Orthodontic Consideration in Pierre Robin Sequence Patient: a Case Report

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ABSTRACT

The Pierre Robin sequence (PRS) is a rare condition that affects 1 in 20,000 to 1 in 8,500 people. In this condition, it is not always possible for the mandible to attain its normal size, shape, and orientation. Several cephalometric studies have reported the distinctive lower jaw morphology of PRS, with a small ramus of the mandible and a steep mandibular plane. This case report will discuss a female patient diagnosed with PRS and found to have a retrognathic mandible with teeth crowding and deep bite. The patient had a convex profile, obtuse nasolabial angle, deep mento-labial sulcus, and recessive chin. Dental analysis revealed a deep bite with Angle's Class II molar relationship. Cephalometric examination showed a class II skeletal pattern due to a retruded mandible and hyper-divergent mandibular plane. The patient was treated with a pre-adjusted edgewise orthodontic fixed appliance, cross-elastic, bonding button, and GIC to correct a crossbite, then mandibular surgical advancement with genioplasty. After a surgical recovery period of two weeks, the patient was seen in the postsurgical orthodontics department for a total of two months. After the treatment, the patient had achieved good functional occlusion, characterized by normal overjet, overbite, and adequate intercuspation, class I molars and canines relation on both sides of the mouth, nearly coincident midlines, and normal proclination of mandibular and maxillary incisors. Cephalometric measurements showed maxillary clockwise rotation and mandibular anticlockwise rotation and advancement, both of which contributed to an improved facial profile, which led to the elimination of vertical skeletal excess and corrected the recessive chin.

Keywords:

Orthodontics, Micrognathia, Orthodontic Surgery, Pierre Robin Sequence, Surgical Orthodontic, Case Report. Evidence-Based Dentistry, Dentistry.

INTRODUCTION

A retrognathic appearance, glossoptosis, and cleft palate are the defining characteristics of those who have the Pierre Robin Sequence (PRS) [1]. It has been reported that the prevalence of PRS ranges from 1 in 20,000 to 1 in 8,500 people [2,3]. Patients frequently present with symptoms of upper airway obstruction as well as concurrent difficult feeding [1]. This condition, also known as mandibular micrognathia or retrognathia, is characterized by an obstruction of the upper airway caused by the tongue's interference with the fusion of the palatal shelves [4,5] On the other hand, an acceleration in the rate at which the mandible grows, significantly reduces the severity of these discrepancies over time [6].

It is not always possible for the mandible to attain its normal size, shape, and orientation. Several cephalometric studies have reported the distinctive lower jaw morphology of PRS [7-10]. The patients were described as having a small ramus of mandible and a steep mandibular plane in each of these reports; however, variation in mandible size and the gonial angle was found to be varied from report to report [7-10].

There have only been a few single case reports done so far to report orthodontic treatment outcomes. This has limited the amount of useful information that can be obtained for the treatment of this sequence [6-8,11] In this particular instance, a female patient was diagnosed with PRS and found to have a retrognathic mandible with teeth crowding in an anterior deep bite. In this report, the outcome of the orthodontic treatment is discussed.

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Case report

A 12-year-old female patient presented to the College of Dentistry Orthodontic Clinic with the chief complaint of malaligned upper front teeth and poor esthetics due to a small lower jaw. The patient was diagnosed with a Pierre Robin sequence and underwent palatal surgery in childhood. She also has a prior history of extraction of upper and lower 1st premolars (#14, 24, 34, 44).

Facial analysis revealed a convex profile, obtuse nasiolabial angle, deep mento-labial sulcus, and recessive chin. At the time of the clinical examination, it was discovered that the patient had an anterior deep bite as well as Angle's Class II molar relation. Additionally, the patient's lower midline was shifted towards the right side of the body, and there was crowding in the mandibular and maxillary anterior region (Figure 1). Cephalometric examination revealed a class II skeletal pattern (ANB=6.3°) due to a retruded mandible and hyper-divergent mandibular plane. The intraoral/dental findings included ½ cusp class II right molar and canine relationship, full cusp class II left molar relationship and ¾ cusp class II left canine relationship, a mild spacing of 3 mm in maxillary and mandibular jaws with a deep bite of 7 mm, increased overjet of 6 mm and normal inclination of the upper and lower incisors (Table 1). The study model analysis showed that the patient had a 7 mm deep bite and a mandibular midline that was shifted 1 mm to the right of the patient (Figure 1). The patient was filmed with extraoral and intraoral photographs, cast models, lateral cephalograms, and orthopantomograms were taken.

