ORIGINAL ARTICLE

3D evaluation of the effects of traumatic surgical techniques on Vomer bone volume and morphology in the treatment of lip and palate clefts

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ABSTRACT

BACKGROUND: Cleft lip/palate (CLP) deformity is the most common congenital facial anomaly. In this study, it was aimed to evaluate the changes in volume and shape of Vomer bone after CLP repair surgery.

METHODS: The images of a total of 30 patients aged between 9 and 12 years which were recorded with computed tomography were retrospectively analyzed. The patients were divided into three groups: No syndrome, operated for unilateral CLP group (n=10), no syndrome, operated for bilateral CLP group (n=10), and control group (n=10) with no syndrome, no operation history, or no lip/palate deformities. Data of the patients were transferred to a software program and a new three-dimensional image was created for the Vomer.

RESULTS: There was no statistically significant difference in the Sella-Nasion lengths, Vomer base lengths, and Vomer vertical lengths among the three groups. However, the Vomer bone volume of the patients with bilateral CLP was found to be statistically significantly higher than the control group.

CONCLUSION: We can conclude that more bone formation may be observed due to the periosteal reaction following bilateral Vomer flap elevation or during maxillary growth, tension on the palatal flap may be increased new bone formation by pulling the bilateral Vomer flap if it is elevated and sutured palatal mucoperiosteal flap in the early period. Our findings have led us to the conclusion that size and volume of the Vomer bone can be significantly affected by environmental factors. According to the functional matrix theory, scar tissue formation and lack of Vomer-maxilla fusion cannot stimulate the further development of the anterior cranial bones, leading to shorter anterior cranial base.

Keywords: Cleft lip/palate; computed tomography; surgical trauma; veau-wardill-kilner palatoplasty.

INTRODUCTION

Cleft lip/palate (CLP) deformity is the most common congenital facial anomaly seen in 1/2400 births.[1] According to Göyenç et al.'s study,[2] 9.89% of CLP cases had primary cleft, 36.26% had secondary cleft, and 53.85% had total cleft. About 27.28% of the secondary cleft cases present soft palate cleft, whereas 72.72% present hard and soft palate cleft. About 65.31% of the total cleft cases present unilateral cleft as 34.69% has bilateral cleft. In 40.63% of the unilateral total cleft cases, cleft was on the right side whereas in 59.37% on the left side. Some researchers regarded the nasal septum as the primary growth center of the midface skeleton.[3,4] The size and volume of the Vomer bone usually show the greatest increase between the 8th and 21st weeks of fetal life. Moss named anatomical structures in which functions were carried out as "functional cranial component." A functional cranial component comprised two parts: (1) Functional matrix and

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(2) skeletal unit. Functional matrix consisted of functioning spaces with all surrounding soft tissues and organs. Skeletal unit indicated bones or parts of bones that preserves and supports the functional matrix. The impelling cause that led to the growth and development of bones was the growth and development of these functional matrices.[5] The functional matrix theory states that the Vomer grows and develops following the surrounding tissues.[6,7] During this period, the rapid development of the Vomer has been proposed to be associated with the rapid development of the oronasal airway[8] and maxillary sinus. Concurrently, there are nasal malfunctions and nasal defects in the nasal airways during the infertile period of individuals with CLP.[9] In such cases, nasal and skeletal nasal base anomalies are linked to each other.[10]

The Vomer may play an important role in the development of hard palate bones in healthy individuals and those with a cleft palate.[11] On the other hand, there are no morphological or histological variations between healthy individuals and CLP patients, except for mild shape deformation.[12]

Orthodontists are the first physicians that infants with cleft lip and palate visit at the beginning of their journey. Early initiation of interventions significantly increases the chances of success and efficiency of the treatment. For this purpose, various pre-operative treatment techniques have been defined and used. Recently, nasoalveolar molding is preferred by orthodontists. Treatment of CLP takes many years, and here, success is tightly related to teamwork performance. These patients might undergo many operations with different techniques depending on the condition of the cleft. These surgical operations are traumatic for related tissues and surrounding structures.

Until now, several surgical techniques have been defined for CLP which offer a wide range of management approaches, and each has distinct benefits.[13–18] Various types of techniques are used to restore the nasal area of patients with CLP, depending on the type of deformity.[19] Differences of techniques, timing, and sequences are the most important traumatic iatrogenic effects on the face form of primary surgeries. The presence of several clinical methods is one of the major difficulties in the investigation of the problem.

