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E D I T O R I A L

On cleft lips and cleft palates

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As we approach the end of another year we have the great pleasure of welcoming Jean-Jacques Aknin. He is the Director of the Department of Dento-Facial Orthopedics in the Faculty of Odontology of Lyon and a Hospital Practitioner responsible for the Functional Unit of Dento-Facial Orthopedics in the Service of Odontology of the Civil Hospices of Lyons. An eminent member of the 'Association of the Revue of the ODF and the new President of the SFODF, he has prepared his initial editorial in the form of a short article in which he presents a synthesis of the responses to a question that is important but little known to practitioners who do not work in hospital or university settings, primarily because patients who suffer from cleft lips and cleft palates do not ordinarily consult private practitioners, remaining instead under the care of hospital and university services.

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Children who suffer from clefts of lips, alveoli, and hard and soft palates, phenomena that occur once in every 700 births, are often obliged to travel great distances to receive orthodontic treatment. It would seem advisable, accordingly, that more orthodontists be trained in this special area so that patients with clefts could receive care at facilities located nearer to their homes. Perceived for many years as serious deformities with grave consequences, cleft palates can now be treated with remarkable facility and success thanks to new procedures and surgical techniques and also because of the efficacy of the multidisciplinary therapeutic approach that has become increasingly utilized.

1 - EMBRYOLOGY

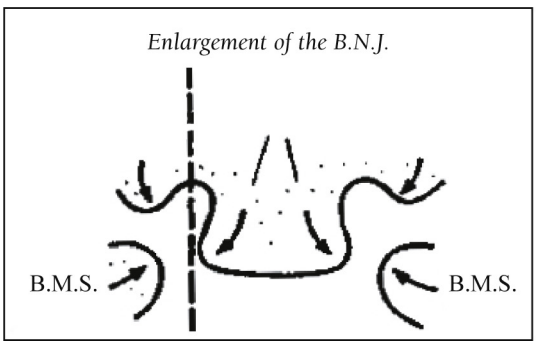
The eventual configuration of the face derives from the fusion of the facial buds.

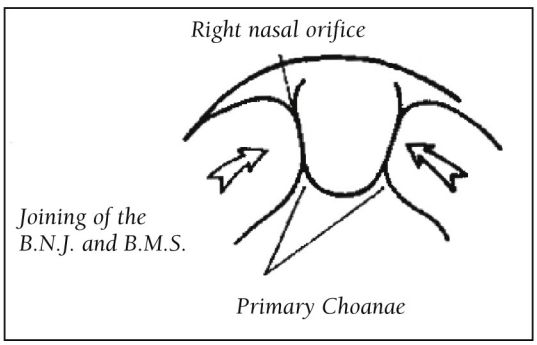
1 - 1 - Formation of the primary Palate

During the 6th week the maxillary processes begin to develop under the embryonic eyes. They come into contact with the internal and external nasal processes. Next the right and left maxillary processes fuse with the internal nasal process to form a cellular mass that constitutes the **primary palate**.

1 - 2 - Formation of the secondary Palate

During the 7th week, behind the primary palate two small horizontal lamina appear at the level of the maxillary processes. They are the **palatal processes** that are going to develop horizontally on both sides of the tongue. Then the tongue moves from its position near the nose to a place within the buccal cavity thus facilitating closure of the palatal processes to form the **secondary palate**. The joining of the palatal laminae proceeds from to rear, from the incisive canal to the uvula. At the same time, at another level, a vertical crest arises in the **naso-frontal** process, becoming the **nasal septum** that is going to descend to meet the palatal processes in joining the upper aspect of the secondary palate, which will define the two definitive nasal processes.





