CLASS I MALOCCLUSIONS

Treatment of local and general anomalies

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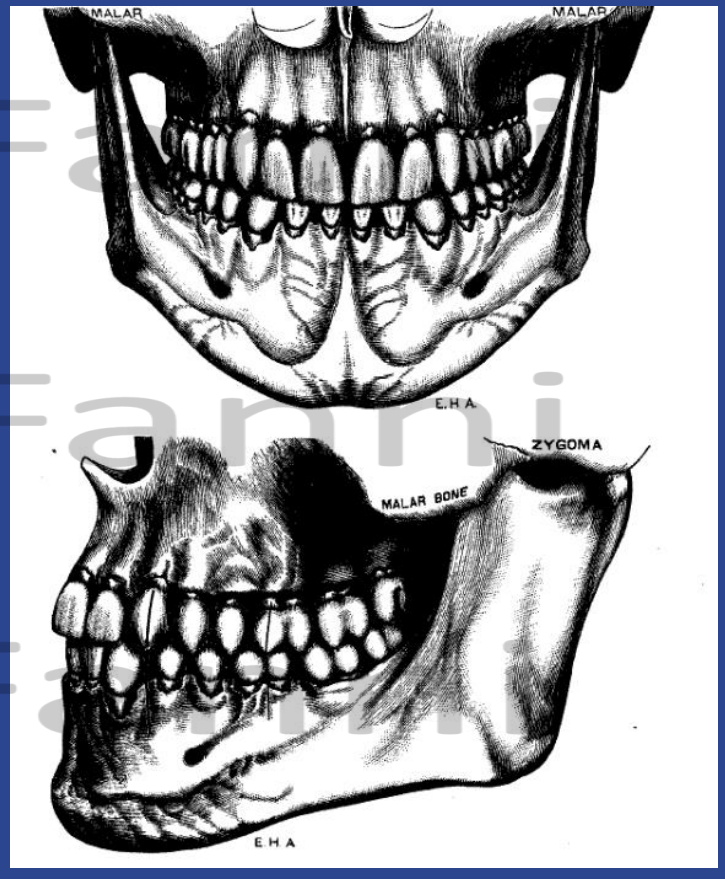
ANGLE’S CLASSIFICATION

- it subdivided major types of malocclusion
- included the first clear and simple definition of normal occlusion in the natural dentition
- Angle's postulate was that the upper first molars were the key to occlusion.
- "If the teeth were arranged on a smoothly curving line of occlusion and this molar relationship existed so that the mesiobuccal cusp of the upper molar occludes in the buccal groove of the lower molar, then normal occlusion would result."