Doğan et al.[20] spotted significant changes in craniofacial morphology in their study that unilateral CLPs were surgically repaired following Oslo protocol (lips at 3 months and palate at 12 months) which were short and retrusive maxilla and decrease in superior posterior face height. Ross[21] reported that repairing soft palate inhibits posterior vertical maxillary development and repairing hard palate inhibit forward translation of maxilla as well as forward development of the alveolar process. Shao et al.[22] reported that the sagittal position of the maxilla was normal in patients with unilateral CLP, but maxillary sagittal length decreased after lip repair. Xu et al.[23] reported that one- and two-stage palatoplasty operations performed on unilateral complete CLP patients led to growth restriction of the maxilla in the sagittal direction, maxillary retrognathia, shortening of maxillary length in the sagittal direction, and malrelation of jaws. It was found that the repair of the denuded bone with Vomer flap inhibited the vertical growth of maxilla and the presence of the adherent lip adversely affected the position of the maxilla. He said that lip repair (chelioplasty) operation performed in the 3rd month had no adverse effect on craniofacial morphology. Also reported that, soft palate repair would inhibit the vertical growth of the posterior maxilla and hard palate repair would prevent forward development of maxilla and alveolar process. Pool and Farnworth[24] said that lip repair may play role, if not the main cause, in the inhibition of the development of maxilla.

Velopharyngeal insufficiency significantly affects speech. Surgery should be performed before speech development begins; the best speech results are obtained when surgery performed at about 12 months.[25] Lip repair adversely affects the position of the maxilla while promotes speech.[23] Karsten et al.[26] stated that although maxillary surgery has been avoided to prevent inhibition of growth, other surgical techniques should be used for cleft repair to improve speech. Similar techniques used in hard and soft palate repair have the same effect on facial growth.[21] Scar tissue has been accepted as the source of complications in maxillary and dentoalveolar growth in CLP surgeries.[26] With this thought, single- and two-stage surgical protocols have been introduced to reduce scar tissue. In one stage protocol, hard and soft palates are repaired at the same time. In two-stage protocol, soft palate is operated first and the cleft in the hard palate decreases subsequently, then hard palate is operated.[27] Among these procedures, in two-stage protocol, maxillary development and occlusion result better.[28] Karsten et al.[26] examined the effects of Veau-Wardill-Kilner (V-W-K) technique introduced by Nyle in 1961 and V-W-K-like microincision (MI) technique modified by Mendosa in 1994 in CLP surgery. He reported that the maxillary arch width increased in the MI technique and less scar tissue was formed.

All surgical procedures performed in CLPs contribute to advancement in nutrition, speech and mood of patient, and decrease in incidence of upper respiratory tract infections. However, scar tissues and force vectors formed as a result of these procedures that are incompatible with phytomorphology of dentoalveolar and maxillary structures causes negative effects on the maxillofacial area in terms of both function and esthetics and on development and growth direction, at a significant level. In the literature, we did not find any study examining the effect of traumatic operations on the volume and shape of the Vomer bone using computed tomography (CT) in patients with CLP. In the present study, therefore, we aimed this pioneering study to evaluate the effects of traumatic repair operations on the shape and volume of the Vomer bone in three dimensions in patients with CLP.

MATERIALS AND METHODS

Study Design and Study Population

The 3D modeling of patients with cleft lip and palate using CT enables us to visualize the anatomy in more detail and to do a better study.[29] This retrospective study was conducted at Plastic, Reconstructive, and Aesthetic Surgery Department of Marmara University, School of Medicine between Orthodontic Department of Marmara University, School of Dentistry. The images of a total of 30 patients aged between 9 and 12 years which were obtained from a CT device (Siemens Somatom Emotion, Siemens Medical Solutions, Erlangen, Germany) were included in the study. The CT material used in this study was selected from the archival CT scans which were previously registered for diagnostic and therapeutic purposes and saved at the Radiology Department of Marmara University, School of Medicine. Inclusion criteria were as follows: Having no syndrome with previous unilateral or bilateral CLP surgery. The patients were divided into three groups: No syndrome, operated for unilateral CLP (Group 1; n=10), no syndrome, operated for bilateral CLP (Group 2; n=10), and control (Group 3; n=10) with no syndrome, no operation history, and no lip/palate deformity. A written informed consent was obtained from each parent and/or legal guardian of the participant. The study protocol was approved by the Ethics Committee of Marmara University, School of Medicine (09.2019.119). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Treatment Protocol

In our routine practice, treatment of lip/palate deformities during infancy varies depending on each individual case. In general, however, nasoalveolar molding is performed by an orthodontist as the first-stage procedure in infants with all types of lip/palate deformities. The operational stages can be mainly classified into two groups as follows (Fig. 1):

Stage 1: Treatment Protocol for Unilateral CLP

- Phase 1: At 4 months of life, the anterior palate and lip repair are simultaneously done. The planned incision on the Vomer is extended to the gingiva for a full repair
- Phase 2: Posterior palate repair is performed according to the VWK method at 10–12 months.[30]

Stage 2: Treatment Protocol for Bilateral CLP

- Phase 1: Anterior palate repair is done at 4 months. The incision on the Vomer does not extend beyond the pre-maxillary junction to the gingiva
- Phase 2: Repair of double-sided lips is done at 6 months, and repair is performed in such a way that a tie plate is planned on the pre-maxilla and an L-shaped floor of the nasal base is formed
- Phase 3: Posterior palate repair is performed at 10 months according to the VWK method.

