

The Foundational Basis of Aesthetic Cleft Lip Surgery for Cleft Surgery Trainees: A Retrospective, Observational Study of Early Post-Operative Results in Bilateral Cleft Lip Surgery Using Some Anthropometric Nuances

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Received: August 05, 2020

Published: August 27, 2020

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Abstract

The bilateral cleft lip deformity is often a challenging surgery for younger cleft trainees because of the associated nasal deformities. Done with care, using Mulliken's five principles of symmetry, muscle continuity, philtral size and shape, median tubercle formation using labial elements, and alar cartilage positioning, one is able to achieve satisfactory results over time. These pillars remain the constant for younger cleft trainees. Anthropometric measurements form the basis of functional aesthetic bilateral cleft lip repair. Success of bilateral cleft lip surgery involves correct anthropometric measurements and the five principles.

Keywords: Bilateral Cleft Lip; Cleft Training; Secondary Revision; Anthropometric Measurements

Introduction

Anthropometric nuances are an important aspect of accurate bilateral cleft lip repair. Good postoperative outcomes are a result of accurate lip and nose measurements using the usual anatomical landmarks for cleft lip surgery (picture 2). This provides the cleft surgeon with some quantitative measurements to work with, to create a symmetrical repair. The groundbreaking work of Leslie Farcas in 1993 has paved the way for more accurate quantitative measurements for all cleft surgeons, and the results of bilateral cleft lip surgery have since become more predictable and accurate in most cleft units [1]. Using a Castrojevo caliper, one is able to take the required measurements and recheck for symmetry of the labial and nasal elements after the procedure. This is done routinely for all cases. Taking into consideration the differences in the rate of growth after bilateral cleft lip repair, we find that the median tubercle lags behind whereas the philtrum tends to become nearly two and a half times its width over the years [2]. This is the reason why cleft surgeons try as much as possible to create a narrow philtrum, 3 to 4 millimeters shorter because of vertical growth later,

and increase the lip pout along the median tubercle. One of the difficult challenges in bilateral repair is the obtuse naso frontal angle post-operative and wide nostril, and attempts have been made to correct these two problems during cheilo septorhinoplasty, with some success.

Bilateral cleft lip repair, which is mostly, a single stage procedure these days can provide excellent symmetry if pre-operative anthropometric measurements are carefully noted. Over the years, several surgeons have advocated different strategies of corrective surgery for the lip and columella, using forked flaps and prolabial elements, only to find strange distortions on follow up. Our dear mentor for many years, John Mulliken always stressed on his five principles for accurate bilateral cleft lip repair which include symmetry, muscle continuity, proper philtral size and shape, median tubercle formation from lateral labial elements and positioning of alar cartilages to form the nasal tip and columella [3]. These five principles, in our opinion, have helped many of us cleft surgeons avoid the prolabial flap technique used by many surgeons in the past [4]. Mulliken mentioned to us that a badly repaired bilateral

cleft lip is the typical, poorly understood, executed procedure, including the old forked flap which leads to bad scarring, especially in adults. There are limitations to assessing the cleft patient's face using 2D photography, 3D imaging, plaster casts or direct observations [5]. Facial anthropometric measurements may also be used to help us plan the most suitable surgery, sometimes using a "square" or our innovative Nasion-Pogonion cantometer. Despite the limitations of anthropometric methods to assess bilateral lip deformities both pre and post operatively, the methods could help one identify the discrepancies between accurate and non-accurate repairs. Pre-surgical naso alveolar molding improves outcomes, but is not always available in poorer regions. The columella is lengthened significantly and nasal appearance improved by this method [6]. Using the five principles of Mulliken for bilateral cleft lip repair, along with some newer modifications, can lead to good, early post-operative results.

Materials and Methods

As part of our observational study, we made note of some essential anthropometric measurements in children and adults. These were used as guidelines in our repairs as well as assessment post operatively for our cases, as well as other cases.

Pediatric cleft lip [6]

Philtral flap is designed as:

- 2 -2.5 mm at the columella-labial junction for a partial narrow defect *
- 3 -4 mm between the peaks of Cupid's bow.
- We use the full height of the cutaneous prolabium, 7 to 8 mm if available.
- The median tubercle is designed as plump as possible.
- The columella is at least 4 to 5 mm in length, no longer than 7 mm.
- The interalar distance to be 24 mm or less.