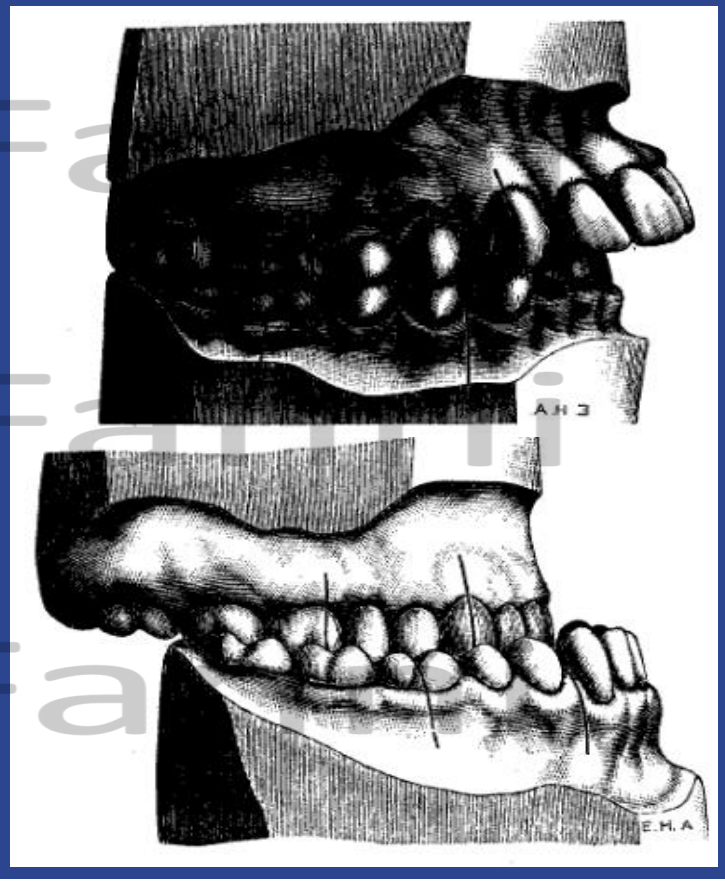


ANGLE, E. H. TI - Classification of malocclusion. Dental Cosmos - 1899

ANGLE’S CLASSIFICATION

- Angle's classification thus created the following four groups:
  - Normal occlusion: Normal (Class I) molar relationship, teeth on line of occlusion
  - Class I malocclusion: Normal (Class I) molar relationship, teeth crowded, rotated, etc.
  - Class II malocclusion: Lower molar distal to upper molar, relationship of other teeth to line of occlusion not specified
  - Class III malocclusion: Lower molar mesial to upper molar, relationship of other teeth to line of occlusion not specified

- Normal occlusion and Class I malocclusion share the same molar relationship but differ in the arrangement of the teeth relative to the line of occlusion



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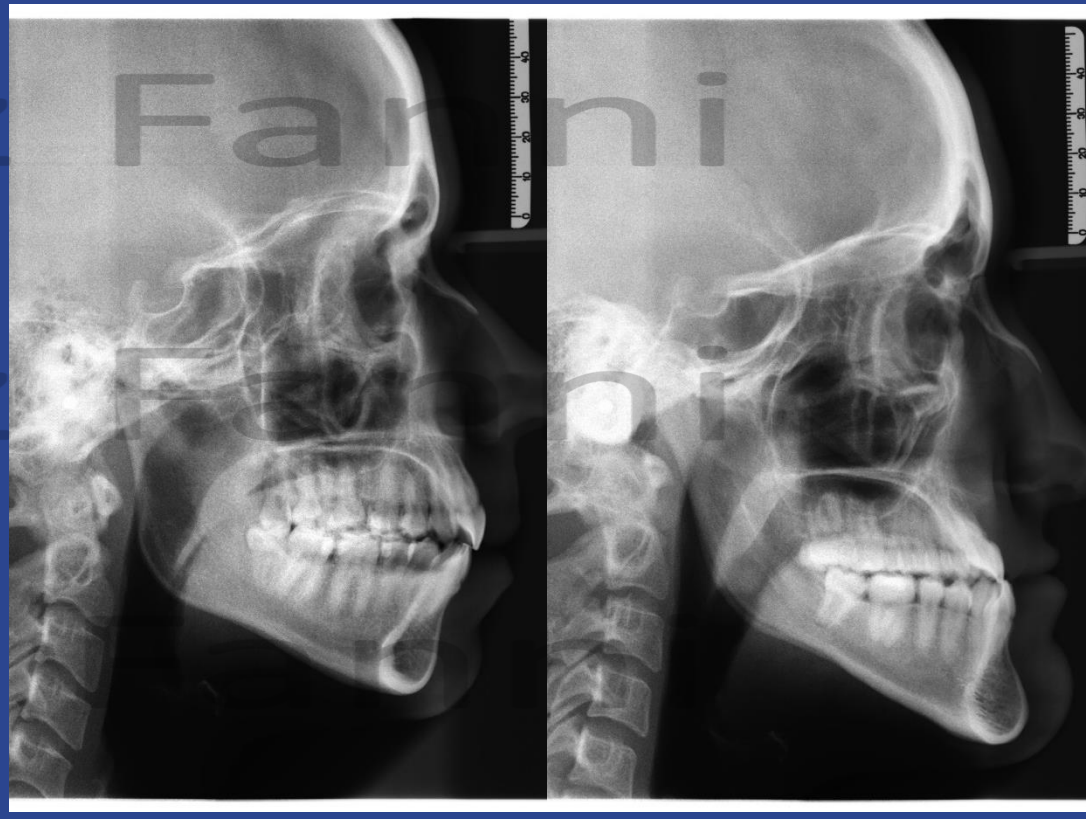
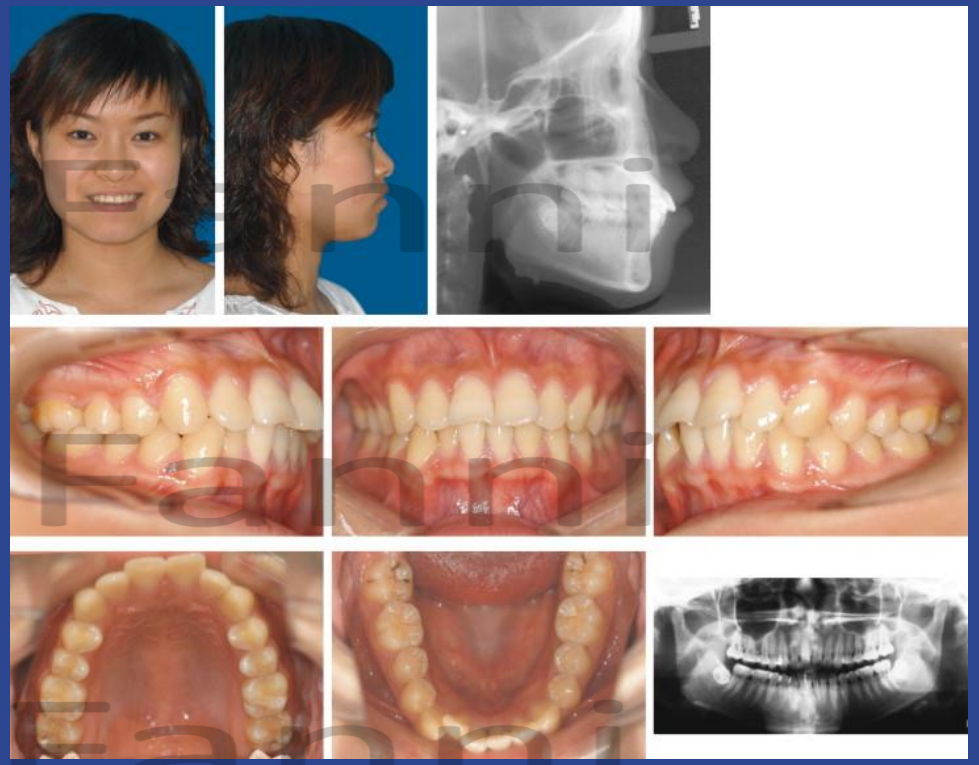
ANGLE'S CLASSIFICATION