When the patients with CLP grow to 3 years old and when they start communicating with the social environment, speech evaluation is performed. If velopharyngeal insufficiency is present, the patient is referred to an ear, nose, and throat specialist for transoral endoscopic and transnasal fiber-optic velopharyngoscopy. The treatment plan for velopharyngeal insufficiency is established by identifying the areas where the imperfection defect is located. In case of wrong learning pattern, the patient is referred to a speech therapist. Meanwhile, the patient continues to be followed by the orthodontic department. Then, bone graft and alveolar bone repair are performed at around the age of 9 years, during the eruption period of the canine and lateral teeth. Following alveolar repair, the patient is scheduled for follow-up at 6 months.

Data Processing

Data of the patients were stored on a desktop computer as Digital Imaging and Communications in Medicine data and were transferred to the MIMICS® version 17.0 software (Materialise NV, Leuven, Belgium). With the aid of the MIMICS® base module and simulation module, two-dimensional image sections were combined, and three-dimensional (3D) images were obtained on which the measurements could be made.

The axial images of the patients were processed using the program. Axial, sagittal, and coronal sections were created from the obtained data, and all data were examined and measured on three planes created. During this procedure, the anatomical points of the planes were correctly formed on CT.

The Vomer was segmented from the head complex to calculate its volume (V-Vol: Vomer volume). The base of the sphenoid sinus was considered as the boundary to separate the image from the skull base on three dimensions. The Vomer base (VB: The length of Vomer base) was segmented from the area where it merged with the maxilla. The Vomer height (VH) was measured as the vertical direction length of the Vomer, which is the distance between the foremost point of the Vomer and the base of the Vomer. In addition, the cephalometric points were used for standard orthodontic measurements where the distance between the sella and nasion (S-N) was measured for standardization.

A new 3D image of the Vomer painted in a different color which included the volume of the segmented Vomer was created (Figs. 2 and 3).

Statistical Analysis

Statistical analysis was performed using the SPSS version 25.0 software (IBM Corp., Armonk, NY, USA). Data were expressed in mean ± standard deviation, median (min-max), or number and frequency. The Shapiro–Wilk test was used and a histogram, Q-Q plot, was drawn to assess the data normality. For all continuous variables, the groups were compared using

Table 1. Descriptive characteristics of study population

Variable	Group	n	Minimum	Maximum	Median (Q1-Q3)	Mean	Standard deviation
S-N, mm	Control	10	58.3	83.55	63.92 (62.19–70.58)	66.73	7.73
	Unilateral	10	59.67	66.06	61.88 (60.4–64.26)	62.36	2.21
	Bilateral	10	60.11	74.64	63.72 (61.96–67.98)	64.91	4.37
VB, mm	Control	10	14.31	43.98	37.03 (30.63–40.04)	34.49	9.06
	Unilateral	10	14.35	38.21	33.92 (29.23–36.36)	31.56	7.1
	Bilateral	10	9.95	39.95	24.38 (19.37–34.03)	25.65	9.74
V-Vol, mm^3	Control	10	591.23	1938.3	892.25 (738.17–1138.54)	1004.63	403.52
	Unilateral	10	747.18	2106.85	1128.54 (785.62–1349.5)	1179.94	423.59
	Bilateral	10	1050.66	2638.5	1357.63 (1218.44–1786.94)	1537.91	489.74
VH, mm	Control	10	12.77	28.97	19.13 (16.77–22.1)	19.91	4.68
	Unilateral	10	13.51	22.9	19 (14.74–20.12)	17.83	3.2
	Bilateral	10	17.55	39.91	23.06 (17.88–25.88)	23.6	6.7

S-N: Sella and nasion; VB: Vomer base; V-Vol: Vomer volume; VH: Vomer height.

the non-parametric Kruskal–Wallis test. In case of statistical significance, the Dunn-Bonferroni multiple comparison test was used to determine the cause of the difference among the groups. P<0.05 was considered statistically significant.

RESULTS

Table 1 shows the descriptive characteristics of the study groups.

Table 2. Results of Shapiro-Wilk test of normality

Variable	Group	Statistic	Degree of freedom	p-value*
S-N	Control	0.836	10	0.039
	Unilateral	0.914	10	0.309
	Bilateral	0.883	10	0.142
VB	Control	0.841	10	0.045
	Unilateral	0.819	10	0.025
	Bilateral	0.967	10	0.861
V-Vol	Control	0.840	10	0.044
	Unilateral	0.880	10	0.132
	Bilateral	0.826	10	0.030
VH	Control	0.915	10	0.317
	Unilateral	0.904	10	0.243
	Bilateral	0.808	10	0.018

*Shapiro-Wilk test was used to assess normality of variables. The S-N variable for the control group, the VB for the control and unilateral CLP group, the V-Vol variable for the control and bilateral CLP group, and the VH variable for the bilateral CLP group showed non-normal distribution. Therefore, the Kruskal-Wallis test was used for the inter-group comparison. S-N: Sella and nasion; VB: Vomer base; V-Vol: Vomer volume; VH: Vomer height; CLP: Cleft lip/palate.

