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Managing labio-maxillary-palatal clefts: the Nancy protocol

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ABSTRACT

Labio-maxillary-palatal clefts, which are caused by fetal nasal buds failing to fuse with the maxillary bud, disrupt the ensemble of the structures that support and interact with the nose and upper jaw creating a rupture of balance that becomes an increasingly exacerbating vicious circle. In correcting these defects practitioners must effect a compromise between the need to re-unite separated parts – under as little tension as possible – and the need to preserve the interrupted potential for growth in the affected facial region. They must carry out this compromise in the double sense of topography and chronology.

Adhering to this therapeutic philosophy, the Nancy protocol closely associates orthopedic preparation and surgical treatment of patients to obtain:

– high quality morphology,
– an unblocked, sufficiently broad maxilla,
– correct nasal breathing,
– velo-pharyngeal competence.

We use a tibial periosteal graft to repair the oral cleft as an important element of our procedures.

KEYWORDS

Palatal cleft,

Labial cleft,

Surgical technique.

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1 – INTRODUCTION

Labio-maxillary-palatal clefts are caused by fetal nasal buds failing to fuse with the maxillary bud sometime between the 3rd and 6th weeks of intra-uterine life. The imbalance in the muscular system that follows provokes malpositioning of associated supporting bones.

The principal goal of primary treatment for these clefts consists of rejoining the disrupted mucosal, cutaneous, osseous, and muscular borders, which has to deal with three characteristics of the malformation: the size of the borders, the quantity of the available tissue, and the quality of the tissues to be reunited.

In carrying out these procedures surgeons must be careful not compromise growth potential.

While protocols for treating unilateral and bilateral clefts differ in some aspects they both combine orthodontic and surgical procedures, a collaboration that is especially important at the time of lip adhesion.

2 – UNILATERAL CLEFTS

2 – 1 – Orthopedic treatment

- **Passive plates**

Orthodontists begin pre-operative orthopedic treatment with a prosthetic palatal plate whose principal goal is to obturate the palatal defect, at least partially, thus making it easier for patients to ingest food, and restoring a separation between the respiratory and digestive pathways. It also provides a site against which the tongue can orient itself and thereby improve its posture. By no longer thrusting itself into the cleft the tongue can then resume contributing to correct growth by exerting pressure on the palatal plates.

Taking an impression from which a model can be made for construction of the prosthetic plate is a routine dental procedure but, for patients with clefts, it is not without its risks, especially for infants whose state of health is precarious. But by substituting silicone for alginate as an impression material practitioners can reduce the risk of residual particles insinuating themselves into the cleft and the aero-digestive pathways. (fig. 1) Practitioners usually take impressions in a hospital operating room for these special patients so that careful supervision of their ventilation can be maintained. We have our affiliated laboratory construct a passive prosthetic plate for cleft pages in the first week of their post-natal life and re-adapt it every five or six weeks to compensate for the infant's growth changes (fig. 2).

- **Active plates**

In order to improve the contours of the upper dental arch we soon replace the initial passive devices with active plates that can apply gentle force to the osseous fragments on either side of the cleft.

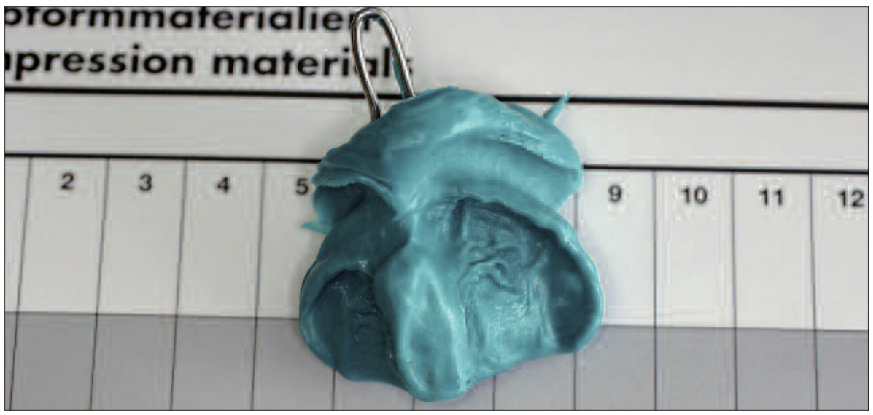


Figure 1
Taking an impression for a unilateral labio-maxillary-palatal cleft.

