



## Midline in Cleft Lip and Palate Patients. Evaluation at the End of Orthodontic Treatment.

<b>Noemí Leiva V</b>	Director of the department of craniofacial malformations. Faculty of Dentistry, University of Chile.
<b>Loreto Maureira P</b>	Surgeon Dentist. Department of craniofacial malformations. Fellow. Faculty of Dentistry, University of Chile.
<b>Macarena Rotman S</b>	Surgeon Dentist. Department of craniofacial malformations. Fellow. Faculty of Dentistry, University of Chile.
<b>Marcela Salas S</b>	Surgeon Dentist. Department of craniofacial malformations. Fellow. Faculty of Dentistry, University of Chile.
<b>Paulina Sciaraffia R</b>	Surgeon Dentist. Department of craniofacial malformations. Fellow. Faculty of Dentistry, University of Chile.

### ABSTRACT

Patients with cleft lip and palate have a several number associated of dento-maxillary anomalies , including displaced dental midline, so its centralization is a complex objective of orthodontic treatment. The aim of this article is to assess the degree of deviation of the midline in patients with unilateral cleft lip and palate with orthodontic treatment completed. In addition, a brief review of the literature on this area, focusing primarily on the outcome of the final treatment and maintenance over time.

### KEYWORDS

cleft lip and palate, midline, orthodontics

### Introduction:

The dental midline is a vertical imaginary line between the contact area of the two central incisors. There is an upper dental midline and a lower dental midline for the teeth of the upper and lower arches, respectively. Ideally, both midlines coincide with each other and with the facial midline and conferring symmetry, harmony and aesthetics.

When the integrity of the dental arch, both, maxillary and mandibular, is preserved, a similar dissipation of the anterior component of the forces (caused by occlusal forces) on both sides, keeps the symmetry of the arc. But, if this continuity is interrupted due the lack of dental alignment (1), the transmission of force is not equal on both sides, resulting in the arch: mesialization of teeth, midline deviation, rotations and aggravation of dental crowding (2). In many cases, there is also maxillary compression and the loss of arch form present(1). Patients with alveolar-palate cleft often have these features, so it is necessary to correct both: the shape of the arch and center midlines to reduce the factors affecting occlusal stability and facial harmony.

### The aesthetic ideal

The aesthetic ideal, according to the articles found in the literature, is the coincidence of the two maxillary midlines with facial midline, although there is an acceptable average deviation of the facial and dental midline. In the study of Jayalakshmi NS (2013), 200 young people, between 18 and 30 years old, with full front dental alignment were observed. The dental midline was measured and compared with the facial midline. The results showed that 44.4% of men and 55% of women had a midline deviation between 0-1mm, while a 54% of men and 33% of women showed a deviation between facial and dental midline of 1-2mm. 80% of the study population, did not match maxillary and mandibular midlines. Most of the study population showed deviation of the facial and dental midline, within a range of 0-1 mm. (3)

### 1. Description of cleftpatients

Patients with cleft lip and / or palate (L / P) constitute a significant fraction of all human birth defects. The etiology is complex and has a significant morbidity throughout life. Its global frequency is 1 per 1,200 live births. In Chile, it affects about twice the global rate, with an incidence of 1.78 per 1,000 live births in hospitals in the metropolitan region and 1.66 per 1,000 live births in the rest of the country's hospitals, allowing an estimate of about 450 new cases annually. (4)

Patients with cleft L/P present significantly more teeth abnormalities than those individuals without cleft. These anomalies can be attributed to the cleft itself or early surgical correction of the defect (4). This relates with Tang's prevalence study (1992), which concluded that there is a high percentage of severe malocclusions in cleft patients, 92.3% in men and 71.5% in women, where 69.2% of men and 57.1% of women had the following set of signs: molar mesiocclusion, posterior cross-bite, midline diastema and deviation of midlines, where the deviation average was 2.2 mm. (5)

That is, these patients have a deficit in the growth of the maxilla both: sagittal and transversed. Also there are developmental disorders of dentition, so many patients with cleft L/P require a long multidisciplinary treatment, where orthodontic treatment is essential (6-7), see figure 1, 2 and 3.