The normal distribution of the data was checked with the Shapiro–Wilk normality test. According to Table 2, control group values for S-N variable, control and unilateral group values for VB variable, control and bilateral group values for V-Vol variable, and bilateral group values for VH variable do not show normal distribution.

Therefore, comparisons between groups were made with nonparametric Kruskal–Wallis test. Table 3 summarizes the descriptive statistics and intergroup comparisons. In addition, the mean S-N length was 62.36±2.21 mm in the unilateral group, 64.91±4.37 mm in the bilateral group, and 66.73±7.73 mm in the control group, indicating no statistically significant difference among the groups (p>0.05) (Table 3 and Fig. 4). The mean VB length was 31.56±7.1 in the unilateral CLP group, 25.65±9.74 in the bilateral CLP group, and 34.49±9.06 in the control group, indicating no statistically significant difference among the groups (p>0.05) (Table 3 and Fig. 5). In addition, there was no statistically significant difference in the mean VH among the groups (17.83±3.2, 23.65±6.7, and 19.91±4.68,

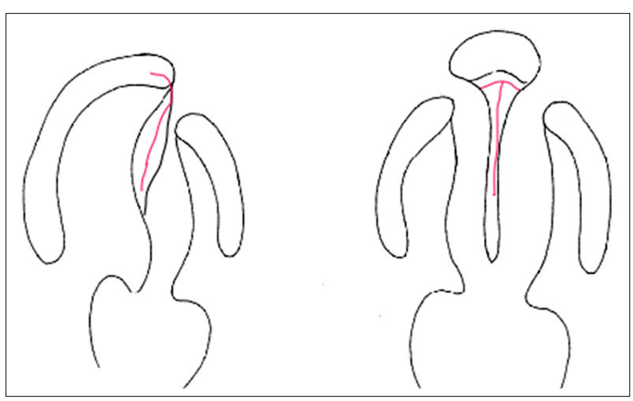

Figure 1. Planned incision lines for primary palate repair in unilateral and bilateral cleft lip/palate cases.

Table 3. Statistical evaluation of points and measurements

Variable	Group	n	Mean±SD	p value*	Post-hoc comparison
Sella and nasion	Control	10	66.73±7.73	χ^2=2.601; p=0.272	–
	Unilateral	10	62.36±2.21		–
	Bilateral	10	64.91±4.37		–
Vomer base	Control	10	34.49±9.06	χ^2=5.403; p=0.067	–
	Unilateral	10	31.56±7.1		–
	Bilateral	10	25.65±9.74		–
Vomer volume	Control	10	1004.63±403.52	χ^2=9.177; p=0.010	C-U: 0.791
	Unilateral	10	1179.94±423.59		C-B: 0.008
	Bilateral	10	1537.91±489.74		U-B: 0.180
Vomer height	Control	10	19.91±4.68	χ^2=4.539; p=0.103	–
	Unilateral	10	17.83±3.2		–
	Bilateral	10	23.65±6.7		–

*The Kruskal-Wallis test was used. SD: Standard devitaiton.

respectively; p>0.05) (Table 3 and Fig. 6). However, the V-Vol was significantly higher in the patients with bilateral CLP than the control group (Table 3 and Fig. 7).

DISCUSSION

The Vomer plays a major role in the craniofacial development. Alterations in the Vomer size and angulation significantly affect other craniofacial structures.[11] Some researchers have highlighted the necessity of healthy development of the nasal septum, as the midface develops. Millard and Latham[7] reported that the nasal septum enlarged anteriorly, due to the traction force applied to the maxilla and pre-maxilla by the anterior septomaxillary ligament. In a study by Siegel et al.,[9] the authors suggested that the orbicularis oris muscle played a role in the development of the healthy midface, as part of the mechanism of the traction. In an experimental rat model, Ferguson[11] also reported that the anterior and posterior nasal septum supported the normal closure of palatal shelves.