In adults: Upper philtrum width 4-4.5mm, length 14-15mm, Cupid peak to peak 8-9mm.

This is useful especially for secondary revision and the Abbe flap measurements.

Some prefer more than 2 mm because the width may compromise blood supply especially if the cleft is not narrow. It may be

okay for partial narrow clefts, but wider clefts may require about 3 mm above and 4.8 below.

Using our idea of the cantometer, where the Nasion (Na) vertical guide in natural head position is used for correct alignment during cleft surgery.

The Na vertical point in the natural head position helps us to correctly align the lip and nose tissues during cleft lip repair.

The N vertical falls in line with the centre of cupid's bow and pogonion

Any deviation from this line can be corrected during the surgery. We have found this simple idea to be useful in observing post-operative results to detect if the center of Cupid's is off or on the vertical reference line (Picture 1).

Picture 1: The Nasion vertical line and Frankfort horizontal.

Adult: measurements in millimeters (*7, 8).

Picture 2: Usual anatomical landmarks for lip and nose with measurements in millimeters.

- Cupids bow
- Centre to peak 2.5
- Peak to commissure point 26
- Philtrum length 14
- Philtrum upper width 4.5
- Philtrum lower width peak to peak 8.5-9
- Alar point to Cupids peak 22
- Alar to commissure point 26
- Columella length 6-6.5
- Columella width 6.6.5
- Nostril width 6.5-7
- Nostril height 7
- Alar to alar width 31-32.

Observations post-operatively: (pictures courtesy L Bona, Yemen Global Smiles)

Period: Jan 2010-March 2015

Number of BCL patients observed early post op: 40 patients, 45 males (between 6 months to 50 years); 5 females (between 3 months and 20 years)

Primary Incomplete BCL: 20 (Males- 17, Female-3)

Primary Complete BCL: 10 (Males 10)

Secondary BCL due to maladjustments: 10 (Males - 8, Females - 2).

Anthropometric measurements: Taken in all (as mentioned), including secondary repairs.

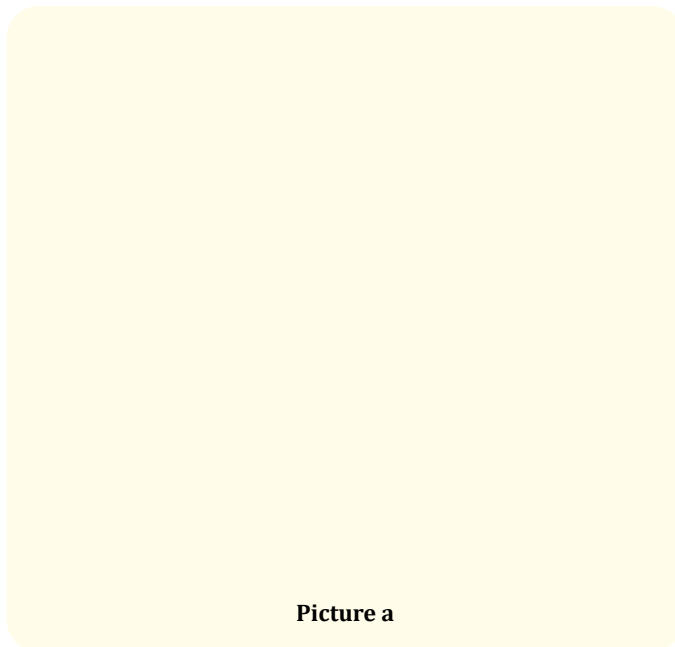
Outcomes after surgery: measured by symmetry, nasion pogonion vertical reference line alignment, philtrum shape, size and direction –straight or crooked, median tubercle, Centre of Cupid’s bow alignment on nasion vertical, nose shape, muscle continuity and dimpling above Cupid bow. We also note the normal reference measurements in millimeters as mentioned in our paper. All complete BCL cases had floor of nose reconstruction using mucosal flaps and two also had inferior turbinate flaps added (examples 11,12).

- Incomplete BCL- satisfactory
- Complete BCL with premax deformity secondary revisions-improved appearance
- Secondary revisions – good.