- „Cephalometric radiography, which enabled orthodontists to measure the changes in tooth and jaw positions produced by growth and treatment, came into widespread use after World War II. These radiographs made it clear that many Class II and Class III malocclusions resulted from faulty jaw relationships, not just malposed teeth."
- Gradually, Angle's classification numbers were extended to refer to four distinct but related characteristics:
  - the classification of malocclusion, as in the original plan;
  - the molar relationship;
  - the skeletal jaw relationship;
  - and the pattern of growth



Malocclusion vs. Orthodontic conditions

- "**Malocclusion**" - any deviation from ideal occlusion
- "**Orthodontic condition**" (National Academy of Sciences)
  - ideal occlusion accompanied by dentoalveolar protrusion with excessive facial convexity and lip incompetence, in a patient whose chief concern is social problems related to appearance, is a definite indication for treatment
  - one that Angle refused to accept—if you did not like the way you looked with protrusive teeth in ideal occlusion, he questioned your perception.



Kun Chen, Xianglong Han, Lan Huang, Ding Bai: Tooth movement after orthodontic treatment with 4 second premolar extractions, American Journal of Orthodontics and Dentofacial Orthopedics, Volume 138, Issue 6, 2010, Pages 770-777,

The soft tissue paradigm

- Both the **goals** and **limitations** of modern orthodontic and orthognathic treatment are determined **by the soft tissues of the face**, not by the teeth and bones.
- Reorientation of orthodontics away from the Angle paradigm
- increased focus on **clinical examination** rather than examination of dental casts and radiographs
- It leads to a different approach to obtaining important diagnostic information and that information is used to develop treatment plans that would not have been considered without it.

Class I Malocclusion

1. Local anomalies
   - Midline diastema
   - Anterior crossbite
   - Single tooth misalignments
   - Hyperdontia
   - Aplasia, Hypodontia
2. General anomalies
   - Crowding
   - Cross bite
   - Deep bite
   - Open bite

MIDLINE DIASTEMA

Etiologic factors:

- midline supernumerary tooth
- congenitally missing teeth
- thick labial frenum
- intrabony lesion

A maxillary occlusal or periapical radiograph would show whether there was a pathologic condition in the area, and whether any treatment would be needed at that stage of development.

Midline diastema

Ugly duckling stage (Broadbent)

- diastemas in the maxillary arch
- The central diastema tends to close as the lateral incisors erupt
- The diastema can persist even after eruption is complete.
- This situation occurs so frequently that it is considered normal.
- Parents often worry about dental spacing, and the orthodontist must explain that this unesthetic period is normal and is not to be treated at that time.