**Figure 1: Patient with unilateral cleft on the right side. Figure 2 and 3: Patient with unilateral cleft on right side and upper and lower dental midline deviation.**

**2. Midline in cleftpatientsaftersurgical-orthodontictreatment.**

According to Schultes G (2000), 25 out of 30 patients with unilateral cleft, cleft lip and alveolar ridge after 1.5 years after satisfactory orthodontic treatment, there was a displacement in the maxillary and mandibular dental midline. We also found a displacement of midline on 19 of 30 patients with isolated cleft palate. Schultes attributes this to the specific dysfunction of the maxillary growth in these patients, particularly in patients with cleft palate, and alveolar ridge (8). This coincides with the Gaggli's study (1999), which followed, from 2 to 4 years, after orthodontic treatment, patients with bilateral cleft lip and palate. We established that 15 of 20 patients had a deviation of the maxillary and mandibular midline. However, these patients showed a better morphology of the anterior maxillary arch than patients with unilateral cleft. (9)

According Ramstad T (1997) this may be due to a constant recurrence of the maxillary expansion, mainly in the side of the cleft. This, despite the use of restraints, due to the lack of maxillary lateral stability for long term in these patients (10).

It has been observed that the tendency to relapse in patients with cleft L/P also occurs in patients with surgery Le Fort 1. According to Saltaji's H (2012) review, of a total of 10 studies there was a recurrence of 20-30 % in 4 studies, and 30-40% in 3 studies in horizontal direction. In vertical direction, recurrence was more than 50% in 5 studies. So it was concluded that in patients with cleft L/P with surgical treatment of Le Fort 1, there is a moderate recurrence in horizontal direction and a high rate of relapse in the vertical direction (11).

**Materials and methods**

The degree of deviation of the dental midline in patients with complete orthodontic treatment of the Craniofacial Malformations Unit of University of Chile was measured.

The study analysed 38 patients with a diagnosis of cleft lip and unilateral velopalatal cleft whose surgery and orthodontic treatment had been completed. Through model analysis, the coincidences of the dental midlines were measured. In case of a mismatch, the deviation degree, in millimeters (mm), and the direction of this deviation were measured. Figure 2



**Figure 2: Case treated, note the midline centered**

**Results**

Of a total of 38 patients with cleft lip, unilateral velopalatal cleft and complete orthodontic treatment, 12 patients, corresponding to 32%, obtained centricity of the midlines. In 26 patients, corresponding to 68% centricity of midlines was not achieved, obtaining different degrees of deviation. See Table 1

Of these 26 patients, 12 of them (32% of total), had a deviation of 1 mm: 8 with deviation of the mandibular midline to the right (21%) and 4 to the left (11%).

9 of the 26 patients (24% of total), had a deviation of 2mm: 3 with deviation of the mandibular midline to the right (8%) and 6 to the left (16%).

4 of the 26 patients (11% of total), had a deviation of 3 mm: 3 with deviation of the mandibular midline to the right (8%) and 1 to the left (3%).

Finally, only one patient had a deviation of 4mm, with deviation of the mandibular midline to the right, equivalent to 3% of the total.

Deviation (mm)	Nº of patients	Percentage	Deviation Side of mandibular midline
0	12	32%	-
1	8	21%	Right(R*)
1	4	11%	Left (L*)
2	3	8%	(R*)
2	6	16%	(L*)
3	3	8%	(R*)
3	1	3%	(L*)
4	1	3%	(R*)

**Table 1: Deviation of mandibular midline (mm) of the 38 patients with cleft lip, unilateral velopalatal cleft and completed orthodontic treatment.**

Regarding these results, it can be established that the median corresponds to 1 mm and the average was 1.21 mm. In addition, 33 patients, equivalent to 87% of patients, had 2mm or less deviation. Also, of 26 patients with varying degrees of deviation: 15 (57%) had a deviation of the mandibular midline to the right side and 11 to the left (47%).

**Conclusion**

Surgical and orthodontic treatment for long periods is essential in cleft patients, to correct the high percentage of severe malocclusions and transverse maxillary deficiency, and also the deviation degree of midlines. This will help in providing proper functional stability and appropriate esthetics, improving the quality of life of this type of patient (5).

According to available evidence, fewer patients with midline deviation is observed in those with isolated cleft palate, followed by bilateral cleft and finally the unilateral lip, palate and alveolar ridge cleft (9).

The likely explanation for the major stability of the midline, would be the preservation of the shape and dimensions of the arc, and the stability of the proximal contacts, which are greater in patients with isolated cleft palate, than in those with bilateral cleft and finally with complete unilateral cleft.

