REPAIR OF WIDE UNILATERAL CLEFT LIP & ALVEOLUS - HOW IS IT DIFFERENT

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GSR Institute of Facial Plastic Surgery

- Non-profit hospital established in 1996
- Dedicated Cleft & Craniofacial Centre of Excellence
- Presently 1,600 cleft and craniofacial surgeries are done every year
- 3 surgeons and 4 fellows with full support team
- More than 30,000 documented cleft & craniofacial surgeries have been performed since 1996
- 600 primary new born cleft children are registered every year
Unilateral Cleft Lip Defect
A 3-Dimensional Problem

Oral
• Discontinuity and mal insertion of Orbicularis oris muscle causing horizontal and vertical lip length discrepancy

Nasal
• Deformity of nasal form caused due to mal insertion of Nasalis and other oro-nasal muscles
• Displacement of septum

Alveolar
• Loss of bony support

Unilateral Cleft Lip Defect

Is the morphology of the unilateral cleft lip defect the same in all patients?
Complete Unilateral Cleft Lip

Without Simonart’s band (Type I a)  With Simonart’s band (Type I b)

Without complete collapse of nasal dome and ala (Type II a)  With complete collapse of nasal dome and ala (Type II b)
Complete Unilateral Cleft Lip

Without difference in level of alveolar ridges (Type III a)  
With difference in level of alveolar ridges (Type III b)
Problems of Wide Clefts

• Differential height of the alveolar segments.

• Variations in the horizontal width of the segments.

• Inward turning of the Cupid’s bow towards Columellar base on non cleft side.

• Leading to Severe shortening of skin for Millard rotation.

• Shortening of vertical Height on cleft side and retraction of tissue into the nasal web.

• Collapsed of the nasal dome and severe deviation of nasal septum.
Before primary lip repair (NAM)

Presurgical Nasalveolar Orthopedic Moulding in Primary Correction of the Nose, Lip, and Alveolus of Infants Born With Unilateral and Bilateral Clefts

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This addendum to the “State of the Art Dental Treatment of Predental and Infant Patients With Clefts and Craniofacial Anomalies,” by Prahl-Andersen (Cleft Palate Craniofac J. 2000;37:528–532), offers an extended perspective on this controversial subject. This article reviews the role of combined nasal and alveolar (nasalveolar) molding in the primary correction of the nose, lip, and alveolus of infants born with unilateral and bilateral clefts. The background of presurgical nasalveolar orthopedic molding, the technique, and the literature are presented. The proposed benefits of treatment from the traditional techniques of presurgical orthopedics have been shown to be unsubstantiated (Kuljpers-Jagtman and Prahl, 1996). A close comparison of the proposed benefits of earlier forms of presurgical orthopedics, along with those of the current technique of nasoalveolar molding, is presented.

KEY WORDS: bilateral unilateral cleft lip and palate, gingivoperiosteoplasty, nasal stent, nasalveolar molding, nonsurgical columella elongation, presurgical orthopedics

Presurgical Nasalveolar Orthopedic Moulding in Primary Correction of the Nose, Lip, and Alveolus of Infants Born with Unilateral and Bilateral Clefts
Dr. Barry H. Grayson, DDS  

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We don’t believe in NAM. Due to burden of care.

So

We believe in **Morpho- Functional** Correction.
Goals of Morphofunctional Correction of Unilateral Cleft Lip Defects

A functional anatomical repair of the underlying hard and soft tissues is essential.

Goals of primary cleft lip repair

- Harmonious lip form in vertical and horizontal dimension
- Nasal symmetry
- Bridging the alveolar ridge
Millard’s Incision for Unilateral Cleft Lip (1996-2000)

Produces better results where
• preoperatively there was a more prominent Cupid's bow and
• where the width of the lip and nostril on the cleft (lateral) side were greater than mean values

Source:
Choice of Incision for Primary Repair of Unilateral Complete Cleft Lip: A Comparative Study of Outcomes in 796 Patients.

Produces better results

- where the height of the lip on the cleft side was greater and
- where the columella height and width were greater than mean values

Source:
Choice of Incision for Primary Repair of Unilateral Complete Cleft Lip: A Comparative Study of Outcomes in 796 Patients.

www.craniofacialinstitute.org
Choice of Incision for Primary Repair of Unilateral Complete Cleft Lip: A Comparative Study of Outcomes in 796 Patients.

