Aesthetic Treatment Of Maxillary Central Diastema Due To Differences In Teeth And Jaw Sizes With Removable Orthodontics

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ABSTRACT

Background: *The aesthetic treatment of maxillary central diastema due to differences in tooth and jaw size is an important component of orthodontic treatment. Tooth size and shape are crucial factors that affect the smile and face in treatment results. From an orthodontic perspective, evaluating the ideal mesiodistal width of teeth in relation to the upper and lower jaw arches is necessary to plan for proper occlusion, aesthetics, and functionality.*
Case: *A 19-year-old woman came to RSIGM Sultan Agung complaining that her upper front teeth appeared spaced apart and affected her appearance. The patient's medical history showed that he was in good general health. Extraoral examination was within normal limits. Intraoral examination revealed a diastema between the upper central incisors, normal frenulum attachment, an overjet of 3.4 mm, and an overbite of 3.1 mm. Analysis of the working model revealed a positive arch length discrepancy in the upper jaw, while other analysis results were within normal limits. The etiology of the diastema in this case was the size of the available dental arch and normal tooth size. The patient underwent treatment for central diastema using removable orthodontic appliances equipped with active and passive devices, as well as additional finger spring components to mesialize teeth 11 and 12 and close the maxillary central diastema*
Conclusion: *Esthetic treatment of maxillary central diastema caused by differences in tooth and jaw size can be performed using removable orthodontic appliances with additional finger spring components. Patient cooperation during treatment and retention appliances are necessary to achieve stable long-term orthodontic results*

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INTRODUCTION

Central diastema maxilla is problem aesthetics general that can caused by existence mismatch between dimensions teeth and jaws.[1] In the period tooth deciduous and mixed, central diastema maxilla is common and considered things as normal phenomenon.[2] However, on the teeth permanent very disturbing harmony dentofacial. Prevalence of central diastema maxilla on teeth permanent reported range between 3.7% to 36.8%.[3]

The aetiology of maxillary central diastema is diverse, ranging from functional factors (such as tongue thrusting) and developmental factors (low upper lip frenulum) to anatomical factors. However, one complex cause is tooth-size discrepancy, whereby a relatively large jaw creates excess space for normally sized teeth.[4] This condition results in excess space in the jaw arch, which manifests as diastema or generalised spacing.[5] Diastema can be defined as a space greater than 0.5 mm between the proximal surfaces of two adjacent teeth in the upper or lower jaw.[6]

For cases of space-related central diastema (where the teeth are still healthy), orthodontics is the most ideal and ethical treatment option. Removable orthodontic treatment is very conservative as it only moves the teeth into their correct physiological position. This procedure does not involve reducing the original tooth structure as in veneer treatment. In cases of wide central diastema (>3 mm), the use of veneers to close the gap requires a significant amount of material. This can make the two central teeth appear too wide, large, or disproportionate (relative macrodontia) compared to the adjacent (lateral) teeth and the patient's face. Veneers have a limited lifespan (average 10-15 years) and need to be replaced over time. Each time veneers are replaced, the risk of further reduction of the original enamel tissue increases.[7] Tipping movement will cause the crown to move 1 mm per month. Tipping movement can be performed in the mesio-distal, buccal-palatal, labio-palatal, buccal-lingual, or labio-lingual directions.[8]

Orthodontic appliances must be comfortable to use, acceptable to patients, and cleanable by patients so that oral health is maintained.[9] Removable orthodontic appliances have several advantages, namely they are easy to apply, have a simple design, and are more economical. However, the success of these appliances depends on patient compliance in using them.[10] Based on the force they exert, removable orthodontic appliances are divided into two types: active and passive. Active appliances are equipped with active components to move teeth or several teeth or expansion screws to create space, while passive appliances are designed to maintain teeth in their position. Indications for treatment using removable orthodontic appliances include simple tooth tipping, overbite reduction, crossbite correction, tooth extraction, diastema correction, and mild crowding.[11]

This case report discusses the management of maxillary central diastema using an orthodontic treatment approach. Central diastema can cause various problems such as aesthetic problems, functional problems, and problems with the health of hard and soft tissues in the mouth. During treatment, the success of patient treatment at RSIGM Sultan Agung Semarang was demonstrated using removable orthodontic appliances based on the indications and treatment needs of the patient.

CASE REPORT

A 19-year-old woman came to Sultan Agung General Hospital complaining that her upper front teeth were spaced apart and affected her appearance. She had noticed this for three years

and wanted to have her teeth treated. The patient had a history of peanut allergy but this was not a contraindication for orthodontic treatment. She had no history of persistent, premature loss, or trauma to her teeth. The patient had no bad habits. Based on the family history, there were no similar complaints.

The patient's body mass index was normal, and signs of secondary maturation were visible. The patient desired orthodontic treatment to align her upper front teeth. The extraoral examination (Figure 1) revealed a dolichocephalic head shape, a leptoprosopic and symmetrical facial structure, and a convex facial profile. The patient's lips are symmetrical, with normal proportions, competent relation, normal tone, and frenulum of the lip attached to the attached gingiva. On palpation of the temporomandibular joint, there are no abnormalities such as clicking, crepitation, or deviation. Intraoral examination, good oral hygiene, normal tonsils and no torus. There is a diastema between teeth 11-21 measuring 1.2 mm, with an overbite of 3.1 mm and an overjet of 3.4 mm (Figure 2).

Figure 1. Extraoral photo before maintenance orthodontics
(symmetrical, profile convex)

Figure 2. Intraoral photo before (a) Right lateral view (b) right lateral view frontal (c) Left lateral view (d) View occlusal jaw above (e) View occlusal jaw below. There is a diastema between the teeth 11-21

Figure 3. Frontal view of the patient use tool orthodontics loose

Figure 4. