



## Original Research Article

## Relationship of complete unilateral and bilateral cleft palate with malposition and malformation of maxillary lateral incisors

Rizqa Septianoly Pratiwi<sup>1\*</sup>, Willyanti Soewondo<sup>2</sup>, Eka Chemiawan<sup>2</sup>,  
Belly Sam<sup>3</sup>, Eriska Riyanti<sup>2</sup>, Arlette Setiawan<sup>2</sup>

<sup>1</sup>Rumah Sakit Khusus Gigi dan Mulut, Bandung, Indonesia

<sup>2</sup>Dept. of Pediatric Dentistry, Padjadjaran University, Bandung, Indonesia

<sup>3</sup>Dept. of Dentomaxillofacial Radiology, Padjadjaran University, Bandung, Indonesia



## ARTICLE INFO

## Article history:

Received 25-09-2023

Accepted 12-12-2023

Available online 16-01-2024

## Keywords:

Complete unilateral and bilateral cleft  
palate  
Malposition  
Malformation  
Maxillary lateral incisors

## ABSTRACT

Cleft palate is a facial deformity that allows primary and permanent teeth to be affected by anomalies such as malpositions and malformations. The lateral incisors are the most commonly affected in patients with cleft palate. The diagnosis of malposition and dental malformation is established through history taking, clinical examination, and diagnostic evaluation in the form of study models, clinical photos, and panoramic radiographs. The aim of this study was to analyze the relationship between complete unilateral and bilateral cleft palate and maxillary lateral incisor malposition and malformation.

The research method is analytic cross-sectional, with the research sample consisting of 35 primary data from clinical examinations and secondary data from panoramic radiographs of pediatric patients 5-13 years old at YPPCBL RSGM Padjadjaran University, Bandung. This study looked at the clinical condition of dental anomalies and the interpretation of panoramic radiographs. Data were analyzed using Kendall Concordance analysis and Spearman rank correlation. The results showed that the impaction is the most common type of maxillary lateral incisor malposition found in complete unilateral and bilateral cleft palate. Peg shape is the most common type of maxillary lateral incisor malformation found in complete unilateral cleft palate. The highest rate of maxillary lateral incisor agenesis was found in bilateral complete cleft palate compared to complete unilateral clefts. There is a relationship between complete unilateral and bilateral cleft palate, which was statistically significant at 78% with  $p\text{-value} = 5.69E-32 < 0.05$ . The conclusion of the study is there is a relationship between the unilateral cleft palate; and bilateral complete with malposition and malformation of maxillary lateral incisors.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

## 1. Introduction

Cleft lip and/or palate is a congenital anomaly of the facial structure characterised by a cleft lip and/or palate.<sup>1</sup> Research conducted in the city of Bandung from 2011 to 2015 showed that the incidence of cleft lip and/or palate in Indonesia is quite high, with a total of 1,596 patients.<sup>2-4</sup> A cleft lip and/or palate is multifactorial with both genetic

and environmental factors playing a role.<sup>5-7</sup> Patients with cleft lip and/or palate have a morphological shape that is different from that of normal children.<sup>8,9</sup> This anomaly can have a clinical impact on the quality of life of patients, as it can cause various problems, such as psychosocial aspects, communication and hearing problems.<sup>10</sup>

Primary and permanent teeth can be affected by cleft lip and/or palate, and teeth on the affected side of the cleft are often compromised.<sup>11</sup> It has been found that 96.7% of nonsyndromic cleft lip and palate patients have at least

\* Corresponding author.

E-mail address: [rizqa19001@mail.unpad.ac.id](mailto:rizqa19001@mail.unpad.ac.id) (R. S. Pratiwi).

one dental deformity.<sup>12</sup> Dental anomalies in the cleft area indicate that the cleft does not affect the dentition generally, but rather affects the dentition locally as in specific teeth only.<sup>13</sup> The prevalence of dental anomalies depends on the severity of the cleft. Specific teeth are usually affected on the side of the possible cleft, including premolars, incisors or canines.<sup>14</sup> The lateral incisors are the most commonly affected teeth in the dentition of patients with cleft lip and palate.<sup>12,15,16</sup> Dental anomalies have comprehensive variations consisting of: number, size, shape, and eruption abnormalities and can cause difficulties in dental care and aesthetic problems.<sup>17–19</sup> Dental anomalies can cause malocclusion and disturbances in tooth eruption and dental arch development.<sup>20,21</sup>

Early diagnosis is important in preventing advanced maxillofacial deformities. Early diagnosis also allows for appropriate treatment planning and can reduce problems and the cost and difficulty of treatment. Panoramic radiographs produce images showing the maxillary and mandibular structures and supporting tissues that can be used to diagnose maxillofacial pathologies, make treatment plans, evaluate tooth development, and detect clinical symptoms of anomalies.<sup>22,23</sup> Early detection of asymptomatic situations with panoramic radiographs is particularly important in children because delayed treatment of long-term lesions and maxillofacial deformities can bring about several psychological problems.<sup>24–26</sup> Early detection of dental anomalies is fundamental in terms of preventing several deviations that may occur in the permanent dentition.<sup>22,24,27</sup>

A new approach to craniofacial rehabilitation where paediatric dentists can assess facial and dental anomalies at the tooth seed stage using panoramic radiographs has been widely used and researched, but the assessment of malposition and malformation of maxillary lateral incisors has never been done in Indonesia or at the YPPCBL Indonesian Cleft Centre RSGM Unpad Bandung. Assessment of malposition and malformation of maxillary lateral incisors using panoramic radiographs is very useful for paediatric dentists in determining treatment plans for children with cleft lip and palate in Indonesia. The lack of data on dental anomalies in children with cleft lip and palate in Indonesia, and the relationship between these anomalies and the type of cleft, may hinder paediatric dentists in educating parents and developing comprehensive treatment plans to improve the quality of life of children with cleft lip and palate. With this background, the researcher conducted a study on the relationship between unilateral and bilateral complete non-syndromic cleft lip and palate with malposition and malformation of maxillary lateral incisors at Yayasan Pembina Penderita Celah Bibir dan Langit-langit (YPPCBL).

## 2. Material and Methods

The object of this study uses primary data on clinical examination and secondary data in the form of data on paediatric patients aged 5-13 years obtained from the Yayasan Pembina Penderita Celah Bibir dan Langit -langit (YPPCBL) and panoramic x-ray data together with the results of interpretation signed by a dentist with expertise in radiology dentistry on paediatric patients with cleft lip and palate aged 5-13 years who meet the inclusion and exclusion criteria between January 2019 and January 2022 at the Radiology Dentistry Installation of RSGM UNPAD. The sampling technique in this study was a total sampling technique, which means that the sample was taken as a whole that met the inclusion as follows:

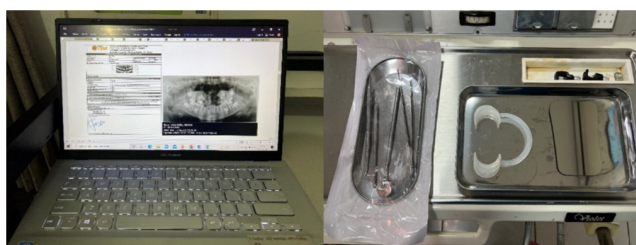
1. Digital panoramic radiographs and intraoral clinical photographs of girls and boys with unilateral or bilateral complete nonsyndromic cleft lip and palate aged 5-13 years who underwent primary surgery (labioplasty and palatoplasty) at the Indonesian Cleft Centre.
2. Panoramic radiographs were taken between January 2019 and January 2022.

The exclusion criteria in this study were:

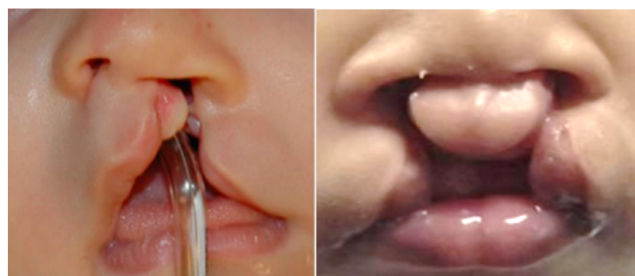
1. Digital panoramic radiographs and intraoral clinical photographs of girls and boys with unilateral or bilateral complete nonsyndromic cleft lip and palate aged 5-13 years who underwent secondary surgery (palatal repair and bone grafting) at the Indonesian Cleft Centre.
2. Poor quality digital panoramic radiographs: incomplete anatomical coverage, poor contrast and dentition, unclear anatomical structural details that cannot be used for diagnosis.