The main goals of the orthognathic treatment were focused on lengthening the mandible and chin. Therefore, a comprehensive, surgical, non-extraction orthodontic treatment plan with genioplasty i.e. mandibular advancement was planned. The presurgical orthodontic phase aimed to correct the dental disharmonies to correct the alignment to facilitate the skeletal correction.

Table 1: Pre and post cephalometric analysis

Measurements		Normal Values	Preoperative		Postoperative	
			Values	Difference	Values	Difference
Skeletal Analysis						
Angle SNA		80.0±2.0	80.4	0.4	76.5	-3.5
Angle SNB		82.0±2.0	74.2	-7.8	73.3	-8.7
ANB		2.0±4.0	6.3	4.3	3.2	1.2
SN-MP-abo		32.0±6.0	43.6	11.6	49.3	17.3
FMA-abo		25.0±4.0	37.0	12.0	42.5	17.5
Dental Analysis						
+1i/NA	mm	4.0±1.0	0.1	-3.9	2.3	-1.7
+1/SN		103.0±4.0	87.8	-15.2	93.4	-9.6
-1i/NB	mm	4.0±1.0	3.3	-0.7	4.8	0.8
-1/MP-abo		99.0±1.0	83.7	-15.3	84.0	-15.0
Overjet	mm	3.5±2.5	6.4	2.9	2.5	-1.0
Overbite	mm	2.0±2.5	4.9	2.9	2.1	0.1
Facial Analysis						
Ls/E-line	mm	-4.0±2.0	0.0	4.0	-3.1	0.9
Ls'/E-line	mm	-2.0±2.0	1.2	3.2	-0.1	1.9