In a human study, Kimes et al.[8] compared the volume and length of Vomer bone of healthy individuals and CLP pa-

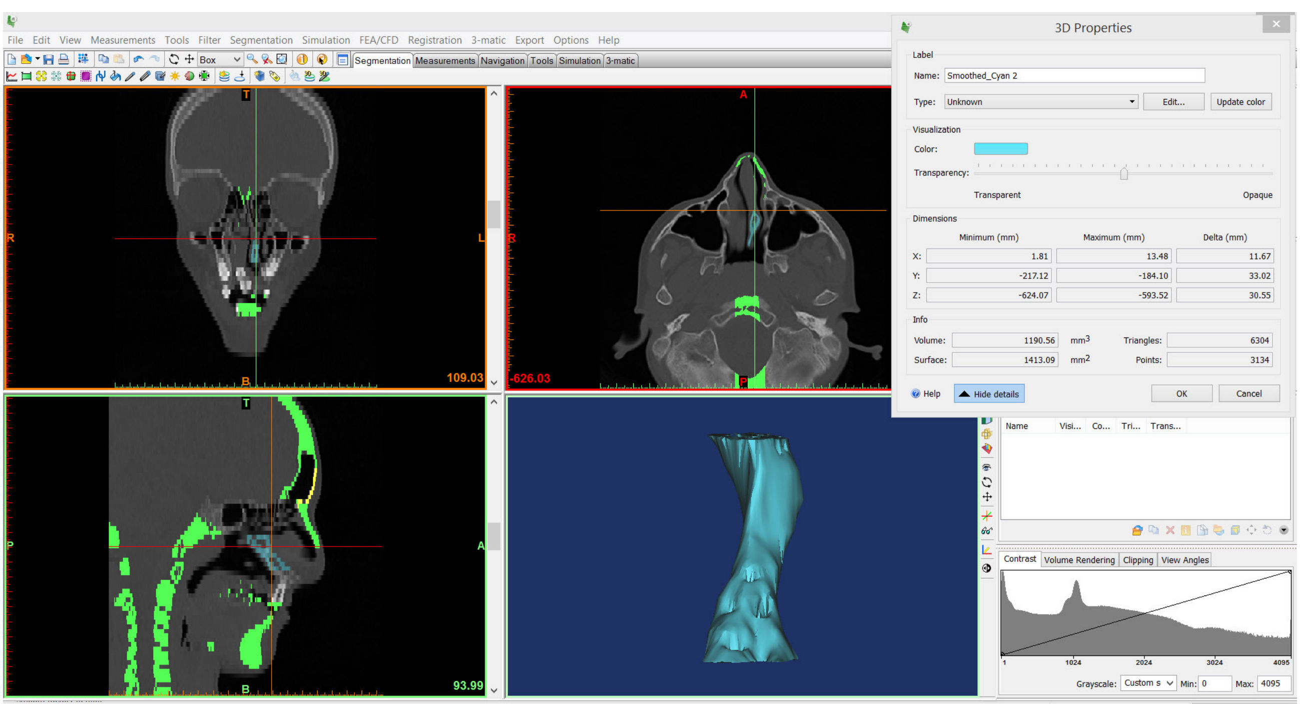

Figure 2. A front view of segmented vomer.