Plastic and Reconstructive Surgery 121: 932, 2008

The Millard flap produced better results when there was a need to rotate the cupid’s bow.

Pfeifer’s design produced better results in the vertical elongation of the lip.

It was found that one technique was essentially as good as the other.
An incision utilizing the advantages of both Millard and Pfeifer incision

Afroze incision

- Developed to address the problem of **lip length discrepancy and vermillion matching** using only one incision.

- Combined the **Millard incision on the non-cleft side** (medial side) and the **Pfeifer incision on the cleft side** (lateral side).

- **Millard incision** on the non-cleft side **aids rotation** and the **Pfeifer incision** on the cleft side **aids lengthening** trying to address horizontal and vertical discrepancies of the lip.

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
The Afroze incision does not cross onto the base of columella.

Incisions which cross the columella cause scarring leading to growth retardation and severe downward pull of the columella on affected side.

The Afroze incision separates the medial part of ala on cleft side and its associated mal-aligned muscle to further lift the tip of the nose and improve the alar contour and reduce the webbing in the nose.

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
Afroze Incision for Functional Cheiloplasty

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Abstract. Repair of unilateral cleft lip is a fascinating and challenging procedure. Although a great number of operations have been described for the unilateral cleft lip repair, some still hold the plastic surgery criteria, and in most cases, cleft lip repairs require secondary operations to achieve balanced soft- and hard-tissue development. This incision is a combination of incisions that is based on the Millard incision on the concave side and the Millard incision on the convex side. The flap is centred on the Millard line on the concave side and rotated downward, and the peak of the distal curve of the Millard flap is pointed to the triangular defect formed by the movement of the Millard flap. This flap is then advanced on the convex side using the concept of "microtome flaps." Measurements of concave side lengths and lengths are made and transferred to the cleft side using a flexible wire, thus determining natural anatomic points. The 2 curves are brought together such that the highest and lowest points of 1 curve are approximated with the corresponding highest and lowest points of the other, forming a straight line. On superimposition of both curves, each has its own advantages and disadvantages. The Millard flap produced better results when considering cleft lip symmetrization. In this respect, it is neither more flexible than a straight line design and the surgical incision is able to produce the rotation flap on the concave side where it is judged likely to produce the best outcome. This technique also has an improved outcome when compared to the upturned lip on the convex side. This would be attributed to the rotation flap on the convex side. The flap is then advanced on the convex side using the concept of "microtome flaps." Measurements of concave side lengths and angles are made and transferred to the cleft side using a flexible wire, thus determining natural anatomic points. The 2 curves are brought together such that the highest and lowest points of 1 curve are approximated with the corresponding highest and lowest points of the other, forming a straight line.

Key Words: Complete unilateral cleft lip, Afroze incision, Cheiloplasty (J. Craniofac. Surg. 2009;20:1733-1736)

Introduction

Repair of unilateral cleft lip is a fascinating and challenging procedure. Although a great number of operations have been described for the unilateral cleft lip repair, some still hold the plastic surgery criteria, and in most cases, cleft lip repairs require secondary operations to achieve balanced soft- and hard-tissue development. This incision is a combination of incisions that is based on the Millard incision on the concave side and the Millard incision on the convex side. The flap is centred on the Millard line on the concave side and rotated downward, and the peak of the distal curve of the Millard flap is pointed to the triangular defect formed by the movement of the Millard flap. The primary incision is continued using the concept of "microtome flaps." Measurements of concave side lengths and angles are made and transferred to the cleft side using a flexible wire, thus determining natural anatomic points. The 2 curves are brought together such that the highest and lowest points of 1 curve are approximated with the corresponding highest and lowest points of the other, forming a straight line.

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Morpho-functional Cleft Lip Repair

Incision design for unilateral cleft lip surgery

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
Morpho-functional Cleft Lip Repair

Minimal muscle dissection on cleft side ensuring dissection of OrbicularisOris and Alar head of Nasalis muscle

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
Wide sub-periosteal dissection is done from the vestibule on the cleft side over the piriform rim, nasal bone, infraorbital and malar to lift the facial mask.

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
Minimal muscle dissection is done on the non-cleft side relieving all abnormal attachments on anterior nasal spine and columella.