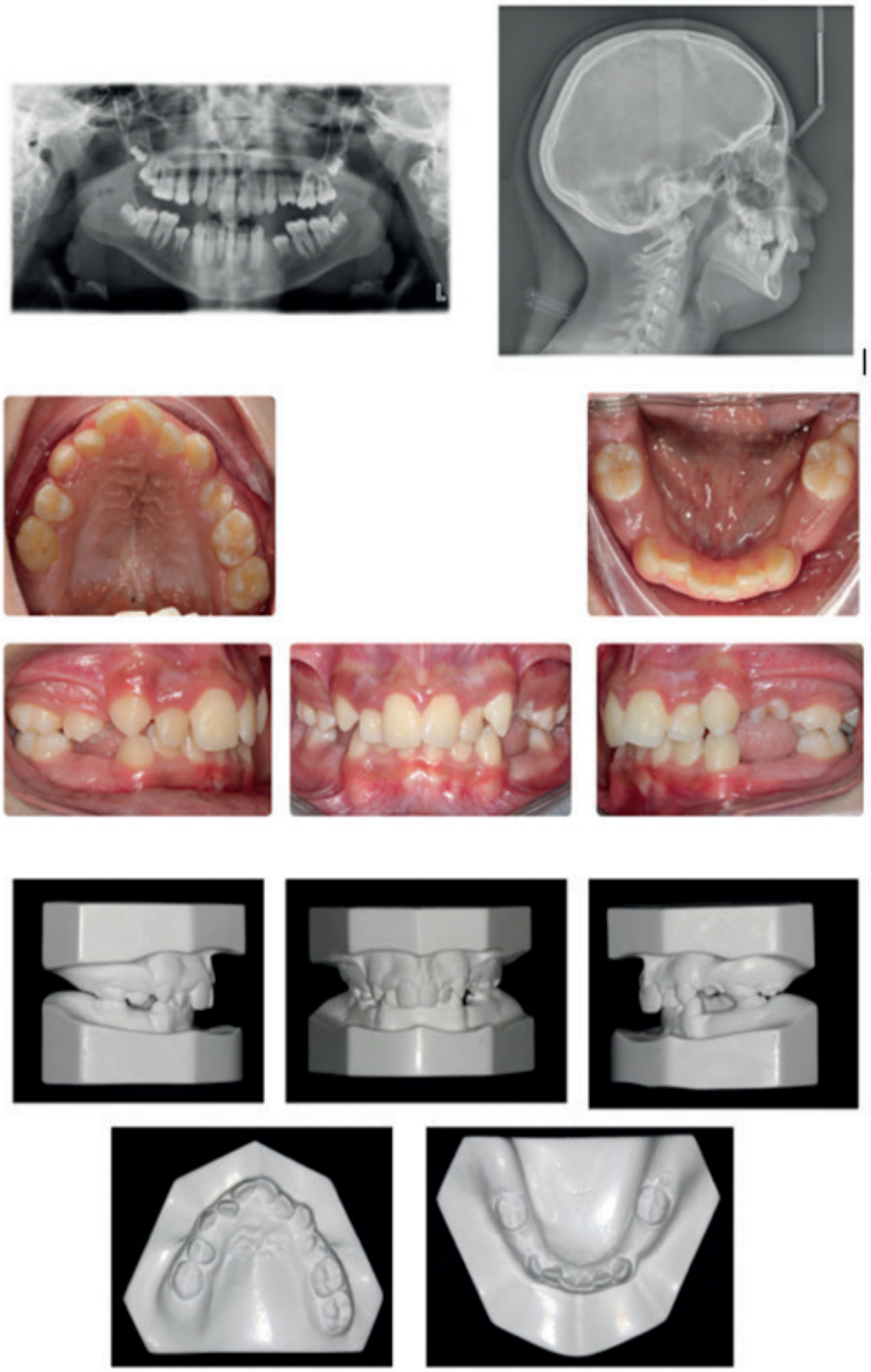

Figure 1: Pre-treatment Records: Radiographs, Intra-Oral Photos and Casts

Initially, pre-adjusted edgewise orthodontic fixed appliances (0.014 NiTi, 0.016 NiTi, 0.017x0.025 NiTi, 0.018x0.025 NiTi then 0.019x0.025NiTi) were brought together for alignment, and teeth levelling on MBT 0.022 x 0.028 bracket slot prescription. The cross-elastic was used to correct the crossbite of tooth #17 with the help of a bonding button on the lingual surface of tooth #47 and the bite was raised by GIC to help free the contact to correct the crossbite (Figures 2 & 3). The treatment time for presurgical orthodontics was 24 months.

After coordinating the upper and lower arch and recording pre-surgical impressions (Figure 4), the case was discussed with the oral and maxillofacial surgeon and it was made sure that the initial treatment plan was applicable and no further correction was needed. From the oral surgeon's perspective, it was suggested that mandibular advancement and genioplasty would suffice.

Following an initial recovery period of two weeks after surgery, the patient was then seen in the postsurgical orthodontics clinic, which lasted for a total of three months. To settle the occlusion, settling elastics were provided, and the canine torque was corrected. Following the removal of the appliance, fixed bonded retention was delivered. The total treatment duration was 27 months.

After the treatment, it was determined that the patient had achieved functional occlusion, characterized by normal overjet, overbite, and adequate intercuspation; class I molars and canines relationship on both sides of the mouth; nearly coincident midlines; and normal proclination of mandibular and maxillary incisors. Cephalometric measurements showed maxillary clockwise rotation and mandibular anticlockwise rotation with advancement, both of which contributed to an improved facial profile, which led to the elimination of vertical skeletal dysplasia and severe convex profile (table 1). A correction was made to the axial inclinations of the maxillary and mandibular incisors. Even though the case

could have been finished more effectively, it was decided to be debonded (figure 5) because the patient was pleased

e outcomes of the treatment and was not particularly interested in extending the treatment for further finishing and detailing.

In Figure 6; The cephalometric superimposition tracing of pre-surgical and post-surgical x-rays. The improvement of the profile is obvious in the cephalometric radiograph as it is in extra-oral photos.

