WHAT HAPPENS TO COLUMELLAR ANGLE AFTER CLEFT LIP SURGERY?

O que ocorre com o ângulo columelar após cirurgia de correção da fissura labial?

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ABSTRACT

Purpose: to evaluate post operative columelar angle changes after cleft lip repair. **Methods:** observational, descriptive and cross-sectional study. Were evaluated 11 childrens in first and second year old, with unilateral cleft lip, of both genres, who underwent surgery to correct the lip defect. Were examined child's nasal area and upper lip and identified anthropometric points pronasale, subnasale and glabella, then photographic documentation was performed for photogrammetric analysis. Photos were taken preoperatively and 4 months after surgery. Images obtained by photogrammetry were evaluated with graphics program Image J, through angular study tools. **Results:** the mean of angles measured preoperatively was 55.41 degrees, and at the postoperative was 78.80 degrees, realizing an approximation to the vertical plane ($p<0.0001$). Cleft lip and palate patients had a variation of 32 degrees when compared pre and post-operative measurements, while in patients with only cleft lip or cleft lip and alveolus the changes where minors (0.75 and 25 degrees respectively). **Conclusion:** occurs a columellar angle verticalization after cleft lip surgery. Patients that had greater increase to the angle were those who had more complex deformities.

KEYWORDS: Cleft Lip; Nose; Anthropometry

INTRODUCTION

Cleft lip deformities represent the most common facial congenital malformation[1], with about 1 case per 700 live births; are significant problems in society[2], with wide variability, depending on the geographical, racial or ethnic groups, as well as exposure to external or economic factors[3]. May be associated with cleft palate[4] and causes great distress to the child's family[5]because the important involvement of central facial structures, especially the nose and superior lip[6]with possible sequelae[7].

The main nasal deformity associated to cleft lip is nostril asymmetry[8], which tends to be more severe at patients with widerclefts[6,9], and is caused by the nasal alar cartilages malformation and abnormal insertion of the facial muscles, which leads to a collapsed nostril and reduction of columellar angle[10], that remains even after surgical treatment of cleft lip[11]. The correction of these cited and other deformities of cleft lip nose, and creating a symmetrical nose are a great challenge[12] and involve nostril width reduction and the increase of columellar angle with approximation to the maximum, the vertical position[13].

The use of anthropometric measurements allows quantification of anatomic changes[14], and the application of these techniques tocolumellar angle study, improved the characterization of this deformity[15] and provided more data to guide pre and postoperative

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strategies[16], besides allowing the evaluation of postsurgical[17] or auxiliary results[18].

It is believed that there is anincrease of columellar angle, with approximation to the vertical position, after unilateral cleft lip surgery when compared the measured values pre and postoperatively.

The objective of this study was to quantify the changes of the columellar angle that occurs after unilateral cleft lip surgery.

METHODS

This research was approved by research and ethics committee of IMIP (Instituto de Medicina Integral Prof. Fernando Figueira), where the study was conducted and scored as protocol number 2684-11.

The type of study was prospective, observational, descriptive and cross-sectional.

Children were assessed in the first and second years of life, diagnosed as suffering from unilateral cleft lip[4], of both genres, and underwent surgery for correction of unilateral cleft lip in IMIP, at the period of January to May 2012. The sample was selected by convenience and not randomization or blinding was performed.

Were included in the proposed study: children with unilateral cleft lip, both sides, which, according to the Spina's classification[4], were classified as incomplete pre-foramen cleft (cleft lip only), complete pre-foramen cleft (cleft and alveolus), or transforamen cleft (unilateral complete cleft lip and palate), of both genres, who underwent surgical correction of cleft lip until the end of the second year of life, children without craniofacial malformations or other systemic diseases, children who have not undergone previous surgical interventions on the face. The treatment group consisted of 14 patients operated in the period described above.

Patients who did not undergo postoperative follow-up (03 patients) were excluded. Exclusion criteria applied on the sample, the survey had a total of 11 participating children.

Nasal and upper lip regions of the child were examined, identified anthropometric landmarks for measurements according to Farkas (1994)[19], with subsequent pen labeling the dermatographic points:

- Highest point on the nasal tip, which corresponds to the anthropometric point *pronasalle* (prn), or most anterior point of the nasal apex (Figure 1).

Figure 1 insertion place

- Lowest point of the columella, corresponding to *subnasalle* point (sn), where this meets the upper lip (Figure 1).