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
Morpho-functional Cleft Lip Repair

SEPTUM IS KEY
The septum is positioned in its rightful anatomical position

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note

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Perialveoloplasty is done to exert more medial pressure on the palatal shelves.

Source:
Afroz Incision for Functional Cheiloplasty, Technical Note
At the time of primary lip repair
(Morphofunctional Cleft Lip Repair-Peripheralveoplasty)


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Ala of nose stabilized symmetrically to match that of the normal side by taking a suture through the alar head of the nasalis muscle on the cleft side to the contralateral muscle through the septum.

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note

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Morpho-functional Cleft Lip Repair

OrbicularisOris muscle approximation and closure is done

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
Does this incision design protect the vascularity of the lip?
What we have identified in naso-labial vasculature in cadaver dissection

Morphological and functional variability

- Superior Labial Artery Caliber asymmetry
- Superior Labial Artery Anastomosis Inconsistent
- Superior Labial Artery Duplications
- Philtral Artery Redundancy Medially
- Philtral Artery Asymmetry Laterally
- Facialis Artery Asymmetry
Measurements of $S_vO_2$, rHb, flow, (O$_2$-metab.) in 2 anatomical planes:

Tissue spectroscopy

Laser doppler flowmetry

0.4 mm $\rightarrow$ skin

4 mm $\rightarrow$ muscle
8 surgical landmarks

22 normal
mean age 62m (SD 43)

33 unilat. Cleft preop
mean age 9m (SD 6)

29 unilat. cleft Late postop
mean age 23m (SD 48)
time postop 27.5m (SD 33.6m)
Intraoperative Vascular Anatomy, Arterial Blood Flow Velocity, and Microcirculation in Unilateral and Bilateral Cleft Lip Repair

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Background: Cleft lip repair seeks to normalize the distorted anatomy and function. The authors determined whether normalization of blood circulation is achieved.

Methods: The authors measured the microcirculatory blood oxygen saturation, and hemoglobin levels in the lip and upper levels of contralateral controls (n = 25) and in patients with unilateral and bilateral cleft lip–palate. The authors monitored the parameters before lip repair (n = 29 and n = 11, respectively), at the end of lip repair (n = 19 and n = 9, respectively), and in the late postoperative period (n = 13 and n = 50, respectively). The arterial flow velocity was measured in unilaterial groups at the same time points (n = 13, n = 11, and n = 13, respectively).

Results: Before surgery, the arterial flow velocity and microcirculation values were similar on either side to the face and between groups. The microcirculatory flow was significantly higher in the presence of bilateral patients than on the side of controls. All circulatory values in unilateral and bilateral patients in the late postoperative period were within the range of controls and of controls before surgery. Postoperatively, the authors consistently found a perfusing artery on the superficial side of the triangular muscle complex.

Conclusions: This approach appears to be a feasible micrometabolic defect in unilateral and bilateral cleft lip–palate patients. The increased flow in the posterior atresia indicates a strong hemodynamic factor in this territory, compelling to vascular preservation. Whether surgical preservation of the main end arteries is sufficient to benefit should be addressed in future studies. (Plast Reconstr Surg 130: 1120, 2013.)

CLINICAL QUESTION/EVII. OF EVIDENCE: Therapeutic, V.

Cleft lip repair techniques differ mainly in the design of the skin incision, how the muscle portions are reconstructed, and how the nasal framework is reconstructed.1 The vascular anatomy has remained largely unaltered in current surgical techniques, and the reasons for this have yet to be explored.

Normal blood supply is a prerequisite for development and growth. Thus, it would be of clinical interest to determine whether cleft surgery leads to a change in the blood supply before or after surgery.

Current techniques for cleft lip repair exclude surgical anastomosis of the lip arteries. However, this clinical approach is not based on blood circulation data and the current standard must be challenged. Vascular anastomosis in cleft surgery interrupts the existing hemodynamics and necessitates further trauma to the blood vessel, after which the blood circulation may take several months to recover.2 Complete surgical soft-tissue ham-

Vascular adaption
normal microcirculation late postoperative in cleft lips.

Columella shows a flow oversupply, which is maintained late postoperative.
Comparison of Three Incisions to Repair Complete Unilateral Cleft Lip

Afroze incision performed better
- Cupids bow position
- Lip length
- Lip height

Millard Incision performed
- Scar position

What about the nose?
Is Primary Septoplasty necessary???

