Case Report - Treatment Planning

The use of three-dimensional imaging to evaluate the effect of conventional orthodontic approach in treating a subject with facial asymmetry

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ABSTRACT

The growth of the craniofacial skeleton takes place from the 3rd week of intra-uterine life until 18 years of age. During this period, the craniofacial complex is affected by extrinsic and intrinsic factors which guide or alter the pattern of growth. Asymmetry can be encountered due to these multifactorial effects or as the normal divergence of the hemifacial counterpart occurs. At present, an orthodontist plays a major role not only in diagnosing dental asymmetry but also facial asymmetry. However, an orthodontist's role in treating or camouflaging the asymmetry can be limited due to the severity. The aim of this research is to report a technique for facial three-dimensional (3D) analysis used to measure the progress of nonsurgical orthodontic treatment approach for a subject with maxillary asymmetry combined with mandibular angular asymmetry. The facial analysis was composed of five parts: Upper face asymmetry analysis, maxillary analysis, maxillary cant analysis, mandibular cant analysis, and mandibular asymmetry analysis which were applied using 3D software InVivoDental 5.2.3 (Anatomage Company, San Jose, CA, USA). The five components of the facial analysis were applied in the initial cone-beam computed tomography (T1) for diagnosis. Maxillary analysis, maxillary cant analysis, and mandibular cant analysis were applied to measure the progress of the orthodontics treatment (T2). Twenty-two linear measurements bilaterally and sixteen angular criteria were used to analyze the facial structures using different anthropometric landmarks. Only angular mandibular asymmetry was reported. However, the subject had maxillary alveolar ridge cant of 9.96°and dental maxillary cant was 2.95° in T1. The mandibular alveolar ridge cant was 7.41° and the mandibular dental cant was 8.39°. Highest decrease in the cant was reported maxillary alveolar ridge around 2.35° and in the mandibular alveolar ridge around 3.96° in T2. Facial 3D analysis is considered a useful adjunct in evaluating inter-arch biomechanics.

Keywords: Facial asymmetry, inter-arch biomechanics, three-dimensional imaging

INTRODUCTION

The craniofacial structure is considered a complex part of the human skeleton. It encloses the most vital organ which is the brain and holds our distinct facial characteristics. Facial asymmetry can be affected by dental, skeletal, or soft tissue component.[1] The prevalence of facial asymmetry was found to be 34% on a sample of 1460 dentofacial deformities population[2] and usually the right side is more dominant.[3] On a sample of 495 clinical asymmetrical

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patients, it was found that the least amount of asymmetry is present in the upper face 5%, followed by the midface 36%, and then the chin in 74%.[2] In a study done on the photographs, it was found that occlusal cannot be shifted on the right side. It had an incidence around (28.5%) which was more that left-dominant side (16.7%).[4] Furthermore, Padwa *et al*. noted that 4° of occlusal cannot is the threshold for diagnosing asymmetry.[5]

Growth of the craniofacial complex

The anterior cranial base and the skull vault are derived from the neural crest cells, while the posterior part is derived from mesoderm.[6] The cranial vault is usually formed by intramembranous ossification while the cranial base is formed by endochondral ossification. Sphenoid, basioccipital, ethmoid, and frontal bones make the bony structures in the midline of the cranium and the temporal bones circumscribe the lateral part of the scalp. In the midline of the cranial base, these bones are separated by perichondral synchondroses which are: Spheno-occipital, mid-sphenoidal, and sphenoethmoidal synchondrosis.[7] Fusion of the synchondrosis starts with the mid-sphenoidal perinatally followed by the other two synchondroses around adolescence, meanwhile a flexion at the sella between the anterior cranial base and the posterior cranial base happens creating the cranial base angle.[7] Early fusion of the synchondroses can lead to thanatophoric dysplasia and asymmetry in the anterior cranial base can be noticed in Apert syndrome.[7]

The maxilla occurs mainly by intramembranous ossification.[8] It usually reaches 53% of its total size at 5 years of age around 53% before its final size at age 15.[9] This happens by bone deposition on the maxillary tuberosity and bone resorption on the inner wall of the hard palate which elongates the maxilla backward.[10] This process is balanced by primary displacement of the maxilla anteriorly on an equal amount. The maxilla gets displaced forward due to its junction with the expanding middle cranial fossa as a part of a process called secondary displacement of the maxilla.[10] Deficiency in the maxillary growth due to early fusion of synchondroses can lead to Crouzon syndrome (Nie 2005).

