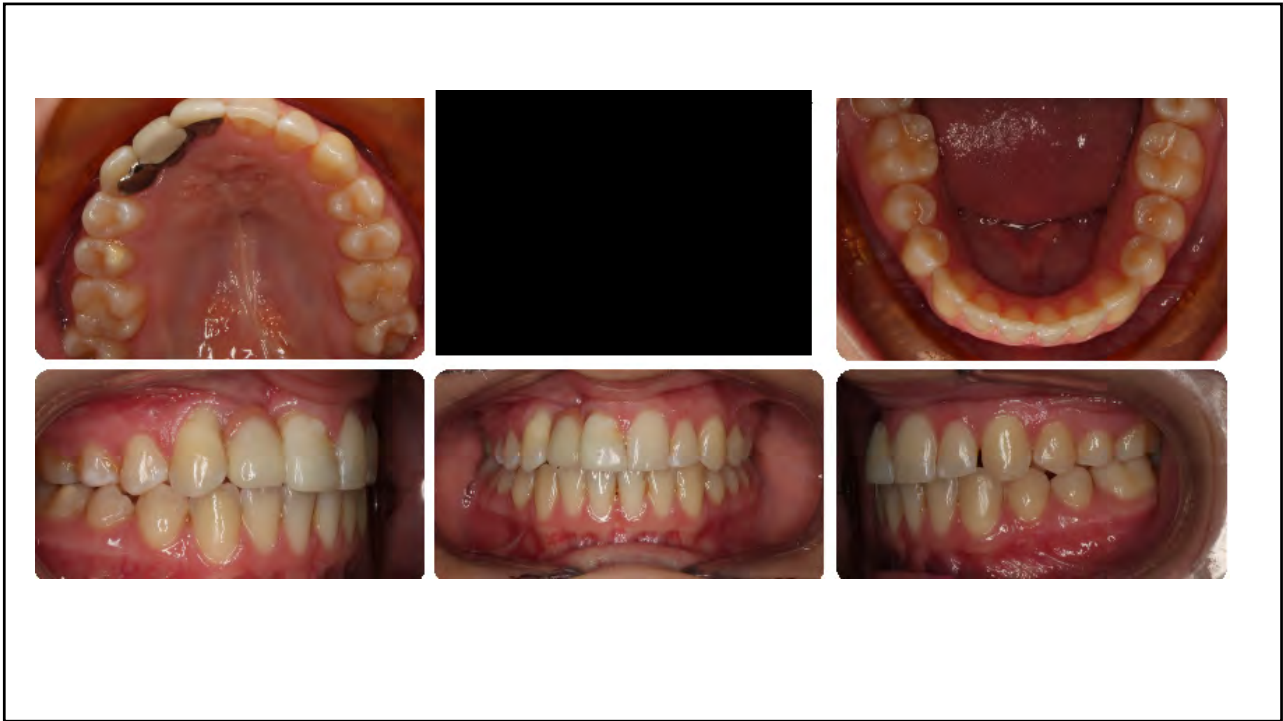




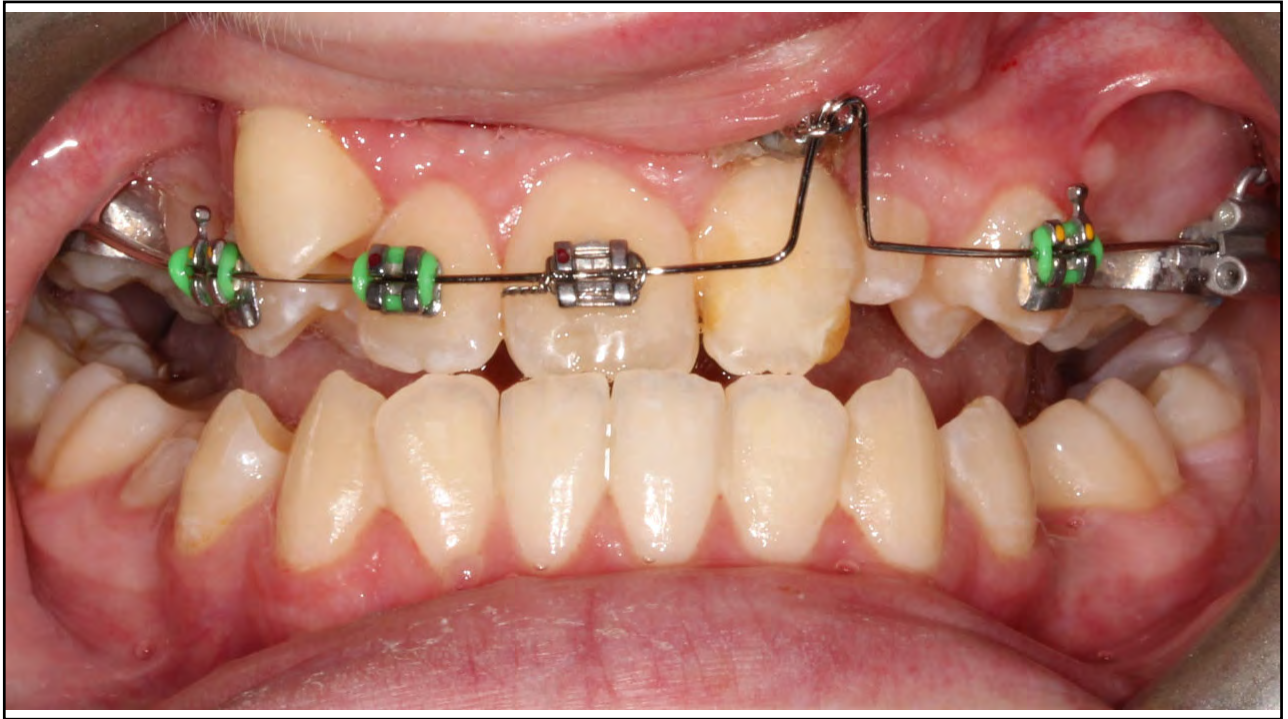