ANTERIOR DENTAL CROSS BITE

- normal skeletal pattern
- Abnormalities in the axial inclination of the affected teeth only

Etiologic factors:

1. **Traumatic injuries** to the primary dentition that cause a lingual displacement of the permanent tooth bud
2. An **overretained primary tooth**
3. A labially situated **supernumerary**
4. A sclerosed bony or fibrous **tissue tooth barrier** caused by losing a primary tooth prematurely
5. An inadequacy of **arch length** causing the lingual deflection of the permanent tooth during eruption
6. Detrimental **habit** patterns
7. A repaired **cleft lip**

ANTERIOR DENTAL CROSS BITE

Considerations before treatment (Lee)

1. Adequate space in the arch to reposition the tooth
2. Sufficient overbite to hold the tooth in position following correction
3. An apical position of the tooth in crossbite that is the same as it would be in normal occlusion
4. A Class I occlusion.

ANTERIOR DENTAL CROSS BITE

Treatment approaches

1. Tongue blade therapy.
   - A simple 1-tooth anterior dental crossbite
   - patient cooperation and parental supervision
2. Hawley retainer with auxiliary springs.
   - for minor tooth movement in pediatric dentistry.
   - patient cooperation and parental supervision.
3. Lower inclined plane.
   - Anterior dental crossbite of 1 or more teeth
   - a cemented lower inclined acrylic plane.
   - This technique has the possibility of opening the bite if worn for more then 3 weeks.
4. Stainless steel or composite crowns.
   - cementing a reverse anterior stainless steel crown on the lingually locked incisor at a 45° angle to the occlusal plane.
   - This method is subject to all the disadvantages of the inclined plane method
   - difficult to apply to partially erupted maxillary incisors.

Sharma A(1), Hegde AM(2): Use of Tongue Blade to Reposition Palatally Luxated Tooth due to Trauma: A Novel Technique. Int J Clin Pediatr Dent. 2012 Sep;5(3):207-8








Crowding

Treatment of bimaxillary protrusion using fiber-reinforced composite.
F Uribe, Ravindra NandaPublished 2007 in Journal of clinical orthodontics : JCO

To extract or not to extract?

Angle

- Angle and his followers **strongly opposed extraction** for orthodontic purposes
- required a full complement of teeth in both arches, maintaining an intact dentition became an important goal of orthodontic treatment, however, less attention came to be paid to facial proportions and esthetics.
- by **focusing solely on the occlusion** and declaring that facial esthetics and stability would take care of themselves. Unfortunately, they did not.

To extract or not to extract?

- **esthetic problems** despite the excellent occlusion
- it often proved **impossible to maintain** an occlusal relationship achieved by prolonged use of heavy elastics to pull the teeth together as Angle and his followers had suggested.
- Under the leadership of *Charles Tweed* in the United States and *Raymond Begg* in Australia (both of whom had studied with Angle), extraction of teeth was reintroduced into orthodontics in the 1940s and 1950s to enhance facial esthetics and achieve better stability of the occlusal relationships.

To extract or not to extract?

- In a rational contemporary view, the majority of orthodontic patients can and should be treated without removal of teeth, but some will require extraction to compensate for crowding, incisor protrusion that affects facial esthetics, or jaw discrepancy.
- Their number varies, depending on the population being treated.

- The advantages of extraction of some teeth may outweigh the disadvantages
  - to provide space for the others
  - greater stability of the result is likely
  - facial and dental esthetics
  - the loss of a tooth or teeth is a disadvantage
  - facial and dental esthetics

- to discuss the pros and cons with the patient and parent before making the expansion-extraction decision

To extract or not to extract?

Dental expansion is not possible, because

- Bone resorption - There is an increasing risk of fenestration beyond 3 mm of transverse tooth movement
- The soft tissue equilibrium can no longer be maintained (
  - Intercanine width
  - Incisor position
    - Tweed: the inclination of the mandibular incisors (IMPA) and the mandibular plane angle (MPA).
    - This defines the amount of extraction space required for retraction of the anterior teeth (extracted teeth, anchorage)
    - 2 mm incisor advancement
    - Particularly in an anterior direction, can have an adverse effect on facial appearance (an already convex face, the lips will move two-thirds of the distance that the incisors are retracted)

Indication for extraction - to provide space to align crowded incisors without creating excessive protrusion

- Severe crowding or extremely procumbent maxillary and mandibular incisors
- Marked facial convexity and
- Severe lip protrusion