The mandible also ossifies intra-membranously.[8] Infants usually have a retrognathic mandible which usually catches up with the maxillary growth after birth. A protruded mandible in an infant is usually seen when there is a deficient maxilla.[11] Before puberty growth of the mandible is approximately 1–2 mm in the ramus and 2–3 mm in the body of the mandible and might double around puberty.[8] Deficiency of the mandible can be noted in Treacher Collins syndrome and asymmetry of the mandible is obvious in hemifacial microsomia.[8]

Diagnosis and evaluation of facial asymmetry

Diagnosing asymmetry can be done through clinical examination and radiographic analysis. This can help in determining the severity of asymmetry and its extent to corresponding soft tissue.

Clinical examination involves dental and skeletal asymmetry evaluation. According to Bondi facial asymmetry can be detected by examining the patient from 60 cm distance from three views: Frontal, basal view, and oblique view.[12] Frontal view can detect the direction of asymmetry by dividing the face into right and left through the imaginary mid-sagittal plane (MSP). The basal view can detect any asymmetry present in the chin or nasal base. A more rotated oblique is used to assist the nasal pyramid while a less rotated is used to assist the orbitozygomatic area.[12] Dental evaluation usually starts by examining any midline shift and reporting the side of deviation. Any midline shift with occlusal shift can be due to occlusal interference and not a true asymmetry.[13] The shift can be ipsilateral or contralateral with the side of asymmetry and it could worsen or camouflage the asymmetry.[13]

On physical examination, clinical records should involve taking extra-oral and intra-oral photos. In a normal patient, the occlusal cannot be around 2.15–2.90° when analyzing digital photos.[14] The presence of an elevated labial commissure or alar base on unilaterally gives an indication of vertical skeletal asymmetry. The asymmetry will be more obvious when the patient is smiling.[5]

Radiography has been used extensively in evaluating the level of asymmetry. A panoramic radiograph is one of the most common taken images for initial diagnosis due to its low cost and low radiation dosage. In 1988, Habets reported the use of orthopantomogram in diagnosing vertical asymmetry in the mandibular condyle and rami comparing patients coming for routine dental treatment and patients treated for craniomandibular disorders.

Since the introduction of posteroanterior (PA) cephalograms in the 1930s, this radiograph has been used remarkably in orthodontics diagnosis,[15] tracing growth pattern of the maxilla and mandible by superimposing different cephalograms taken in different time intervals and plan surgical correction of facial malformation.[16] One of the drawbacks of cephalograms is accurate landmark identification due to the difference in the contrast due to different bone density and superimposition of several anatomical structures.[17]

High-quality cone-beam computed tomography (CBCTs) were produced by Arai in 1999 of the oral and maxillofacial region at a low radiation dose.[18] Nowadays, CBCTs are being used remarkably in dentistry due to its high quality in comparison with panoramic radiographs[19] and PA cephalograms.[20] In a literature review done by De Vos *et al*. for 86 articles in the clinical application of CBCT in the oral and maxillofacial region, he found that 16% of these articles are related to orthodontics.[21] CBCTs made it easier to measure external apical root resorption because of its 1:1 ratio magnification,[22] airway evaluation,[23] best place for mini-implant placements,[24] and to measure the alveolar bond thickness after palatal expansion in the maxilla.[25] Furthermore, it was used to measure the progress of facial asymmetry due to condylar resorption.[26] The wide application of three-dimensional (3D) imaging in orthodontics can be due to the accurate 3D representation of a subject and the possibility of conversion from 3D images to 2D images when required. In research done by Periago *et al*., he found that CBCT images have a mean percentage error of 2.31%. When compared with cephalograms this percentage is considered acceptable to overcome the low resolution in cephalograms.[27] On the other hand, CBCTs have low radiation dose but it is still considered higher than the cephalograms radiation dose.

Treatment of facial asymmetry

Mild cases of asymmetry can be limited to orthodontic treatment in cases where there is dental asymmetry and no skeletal counterpart involved. The main goal is to achieve occlusal interdigitation with canine guidance.