DISCUSSION

To plan a treatment strategy that is both accurate and efficient, it is essential to have a solid understanding of the factors that contribute to facial discrepancy. During the cephalometric analysis, it is determined whether the discrepancy is due to the maxilla, the mandible, or both of these structures, and it is analyzed about all three planes of space. Additionally, it decides how the disparity is connected to dental compensation.

The case of PRS that is presented here had a small SNB angle, a steep mandibular plane, and a short ramus length, all of which were characteristics that had been reported previously [6-11]. When it comes to treating this Class II malocclusion with a recessed chin, the primary focus should be on dimensional control in the sagittal and vertical plane. In this instance, an interdisciplinary approach to management was utilized. Orthodontic treatment was used to normalize the retroclined position of the upper incisors, and a specialized orthognathic surgery was carried out to advance the position of the mandible. These procedures were carried out successfully improving the aesthetics, functionality, and structural integrity of the area.

In this particular instance, the following can be deduced to be the etiology of the deep bite: First, there was a lack of development in the mandible. Second, a mandible that is retropositioned can be the result of a slightly shorter corpus. Third, the severe overeruption of the upper incisors hampered the growth of the mandible. The following steps were involved in the treatment strategies for deep bite correction: (1) overtreatment of upper incisor intrusion to avoid posttreatment relapse in the first year; (2) increasing the distance of molar advancement to correct overjet and overbite simultaneously during mandibular advancement surgery; and (3) achieve good inclination of the upper and lower incisors before surgery to lessen the finishing stage.

An increased mandibular plane was largely expressed in this patient's case, and it was characterized by normal anterior facial height. Although the upper molars initially presented with a slight under-eruption, surgical correction with

Figure 2: Author starts treatment of the upper arch first, to help level and align and free space for the brackets in the lower anterior teeth.

Figure 3: Author raised the bite by GIC in lower 1st & 2nd molars, bonded lingual button on tooth #47 and used cross-elastic to help correct the crossbite of tooth #17.