Contemporary Extraction Guidelines

1. Less than 4 mm arch length discrepancy
   - Extraction rarely indicated
   - only if there is severe incisor protrusion or in a few instances, a severe vertical discrepancy
   - Treatment options:
     - arch expansion
     - by slightly reducing the width of selected teeth
2. Arch length discrepancy 5 to 9 mm:
   - The hard- and soft-tissue characteristics of the patient and the final position of the incisors
     - Nonextraction
       - usually requires transverse expansion across the molars and premolars, and additional treatment time if the posterior teeth are to be moved distally, to increase arch length.
     - Extraction treatment
       - any of several different teeth could be chosen for extraction.
3. Arch length discrepancy 10 mm or more
   - Extraction almost always required
   - little or no effect on lip support and facial appearance
   - The extraction choice is four first premolars or perhaps upper first premolars and mandibular lateral incisors (second premolar or molar extraction rarely is satisfactory)

EXTRACTION GUIDELINES

- The more you can **expand without moving the incisors forward**, the more patients you can treat satisfactorily (from the perspective of both esthetics and stability) without extraction.
- The more you can **close extraction spaces without overretracting the incisors**, the more patients you can treat satisfactorily (again, from the perspective of both esthetics and stability) with extraction.
- For oral health, excessive **expansion** increases the risk of mucogingival problems.
- For masticatory **function**, expansion or extraction **makes no difference.**

TRANSVERESE EXPANSION

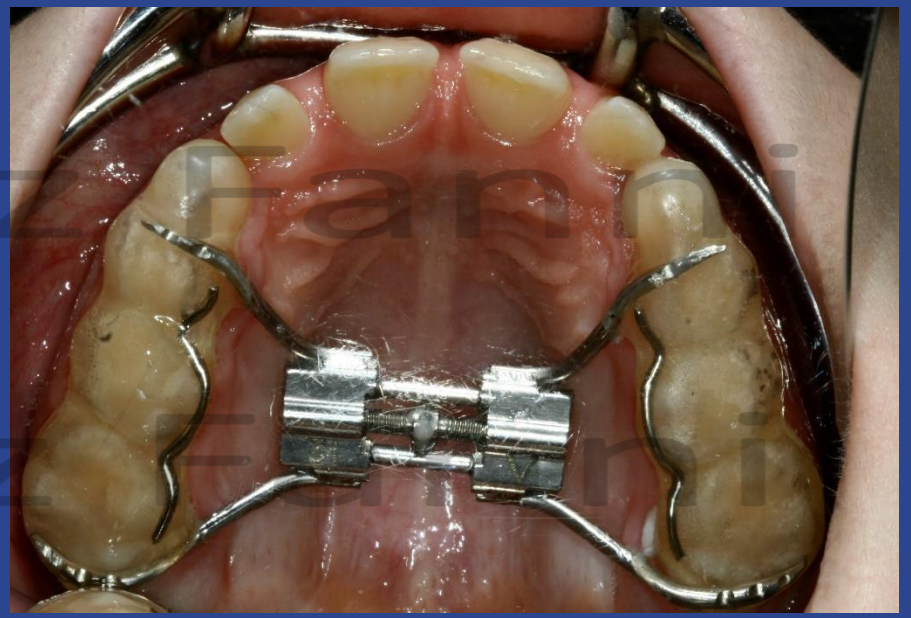
Types of Expansion

In preadolescent children - produce both skeletal and dental changes, but are not equally sensible to use.

1. a split removable plate with a jackscrew or heavy midline spring (slow expansion)
2. a lingual arch, often of the W-arch or quad-helix design (slow expansion)
3. a fixed palatal expander with a jackscrew, which can be either attached to bands or incorporated into a bonded appliance.
    A. rapid (0.5 mm or more per day)
    B. semirapid (0.25 mm/day)
    C. slow (1 mm/week) expansion.

In adolescents, expansion across the suture can be done in three ways:

1. rapid expansion with a jackscrew device attached to the maxillary posterior teeth, the original (1960s) method, typically at the rate of 0.5 to 1 mm/day
2. slow expansion with the same device at the rate of approximately 1mm per week, the method advocated more recently
3. expansion with a device attached to bone screws or implants, so that the force is directly applied to the bone and there is no pressure against the teeth.



Impacted teeth - Maxillary Canines

- the **incidence** of ectopic eruption and impaction of canines 1-2%
- **labial/buccal** to the arch in 15% of the cases of maxillary canine impaction and often is associated with dental crowding.
- The canine impacted or displaced **palatally** occurs in 85% of the cases and typically is not associated with dental crowding.