Asymmetrical extraction has been successfully reported in treating patients Class II subdivision malocclusions and Class III cases with midline deviation in the mandible. This is done by unilateral side extraction of lower first premolars to create space to shift the midline to coincide with upper midline. In Class II cases with maxillary midline is deviation and the arch does not allow extraction then extraction can be limited to the removal of the maxillary premolar on the Class II side.[28]

Asymmetric use of elastics to correct midline shift is a successful measure to reduce midline shift. Sabuncuoglu has reported the use of inter-arch mechanics to correct maxillary midline shifted 3 mm to the right side, and the mandibular midline was shifted 3 mm to the left, shift to the right side.[29] The subject had Class III canine and molar relationship on the right side.[29] On the left side, the subject had Class II canine relationship with molar in Class III. Class II elastic on the left side was combined with Class II elastic on the right side and oblique elastic anteriorly to correct the midline shift.[29]

Special consideration for the elimination of dental compensation is of paramount importance in treating patients with severe facial asymmetry before proceeding with the orthognathic surgery.[30] In order to determine the extent of the surgical approach, a thorough examination should be done to diagnose the arch with dominant asymmetry and examine the mandibular condyle for any abnormal growth pattern. Surgical correction can be less invasive as in inferior border osteotomy or genioplasty.[31] Unilateral condylectomy can be the treatment of choice in growing subjects with unilateral condylar hyperplasia and can decrease any apparent asymmetry to satisfactory results.[32] In subjects with severe frontal occlusal cant, a Lefort 1 osteotomy to impact the affect maxillary side can be done combined with bilateral split sagittal osteotomy.[32] Several treatment outcomes should be achieved at the end of the orthognathic correction of facial asymmetry: (1) dental midline should falls in the midline of the face, (2) leveled oral commissures, (3) symmetric appearance on the canine bilaterally, and (4) menton point should fall in the midline of the face.[14]

CASE REPORT

A 32 years old female who was diagnosed in the Department of Orthodontics in the University of Alabama at Birmingham. On clinical examination, the subject had a convex profile on a lateral view and occlusal cant. She had Class III molar relationship on the right side and Class I on the left side. An anterior open bite involving the lateral incisor on the left side and a retained primary canine was noted. Posterior open bite involving the right first molar was also documented. She had a lower midline shift to the left side in centric occlusion due to a functional shift. The subject had also spacing in the upper and lower arch [Figure 1]. Panoramic radiograph was taken and no pathological abnormalities were detected. The subject had four missing third molars. She showed retained primary left upper canine with fully resorbed root and presence of permanent successor [Figure 2].

Cephalometric findings showed maxillary and mandibular excess. ANB was − 0.5 which showed Class III tendency. The subject had proclined upper incisors, retroclined lower incisors, and steep mandibular plane [Figure 3].

Nonextraction of permanent teeth and nonsurgical approach were recommended for the subject. The retained primary left upper lateral was extracted and nonsurgical extrusion of the permanent successor was done. Asymmetric elastics approach was used to treat the midline deviation. Class III elastic on the right side and Class II elastics on the left side were used with cross elastics anteriorly.

Image acquisition and analysis

Kodak 9500 cone beam 3D system device (Carestream, Atlanta, GA) was used to take two CBCTS in two times frames: Initial (T1) and progress (T2). The radiation dose was 90 kV in a pulsed mode and frequency of 140 kHz. The tube focal spot was 0.7 mm with the sensor of a flat panel detector. Voxel size was (300, 300, 300) μm for the full field 3D image taken. The exposure time was 24 seconds, X-ray pulse time was 30 ms, and the image reconstruction took 2 min and 30 s.