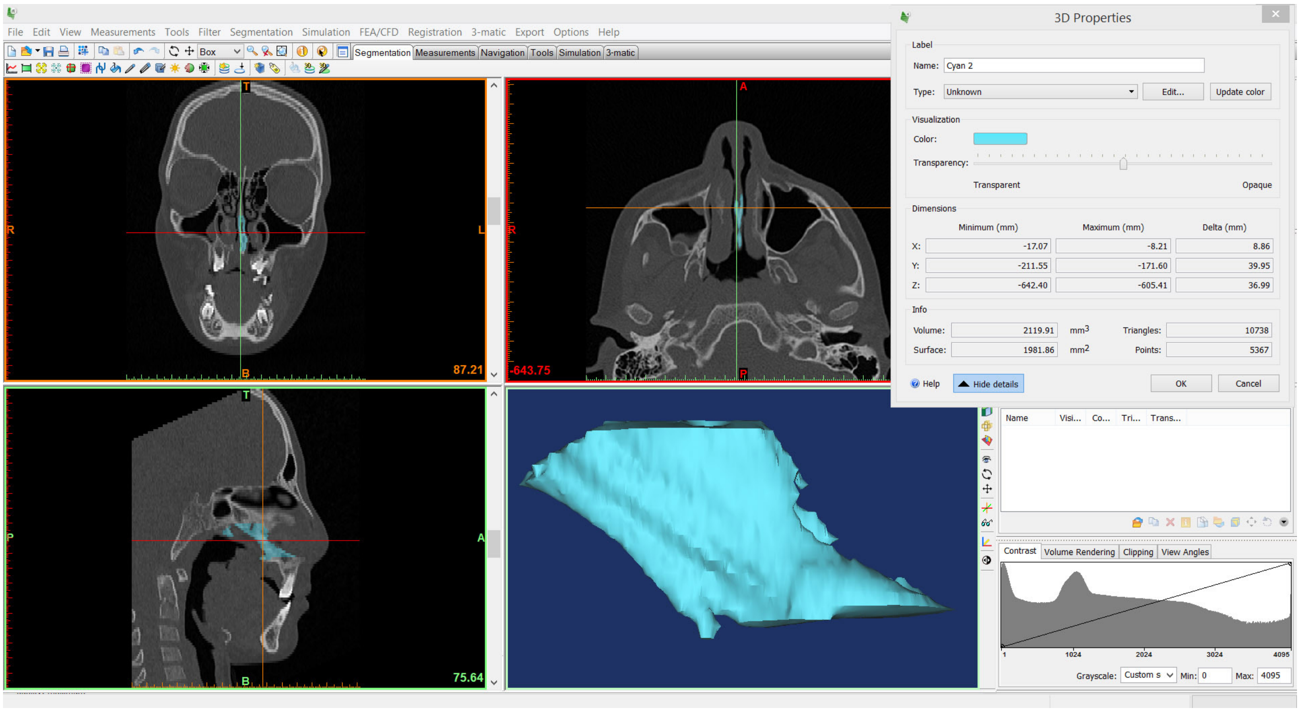

Figure 3. A side view of segmented vomer.

tients and found that the volume and length of the Vomer grew most rapidly in human fetuses between the 8th and 21th weeks. This result is explained by the functional matrix theory which proposes that the growing of soft tissues occurs followed by the developing process of the bone growing.[3] The development of soft tissues is independent of the palatal shelves and grows freely but also depending on the pressure of the rapidly growing tongue.[6] In an experimental study in a mouse model, Sakizlioglu et al.[12] found no significant difference in the chronological sequence of development of the Vomer at the 17th day of gestation when fetuses with normal and cleft palate were compared. In addition, although there were no significant morphological or histological differences, slight changes in the shape of the entire nasal septum were observed.

Scar tissue is regarded as the origin that problems arise in maxillary and dentoalveolar growth for CLP surgeries.[26] However, operations that were performed to improve speech were aimed to design in a way that maxillary growth is minimally restricted.[26] Single- and two-stage surgical protocols have been introduced to reduce scar tissue. While the hard and soft palates are repaired in the same operation in one-step technique; in the two-stage technique, the soft palate is operated first and the cleft in the hard palate cleft decreases, subsequently, then the hard palate is operated.[27] The two-stage technique gives better results on occlusion and maxillary development.[28] Techniques used in palate repair have a similar effect on facial growth.[21] Karsten et al.[26] evaluated the effects of V-W-K technique and V-W-K-like MI technique in CLP surgeries and reported that the max-

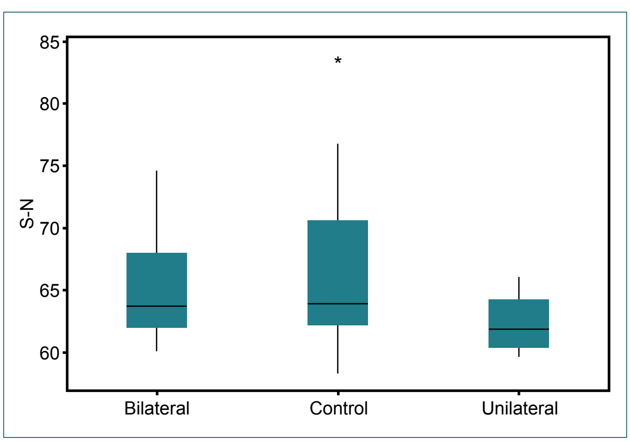

Figure 4. A graphical image of sella and nasion length among the groups.

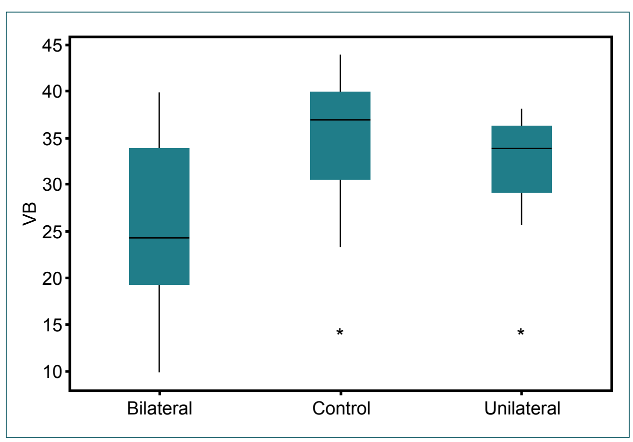

Figure 5. A graphical image of vomer base length among the groups.