No negative sequelae can be observed after manipulation of the septum in children. (Smahel, Z. 1999)

Growth of the nose is favorable after primary rhinoplasty. (McComb, H 1996)
Complete Unilateral Cleft Lip

Without Simonart’s band (Type I a)  With Simonart’s band (Type I b)
Without complete collapse of nasal dome and ala (Type II a)  With complete collapse of nasal dome and ala (Type II b)
Complete Unilateral Cleft Lip

Without difference in level of alveolar ridges (Type III a)

With difference in level of alveolar ridges (Type III b)

COMMON FACTOR IN ALL UNILATERAL COMPLETE CLEFT LIPS

DEVIATED NASAL SEPTUM
Is Primary Septoplasty necessary???

A fifteen year old patient with no primary septoplasty
SEPTOCHEILOPLASTY: Unilateral Cleft Lip

• Perichondrium is reflected on both sides of the septum
• The septum is lifted off the nasal spine
• The septum is positioned in its anatomical center
• Perichondrium is closed
• Nasalis muscle from both sides are approximated to form a sling with the septum in the new central position

Source:
Afroze Incision for Functional Cheiloplasty, Technical Note
Septocheiloplasty: 1 year post operatively
Septocheiloplasty: 3 years post operatively
Septocheiloplasty: 8 years post operatively
2 Dimensional Photographic Analysis
Septocheiloplasty: Measuring Outcomes
2 Dimensional Photographic Analysis

Note the septal deviation and alar droop

Source:
Septocheiloplasty: Measuring Outcomes
2 Dimensional Photographic Analysis

Primary Cheiloplasty with Septoplasty

Note the absence of septal deviation and reduced alar droop

Source:
Primary septoplasty showed better results in terms of nasal symmetry when analyzed using two-dimensional photographic analyses.
3 Dimensional Photographic Analysis
3 Dimensional Photographic Equipment

3 Dimensional LASER Equipment
Measurement: Right Nostril (Transversal)

Right Nostril Transversal: 12.1 mm

Right Nostril Transversal: 12.9 mm

3D Stereophotogrammetric analysis supported by Radboud University, Nijmegen (Prof. Stefaan Berge) and University Medical Center, Basel (Prof. Hans Florian Zeilhofer)

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Landmarks & Measurements
3 D Photographs and LASER Images
Results

3 Dimensional Nasal Analysis of Patients with Complete Unilateral Cleft Lip corrected with Septocheiloplasty

Volumetric analysis of the nose

Source:
Gosla Reddy et.al. 3D Stereo photo grammetric analysis of lip and nasal symmetry after primary cheiloseptoplasty in primary cleft lip repair. 
Rhinology, 49: 546-553, 2011
Results
3 Dimensional Nasal Analysis of Patients with Complete Unilateral Cleft Lip corrected with Septocheiloplasty

Transverse/Horizontal Nostril Length

Vertical Nostril Length

Mean Symmetry ratio of 1.25
Mean Symmetry ratio of 0.97

Source:
3 Dimensional Analysis of Patients with Complete Unilateral Cleft Lip corrected with Septocheiloplasty.
Gosla Reddy S, Mommaerts MY, Reddy R, Chaitidis D, Mueller A, Schwenzer K, Berge S: Ongoing Study, Radboud University, Netherlands and University of Basel, Switzerland

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Results

3 Dimensional Nasal Analysis of Patients with Complete Unilateral Cleft Lip corrected with Septocheiloplasty

Volumetric analysis of the nose

Ratio Left Volume vs. Right Volume = 1.09

Source:
Gosla Reddy et.al. 3D Stereophotogrammetric analysis of lip and nasal symmetry after primary cheiloseptoplasty in primary cleft lip repair.
Rhinology. 49: 546-553, 2011
Primary septoplasty showed better results in terms of nasal symmetry when analyzed using three-dimensional photographic analyses.
My Opinion

The cleft lip defect is a 3 dimensional problem

Only a MorphoFunctional approach that addresses all three dimensions will positively effect the repair of the Unilateral Lip.

My solution

CHEILOPLASTY, SEPTOPLASTY and PERIOPLASTY