In this case report, facial asymmetry was defined as the measurement resulted from subtracting the right side of an anatomical structure from its left counterpart. In order to do this, a 3D facial analysis using 3D imaging software using InVivo Dental 5.2.3 (Anatomage Company, San Jose, CA, USA) software was used. The facial analysis was composed of five parts: Upper face asymmetry analysis, maxillary analysis, maxillary cant analysis, mandibular cant analysis, and mandibular asymmetry analysis. The five components of the facial analysis were applied in the initial CBCT (T1) for diagnosis. Maxillary analysis, maxillary cant analysis, and mandibular cant analysis were applied to measure the progress of the orthodontics treatment (T2). A coordinate system was set for the MSP, Frankfort horizontal plane (FHP), and frontal plane (FP). Nasion, sella, and anterior nasal spine were chosen as landmarks for the MSP because it was found that the nasion and anterior nasal spine falls almost over the MSP.[28] FHP was connecting portion right, orbitale right, and orbitale left. FP was perpendicular on the MSP and FHP.

Twenty-two linear measurements bilaterally and sixteen angular criteria were used to analyze the facial structures using different anthropometric landmarks [Table 1]. The upper one-third of the face will be analyzed using the following landmarks bilaterally: Lateral cranium, lateral scalp, lateral zygoma, exocanthus, endocanthus, and enocanthus. This will segment the superior one-third of the face into (1) cranium width, (2) outer orbital width, (3) inner orbital width, and (4) zygomatic width. This will be applied on T1 CBCT [Figure 4].

The maxillary analysis will have the following landmarks plotted: Lateral maxillary alveolus and mesiobuccal cusp of maxillary first molar. These will segment the maxillary analysis into (1) horizontal position of the first molar, (2) vertical position of the first molar, and (3) maxillary width. The distance between the mesiobuccal cusp of the first molar and the two planes mid-sagittal and FHP will be measured, respectively [Figure 5]. This will give an indication of the position of the first molar in the vertical and horizontal access. The distance between the lateral part of the maxillary alveolus and the mid-sagittal will give the maxillary width.

Figure 1: Extraoral and intraoral clinical photos of the subject in the initial visit

The maxillary cant analysis will be composed of (1) maxillary alveolar ridge cant which is an angle between a line connecting the lateral right maxillary alveolar ridge and its counterpart with