This research had obtained an ethical approval from the Ethical Committee of Padjadjaran University with reference number 388/UN6.KEP/EC/2022. The research was conducted at the Radiology Dentistry Installation of RSGM UNPAD from April to May 2022 and had obtained a research approval number 889/UN6.RSGM/TU.00/2022 and at the YPPCBL from March to May 2022 had obtained a research approval number 017/yppcbl/04/2022.

Materials and tools used in this research were results of digital panoramic radiographs together with interpretation by dentists with expertise in radiological dentistry, informed consent form to allow the taking of intraoral clinical examination photographs from the parents of the research subjects, diagnostic kit, intraoral glass, check retractor for clinical examination, 14" laptop computer, stationery for record keeping, form to collect data on malocclusion and malformation of maxillary lateral incisors.



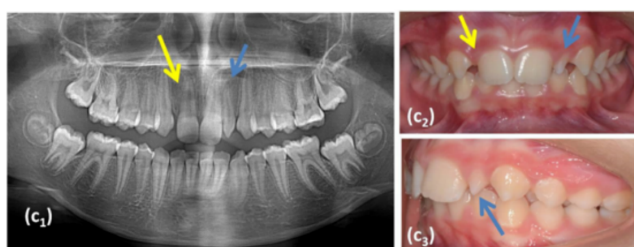
**Figure 1:** Materials and tools



**Figure 2:** Complete unilateral and bilateral cleft palate



**Figure 3:** Impacted maxillary lateral incisors



**Figure 4:** Peg shape maxillary lateral incisors

### 3. Results

The data sample in this study was 35 samples, each consisting of secondary data from digital panoramic radiographs and primary data from clinical examinations obtained based on inclusion and exclusion criteria. Sample this study consisted of 18 male and 17 female patient panoramic radiographs accompanied by clinical examinations with an age range of 5-13 years. Complete unilateral cleft palate sinistra was the most common classification with a total of 14 samples at 40%, consisting

of 6 male samples and 8 female samples. Complete bilateral cleft palate was the second most common condition with 11 samples representing 31.42%, consisting of 5 male and 6 female samples. Complete unilateral cleft palate dextra comes last with 10 samples at 28.57%, consisting of 7 male and 3 female samples. Sample characteristics based on gender, age and cleft type (Complete unilateral cleft palate dextra, complete unilateral cleft palate sinistra and complete bilateral cleft palate) are shown in Table 1.

Table 2 shows the results of the interpretation analysis of malposition, malformation, agenesis and caries in the interpretation of panoramic radiographs and clinical examination. In this study, malposition of the maxillary lateral incisors was more common (41.43%) than malformation of the maxillary lateral incisors (18.57%). The most common malposition of maxillary lateral incisors was impaction in the type of complete unilateral cleft palatedextra in 15%, impaction of maxillary lateral incisors in complete unilateral cleft palate sinistra in 14.29%, and impaction of maxillary lateral incisors in complete bilateral cleft palate in 27.27%.

Rotation and ectopic eruption of the maxillary lateral incisors had the same percentage of 10% in this study and were more common in complete unilateral cleft palate compared to complete bilateral cleft palate. The least common malposition of the maxillary lateral incisors in this study was transposition, with a percentage of only 2.86%.

The most common maxillary lateral incisors malformation was peg shape in the complete unilateral cleft palate sinistra at 21.43%. The second most common maxillary lateral incisors malformation in this study was microdontia which was found in complete unilateral cleft palate dextra at 10%, microdontia of maxillary lateral incisors in complete unilateral cleft palate sinistra was found at 7.14% and 4.55% was found in complete bilateral cleft palate. The least common maxillary lateral incisors malformation found in this study was dens invaginatus which was only 1.43%.

The agenesis of the maxillary lateral incisors in the complete bilateral cleft palate had the highest rate of 59.09%, while the agenesis rate in the complete unilateral cleft palate dextra was almost the same at 25%, and the agenesis of the maxillary lateral incisors in the complete unilateral cleft palate sinistra was 21.43%. The caries affected maxillary lateral incisors in complete unilateral cleft palate dextra had the highest rate of 45%, followed by complete unilateral cleft palate sinistra with 25% and complete bilateral cleft palate with 18.18%.