Figure 2
Passive plate.

These devices can exert, for convergent forms (fig. 3), expansion force derived from a screw or support contracting elastic force for divergent forms with force applied from the internal extremity of the larger fragment at the tuberosity to the smaller fragment.

We stabilize the device with pins set into the maxilla and apply contractile pressure using a pinned coaxial screw of the type Giorgiade and Latham[3] described or the elastic

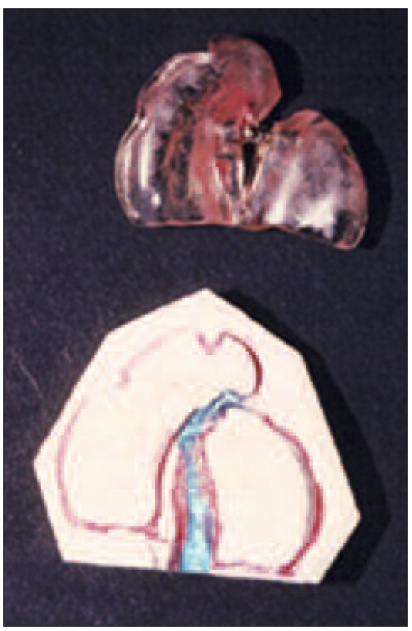
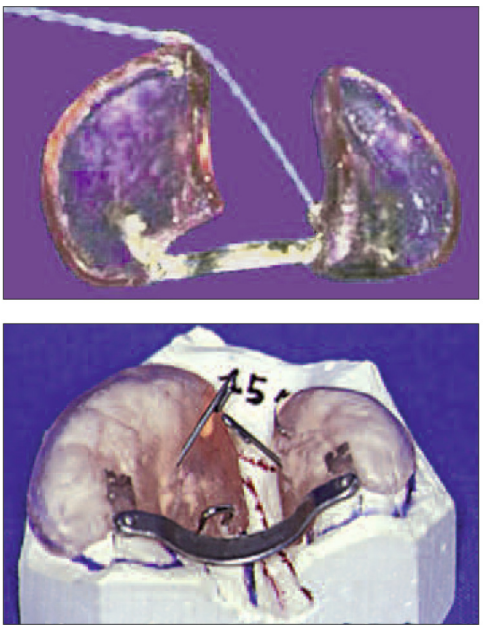


Figure 3
Active plate with screw for convergent forms.

chains that Stricker *et al.*[17] proposed (fig. 4 a and b).

We begin using these active plates for patients whose clefts are greater than 1 cm in width when they are about six weeks old and keep them in place for about three weeks.



Figures 4 a and b
Active plate with elastic chain for large clefts.

Figure 5
Lip adhesion.

- **Labial adhesion** (fig. 5)

Because better results seem to be obtained for patients with incomplete clefts, where a cutaneous bridge (Simonart's band) has remained in place near the nose, Millard[3] suggested that surgeons construct one for patients who didn't have such a connection by placing a cutaneous-mucous suture high on the lip so that organ's distinctive landmark features will be conserved. Randall[13] suggested that surgeons add a complementary muscle suture so that the tissue bridge will be more durable, a technique we have adopted as a complement to the active plates.

2 – 2 – Surgical closure

Following the concept of utilizing the periosteum to stimulate osteogenesis described by Duhamel and Ollier[12], Stricker, *et al.*[16] used a tibial periosteal graft to repair not only the labial cleft but also the entirety of the palatal defect.

They placed tissue they had taken from the anterior, external surface of the tibia (fig. 6) lengthwise from the piriform orifice to the edge of the hard palate (fig. 7) as a means of closing unilateral labio-maxillary-palatal clefts in a single procedure when patients were only six months old.