Cardash's et al (2004) research, about the ability of dentists and people not related to dentistry, to recognize midline deviation, found that in people with less than 1 mm of midline (ML) deviation, observers recognized MD deviation in 14% of the photographs. In deviations of 1-2 mm, in 37% of the photographs, and on deviations greater than 2 mm, in 83% of the photographs. They concluded that about half of the observers of this research were unable to detect midline deviation lower than 2 mm. (12)

The results obtained by Cardash et al (12), are very positive regarding to the results of this study, considering that the deviation average obtained was 1.21 mm. and 87% of patients had deviation lower or equal to 2 mm.

Also, It has been studied that in most of the population with complete anterior alignment, midline deviation present is between 0 and 1 mm, which is considered an acceptable average by facial aesthetics parameters.

Most studies about surgical orthodontic treatment results, are focused on the effects on the facial and jaw growth. There aren't any longitudinal updated studies to enable us in assess in the esthetics results in patients with cleft, after orthodontic treatment finalization. Also, in the existing studies, there isn't any specification if containment was used, what kind of it was used, or which was the period of use.

**Conflict of Interest**

The authors do not present any conflict of interest.

## REFERENCES

1. Alcan T, Ceylano lu C. Uppermidlinecorrection in conjunctionwithrapidmaxillaryexpansion. *Am J OrthodDentofacialOrthop.* 2006 Nov;130(5):671-5. PubMed PMID: 17110267. | 2. Sarig R, Slon V, Abbas J, May H, Shpack N, Vardimon AD, Hershkovitz I. Malocclusion in earlyanatomicallymodern human: a reflectionontheetiology of modern dental misalignment. *PLoSOne.* 2013 Nov 20;8(11). | 3. Jayalakshmi NS, Ravindra S, Nagaraj KR, Rupesh PL, Harshavardhan MP. AcceptableDeviationbetween Facial and Dental Midlines in DentatePopulation. *J IndianProsthodont Soc.* 2013 Dec;13(4):473-7. | 4. Agurto P, Leiva N, Castellón L, Morovic CG. Integral Rehabilitation of theCleftLip and PalatePatient. *Revista Dental de Chi le* 2011; 102 (2) 23-31 | 5. Tang EL, So LL. Prevalence and severity of malocclusion in childrenwithcleftlip and/orpalate in Hong Kong. *CleftPalateCraniofac J.* 1992 May;29(3):287-91. PubMed PMID: 1591265. | 6. Marcusson A, Paulin G. Changes in occlusion and maxillary dental archdimensions in adultswithtreated unilateral complete cleftlip and palate: a follow-up study. *Eur J Orthod.* 2004 Aug;26(4):385-90. PubMed PMID: 15366382. | 7. Smähel Z, TrefnýP, Formánek P, MüllerováZ, Peterka M. Three-dimensional morphology of thepalate in subjectswithisolatedcleftpalate at thestage of permanentdentition. *CleftPalateCraniofac J.* 2003 Nov;40(6):577-84. PubMed PMID: 14577820. | 8. Schultes G, Gaggl A, Kärcher H. A comparison of growthimpairment and orthodonticresults in adultpatientswithclefts of palate and unilateral clefts of lip, palate and alveolus. *Br J Oral MaxillofacSurg.* 2000 Feb;38(1):26-32. PubMed PMID: 10783444. | 9. Gaggl A, Schultes G, Kärcher H. Aesthetic and functionaloutcome of surgicalandorthodonticcorrection of bilateral clefts of lip, palate, and alveolus. *CleftPalateCraniofac J.* 1999 Sep;36(5):407-12. PubMed PMID: 10499402. | 10. Ramstad T, Jendal T. A long-termstudy of transversestability of maxillaryteeth in patientswith unilateral complete cleftlip and palate. *J Oral Rehabil.* 1997 Sep;24(9):658-65. PubMed PMID: 9357746. | 11. Saltaji H, Major MP, Alfakir H, Al-Saleh MA, Flores-Mir C. Maxillaryadvancementwithconventional orthognathic surgery in patientswithcleftlip and palate: isit a stabletechnique? *J Oral MaxillofacSurg.* 2012 Dec;70(12):2859-66. PubMed PMID: 22677329. | 12. Cardash HS, Ormanier Z, Laufer BZ. Observable deviation of the facial and anterior toothmidlines. *J ProsthetDent.* 2003 Mar;89(3):282-5. PubMed PMID: 12644804.