Dental anomalies found in complete unilateral cleft palate dextra were 50% in the maxillary dextra lateral incisors and 20% in the maxillary sinistra lateral incisors. Dental anomalies found in complete unilateral cleft palate sinistra were 17.85% in the maxillary dextra lateral incisors and 50% in the maxillary sinistra lateral incisors, whereas in

**Table 1:** Characteristics of samples according to gender, Age and cleft type

Gender	Age (year)	CUCPD	CUCPS	CBCP	Number of Sampels	%
Male	5	2	2	0	4	11,42
	6	0	0	2	2	5,71
	7	0	0	0	0	0
	8	0	1	0	1	2,85
	9	3	1	0	4	11,42
	10	0	0	1	1	2,85
	11	1	1	1	3	8,57
	12	0	0	1	1	2,85
	13	1	1	0	2	5,71
Female	5	2	3	1	6	17,14
	6	0	0	1	1	2,85
	7	0	2	0	2	5,71
	8	0	0	0	0	0
	9	0	3	2	5	14,28
	10	0	0	1	1	2,85
	11	0	0	0	0	0
	12	0	0	1	1	2,85
	13	1	0	0	1	2,85
Total %		10 28,57	14 40,00	11 31,42	35	100,00 100,00

Notes: CUCPD= Complete Unilateral Cleft Palate Dextra, CUCPS= Complete Unilateral Cleft Palate Sinistra, CBCP= Complete Bilateral Cleft Palate

**Table 2:** Characteristics of samples with malposition, malformation, agenesis, and caries based on panoramic interpretation and clinical examination

Variable	CUCPD (%)	CUCPS (%)	CBCP (%)	Total (%)
Malposition	45,00	39,29	40,91	41,43
Rotasi	10,00	10,71	9,09	10,00
Transposisi	5,00	3,57	0,00	2,86
Impaksi	15,00	14,29	27,27	18,57
Erupsi Ektopik	15,00	10,71	4,55	10,00
<b>Malformation</b>	<b>10,00</b>	<b>32,14</b>	<b>9,09</b>	<b>18,57</b>
Peg Shape	0,00	21,43	4,55	10,00
Mikrodonsia	10,00	7,14	4,55	7,14
Dens Invaginatus	0,00	3,57	0,00	1,43
Agenesis	25,00	21,43	59,09	34,29
Caries	45,00	25,00	18,18	28,57

Notes: CUCPD= Complete Unilateral Cleft Palate Dextra, CUCPS= Complete Unilateral Cleft Palate Sinistra. CBCP= Complete Bilateral Cleft Palate

complete bilateral cleft palate there were balanced results, namely 45.45% in the maxillary dextra lateral incisors and 50% in the maxillary sinistra lateral incisors.

The relationship or association between the category of cleft palate with malposition and malformation of the maxillary lateral incisors was analysed using Non-parametric statistics in the form of Kendall's Concordant Rank Correlation (W) analysis can be seen in Table 4. The variables among malpositions and malformations that affect the cleft and how the relationship between malpositions and malformations variables are analysed by calculating the magnitude of the Spearman Rank correlation coefficient can be seen in Table 5.

The relationship between unilateral and bilateral complete cleft palate with malposition and malformation

of maxillary lateral incisors was analysed by calculating the magnitude of Kendall's Concordance correlation coefficient, which is 78.5% ( $W \times 100\%$ ) which is statistically significant where the  $p\text{-value} = 1.38E - 24 = 0.000.00138 < 0.05$ . The variables among malposition and malformation that affect the cleft and how the relationship between malposition and malformation variables are analysed by calculating the magnitude of the Rank Spearman correlation coefficient can be seen in Table 5.

Seen in Tables 4 and 5, the results of the test of significance of the partial correlation coefficient, where the correlation between the cleft with malposition and the cleft with malformation shows the type of test that is not statistically significant (not meaningful) although the relationship exists but can be said to be

**Table 3:** Characteristics of samples based on the cleft type and percentage of anomalies in the maxillary lateral incisors on the dextra and sinistra sides

Cleft Type	Number of sampels	Number of teeth	I2 Dextra	%	I2 Sinistra	%
CUCPD	10	20	10	50,00	4	20,00
CUCPS	14	28	5	17,85	14	50,00
CBCP	11	22	10	45,45	11	50,00

Note: CUCPD= Complete Unilateral Cleft Palate Dextra, CUCPS= Complete Unilateral Cleft Palate Sinistra, CBCP= Complete Bilateral Cleft Palate

**Table 4:** Relationship between cleft and malposition and malformation of maxillary lateral incisors (Kendall Coefficient of Concordance)