In accordance with this concept, here is the protocol that we now follow:

– a cheiloplasty performed in accordance with the Skoog[15] technique that exerts less of a constraint on maxillary growth than Millard's advancement-rotation procedure[7] (fig. 8 a and b);

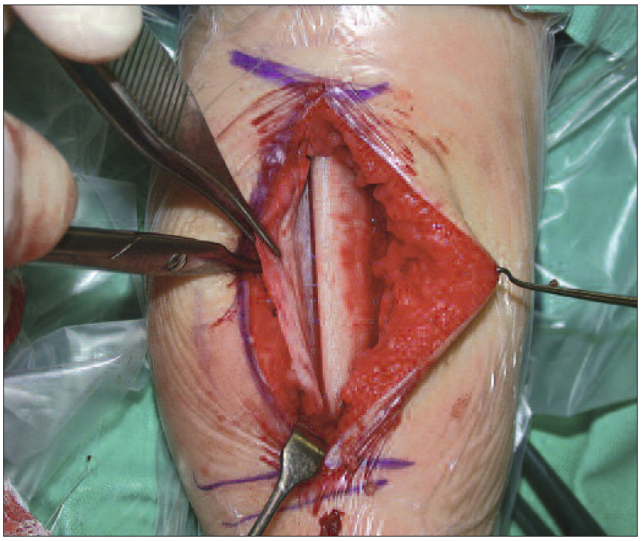


Figure 6
Taking a section of tibial periosteum.

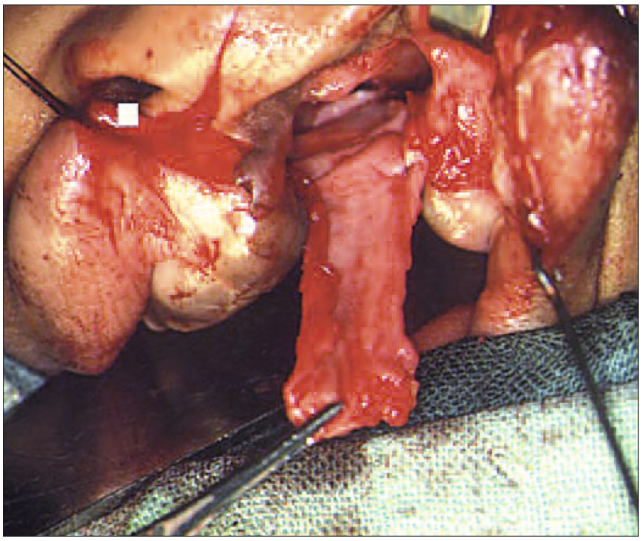


Figure 7
Placement of the periosteal graft for a patient with a unilateral a labio-maxillary-palatal cleft.

– a urano-staphylorraphy, or turbinate remodeling, using a periosteal graft so as to achieve anterior oral closure that will not create a future scar tissue blockage to orthopedic maxillary expansion (fig. 9);

a b

Figure 8 a and b
Pre and post-operative photos of a Skoog[15] cheiloplasty.

– an operative correction of the nasal deformity by inter-cutaneous-cartilaginous dissection associated with placement of a Koken nasal splint[2] (fig. 10);
– a gingivo-periosteoplasty designed to provide additional alveolar bone supporting the continuity of gingival fibro-mucosa; and finally,

Figure 9
Photo taken some time after a periosteal graft for a patient with a unilateral labio-maxillary-palatal cleft.

– placement of a passive post-operative plate that will protect the periosteal graft from the impact of hard foodstuffs and prevent scar tissue provoked retraction.

3 – BILATERAL CLEFTS

Practitioners treat bilateral labio-maxillary-palatal clefts in conformity with the same general principles that guide them in treatment of unilateral clefts by coordinating orthopedic and surgical procedures.

3 – 1 – Orthopedic treatment

The first step in our protocol is placement of a passive palatal plate to re-establish a barrier between the oral cavity and the nasal fossas while at the same time forcing the tongue to accept a new posture.

We correct the prolapse of the median bud by using active plates of the kind first described by Georgiade and Latham[3] and popularized in Europe by Bitter[1]. In this procedure when patients are three weeks old we transfix a spindle, under general anesthesia, into the posterior part of the median bud and then, with the palatal plate as anchorage source, apply elastic force to it for about three weeks (fig. 11 a and b).

When the bud has been moved into place, we join the bilateral clefts by creating a cutaneous-muscular-mucosal bridge[6,13].

Figure 10
Different sizes of Koken nasal splints.