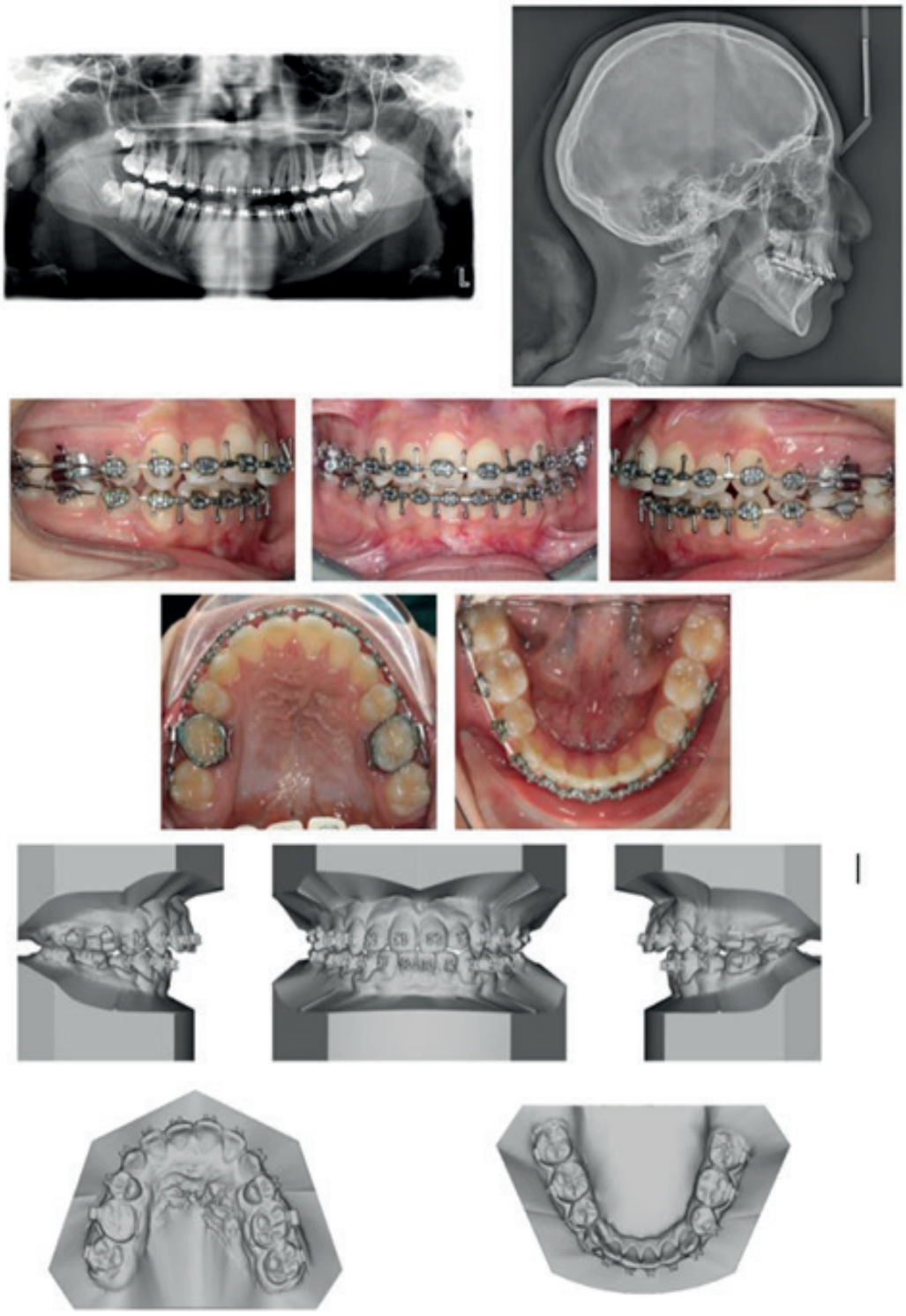

Figure 4: Presurgical Records (intraoral photographs, orthopantomogram, lateral cephalogı and Study Cast). Note the use of surgical hooks on 0.019 x 0.025 SS wire.