Remarks: Anthropometric measurements as well as the five principles of repair improve outcomes.

Example 1: The crooked philtrum and mismatched Cupid bow

Pic: Artist’s Impression: The philtrum and Cupid’s bow and nasion-pogonion vertical N-nasion, MC- mid columella, C- Cupid center

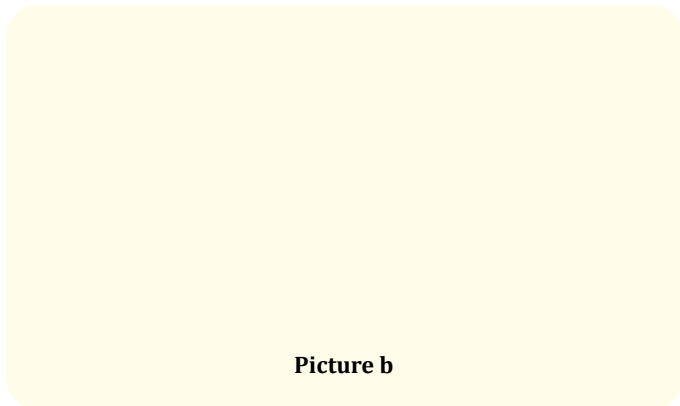


Picture a

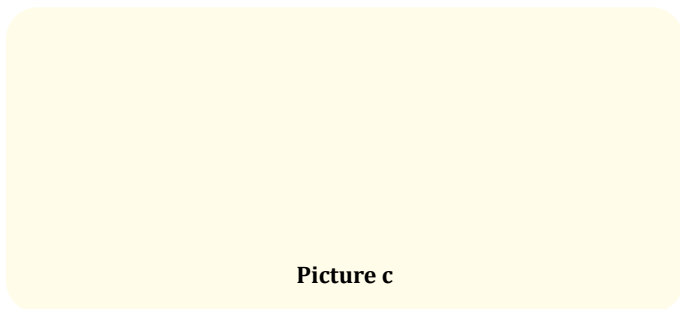
- Centre of Cupid’s peak does not fall in N vertical line. The “crooked “philtrum is because the measurements were not done for the philtrum. To address this, we use the “two skin hook” rule to straighten the flaps along the N vertical line, before and during surgery.
- Alar base cant and Cupid bow peak cant
- The “long lip” in bilateral lip repair is caused by failure to hitch the orbicularis muscle to the columella base during surgery. On the contrary, a short lip repair should avoid this hitch.

Example 2: Our idea for correction of adult cleft, for Secondary BCL using the 5: 7: 14 Philtral Rule on a referred BCL.

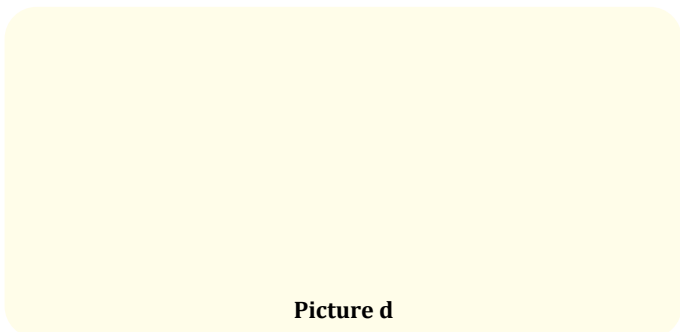
(A: B=Males 1.59 and F 1.61) where 5mm =width of uppermost philtral ridges (A), 7 mm=width of Cupids bow peaks (B), and 14 mm is the length of a normal philtrum in adults.



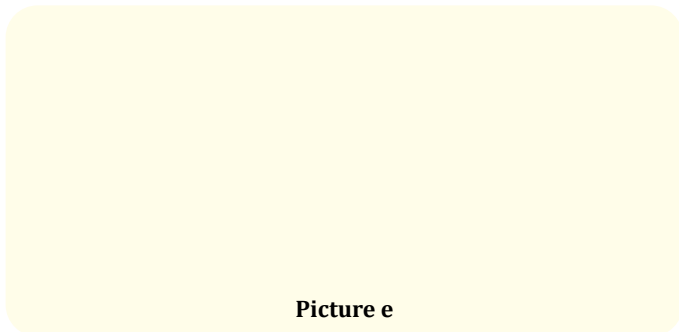
Example 3: Referred case for Secondary BCL using the 5: 7: 14 Philtral Rule. Black technique defect that came for revision of prolabium area RULE: one should not use the central flap for repair-it causes a whistle deformity later.