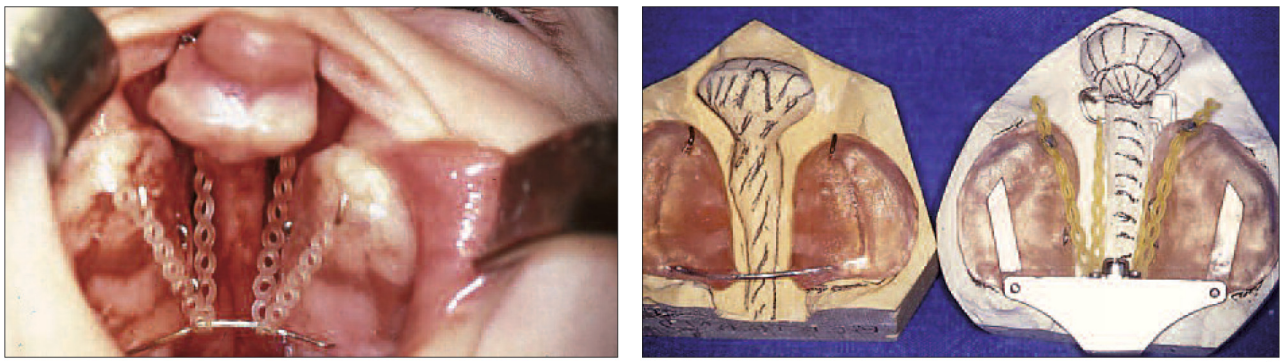
3 – 2 – Surgical treatment

A host of authors have described a variety of procedures for closing total bilateral clefts of the palate and lip where a short columella may complicate the problem.

For clefts of the lip, we believe it is best to close the bilateral defects in the same procedure in order to obtain the best possible symmetry and to avoid scar formation in the region of the philtrum. We prefer to use the Millard cheiloplasty technique[5] as modified by Mulliken[9-11], which facilitates lengthening the columella when indicated (fig. 12 a and b).

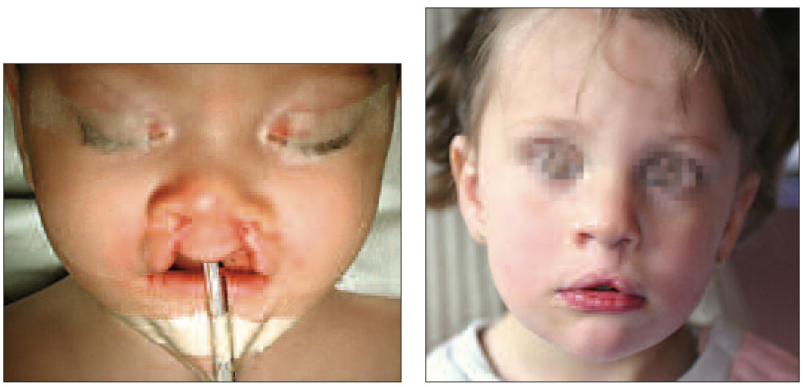
By using a periosteal graft in the hard and soft palates we can close the oral defect without provoking formation of fibro-mucosal scar tissue that would later impede the necessary orthopedic maxillary expansion.

We use simple acrylic plates after surgery to protect the periosteal graft and to resist contracting forces exerted by scar formation and pressure from the orbicularis muscles.



a b

Figures 11 a and b
Latham appliances[3] that are used for labio-maxillary-palatal clefts.



a b

Figures 12 a and b
Pre and post-operative photos of a patient who had a Millard cheiloplasty.

4 – POST-OPERATIVE CHECK-UPS AND PROCEDURES

No matter how successful the initial treatment may seem to have been, it would be illusory to think that treatment for labio-maxillary-palatal clefts is completed when the last primary correction is accomplished. These patients need to be followed diligently by a multi-disciplinary team concerned with:

- **Palatal integrity**

Fistulas may develop at any time along the line of the original cleft. In our protocol we estimate their incidence to be about 12% (fig. 13).

- **ENT follow-ups**

Considering the high risk of cleft palate patients developing severe

Figure 13
Aspect of palatal fistula.

otitis problems at an incidence rate that varies from 30 to 70% depending on the study, careful ENT specialists need to maintain vigilant surveillance of cleft palate patients. We routinely perform a systematic evaluation of every cleft palate patient when we conclude surgery to close the defect.

- **Speech problems**

An eventual insufficiency of the soft palate and pharyngeal tissues may require, after initial speech therapy, an Orticochea[5,13,14] procedure before any further orthophonic treatment can take place.

- **Relationship between the dental arches**

We use the Goslon Yardstick[4], which records the number of teeth in cross bite, to assess relationships between the dental arches.