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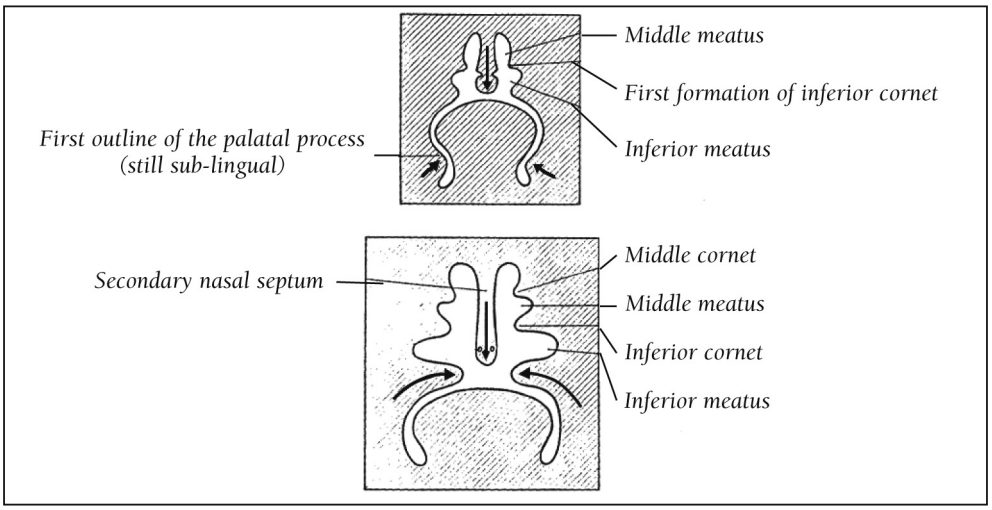

2 - ETIOLOGY

Two genetic factors can be distinguished in the etiology of facial clefts, but extragenetic forces, which can operate separately or in association, in what is called multifactorial etiology, can also contribute to their development.

• **The genetic factors:**

– Isolated clefts often have a multifactorial derivation based on both genetic factors and environmental influences;

– **Very few** clefts derive solely from **inherited** defects such as chromosomal aberrations, mutant genes, or of direct teratogenic action.

3 - DESCRIPTION OF CLEFTS

3 - 1 - Different anatomo-clinical forms

The deeper the cleft, the wider it appears laterally:

– **simple labial clefts;**

– **labio-nasal clefts** (from the lip to the base of the nose);

– **labio-alveolar clefts**. All degrees of partial clefts exist. They can be unilateral or multiple and confined to lips and teeth or extended into:

– **palatal clefts**. These combined defects must be separated into two categories, those that are **primary palatal clefts** and those that are **secondary palatal clefts**.

3 - 2 - The secondary palatal cleft

This type of defect is located along the trajectory of the median sagittal suture of the hard palate, between the