Variable	Avg. Rank	Sum of Ranks
Cleft	2,90	203,00
Malposition	1,67	117,00
Malformation	1,43	100,00
<b>Total</b>	<b>2,00</b>	<b>420,00</b>

**Table 5:** Relationship between cleft and malposition and relationship between cleft and malformation (Spearman rank)

Variable	$r_s$	t	p value	Characteristics	Correlation
Cleft dan malposition	-0,03	-0,24	0,4058	Sign	0,08
Cleft dan malformation	-0,02	-0,14	0,4445	Non-Sign	0,03
Malposition dan Malformation	0,24	2,07	0,0213	Sign	5,90

meaningless (considered equal to zero), while between the variable malposition and malformation shows a statistically significant relationship with a strong relationship of 5.90% ( $rs^2 \times 100\%$ )

#### 4. Discussion

Early detection of dental anomalies in paediatric patients with cleft lip and palate is fundamental to the prevention of various irregularities that may include such as tooth sensitivity, malocclusion, impaired tooth eruption, impaired dental arch development and aesthetic problems.<sup>17,24,28,29</sup> Many recent studies have examined cleft palate in relation to dental anomalies, but the assessment of maxillary lateral incisor malposition and malformation of the maxillary lateral incisors has never been done in Indonesia YPPCBL Indonesian Cleft Centre RSGM Unpad, Bandung. Selection of the age range of the subjects of this study, which is 5-13 years old, the age selection is based on the estimated age of children who are in the period of the transition from primary teeth to permanent teeth.

The subjects of this study were panoramic radiographs of children aged 5-13 years taken for diagnostic purposes. Panoramic radiographs of children aged 5-13 years taken for diagnostic purposes. Secondary data in the form of panoramic radiographs was used as the object of study as this type of radiograph is an appropriate source of information to evaluation. Panoramic radiography is a radiation-enhanced image used in the clinical setting, are non-invasive and provide data that cannot be obtained by clinical examination.<sup>24,30</sup> Panoramic radiography is effectively used used in the imaging of oral and maxillofacial pathology, treatment planning,

evaluation of dental development and detection of clinical abnormalities.<sup>31,32</sup> Secondary data is derived from the results of the use of digital panoramic radiography, which offer several advantages and convenience. The process of making digital panoramic radiographs is much faster, more environmentally friendly because it uses fewer chemicals, and the results can be modified and contrast corrected, reducing the possibility of retakes and minimising the risk of errors in interpretation and analysis.<sup>31,32</sup>

The most common presentation of maxillary lateral incisor malposition in the in this study was impaction in both unilateral and bilateral complete cleft palate with an average of 18.57%. Impacted tooth is resulting from the cessation of tooth eruption due to a clinical abnormality or a radiographically detectable physical obstruction in the path of eruption or due to abnormal tooth position. Movement of the primary dentition during eruption leads to disruption of the position of these teeth in the dental arch, or to their impaction. Unilateral palatal clefts show collapse of the cleft side in the upper jaw resulting in a narrow dental arch.<sup>17,33–35</sup> A narrowed cleft palate and lack of space can also allow improper eruption. Secondary bone grafting should be performed to enhance the eruption lateral incisors and canines; therefore, lack of proper treatment may be the reason for impaction of the upper lateral incisors. Patients with impacted teeth require surgery and multidisciplinary orthodontic treatment to align the teeth with the dental arch.<sup>36–38</sup>

Maxillary lateral incisor rotation and ectopic eruption on the palatal side had the same percentage of 10% in this study. Tooth rotation is defined as the displacement of mesiolingual or distolingual teeth around their longitudinal

axis. A study conducted by Liuk et al in 2013 showed that the maxillary lateral incisors had a greater mesiolabial rotation of 11,7°. <sup>17,39–42</sup> The normal morphology of the maxillary lateral incisor is used as a guide to determine the presence of rotation radiographically. The maxillary lateral incisor does not rotate if the incisal edge of the crown is straight and parallel to the occlusal plane, it has obstacles in this study because the sample in this study has a high carries rate, making it difficult to study. Palatal eruption of maxillary lateral incisors in this study had a percentage that is not much different from impaction, this is in accordance with research conducted by Agnieszka Lasota and Tarac M, Cirakoglu N which states that the common tooth malposition in cleft lip and palate is the eruption of the palatal eruption of the lateral incisor. <sup>17,24,43,44</sup>