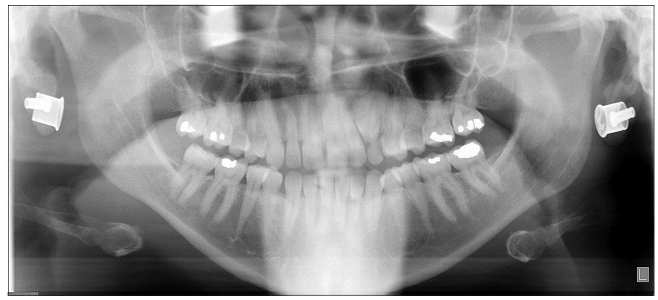

Figure 2: Panoramic radiograph

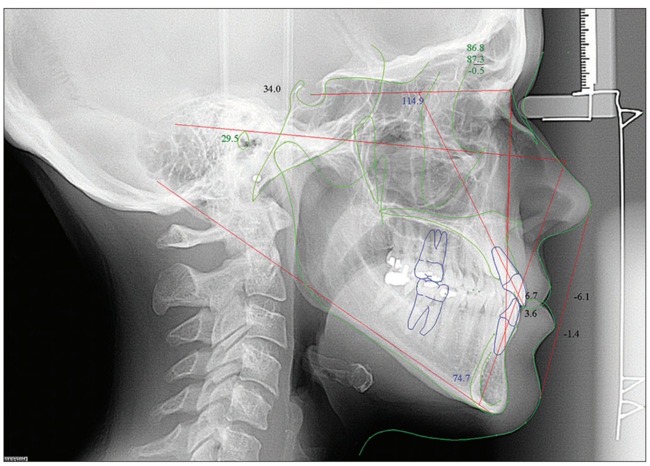

Figure 3: Cephalometric radiograph with the cephalometric tracing

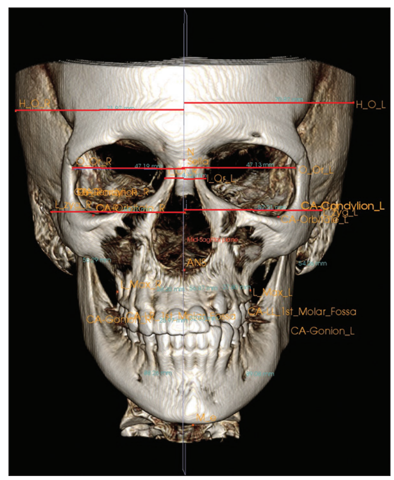

Figure 4: Upper face asymmetry analysis in T1

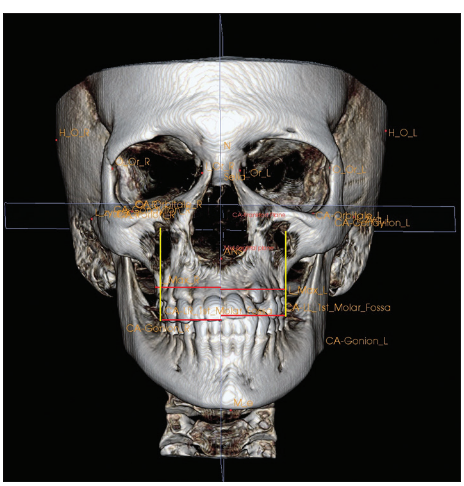

Figure 5: Maxillary asymmetry analysis in T1

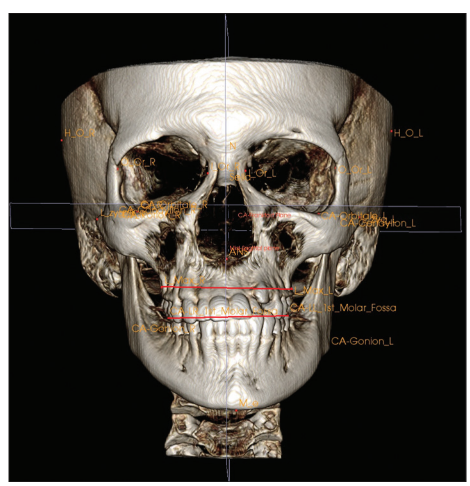

Figure 6: Maxillary cant in T1

the MSP (2) maxillary dental cant which is an angle between a line connecting the mesiobuccal cusp of the first molar on the right side and its counterpart with the MSP [Figure 6]. This will be applied on T1 and T2 frames [Figures 5-11].

The mandibular arch of the face will be analyzed using the following landmarks: Condylion_R, Condylion_L, Gonion_R, Gonion_L, and Menton. This will segment the mandible into four parts: (1) ramus length on the right side, (2) ramus length