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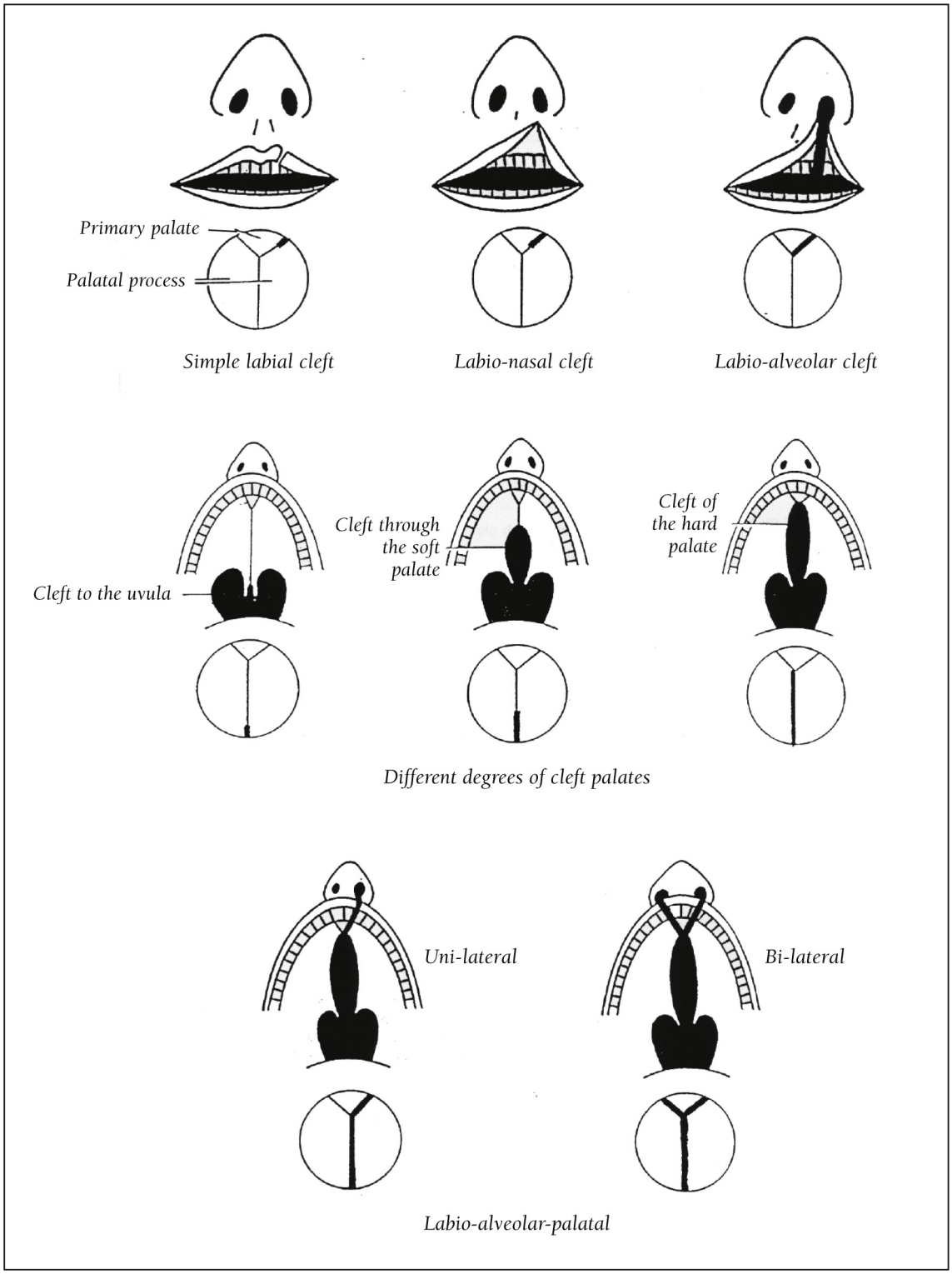

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two palatal plates that it divides, and through the soft palate up to the uvula. This is a posterior, symmetrical, midline anomaly running forward to the anterior palatal canal. Depending upon the severity of the deformation, it can encompass a splitting of the uvula and the soft palate as it extends into the hard palate. Because of its being split into two halves the soft palate cannot fulfill its physiological role of acting as a mobile screen between the cavum and the oropharynx. The cleft makes it impossible for the oral cavity to be closed off from the rhino-pharynx and prevents children from enunciating correctly as they learn to speak.

3 - 3 - The bilateral cleft

Like unilateral clefts, bilateral defects can run through the entire length of the palate or only through part of it. They are characterized by the median process being isolated as a result of the double dehiscence. Two qualities of the median process can complicate treatment:

– it is very hypoplastic;

– the normal orientation of the totality of the median process having been seriously disturbed, it may be tilted forward as much as 45°.

3 - 4 - Growth of soft tissues

The exterior, cutaneous appearance of cleft palate patients reflects the underlying skeletal status. Accordingly, children with facial clefts will have malformed profiles because of the basic initial deformity and the subsequent soft tissue defects that will vary in response to the types of surgical treatment they have received.