- **Diagnosis**
    1. **A digital panoramic radiograph** because dental anomalies are genetically related, and other anomalies may well be present
        - peg or missing lateral incisors
        - missing premolars
        - transposed teeth
    2. Then, depending on the findings, a **small field-of-view (FOV) CBCT**
        - the extent of damage to the roots of adjacent permanent teeth can be seen clearly, and
        - the path can be defined along which it should be moved to bring it into the mouth most efficiently and with the least further damage to adjacent teeth.
    3. These views can be supplemented with a traditional **cephalometric digital image** if required for limited or comprehensive orthodontic care.

Impacted teeth

- **Considerations**
  - devitalization,
  - reexposure or reuncovering of a tooth,
  - ankylosis,
  - external root resorption, and
  - injury to adjacent teeth when an unerupted tooth has been surgically uncovered from the wrong side of the alveolar ridge.
  - the marginal bone loss, gingival recession, and sensitivity problems that occur after the roots have been exposed are complications that invariably result in prolonged treatment time, aesthetic deformities, and in many cases, loss of teeth
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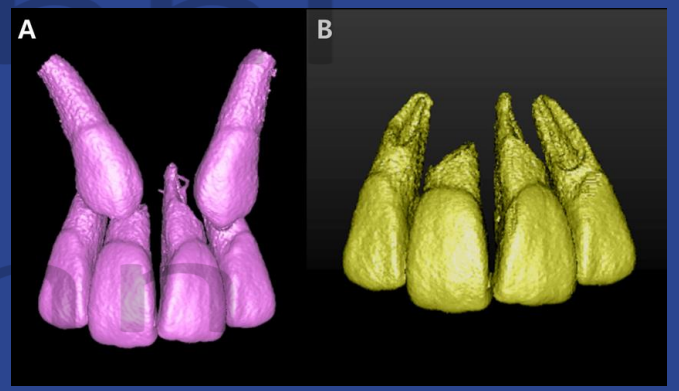


Chang, Na-Young & Park, Jae & Lee, Mi-Young & Cho, Jin-Woo & Cho, Jin-Hyoung & An, Ki-Yong & Chae, Jong-Moon. (2016). Orthodontic Treatment of Maxillary Incisors with Severe Root Resorption Caused by Bilateral Canine Impaction in a Class II Division 1 Patient. The Journal of clinical pediatric dentistry. 40. 161-168. 10.17796/1053-4628-40.2.161.

HYPERDONTIA

Supernumerary or extra teeth also result from disturbances during the initiation and proliferation stages of dental development.

Decidous
- prevalence: 0,3-0,6%
- If there's no clinical indication to extract – no treatment
- Usually in permanent dentition, too

Permanent dentition
- spontaneous eruption or impaction
- Abnormal eruption or position of the normal dentition – sp
- The mesial-distal size of the permanent maxillary incisor a
- Extraction – to prevent or minimize the consequences

Cleidocranial syndrome
- Hyperdontia in decidous and permanent dentition
- Abrupted eruption of the permanent teeth
- Partially or totally missing collarbones
- Treatment: extraction of the supernumerary teeth if possible

Galal Omami, Multiple unerupted and supernumerary teeth in a patient with cleidocranial dysplasia, Radiology Case Reports, Volume 13, Issue 1, 2018, Pages 118-120,

Hyperdontia - Classification

Shape

- **Supernumerary teeth**
  - atypical anatomic form
  - often these teeth are smaller than normal
  - **Conic**
    - tooth of a small volume and conic form
    - its root is short and palatine
  - **Tubercolate**
    - tooth with several cusps
    - its root is short and hooked
  - **Infundibulform**
    - tooth with a funnel form
    - its root is short and conic
- **Supplemental supernumerary**
  - a duplication of teeth in the normal series
  - found at the end of a tooth series