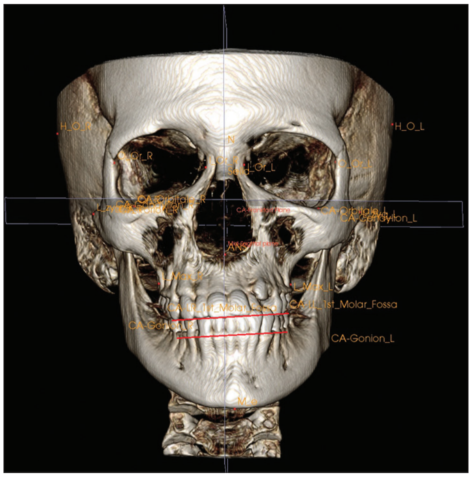

Figure 7: Mandibular cant in T1

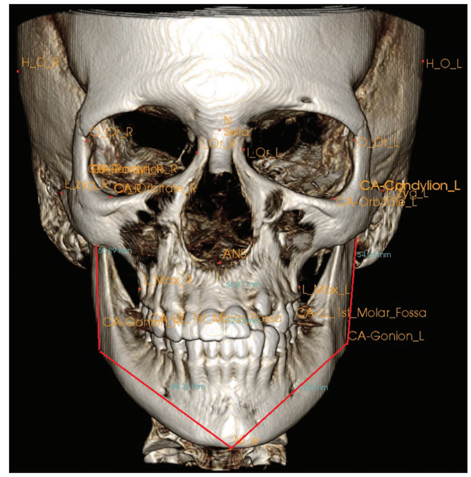

Figure 8: Mandibular asymmetry analysis in T2

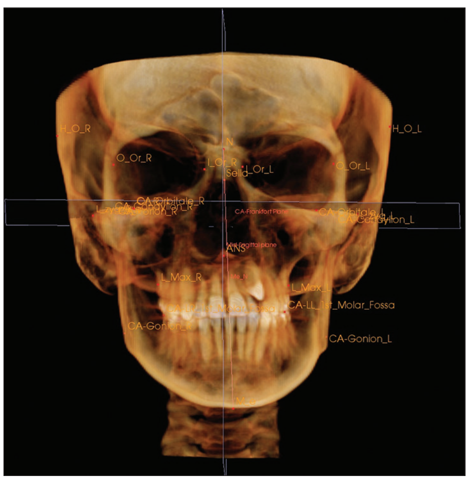

Figure 9: Menton deviation in T2

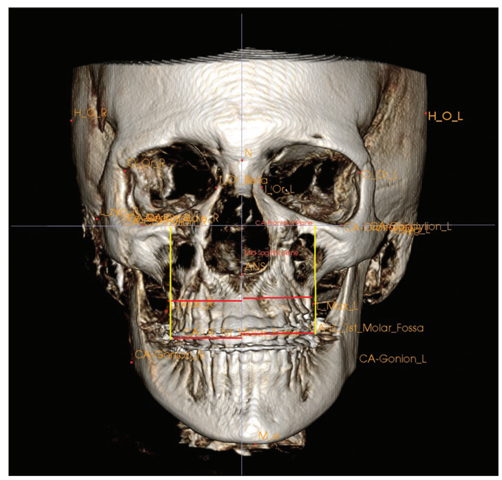

Figure 10: Maxillary asymmetry analysis in T2

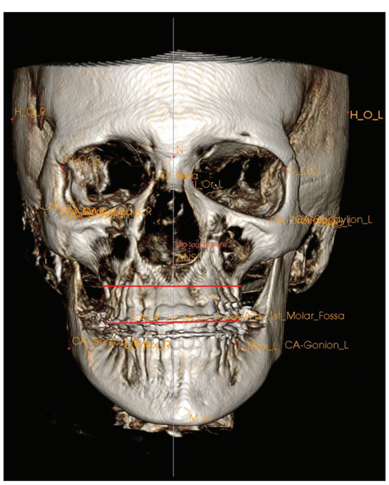

Figure 11: Maxillary cant in T2

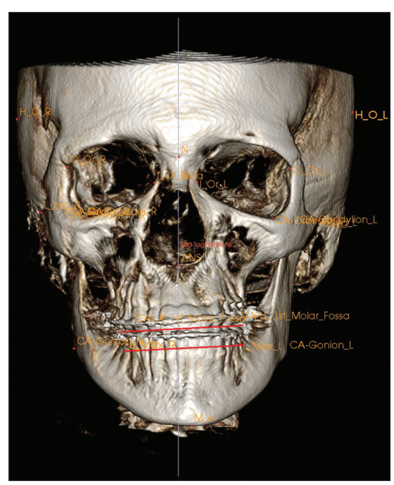

Figure 12: Mandibular cant in T2

Figure 13: Extraoral and intraoral clinical photos of the subject in the last progress visit

on the left side, (3) body of the mandible on the right side, and (4) body of the mandible on the left side. Linear and angular measurement between each part of the mandible and three planes (mid-sagittal, FHP, and FP) will be acquired in order to compare each line from a 3D aspect. Menton deviation from the MSP will be measured [Figure 9]. This will be applied on T1 frame [Figures 8 and 9].

The mandibular cant analysis will be analyzed using lateral mandibular alveolus and mesiobuccal cusp of mandibular first molar. This divided the mandibular cant analysis into (1) mandibular alveolar ridge cant which is an angle measured by a line connecting the lateral right mandibular alveolar ridge and its counterpart with the MSP. (2) Mandibular dental cant which is an angle between a line connecting the mesiobuccal cusp of the first molar on the right side and its counterpart with the MSP. This will be applied on T1 and T2 frames [Figures 6 and 12].

RESULTS

Facial analysis in (T1)

The highest difference recorder between the right and left side of the upper face on the DICOM file used for diagnosis was 1.04 mm when comparing the right side of the cranium with the left side. There was no apparent upper face asymmetry present between the right and left in T1 [Figure 4 and Table 2].