The most common type of malformation of the maxillary lateral incisors found in this study is the peg shape, with an average percentage of 10%, which is consistent with the research conducted by da Cas NV, Machado RA, Coletta R, Della and Rangel in the journal Patterns of dental anomalies in patients with Patterns of dental anomalies in patients with nonsyndromic oral clefts. Common malformations in cleft lip and palate are peg-shaped lateral incisors maxilla. <sup>18,45</sup>

Unilateral and bilateral total cleft palates are associated with malposition and malformation of the maxillary lateral incisors. This was mentioned by Hovorakova that during normal development, the medial fascial process of the nasal and maxillary fuse to form the maxillary arch. The seeds of the incisors lateral maxillary primary incisor develop and has a double seed in the fusion area of the medial nasal and maxillary. If proper fusion of the periphery of the medial nasal and maxilla is followed by a lack of fusion of the dental epithelium in the superficial region of the face, lateral incisor anomalies may occur in normal jaws. Incomplete fusion of the medial nasal and maxillary areas results in maxillary clefts and abnormal incisors, which are often seen in patients with cleft palate. A physiological delay in the fusion of the dental epithelium and multiple seeds of the upper lateral may explain the developmental susceptibility to the occurrence of lateral incisor anomalies even in the absence of lateral incisor anomalies even in the absence of orofacial clefts. <sup>18,45</sup> Results this study shows that the presence of a gap increases the association between malposition and malformation of the maxillary lateral incisors. The most common malposition in this study was impaction of the lateral incisors, while the most common malformation in cleft palate is a peg shape of the maxillary lateral incisors. <sup>17,18,24</sup>

## 5. Conclusions

1. Impaction is the most common maxillary lateral incisor malposition most commonly found in unilateral or complete bilateral cleft palate, followed by rotational and complete bilateral cleft palate, followed

by rotation and ectopic eruption and the least common is transposition.

2. Peg shape is the most common malformation of the maxillary lateral incisors, which is most commonly found in cleft palate, then microdontia and the least common is dens invaginatus.
3. There is an association between unilateral and bilateral complete cleft palate with maxillary lateral incisor malposition with a weak association, so that the association is not significant.
4. There is an association between unilateral and bilateral complete cleft palate with maxillary lateral incisor malposition with a weak association, so that the association is not significant.
5. There is an association of complete unilateral and bilateral cleft palate with malposition and malformation of the maxillary lateral incisors.

## 6. Source of Funding

None.

## 7. Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

## References

1. Bahesh HA, Munjim HFA. Facial Deformity: Cleft Lip and Palate A Recapitulation. *Saudi J Oral Dent Res*. 2020;5(6):281–6.
2. Elfiah U, Kushariyadi, Wahyudi SS. Analisis Kejadian Sumbing Bibir dan Langit: Studi Deskriptif Berdasarkan Tinjauan Geografis. *J Rekonstruksi dan Estet*. 2021;6(1):34.
3. Yılmaz HN, Özbilen E, Üstün T. The prevalence of cleft lip and palate patients: A single-center experience for 17 years. *Turk J Orthod*. 2019;32(3):139–44.
4. Sjamsudin E, Maifara D. Epidemiology and characteristics of cleft lip and palate and the influence of consanguinity and socioeconomic in West Java, Indonesia: a five-year retrospective study. *Int J Oral Maxillofac Surg*. 2017;46:69. doi:10.1016/j.ijom.2017.02.251.
5. Abbott BD. The etiology of cleft palate: A 50-year search for mechanistic and molecular understanding. *Birth Defects Res B Dev Reprod Toxicol*. 2010;89(4):266–74.
6. Dixon MJ, Marazita ML, Beaty TH, Murray JC. Cleft lip and palate: Understanding genetic and environmental influences. *Nat Rev Genet*. 2011;12(3):167–78.
7. Maskoen AM, Nasroen SL, Fauziah PN, Soemantri ESS, Gani BA. Expression of transforming growth factor alpha BamHI and RsaI gene variants associated with non-syndromic cleft palate of Indonesian subjects using polymerase chain reaction method. *Asian J Pharm Clin Res*. 2018;84(4):351–4.
8. Tolarova MM, Al-Kharafi L, Tolar M, Boyd C. DSc is a member of the following medical societies. Medscape. Available from: <https://emedicine.medscape.com/article/995535-overview?form=fpf>.
9. Normastura AR, Khairi MDM, Azizah Y, Nizam A, Samsuddin AR, Naing L. Speech Disorders in Operated Cleft Lip and Palate Children in Northeast Malaysia. *Med J Malaysia*. 2008;63(1):21–5.
10. Octavia A. Perawatan Interseptif Dental Pasien Anak Penderita Cleft. *Insisiva Dent J*. 2016;3(1):10–5.
11. Dyck JV, Llano-Pérula MC, Willems G, Verdonck A. Dental development in cleft lip and palate patients: A systematic review. *Forensic Sci Int*. 2019;300:63–74.