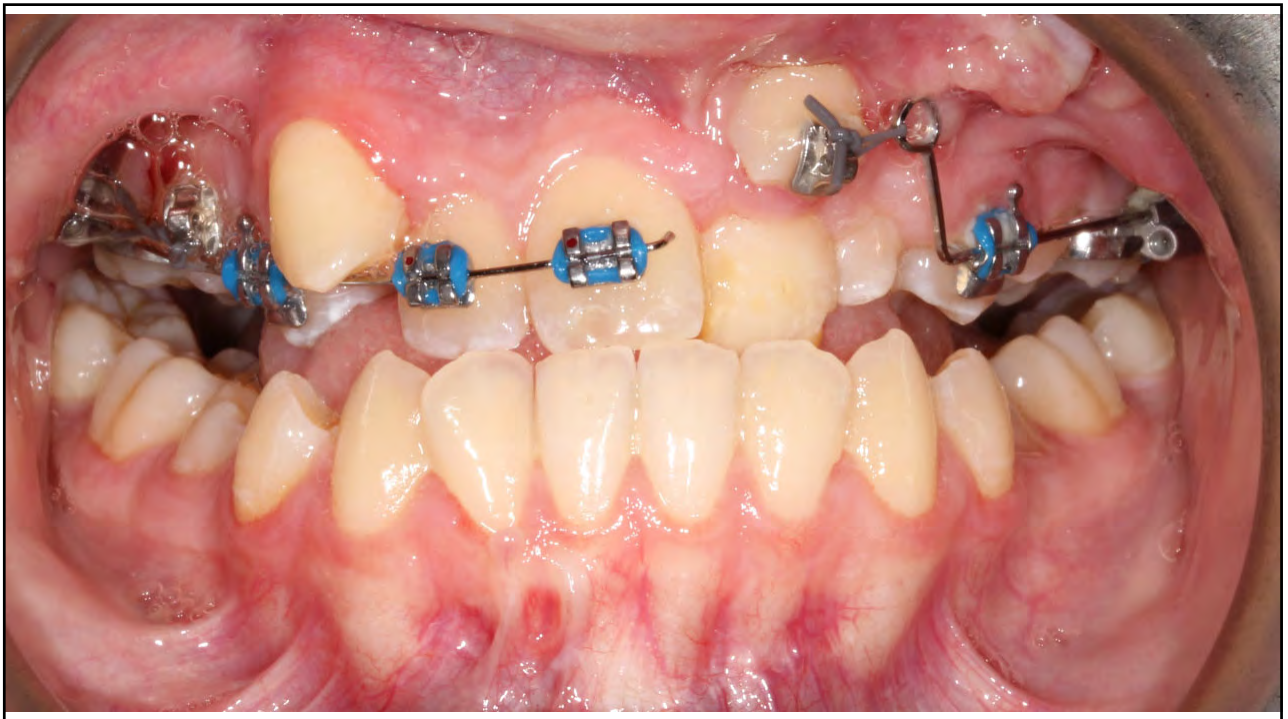






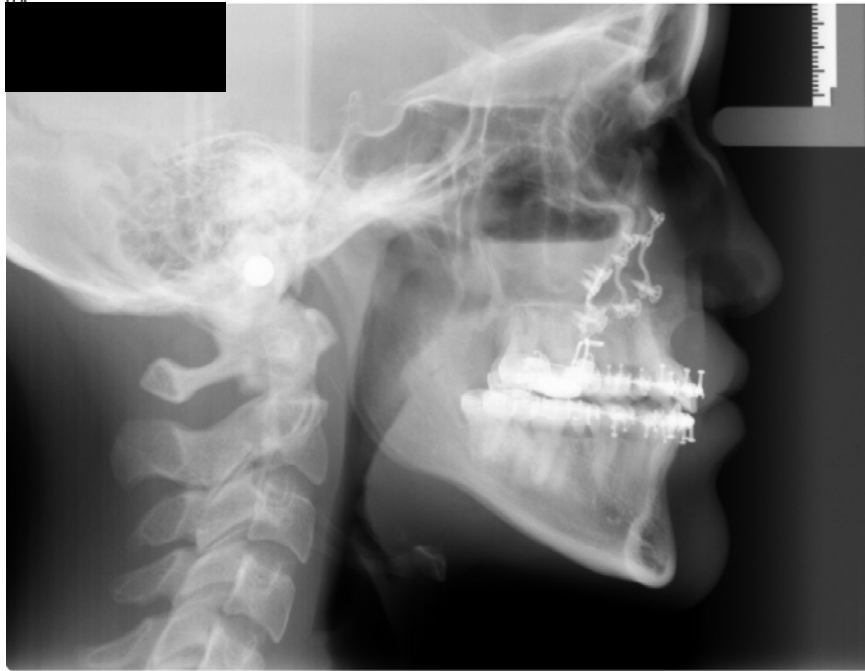