In the maxillary analysis, the linear measurement between the mesiobuccal cusp of the maxillary fist molar on the right side and FHP was 2.02 mm higher than the left side. There was no high transverse maxillary alveolar ridge difference between the right and left side [Figure 5 and Table 3]. There was a cant of maxillary alveolar ridge is around 9.96° and the dental maxillary cant was 2.95° [Figure 6 and Table 3].

The subject had no linear asymmetry when measuring the full length of the mandibular on the right side versus the left side. However, the angular measurement between the body of the mandible on the right side and the mid-sagittal was 5.62°

Figure 14: Debond visit on the left, 3 months follow-up

Table 1: Definition of landmarks used

Landmark	Definition
Sella	Midpoint of the crista galli
Nasion	Deepest point of the frontonasal suture
Orbitale	Most lower point of the inferior border of the orbital cavity
Exocanthion	Most lateral point of the orbital cavity
Endocanthion	Most inner point of the orbital cavity
Anterior nasal spine	Postanterior part of the frontonasal suture
Porion	The highest point of the external acoustic meatus
Eurion	Most lateral point of the cranium
Zygion	Most lateral point of the zygomatic arch
Lateral maxillary alveolus	Most lateral point of the maxillary alveolar ridge
Lateral mandibular alveolus	Most lateral point of the mandibular alveolar ridge
Maxillary first molar	The tip of the mesiobuccal cusp of the maxillary first molar
Mandibular second molar	The tip of the mesiobuccal cusp of the mandibular first molar
Condylion	Most superior posterior point of the condyle
Gonion	Most posterior inferior point of the angle of the mandible
Menton	Most inferior point of the chin

Table 2: Upper face asymmetry in T1

Criteria used	Result
Cranium width on the right side	71.97
Cranium width on the left side	70.87
Outer orbital width on the right side	47.19
Outer orbital width on the left side	47.13
Inner orbital width on the right side	8.12
Inner orbital width on the left side	8.27
Zygomatic width right side	56.22
Zygomatic width left side	57.21

Table 3: Maxillary asymmetry analysis comparing T1 and T2

Criteria used	T1	T2
Maxillary width right side	28.2	30.37
Maxillary width left side	27.8	28.82
Position of the molar on the right side/MS	25.82	24.78
Position of the molar on the left side/MS	26.18	25.93
Position of the molar on the right side/FHP	45.86	46.17
Position of the molar on the left side/FHP	43.84	44.62

MS=Mid-sagittal; FHP=Frankfort horizontal plane; FP=Frontal plane higher in comparison with the left side. Moreover, the angular measurement between the body of the mandible on the left side and the FP was 5.73° higher in comparison with the right side. The angular measurement between the ramus length on the left side and the FHP was 4.54° higher than the right side. As a result, the highest degree in asymmetry was present between the body of the mandible and the FP [Figure 8 and Table 4]. Menton was deviated from MSP by 2.05° to the left side [Figure 9]. The cant in the mandibular alveolar ridge was 7.41° and the mandibular dental cant was 8.39° [Figure 12 and Table 5].

Mid-face asymmetry analysis, mandibular cant analysis comparing T1 and T2

The highest increase in the maxillary width was 2.17° on the right in comparison with the left side [Figures 5 and 10]. The highest decrease between the mesiobuccal cusp of the first molar and the MSP was 1.04 mm on the right side in comparison with the left side [Figures 5, 10, and Table 3]. There was a decrease in the maxillary alveolar ridge cant 2.35° and 1.05° in the dental maxillary cant [Figures 6, 11 and Table 6]. There was a decrease in the mandibular alveolar ridge cant 3.96 and in the mandibular dental cant 2.09° [Figures 7, 12 and Table 5].

DISCUSSION

Several researches were conducted to measure the accuracy of panoramic radiographs in analyzing linear measurements and angular. Rejebian found that horizontal measurements on panoramic radiographs are considered nonreliable and that is due to the different level of magnification which happens according to anatomical structures depth.[33] Starmotas examined the accuracy of dental panoramic tomography in angular measurements. He found that linear and angular measurements taken on dental panoramic tomography showed significant error when the occlusal plane was titled anteriorly around 8°.[34] This finding highlights the fact that panoramic radiographs can be affected tremendously according to the patient head position.