12. Akcam MO, Evirgen S, Uslu O, Memikoğlu UT. Dental anomalies in individuals with cleft lip and/or palate. *Eur J Orthod*. 2010;32(2):207–13.
13. Huda NU, Shahzad HB, Noor M, Ishaq Y, Anwar MA, Kashif M. Frequency of Different Dental Irregularities Associated With Cleft Lip and Palate in a Tertiary Care Dental Hospital. *Cureus*. 2021;13(4):e14456. doi:10.7759/cureus.14456.
14. Răducanu AM, Didilescu AC, Feraru IV, Dumitrache MA, Hânjoiu TA, Ionescu E, et al. Considerations on morphological abnormalities of permanent teeth in children with cleft lip and palate. *Rom J Morphol Embryol*. 2015;56(2):453–7.
15. Garib DG, Rosar JP, Sathler R, Ozawa TO. Dual embryonic origin of maxillary lateral incisors: Clinical implications in patients with cleft lip and palate. *Dent Press J Orthod*. 2015;20(5):118–5.
16. Janes LE, Bazina M, Morcos SS, Ukaigwe A, Valiathan M, Jacobson R, et al. The Relationship Between Dental Agenesis and Maxillary Hypoplasia in Patients With Cleft Lip and Palate. *J Craniofac Surg*. 2021;32(6):2012–5.
17. Lasota A. Dental abnormalities in children with cleft lip with or without cleft palate. *J Pre-Clin Clin Res*. 2021;19(4):134–6.
18. Cas NVD, Machado RA, Coletta RD, Rangel A. Patterns of dental anomalies in patients with nonsyndromic oral cleft. *Braz J Oral Sci*. 2020;19:e208729.
19. Consolaro A, Medeiros MCM, Miranda DAO, DeOliveira IA. Supernumerary teeth in patients with cleft lip and palate: The tooth germs do not separate. *Dental Press J Orthod*. 2021;26(4):e211ns4.
20. Allori AC, Mulliken JB, Meara JG, Shusterman S, Marcus JR. Classification of Cleft Lip/Palate: Then and Now. *Cleft Palate Craniofac J*. 2017;54(2):175–88.
21. Miletich I, Sharpe PT. Normal and abnormal dental development. *Hum Mol Genet*. 2003;12(1):69–73.
22. Bilge NH, Yesiltepe S, Agirman KT, Caglayan F, Bilge OM. Investigation of prevalence of dental anomalies by using digital panoramic radiographs. *Folia Morphol*. 2018;77(2):323–8.
23. Wardill WEM. Cleft Palate. *Lancet*. 2018;226(5836):47–8.
24. Tarac M, Cirakoglu N. Determination of the prevalence of dental anomalies by digital panoramic radiography analysis. *Med Sci*. 2021;10(4):1128–32.
25. Austin AA, Druschel CM, Tyler MC, Romitti PA, West II, Damiano PC, et al. Interdisciplinary craniofacial teams compared with individual providers: Is orofacial cleft care more comprehensive and do parents perceive better outcomes? Cleft Palate. *Cleft Palate Craniofac J*. 2010;47(1):1–8.
26. Berkowitz S. Cleft Lip and Palate: Diagnosis and Management. 2nd ed. Berlin Heidelberg: Springer-Verlag; 2016. p. 225–9.
27. Kjør I. New diagnostics of the dentition on panoramic radiographs-Focusing on the peripheral nervous system as an important aetiological factor behind dental anomalies. *Orthod Waves*. 2012;71(1):1–16.
28. Pastuszak P, Dunin-Wilczyńska I, Lasota A. Frequency of Additional Congenital Dental Anomalies in Children with Cleft Lip, Alveolar and Palate. *J Clin Med*. 2020;9(12):3813.
29. Hovorakova M, Lesot H, Peterka M, Peterkova R. Early development of the human dentition revisited. *J Anat*. 2018;233(2):135–45.
30. Johan L. Maxillary Canine Ectopia and other Developmental Anomalies on Mixed Dentition Panoramic Radiographs at the Tygerberg Oral Health Centre. South Africa; 2017.
31. Francisco IN. Overview of care in cleft lip and palate for orthodontic treatment. Portugal; 2021.