4 - ASSOCIATED DENTAL ANOMALIES

4 - 1 - Anomalies of number

• **Congenital absence of upper lateral incisors occurs frequently:**

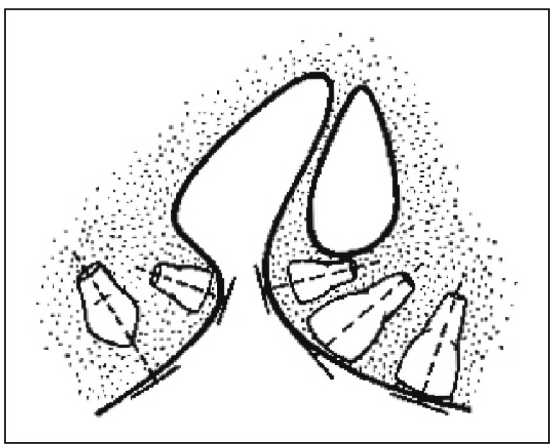
– on the side of the cleft in 40% of the adult dentitions and 27% of the temporary dentitions;

– on the side unaffected by the cleft in 11% of cases.

• **Doubling**

Below, one lateral incisor on the side of the smaller fragment and another on the side of the larger fragment.

Doubling affects lateral incisors on the side of the cleft in 22% of the cases in the permanent dentition and



in 42,5% of temporary dentitions. In these cases lateral incisors appear on each of the two sides of the cleft.

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4 - 2 - Anomalies of position

The poor arrangement of tooth buds results from a disorganization of basal bone, itself a victim of failure of embryonic segments to fuse properly.

4 - 3 - Anomalies of form

The tooth most often malformed is the lateral incisor which presents a **riziform or peg-shaped** appearance or be absent entirely.

5 - OCCLUSAL RELATIONSHIPS

• **In the sagittal sense:** The maxillary retrusion and the pseudo mandibular protrusion in congenital cleft palate cases reflect an underlying Class III skeletal condition with an arch length discrepancy in the maxilla and a mandible unaffected by malformation.

• **In the transverse sense:** a retruded maxilla may or may not be accompanied by a retrusion of the alveolar process. The upper mid-line is deviated. A small sized maxilla may or may not be accompanied by an alveolar process reduced in bulk. The incisal midline is deviated. The difference in size between the large and the small maxillary fragment, which is tilted toward the median, is marked. The mal-position of this smaller portion causes major deviations in tooth alignment and occlusal relationships.

6 - HEARING AND SPEECH

The hearing of cleft palate patients is adversely affected in 75% of the cases because of the intrusion of air into the middle ear, which modifies breathing capacity and tympanic pressures.

6 - 1 - Impact on patients' phonics

Because of the open communication between the oral and nasal cavities, air can escape readily. The types of soft palate insufficiency leading to loss of function are: divided palate, excessively short palate, and inert palate. In all three instances, compensatory functioning may be established, but if that does not occur, dentists should provide patients with obturators.

7 - INITIAL SURGICAL TREATMENT

It is important to emphasize that a multi-disciplinary team should take charge of the patent's treatment from the earliest possible age until adulthood.

7 - 1 - The operatory timetable

Schedules vary from one dental department to another, but to keep this presentation uncomplicated we

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shall offer Psaume and Maleck technique that the team from Lyons is using the clinic Val d'Ouest:

- Isolated labio-alveolar cleft

  Lip + nose: 2 months (+ nasal conformator).

  – **Total unilateral labio-palatal clefts**

  Soft palate correction: 3 months (staphyloraphy).

  Lip + nose + hard palate (Uranoplasty): 5 months (+ nasal conformator).

  Pharyngoplasty before 6 years (before beginning kindergarten).

- Total bilateral labio-palatal clefts

  Soft neo-natal obturator: 3 months.

  Veloplasty: 3 months.

  1st on the side of the lip, hard palate, nose: 5 months.

  2nd on the side of the lip: 7 months.

- Soft palate-hard palate clefts

  Clefts affecting only the soft palate: 3months.

  Soft palate + Hard palate: in two stages: 3 months and 5 months.

8 - ORTHOPEDIC TREATMENT

Orthodontists can begin treating cleft palate patients with orthopedic devices when they are still in the temporary dentition stage to establish functional equilibrium as soon as possible so as to encourage harmonious growth and development of facial structures.

– In the **transverse sense** the appliance of choice is a Quad Helix to expand the constrained maxilla toward normal dimensions.

– In the **sagittal sense** use of the mask of Delaire can be used to compensate for skeletal defects by moving the maxilla forward while holding back mandibular growth. Traditional Class III mechanics can supplement this extra-oral force.