Cephalograms have been used to measure mandibular asymmetry. Damstra reported that posterior-anterior cephalograms were considered unreliable in measuring asymmetry in the body of the mandible (intraclass correlation coefficient [ICC = 0.686]).[35] On the other hand, CBCT was found to be more reliable (ICC > 0.957).[35] The short outcomes of cephalograms can be due to the superimposition of the bilateral side of the skull into a 2D image. This can alter the opacity of the anatomical structures which effects landmark plotting, for example, Sella. The accuracy of the reference plane will be reduced and any asymmetry measurements were done in relation to it.

CBCTs have advantages over the 2D images, for example, no superimposition of bilateral anatomical structures, less magnification, and incorporation of the third dimension. In a study done by Cavalcanti, he reported that the mean difference between the measurements on the actual skull and measurement on a CT was 0.83%. This represents a high accuracy which validated the use of CBCTs in the facial anthropometric analysis.[36]

In this study, the subject had no apparent upper face asymmetry. However, the maxillary alveolar ridge cant was 9.96° and the dental maxillary cant was 2.95° in T1. In T2, the patient showed a decrease in the maxillary alveolar ridge cant around 2.35° and in the dental maxillary cant around 1.05°. This could be due to the extrusion of the upper first molar on the right side 0.31 mm and on the left side 0.78 mm. Extrusion of molars was done bilaterally, so it was hard to correlate the amount of extrusion with the decrease of the dental cant. There was increase maxillary alveolar ridge width on the right side by 2.17 mm on the right and 1.02 mm on the left side. This can be explained by the slight tilt of the crown of the first molar palatally which will lead to movement of the roots buccally and increase in the bone buccal to the roots.

The subject had almost symmetrical bilateral halves of the mandible in linear measurements, but she had a difference of 5.73° between the body of the mandible and the FP with the left side dominating. As a result, the body of the mandible on the left side was located more posteriorly than its counterpart which showed angular mandibular asymmetry. Nonsurgical approach to correct asymmetry can be done with some compromise. Patient was aware of that and a slight asymmetry was present at the debond visit [Figure 14]. Two-dimensional imaging as panoramic radiographs showed high percentage in error in regard to angular measurements.[34] This validates the use of 3D imaging in evaluating angular asymmetry.

These results are based on a single case report and larger sample should be taken to better understand the effectiveness of inter-arch

Table 4: Mandibular asymmetry analysis in T1

Criteria used	T1
Ramus length on the left side	54.26
Body of the mandible length on the left side	89.08
Body of the mandible length on the right side	88.26
Ramus length on the right side	56.29
Body of the mandible on the right side/MS plane	32.05
Body of the mandible on the right side/FHP	23.82
Body of the mandible on the right side/FP	48.04
Body of the mandible on the left side/MS plane	26.43
Body of the mandible on the left side/FHP	23.37
Body of the mandible on the left side/FP	53.77
Ramus length on the right side/MS	5.62
Ramus length on the right side/FHP	69.53
Ramus length on the right side/FP	19.65
Ramus length on the left side/MS	6.3
Ramus length on the left side/FHP	74.07
Ramus length on the left side/FP	15.72
Menton deviation	2.05

MS=Mid-sagittal; FHP=Frankfort horizontal plane; FP=Frontal plane

Table 5: Mandibular cant analysis comparing T1 and T2

Criteria used	T1	T2
Mandibular alveolar ridge cant	82.59	84.68
Dental mandibular cant	81.62	85.57

Table 6: Maxillary cant analysis

Criteria used	T1	T2
Maxillary alveolar ridge cant	80.04	82.39
Dental maxillary cant	87.05	88.1

elastics in correcting asymmetry. Furthermore, the results are done on hard tissue CBCTs, and incorporation of a soft tissue 3D image can give a better presentation of the clinical asymmetry due to soft tissue camouflage in asymmetrical subjects. Better evaluation of the effectiveness of the conventional orthodontic treatment can be done after finishing the treatment of the subject [Figures 13]. Follow-up of the subject should be done to examine the stability of the treatment done.

CONCLUSION

3D imaging is considered as a useful method to evaluate the progress of the mid-face and mandibular asymmetry treatment. Improvement of the maxillary and mandibular cant is noted; however, the case is still in active treatment phase.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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