32. Awadh W, Pegelow M, Heliövaara A, Rice DP. Taurodontism in the first permanent molars in Van der Woude syndrome compared to isolated cleft palate. *Eur J Orthod*. 2021;43(1):29–35.
33. Sivertsen Å, Wilcox AJ, Skjærven R, Vindenes HA, Åbyholm F, Harville E, et al. Familial risk of oral clefts by morphological type and severity: Population based cohort study of first degree relatives. *BMJ*. 2008;336(7641):432–4.
34. Shaye D, Liu CC, Tollefson TT. Cleft Lip and Palate. An Evidence-Based Review. *Facial Plast Surg Clin North Am*. 2015;23(3):357–72.
35. Worley ML, Patel KG, Kilpatrick LA. Cleft Lip and Palate. *Clin Perinatol*. 2018;45(4):661–78.
36. Marzouk T, Alves IL, Wong CL, Delucia L, Mckinney CM, Pendleton C. Association between Dental Anomalies and Orofacial Clefts: A Metaanalysis. *JDR Clin Trans Res*. 2021;6(4):368–81.
37. Vandersluis YR, Fisher DM, Stevens K, Tompson BD, Lou W, Suri S. Comparison of dental outcomes in patients with nonsyndromic complete unilateral cleft lip and palate who receive secondary alveolar bone grafting before or after emergence of the permanent maxillary canine. *Am J Orthod Dentofacial Orthop*. 2020;157(5):668–79.
38. Ickow IM, Zinn S, Stacy JM, Martin B, Losee JE, D'Alesio A, et al. Dens Invaginatus in Patients With Cleft Lip and Palate: A Case Series. *Cleft Palate Craniofac J*. 2021;58(11):1452–8.
39. McDonald RE, Avery DR. Dentistry for the children and adolescent. United States: Mosby Elsevier; 2011. p. 150–74.
40. Kobayashi TY, Gomide MR, Carrara CF, Carrara CFC. Timing and sequence of primary tooth eruption in children with cleft lip and palate. *J Appl Oral Sci*. 2010;18(3):220–4.
41. Moon CL, King NM, Hai MW. Dental development of Chinese children with cleft lip and palate. *Cleft Palate-Craniofacial J*. 2008;45(3):289–96.
42. Suzuki A, Nakano M, Yoshizaki K, Yasunaga A, Haruyama N, Takahashi I. A longitudinal study of the presence of dental anomalies in the primary and permanent dentitions of cleft lip and/or palate patients. *Cleft Palate Craniofac J*. 2017;54(3):309–20.
43. Tunis TS, Sarne O, Hershkovitz I, Finkelstein T, Pavlidi AM, Shapira Y, et al. Dental anomalies' characteristics. *Diagnostics (Basel)*. 2021;11(7):1161.
44. Keskin G, Karaer K, Gündoğar ZU. Targeted next-generation sequencing (NGS) analysis of mutations in nonsyndromic tooth agenesis candidate genes : Analysis of a Turkish cohort. *J Orofac Orthop*. 2022;83(Suppl 1):65–74.
45. Gibson TL, Grayson BH, Cutting CB, Shetye PR. Prevalence of Dental Anomalies in Patients With Unilateral Cleft Lip and Alveolus Treated With 94 Gingivoperiosteoplasty. *Cleft Palate Craniofac J*. 2022;59(8):1017–23.

## Author biography


**Rizqa Septianoly Pratiwi**, -  <https://orcid.org/0000-0003-2401-8734>

**Willyanti Soewondo**, -  <https://orcid.org/0000-0002-4726-2900>

**Eka Chemiawan**, -  <https://orcid.org/0000-0001-5749-5655>

**Belly Sam**, -  <https://orcid.org/0000-0001-6182-7704>

**Eriska Riyanti**, -  <https://orcid.org/0000-0003-2195-7832>

**Arlette Setiawan**, -  <https://orcid.org/0000-0001-5005-8081>

**Cite this article:** Pratiwi RS, Soewondo W, Chemiawan E, Sam B, Riyanti E, Setiawan A. Relationship of complete unilateral and bilateral cleft palate with malposition and malformation of maxillary lateral incisors. *Int J Oral Health Dent* 2023;9(4):251–257.