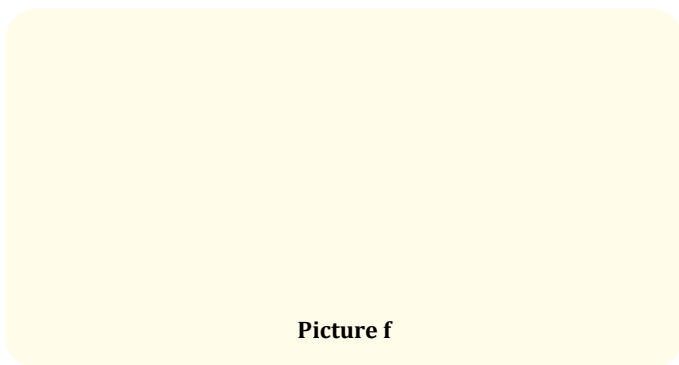
Example 4: Incomplete bilateral cleft lip repair in a 5-month old baby. Note vermillion migration on left Cupid since we cut too close to vermillion and not 1mm above white roll.



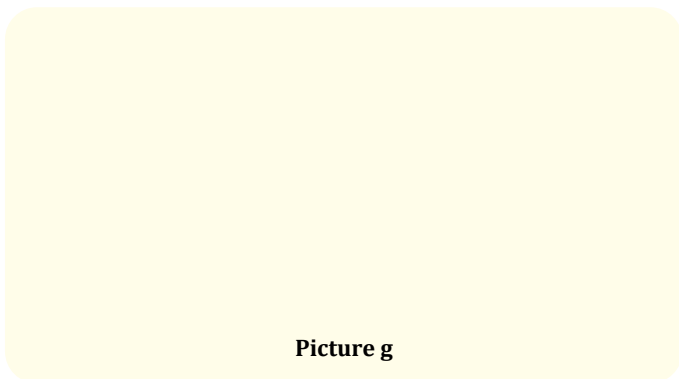
Example 5: Secondary revision of referred bilateral cleft lip maladjustment. In stage one, the revision is for premax push back philtrum and lip alone. Finer adjustments later.



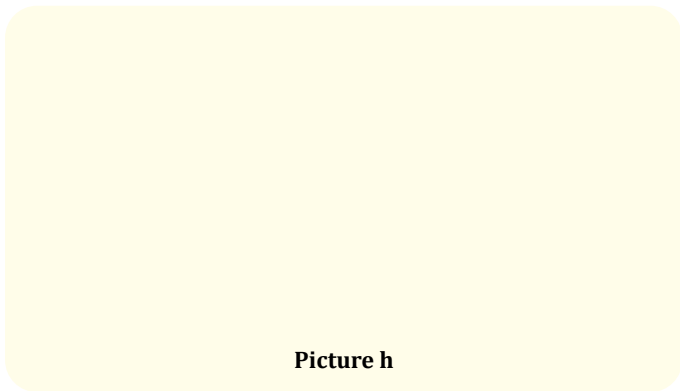
Example 6: Incomplete BCL after cheiloplasty; Tajima was not done.



Example 7: Referred case of BCL for secondary revision after central lip flap was used; no Tajima here.

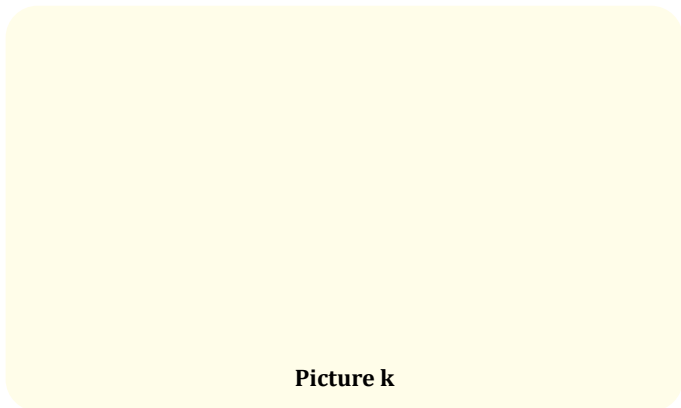


Example 8: Referred case of BCL for secondary revision after central lip flap was used.