Hyperdontia - Classification

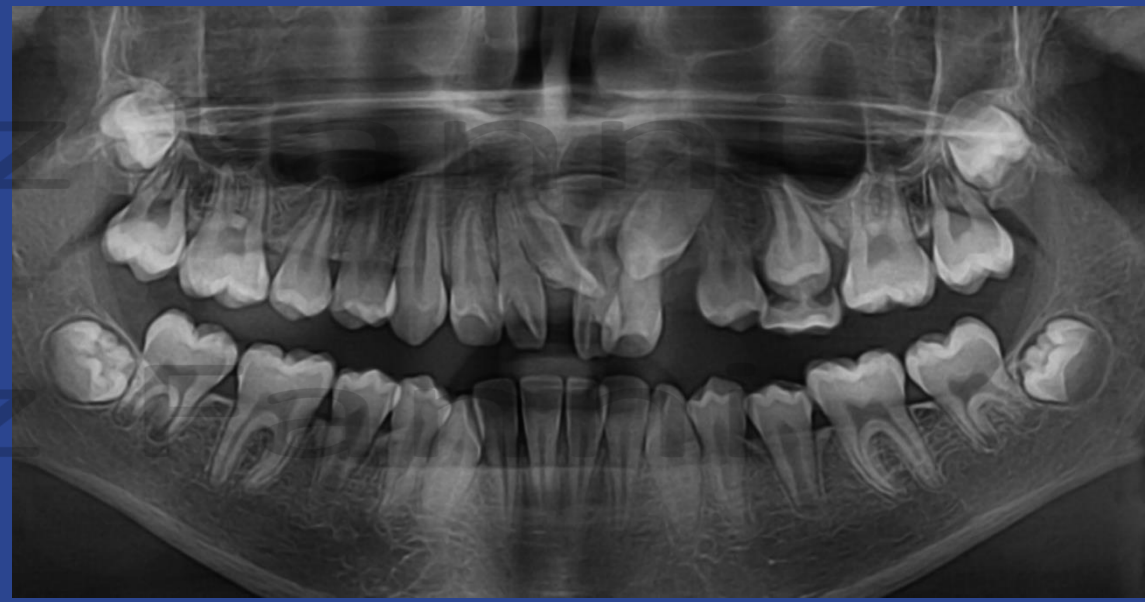
Location

1. **Mesiodens**
   - can be defined a tooth located between central upper incisors
   - Usally conic shape
   - Incidence: 0,5-0,7%
   - 20% 2 or 3 mesiodens
   - 25% spontaneous eruption, usually before the permanent incisor would erupt (extraction)
   - Inverse position
   - Age of 6 or 7 years OPG or intraoral X-ray
2. **Paramolar** a tooth placed in molar region;
3. **Distomolar** a tooth that lies distal to the third molar

HYPERDONTIA

Treatment

- The more, the more irregular teeth or the higher the position of the supernmerary teeth, the more difficult is the treatment
- Extraction without harming the permanent teeth
  - Later
    - Better the operation site
    - Better cooperation
  - Sooner
    - Less effect on the eruption of the permanent teeth
  - Keep the tooth that most similar to the normal permanent tooth
    - Shape
    - Size
    - Colour
    - Positon – if everyhing else is the same, CBCT



HYPODONTIA, APLASIA

Disturbances during the initial stages of formation of a tooth—**initiation** and **proliferation**

Anodontia - the total absence of teeth, is the extreme form.
Oligodontia - refers to congenital absence of many but not all teeth, usually with ED, but sometimes with a random pattern to the missing teeth.
Hypodontia - the absence of only a few teeth.

- a relatively common finding
- polygenic multifactorial model of etiology (relatives who do not have hypodontia still may manifest teeth that are small.)
- if only one or a few teeth are missing, the absent tooth will be the most distal tooth of any given type
- The most commonly missing permanent teeth are second premolars (especially mandibular) and maxillary lateral incisors, rarely is a canine the only missing tooth.
- A general trend in patients with hypodontia is to have the mesial-distal size crowns of the teeth present to be relatively small (especially if more teeth are missing).

No permanent tooth if its primary predecessor was missing.
It is possible, however, for the primary teeth to be present and for some or all the permanent teeth to be absent.

Ectodermal Dysplasia

- anodontia and oligodontia are usually associated with this systemic abnormality
- thin, sparse hair and
- an absence of sweat glands

Hypodontia, aplasia - Missing maxillary lateral incisors

- One of the most common pattern of hypodontia (about 5% of the patients treated)
- Etiology:
  - an autosomal dominant trait with incomplete penetrance and variable expressivity
  - a polygenic mode of inheritance also has been proposed.90
- Long-term retention of primary laterals is almost never an acceptable plan.
- When the lateral incisors are missing, one of two sequelae usually is observed.

1. The erupting permanent canine resorbs the primary lateral incisor and spontaneously substitutes for the missing lateral incisor, which means that the primary canine has no successor and is sometimes retained.
   - Some of these patients are seen as adults with primary canines in place, but most primary canines are lost by the end of adolescence even if their successors have erupted mesially.
   - Having the permanent canine erupt in the position of a congenitally missing lateral incisor is advantageous, whether or not the ultimate treatment is substitution of the canine for the lateral or opening space for a prosthetic lateral replacement because it generates alveolar bone in that area.
2. Less often, the primary lateral is retained when the permanent canine erupts in its normal position. This usually means that the lateral incisor space is reduced to the size of the primary lateral incisor and the remaining primary incisor is unesthetic.