- *Glabella* (g): corresponds to the most anterior point of the projected frontal bone surface located on the median line between the eyebrows (Figure 1)

After landmarks identification, photography was performed for photogrammetric analysis. The child was positioned lying, according to described by Farkas (1994)[4], with the sagittal plane of child's head forming 90 degrees to the examination table. Photographs were taken at baseline standard view, with *pronasalle* and *glabella*alignment, allowing full

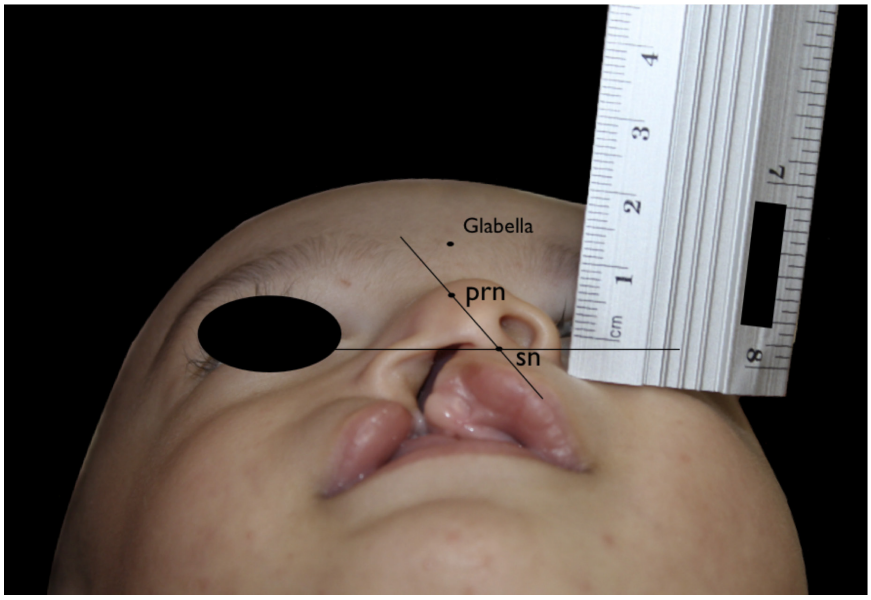

Figure 1 – Basal view angle example (FARKAS, 1994). Note the alignment between *glabella* e *prn (pronasale)* anthropometrical points. Columellar angle is obtained by the angular measurement between horizontal plane and the line connecting the points *prn* and *Sn (subnasale).*

view of the nostril base, without distortions, considering that these structures are parallel to the camera lens plane. Canon Rebel S camera was used with manual focus adjustment.

The images obtained by photogrammetry were evaluated with the Image J software, which is in the public domain, and allows measurements and photogrammetric analysis. Using angular study tools, calculation of columellar angle was performed.

The children were kept in the IMIP's ambulatory monitoring, with returns on terms determined by the center, with one, two and four weeks and after two, three and six months.

After 3 months postoperatively, the children were subjected to new measurements by the researcher under the same techniques described above.

Shapiro-Wilk normality test was performed on each of the two columns of measurement results (pre and postoperative columellar angle). All columns were normally distributed. Then data columns were paire

RESULTS

Preoperatively, the mean age of the children was 6 months, with the youngest child under 3 months of age and the oldest 24. At the postoperative evaluation, the mean age was 11.45 months, with the youngest child 7 months old and the oldest 32 months (Table 1).

Table 1–preoperative and postoperative patient's age distribution

	Preoperative age	Postoperative age
Mean	6 months	11.45 months
Minimum	3 months	7 months
Maximum	24 months	32 months

From the 11 patients, two were female and 09 were male.

Three patients had cleft lip on the right side and 08 patients on the left.

Regarding the type of unilateral cleft, two patients were classified as incomplete pre-foramen cleft (cleft lip only), five complete pre-foramen cleft (cleft and alveolus), and four had transforamen cleft (unilateral complete cleft lip and palate).

Performing a comparison between cleft types and columellar angles was observed that patients with transforamen cleft (unilateral complete cleft lip and palate) had lower average value of preoperative measured columellar angles (45.52 degrees) and, the greater difference between the pre and postoperative means(increase of 32.59 degrees), but without statistically significance(table 2).

The mean preoperatively angle measurement was 55.41 degrees, and 78.80 degrees after cleft lip surgery (Table 3). Statistical analysis showed a statistically significant difference for these measurements ($p < 0.0001$).

Table 2– Comparison between different cleft types columellar angle at preoperative and postoperative

	Incomplete cleft lip	Complete preforamen cleft lip and palate	Complete cleft lip and palate
Mean preoperative columellar angle	79,85	53,54	45,52
Mean postoperative columellar angle	80,60	78,64	78,11
Difference	0,75	25,00	32,59
p	***>0,05***	***>0,05***	***>0,05***

Student t test.

Table 3 – Patients distribution of pre and postoperative columellar angle means

	Angle (degrees)	
	Preoperative	**Postoperative**
Patient 1	83,13	83,29
Patient 2	76,58	77,91
Patient 3	60,41	73,77
Patient 4	45,75	79,12
Patient 5	52,13	76,14
Patient 6	36,16	85,10
Patient 7	42,83	78,86
Patient 8	42,67	74,72
Patient 9	58,20	77,39
Patient 10	49,51	81,21
Patient 11	62,10	79,33
Mean	**55,41**	**78,80**

DISCUSSION

Since 1957, when the technique of rotation and advancement described by Ralph Millard, the most widely used for cleft lip correction[20], to correct cleft nose deformity has become mandatory for the treatment. This procedure is useful to repair unilateral cleft lip, with reconstruction of the nasal floor, cupid bow and correction of columellar angle[21].