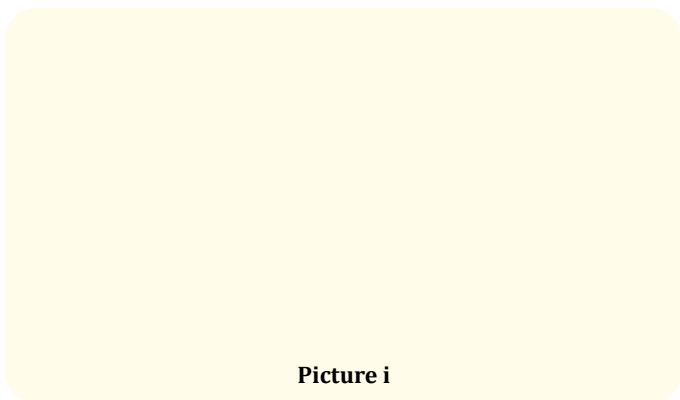
Picture h

Example 9: Referred case of BCL for secondary revision after central flap was used.



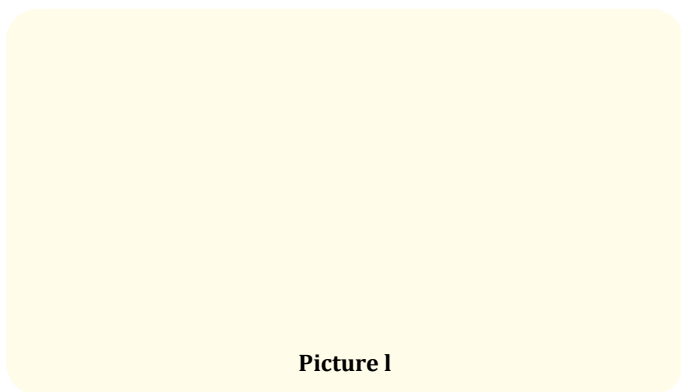
Picture k

Example 12: Complete BCL for cheiloplasty and Tajima rim incisions.



Picture i

Example 10: Referred case of BCL for secondary revision after central lip flap was used.



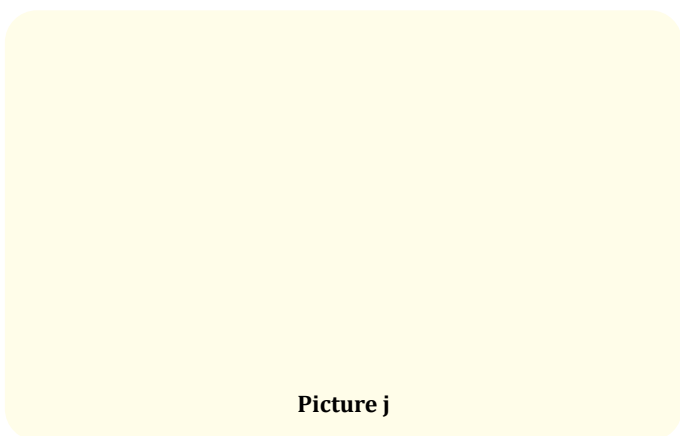
Picture l

Results

We noted the type of deformity, procedure used, measurements, and early post-operative appearance. To make it easier for trainees, we prefer to use only some key measurements and not many complicated measurements, to help us achieve better post-operative results (Table).

- Type of bilateral cleft lip(BCL)
- Design of repair
- Measurements used
- Early post-operative symmetry and appearance.

Accurate pre-operative measurements lead to more symmetrical and pleasing post-operative results. The nasion vertical line is an important reference line for aligning the entre of Cupid’s bow of the lip in a more central position. The prolabial flap leads to a whistle deformity and abnormal appearance and should not be used.



Picture j

Example 11: Asymmetric complete BCL after cheiloplasty and Tajima with nasal conformer.