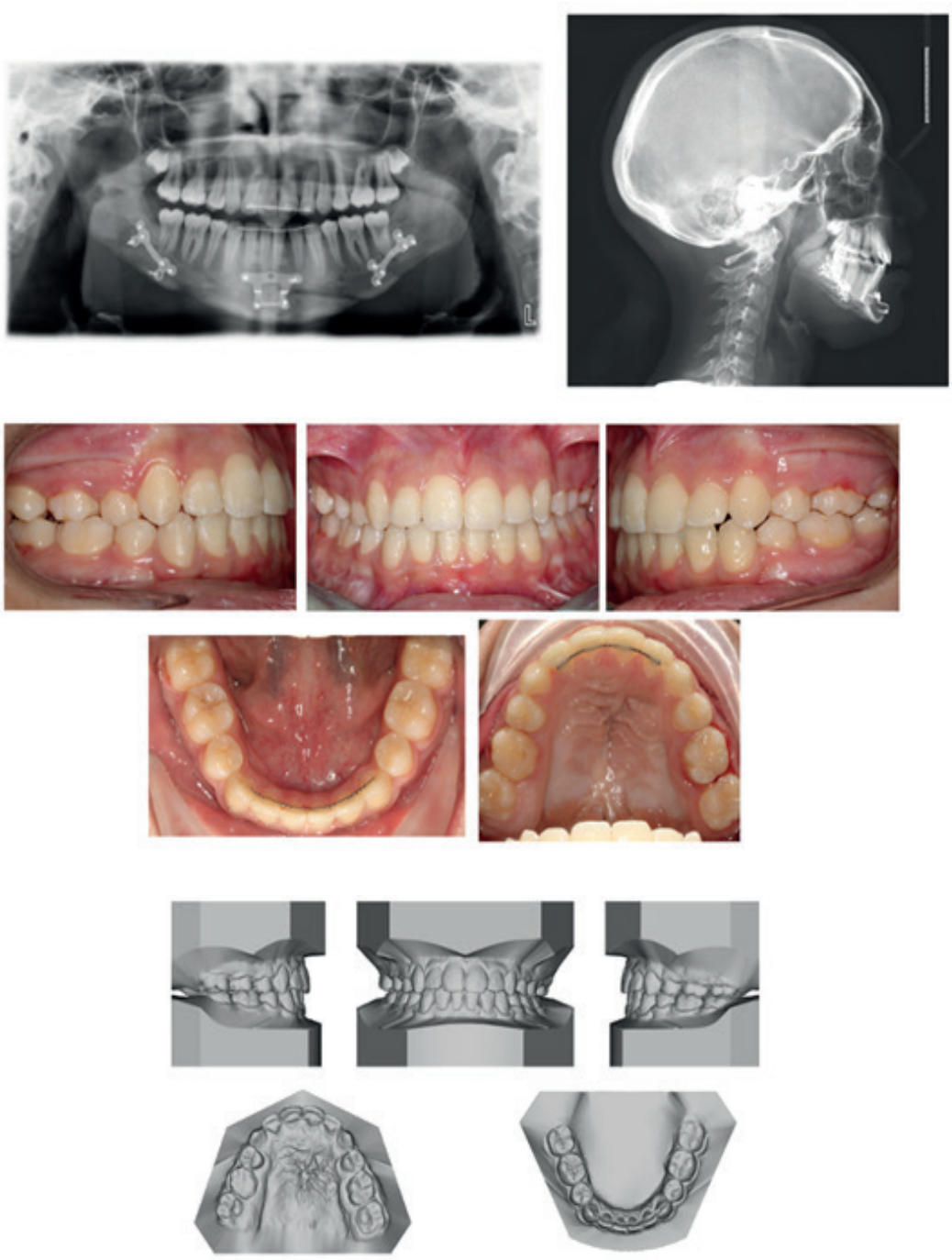

Figure 5: Final Records: Final Records Orthopantomogram, Cephalometric, Intra Oral Photos, and Study Model. Note the plates on the x-ray that have been used for mandibular and chin advancement. The author used fixed retainers upper and lower, in the upper from lateral-to-lateral incisors to reduce the failure of the retainer.