More recently, modifications described by Noordhoof, Mohler, Skoog, and McComb were associated to Millar's Technique obtaining better results[22]. So, these changes, that usually involve detachment and repositioning of nasal cartilages, have allowed an improvement of the nostril symmetry which is reflected to columellar angle. Nakamura et al. (2010)[23] explain that nasal muscle repositioning and nasal vestibule expansion are also important for cleft nose deformity correction.

The comparison between cleft types and average values of columellar angle measures for each cleft type, measured pre and postoperatively, was an Interesting finding, but without statistical significance. The cleft lip deformities that are graded more severe, transforamen cleft lip, generally are responsible for wider clefts, and were associated with lower preoperative columellar angles, had the greater benefits from surgical procedure with significant improvement in columellar angle, reaching values close to the average of all the group. Fisher et al. (2008)[6] identified the correlation between objective anthropometric measures and subjective classification by experts for evaluation of unilateral cleft lip nose deformity and concluded that the measures that individually have a direct relationship with these reviews are the ratio of the nostril width and columellar angle. The more severe deformity, according to the expert, columellar angle will be more inclined ($p < 0.001$).

Another fact that also draws attention is the minimum change that has occurred in patients with incomplete cleft lip, which can be explained by the lower deformity caused by the smaller separation of lip muscles in the cleft. Thus, some authors claim that was observed no relationship between the severity of the cleft and the final nose position[24], agreeing with the results of this study, in which, although different cleft, very close measures were found postoperatively. Although no statistical significance was found for these comparisons, it is believed that they represent what happens in most cases. Further studies with larger samples in this population may offer evidence.

Columellar angle change was found, from an average of 55.41 to 78.80 degrees, with statistical significance, which agrees with other studies that also compared the measurements of this angle in pre and postoperatively[13]. Despite these changes in angle, one sees that in a few isolated cases it reaches the ideal 90 degrees, always persisting some angulation after surgery. According to Farkas (1994)[19], the high incidence of nasal tip deformity and nasal bridge deviation indicates the persistence of this deformity despite the primary surgery.

Some studies report results in which there is a greater improvement to columellarangle[13,18,25], what can rightly be attributed to the use of nasoalveolar mold, from the preoperative period, that provides alignment of the alveolar segments and cleft lip nose deformity, correcting depression of lateral nose cartilages, deviated septum, short columella and width alar base [18,25]. However, according to literature, due

to the relative paucity of high level evidence studies, the nasoalveolar molding is a promising technique that deserves further studies[26].

In this research, was used photogrammetry measurement because thisis a method that provides fast and reliable data. The choice of photogrammetry for angular measurements was proved as reliable as direct measurement in studies of Farkas et al. (1980)[27]. According to He et al. (2009)[17] in addition, determination of angular measurements was independent of vertical movement of the camera or image increases, but was dependent of the head rotation. Besides these, another major advantage of photogrammetry on direct measurement is the ability to maintain this documentation retained for many years, allowing new studies, including cohort, or even complement the information from the medical records in litigations cases.

CONCLUSIONS

Postoperative columellar angle verticalization was observed. Patients with higher columellar angle modification are, precisely, those with diagnoses related to more complex deformities.

RESUMO

Objetivo: avaliar a mudança do ângulo columelar que ocorre após cirurgia de correção para fissura labial. **Métodos:** o estudo foi observacional de caráter descritivo e de corte transversal. Foram avaliadas crianças no primeiro e segundo ano de vida, portadoras de fissura labial unilateral de ambos os sexos, que foram submetidas a cirurgia para correção da fissura. A pesquisa teve um total de 11 crianças participantes. Foi examinada a região nasal e lábio superior da criança e identificados os pontos antropométricos pronasal, subnasal e glabela. Em seguida, foi realizada fotografia para análise fotogramétrica. Foram realizadas fotos no preoperatório e cerca de 4 meses após a cirurgia. As imagens obtidas por fotogrametria foram avaliadas com o programa gráfico Image J,por meio de ferramentas de estudo angular. **Resultados:** a média da medida dos ângulos no pré-operatório foi de 55,41 graus; a média no pós foi de 78,80 graus, percebendo-se uma aproximação ao plano vertical ($p<0,0001$). Pacientes com fissura lábio-palatina apresentaram variação de 32 graus quando comparadas as medidas pré e pós-operatórias, enquanto que nos pacientes com fissura pré-foramen incompleta e pré-foramen completa foram menores (0,75 e 25 graus respectivamente). **Conclusão:** ocorre verticalização do ângulo columelar após cirurgia de correção da fissura labial. Os pacientes que apresentam maior modificação do ângulo são, justamente, aquelas que apresentam diagnóstico relacionado a deformidades mais complexas.

DESCRITORES: Fenda Labial; Nariz; Antropometria

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