9 - ORTHODONTIC TREATMENT

In the mixed dentition, the objectives of treatment are to:

– solidify disparate osseous fragments;

– correct the malpositions of the incisors while preserving space for the missing or deformed lateral incisor, which will most often be replaced with an implant after placement of an initial bone graft and the end of the growth period;

– restore the premolars and the canines to normal occlusion;

– restore the maxillary arch to a normal contour;

– correct any cross bite relationships.

After this mixed dentition stage of treatment, a palatal acrylic retainer can be used to maintain the corrections.

• **The time for a bone graft varies** in accordance with the age of patients and their motivation, according to the stage of eruption, which is often chaotic in cleft palate patients,

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according to stage of root maturation, and according to the positions and long axes of the unerupted permanent teeth.

Clinical researchers are currently actively trying to determine what is the most desirable moment for the placement of bone grafts; precise timing varies with different teams but, generally speaking, **grafts can be placed on children between the ages of 8 and ten**. **Before the eruption** of the canines or **after the eruption** of the canine in the small fragment when patients are about 12 years old in the adolescent dentition. A dentoscan can help the clinician to visualize the extent of the cleft and its location in 3D.

• **In Class I skeletal cases**, orthodontists can prepare the teeth, correcting alignment and restoring ideal arch form and, above all: **Reducing the size of the cleft by individualized mechanics to bring the large and the small fragments into as close approximation as possible** (fig. 1). This orthodontic preparation should take into account the absence of an upper lateral incisor or the presence of one that is deformed that will, in most cases, have to be removed.

• **In Class III skeletal cases**, combined surgical-orthodontic treatment should be undertaken as soon the graft has been placed and become well established. Orthodontic preparatory treatment, if it has not already been completed, will have restoration of ideal arch form as its goal.

Individualized orthodontic reduction of the cleft, Osseous graft, at the age of 14.

Individualized orthodontic reduction of the size of the cleft, Bone graft (14 years). Compensatory orthodontic corrective treatment, Orthognathic surgery: Lefort 1 advancement and need for pharyngoplasty to be evaluated. When these procedures are completed, a six month fine detail orthodontic finishing treatment should include root paralleling in the implant zones where missing lateral incisors will have been

Figure 1
Individualized orthodontic reduction of the size of the bilateral cleft.
This space closing procedure is accomplished with a contraction arch capable of approximating the three fragments before the graft is set in place. The orthodontic force is 22 bis. Because supernumeray teeth are endowed with a certain quantity of bone in the cleft area, they should never be extracted at too eary a stage for fear of causing the loss of precious osseous material.

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replaced. Finally fixed retention is used until the implant can be placed.

• **Surgery of the lip or nose** (septum nasal, at the end of the growth period) this can take place once the dento-alveolar rampart has been reconstituted.

• **Retention**: unless a transpalatal arch is used there is always the risk of relapse of the palatal expansion achieved. This fixed retention has to be quasi-permanent.

10 - CONCLUSIONS

The multi-disciplinary team evaluates the proper time for beginning surgical orthodontic treatment of clefts based on the interferences the defect is exerting on normal facial growth.

The sequence of the therapeutic stages is complex; every variation in protocol has its advantages and disadvantages.

The difficulty in making treatment choices derives from the compromises each requires, as explained by Talmant, "We must find the best possible balance between the most perfect anatomic restoration and the lowest possible ransom paid in post-operative scarring."

The therapeutic calendar, especially as it is affected by the reciprocal understanding and cooperation of orthodontists and surgeons, will influence the quality of the results obtained.

At the present time, we can safely assert that the treatment of palatal clefts has greatly improved, thanks, of course, to definite improvement in surgical techniques, but also, in a more important global fashion, because of the increasingly effective multi-disciplinary coordination of the efforts of pediatric surgeons, maxillo-facial surgeons, implantologists, general dentists, and the guiding interventions of orthodontists at every stage of treatment, which is enormously demanding but provides even more enormous dividends for the patients it serves.

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