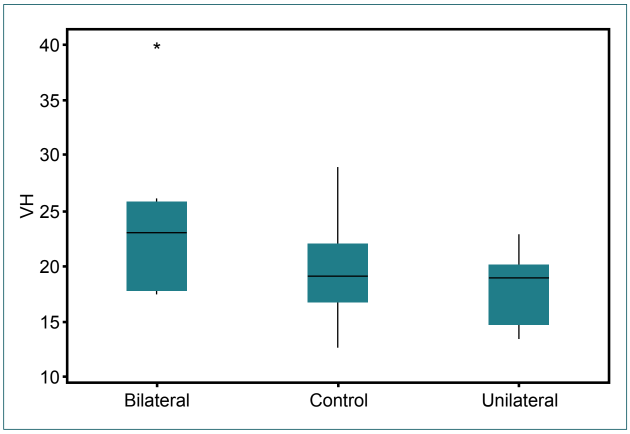

Figure 6. A graphical image of vomer height among the groups.

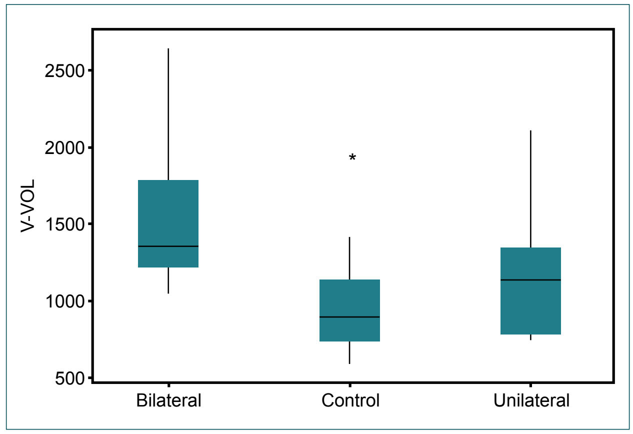

Figure 7. A graphical image of vomer volume among the groups.

illary arch width increased and less scar was formed in MI technique.

At present, several treatment protocols for CLP are applied throughout the world.[19] The "Milano surgical protocol" includes lip, nose, and soft palate repair at 6–9 months of age with an early secondary gingivo-alveolo-plasty and closure of the hard palate at 18–36 months.[31] In the "Oslo protocol," the cleft lip is repaired at 3 months of age, and the single-layer Vomer flap and hard palate repair are performed simultaneously.[32] Using the "von Langenbeck technique," posterior palate repair is performed at the age of 18th months.[32] Alveolar grafting is performed at the age of 8–11 years.[32] In their study, Guercio et al.[19] compared any differences between the craniofacial growth of unilateral CLP patients who were operated in the Milan CLP center with those from the Oslo CLP center at 5 and 10 years of age. The authors found no significant difference in the maxillary protrusion between the Milan CLP and Oslo CLP patients at 5 years of age. However, the Oslo group was significantly more protruded at the maxillary dentoalveolar level at 10 years of age than the Milan group, which could be attributed to the use of different surgical protocols.

In our study, even though it was not statistically significant, the vertical length (VH distance) of the Vomer was found to be longer in the bilateral group than in the control group. However, our finding that the unilateral group presented shorter length than the control group coincides with Doğan et al.,[20] Ross,[21] and Xu et al.'s[23] findings of significant decrease in superior posterior face height. The Vomer base length in the anteroposterior direction (VB distance), which was nearly statistically significant, was shorter in bilateral group than the unilateral and control group which was consistent with the Doğan et al.,[20] Ross,[21] Shao et al.,[22] and Xu et al.'s[23] findings of significant decrease in sagittal length of maxilla. Even though it was not statistically significant, the distance of S-N, which determines the dimensions of the anterior head base in the sagittal direction, was shorter in the bilateral group than in the control group, and the shortest in the unilateral group; which was similar with Xu et al.'s[23] results of a statistically significant decrease in S-N distance in the unilateral group. Scar tissues formed as a result of surgical operations restrict the forward development of maxilla. This situation inhibits the development of the Vomer base, and as a result of inadequate development of Vomer in the sagittal direction, development of the anterior cranial base in the anteroposterior direction is affected.

In our study, calculating the volume of the Vomer bone (V-Vol) by obtaining a 3D image by segmenting Vomer bone from environmental structures was another issue of interest, which was not mentioned in another source. Results showed a statistically significant difference between the groups. Although the unilateral group was insignificantly higher than the control group, the bilateral group Vomer bone volume was found to be statistically significantly higher than the control group.

Growth and development mechanisms work to shape bones to their adult form altogether.[5] These mechanisms are effective in both prenatal and postnatal periods.[5] Our findings have led us to the conclusion that size and volume of the Vomer bone can be significantly affected by environmental factors. In the control group, the base width of the Vomer was the highest because the maxilla below both created a barrier inhibiting the downward development and, due to their adjacency, induced Vomer grows in sagittal direction following maxilla. While the amount of downward development of Vomer in the unilateral group is higher than the control group; it also drifts the attached maxillary part to lateral and forward. However, the reason that vertical growth of Vomer was the highest in the bilateral cleft group is because of the absence of anatomic structures that can inhibit downward development and the lack of bone integration that will allow the maxilla to translate in the sagittal direction as it grows. This also illustrates that Vomer may have a crucial effect on the downward development of the maxilla. In patients with CLP, due to scar tissue formation and lack of Vomer-maxilla fusion, functional matrix is uncapable of stimulating the forward development of the anterior cranial bones which cause anterior cranial base to remain shorter.