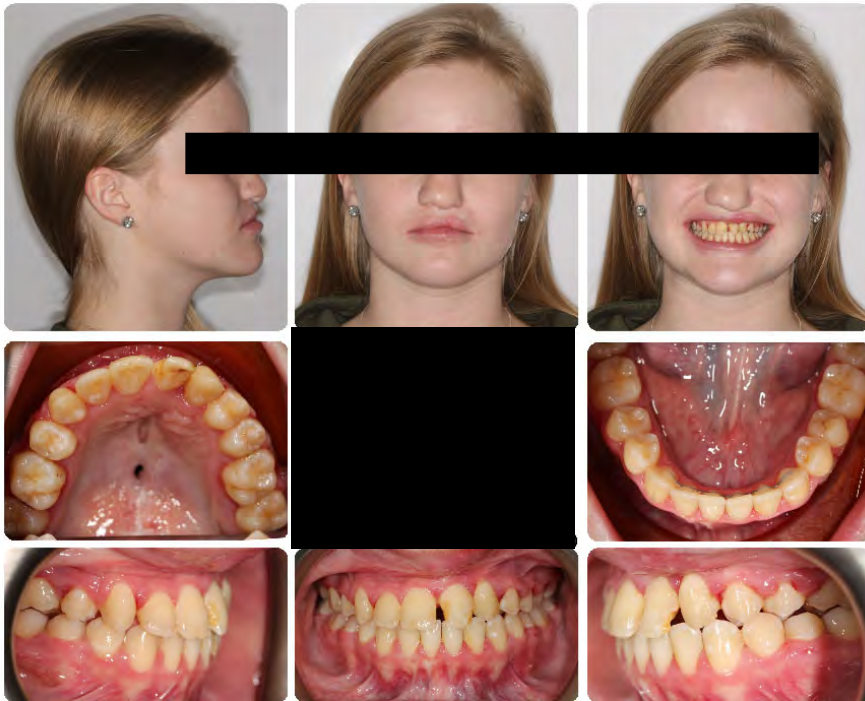














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