Hypodontia, aplasia - Missing maxillary lateral incisors

- Treatment alternatives
  - **closing the space** and substituting the canine, or
  - prosthetic replacement of the missing tooth with a **single-tooth implant** or **fixed bridge**.
    - encouraging the permanent canine to erupt into the lateral incisor position so that alveolar bone is formed in the area of the missing tooth, and then moving the canine distally to open space is the best way to prepare for an eventual implant
    - The implant should not be placed until vertical growth is essentially complete
- Additionally, the canine shape and color can be determined
- Generally, unilateral orthodontic space closure in the anterior region of the mouth is not recommended

Hypodontia, aplasia - Missing second premolars

- Second premolars have a tendency to form late (8 years of age)
- If the patient has an acceptable occlusion, **maintaining the primary second molars** is a reasonable plan, since many can be retained at least until the patient reaches the early twenties or beyond
    - If the size of a primary molar is reduced, the mesiodistal diverging roots of the primary molar will resorb when they contact the adjacent permanent tooth roots.
- **extract primary second molars** that have no successor at age 7 to 9 and allow the first molars **to drift mesially**
    - If the space, profile, and jaw relationships are good or somewhat protrusive
    - This can produce partial or even complete space closure, unfortunately, the amount and direction of mesial drift varies
- **extract the primary teeth** followed by immediate **orthodontic** treatment
    - Unless the second premolars are missing in all quadrants, it may be necessary to extract teeth in the opposing arch to reach a near ideal Class I occlusion
    - Mesial movement of the lower first molar into a second premolar extraction space is diffic
    - The rate of molar traction can be as low as 0.2 mm per month
- **replace** the missing teeth prosthetically or perhaps by transplantation or an implant later

AUTOTRAN

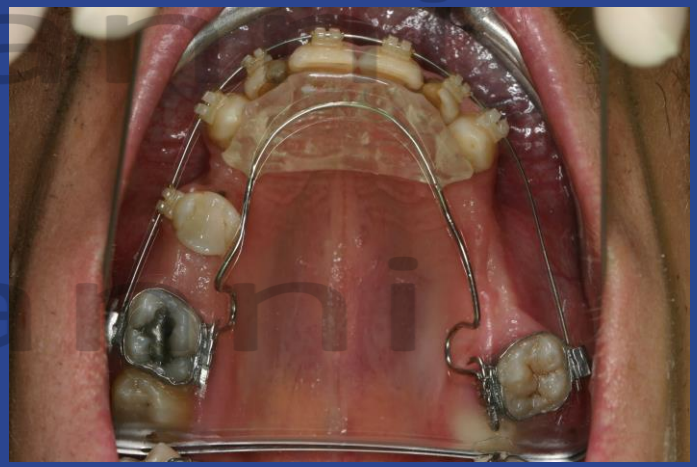
- The long-term fu

Tthe transplanted to

1. careful surgical ir
2. 3 months of heali
3. light orthodontic f
4. restorative treatm

Deep bite

- Skeletal vertical problems, both the short-face and long-face patterns, do not lend themselves to camouflage via tooth movement.
- **Lower facial height increase** in the **adolescent**
  - modification of growth and/or
  - dental eruption
- Treatment options in order of effectiveness:
  - **Functional growth modification appliances**
    - By posterior dentoalveolar eruption.
    - Eruption occurs more rapidly in some patients than in others
    - Eruption is affected by the amount of freeway space, resting mandibular posture, and amount of wear.
    - This type of treatment is most effective in younger patients in active phases of growth.
  - **Anterior bite plates**
    - incorporated into fixed appliances (such as a Nance-type appliance) or removable appliances
    - Anterior bite plates hold the lower incisors against the acrylic while permitting the posterior teeth to erupt freely. The bite plate must be worn continually and also should be worn even after bite opening to maintain the increase in facial height and bite opening.
  - **Cervical headgear**
    - to encourage maxillary posterior eruption during growth modification
    - produces an extraoral force in a posterior and inferior direction below the center of resistance of the teeth and the maxilla, resulting in dentoskeletal extrusion and an increase in lower facial height.
  - **Reverse-curve arch wire**
    - mechanics designed to extrude the mandibular posterior segments



Open Bite

1. The long-face pattern of growth is remarkably difficult to modify
2. **Interceptive procedures** - exercises in therapeutic diagnosis
3. **Functional appliances**
4. **Elongating the anterior teeth** to close an accompanying open bite is the antithesis of camouflage.
5. **Orthognathic surgery** to vertically reposition the maxilla - still the best treatment for severe skeletal open bite
6. Skeletal anchors to **intrude posterior teeth**

Thank you for your kind attention!

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