Based on our CLP repair protocol, the incision does not extend to the gingiva during the anterior palate repair in patients with bilateral CLP. However, the anterior palate and the lip clefts of the patients with unilateral CLP are simultaneously repaired at the age of 4 months, and the incision extends to the gingiva. Therefore, as in the Milan protocol, the length of the Vomer is shorter in unilateral clefts, for which we performed early intervention of the gingiva than bilateral cases.

Conclusion

The growth and development of the pre-maxilla in the prenatal and postnatal period are independent of the lateral segments in patients with bilateral CLP. However, in our clinic, bilateral CLP repair was performed in three steps. In the first step, the pre-maxillary periosteum was not included in the Vomer flap and gingivoperiosteoplasty was performed at the age of 6 months in the patients with primary cleft lip repair. In case of unilateral CLP repair, however, gingivoperiosteoplasty was performed at the age of 4 months along with primary cleft lip repair. Therefore, the volume of the Vomer was significantly higher in bilateral CLP patients than the control group. Based on these findings, we can conclude that more bone formation may be observed due to the periosteal reaction following bilateral Vomer flap elevation or during maxillary growth, tension on the palatal flap may be increased new bone formation by pulling the bilateral Vomer flap if it is elevated and sutured palatal mucoperiosteal flap in the early period. Nonetheless, further large-scale, prospective studies are needed to confirm these findings.

Ethics Committee Approval: The study protocol was approved by the Health Research Ethics Board of Marmara University, School of Medicine (protocol number: 09.2019.119 Date 01.02.2019). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: Ö.B.Ç., B.K.Ü.; Design: B.K.Ü.; Supervision: Ö.B.Ç.; Materials: N.D.K.; Data: N.D.K.; Analysis: B.K.Ü., B.K.; Literature search: B.K.Ü., B.K.; Writing: B.K.Ü., B.K.; Critical revision: B.K.Ü., B.K.

Conflict of Interest: None declared.

Informed consent: A written informed consent was obtained from each participant.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Dudak ve damak yarıklarının tedavisinde kullanılan travmatik cerrahi tekniklerinin Vomer kemik hacmi ve morfolojisi üzerine etkilerinin 3D olarak değerlendirilmesi

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AMAÇ: Dudak damak yarığı (DDY), deformitesi en sık görülen konjenital yüz anomalisidir. Bu çalışmada yarık dudak/damak onarım cerrahisi sonrası vomer kemiği değişikliklerinin hacmi ve şekli değerlendirilmesi amaçlanmıştır.
GEREÇ VE YÖNTEM: Yaşları, 9–12 arasında olan toplam 30 hastanın bilgisayarlı tomografi (BT) görüntüleri geriye dönük olarak incelendi. Bireyler, üç gruba ayrıldı 1) herhangi bir sendromu olmayıp tek taraflı CLP (n=10) için ameliyat edilen grup, herhangi bir sendromu olmayan opere edilmiş çift taraflı CLP grubu (n=10) ve herhangi bir sendromu ve dudak damak yarığı deformitesi olmayan kontrol grubu (n=10). Hastaların verileri, üç boyutlu bir yazılım programına aktarılarak, Vomer kemiğinin üç boyutlu görüntüsü üzerinde metrik ve hacimsel ölçüm yapıldı.
BULGULAR: Üç grup arasında Sella-Nasion uzunluğu, Vomer taban uzunluğu ve Vomer dikey uzunluğu arasında istatistiksel olarak anlamlı bir fark yoktu. Ancak çift taraflı CLP'li hastaların Vomer kemik hacimi, kontrol grubundan istatistiksel olarak önemli derecede yüksek bulundu.
TARTIŞMA: Çift taraflı Vomer flebinin elevasyonunu takiben periost reaksiyonu oluşurken, erken dönemde damak mukoperiosteal flebe dikilince maksilla büyürken vomeri de sürükleyerek daha fazla kemik oluşumuna neden olabilir. Bulgularımız, Vomer kemiğinin boyutunun ve hacminin çevresel faktörlerden önemli ölçüde etkilenebileceği sonucuna varmamızı sağladı. Fonksiyonel matriks teorisine göre skar dokusu oluşumu ve Vomer-maksilla füzyonunun yetersizliği, ön kraniyal kemiklerin gelişiminin yetersiz olması, ön kafa kaidesinin daha kısa kalmasına neden olabilmektedir.
Anahtar sözcükler: Bilgisayarlı tomografi; cerrahi travma; Veau-Wardill-Kilner palatoplasti; yarık dudak/damak.

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