- **The amount of alveolar bone**

The Bjorn, Holmgren[16] method measures this dimension by assessing the relationship between the height of the sub-nasal alveolar bone and the alveolar level in the area of the cleft (fig. 15).

Surgeons provide the sub-nasal alveolar bone required for creation of an osseous bridge in that area by placement of a periosteal graft in their initial operation. Moreover, the alveolar bone is dependent upon fibro-mucosal gingival continuity and in some cases an initial gingivo-periosto-plasty may also be needed.

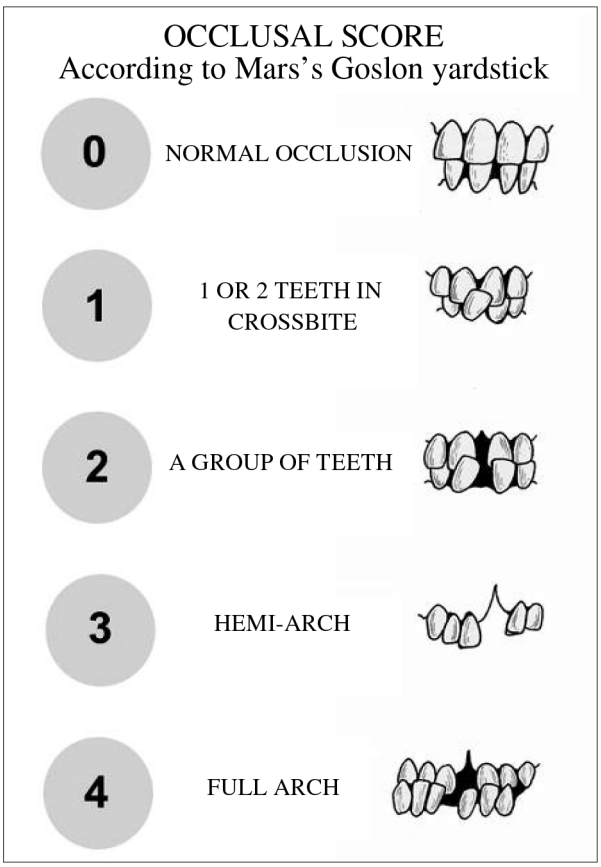


Figure 14
The Goslon Yardstick, a scale classifying arch relationships for patients with unilateral labio-maxillary-palatal clefts.

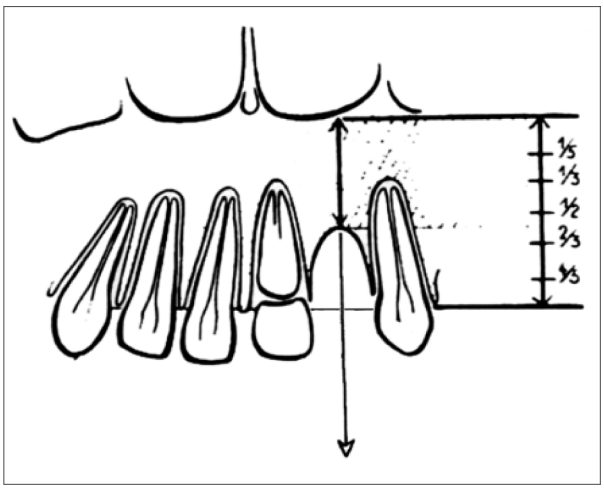


Figure 15
Evaluation of bone height, after Bjorn and Homgren[16].

Figure 16
This patient's unsatisfactory facial appearance caused by a retruded maxilla justifies an osteotomy.

5 – FOLLOW-UP ORTHODONTIC AND ALVEOLAR DENTAL CARE

We evaluate the upper and lower jaws periodically during the growth period. In come cases single jaw or bimaxillary Lefort 1 osteotomy may be indicated to re-establish satisfactory occlusion and to improve the esthetic result (fig. 16).

Finishing procedures for the teeth and the alveoli often require the support of free palatal transplants associated with prosthetic rehabilitation of the dentition with implants or bridges[8].

6 – CONCLUSION

Our protocol of combined orthopedic and surgical management of labio-maxillary-palatal clefts makes it possible for us to provide near normal facial architecture for our patients at a relatively early stage of their treatment.

However, this does not mean we can in way relax the vigilance of multidisciplinary check-up visits because of our inability to predict the ways in which growth will proceed and what will be the nature of the inevitable sequellae.

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