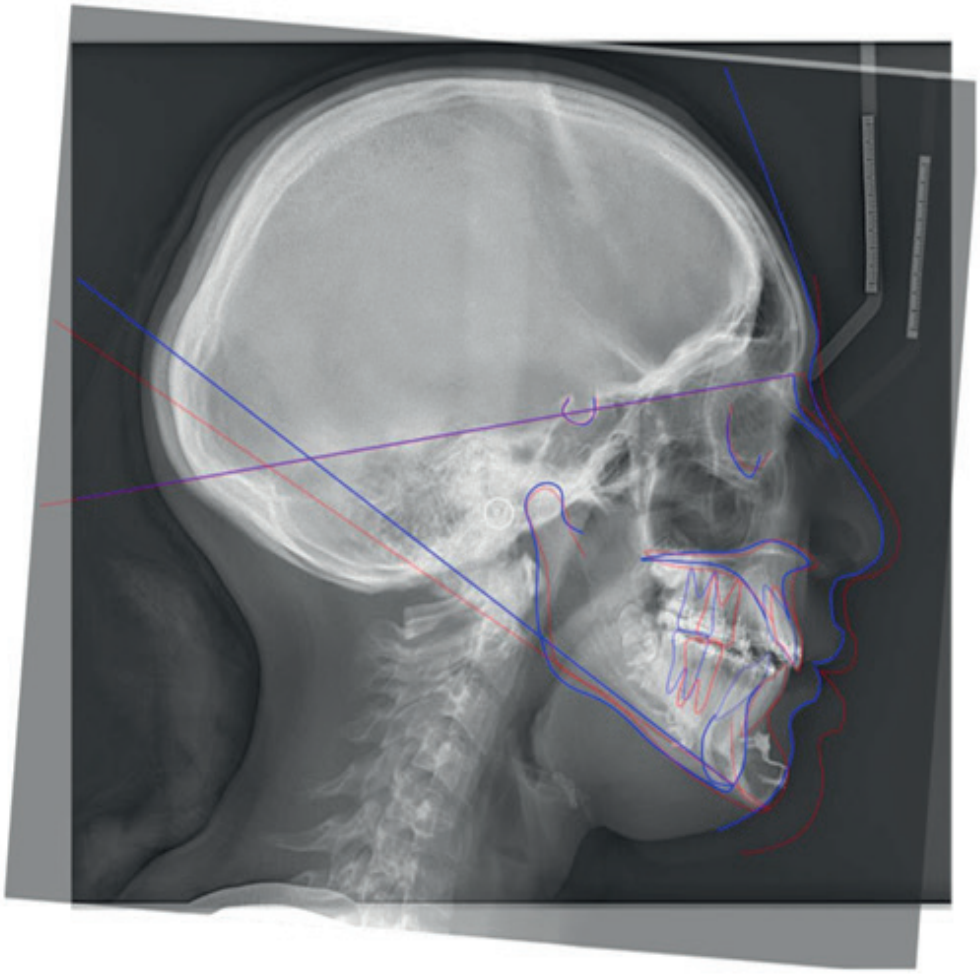

Figure 6: The blue line is the pre-surgical cephalometric tracing, while the red line is the post-surgical final cephalometric tracing. It is clearly obvious the improvement of the mandibular and chin advancement on the profile

the Le Fort I technique was not required to bring them into proper alignment. Both orthodontic treatment and surgical correction were successful in eliminating the accompanying anterior deep bite. To achieve the desired vertical heights, the mandibular plane was corrected with anticlockwise rotation during the advancement. Then, with orthodontic measurement, even a slight vertical maxillary deficiency could be easily corrected. Because of the reactive force from the intrusion arch, the upper incisors were tilted by 4 mm. On the other hand, the upper molars were extruded slightly. Avoiding arch expansion and incisor flaring is important, and orthodontics makes arch coordination simple to achieve.

These results were satisfactory for the advancing mandibular landing that would be achieved through surgery. During the procedure to advance the mandible, the masticatory muscles were not stretched in any way, so the stretch reflex was not activated. Oral

surgeons and orthodontists worked together to maintain the vertical dimension throughout the entirety of the treatment process. As a result, the relapse rate may be low in this particular instance.

To achieve an improved overbite and overjet, the mandibular advancement surgery involved protraction of the tooth-bearing distal segment along with some downward rotation. Following surgical intervention, the incisor was moved forward a greater distance than the pogonion. As a result, the height of the mandibular anterior facial region increased. Surgery to advance the lower jaw is recommended for patients who fall into Class II division 2 or Class II division 1 and have a short lower anterior facial height, a retruded mandible or a poorly developed lower jaw in non-growing adults, and a severe overbite. The mandibular advancement surgery had several benefits, some of which were that it was an easy surgical procedure, it was less expensive, it was efficient, there was less chance of relapse, and it improved the patient's profile more. When it comes to stability, a rotation of the mandible that opens in a clockwise direction can be superior to a rotation that closes in this direction.

A chin that has undergone genioplasty will have its appearance enhanced, and the pogonion will have been moved forward to a significant degree. A forward growth rotation of the mandible may result in a more prominent chin projection in individuals with normal lower jaw size [12], but this did not happen in this particular case because the mandible was not fully developed.

Even though a Class II malocclusion is frequently considered to be a sagittal jaw discrepancy, the vertical effect of a lack of lower molar elongation should always be taken into consideration. This is because a lack of molar elongation can cause crowding of the lower teeth. At this stage, the anterior deep overbite was corrected by an upper anterior intrusion, and the patient gained a significant amount of benefit from the mandibular advancement surgery[13-16].

CONCLUSION

The success of orthognathic cases is determined by careful diagnosis and treatment planning in conjunction with interdisciplinary discussions on planning the surgical aspects of the procedure. Orthodontists are thought to think in millimeters and angles, whereas oral surgeons are more likely to use centimeters in their calculations. Therefore, regular assessments of the patient's condition by both teams as the treatment progresses will be necessary to guarantee that the case remains on track. The case that has been presented serves as an illustration of effective communication between the patient and the various specialists who were involved.

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