Type of cleft deformity	Design used	Measurements used/ none used	Post-operative symmetry on Na- Pog line and appearance	Remarks
Incomplete BCL	Cheiloplasty without fork flaps and back cuts	Usual landmarks measured but not nasion vertical	Centre of Cupid's is off, and philtrum crooked	Need to measure nasion pogonion vertical
Adult secondary cleft lip with prolabium tissue remnant	Black technique	None used by previous surgeon	Whistle deformity and wide philtrum, abnormal lip	Avoid prolabial elements to reconstruct a BCL lip
Secondary deformity BCL incomplete in adult	Black Technique	None used by previous surgeon	Whistle deformity, abnormal philtrum and lip	Avoid prolabial elements to reconstruct a bilateral cleft lip
BCL incomplete in baby	Cheiloplasty without fork flaps and back cuts	Measurements taken pre op with reference to Nasion vertical	Satisfactory result, except vermilion migration left Cupid peak	Incision 1mm over white roll
Referred case of Complete BCL	Maladjusted repair	None used by previous surgeon	maladjustment	Complete revision with pushback of premaxilla
Incomplete BCL	Cheiloplasty	Measurements taken	normal	Tajima not needed here
Referred case of BCL	Central lip flap was used	Measurements taken	Abnormal looking upper lip	Avoid central lip flap
Referred case of BCL	Central lip flap used	No measurements by previous surgeon	Abnormal upper lip	Avoid central lip flap
Referred case BCL for revision	Central lip flap was used	No measurements by previous surgeon	Abnormal upper lip	Avoid central lip flap
Referred case BCL	Central lip flap used	No measurements	Abnormal upper lip	Avoid central lip flap
Complete asymmetric BCL	Cheiloplasty, premax pushback and Tajima rim incisions	Measurements in order	Improved appearance	Tajima and premax pushback are useful additions
Complete BCL	Cheiloplasty, premax pushback and Tajima	Measurements ok	Improved appearance	Tajima and pushback of premax are useful

Table 1: Type of BCL deformity and techniques used for correction.

Discussion and Conclusions

Bilateral cleft lip repair is often more complicated than the unilateral defect because post-operatively, the soft tissue results change over time as the philtrum grows in width to almost two and a half times, whereas the median tubercle lags behind [7]. This leads to an abnormal lip years later that would require revision surgery. The midface deformity in bilateral cleft lip patients

is mostly related to the nasal deformity which has to be corrected simultaneously [8]. Single stage surgery has mostly replaced earlier multistage procedures which increases the burden on patients considerably [9]. In some developing countries, one still encounters surgeons practicing bilateral cleft surgery from a bygone era, between the late 1880s and 1950s. This could be attributed to inadequate training, safari smile surgeries, and great distances from specialist centers. Our numerous experiences during humanitarian

smile mission visits (as shown in some pictures here) have helped us to better understand anatomical landmarks. We routinely use calipers both preoperatively and post operatively, to ensure the best possible results for our patients.

One of our suggestions for cleft trainees is to keep a copy of the landmarks and measurements during every bilateral cleft lip consultation. This would also help younger surgeons during the surgery. It is also useful for managing the more complicated asymmetrical cleft problems, where measurements may take more time and effort.

Since our focus is mainly on the anthropometric nuances this time, we have not included details of the more complicated presentations of the bilateral cleft lip deformity with the deviated, protruding premaxilla, which is a very difficult and challenging surgery, even for senior surgeons. Our main aim here is to provide a suitable take home message for cleft trainees who are learning to get their first few surgeries right without major maladjustments. We have suggested a simple rule for secondary revision of the maladjusted lip and found it to be quite useful for corrections. Observing the five principles along with the rules of standardized measurements, one is able to execute a fairly decent repair in most cases of bilateral cleft lip deformity in the long term. Learning the correct principles of bilateral cleft lip surgery prevents the unfortunate event where the surgeon replaces one deformity with another more complicated defect. In fact, if one understands the principles and measurements well enough, not only is the primary cheiloplasty more accurate and attractive, but secondary revisions also look much better. Bilateral cleft lip surgery is not easy, but we are confident that younger cleft trainees can master the concepts and help more patients over time, easing the cleft burden in their own countries and regions.

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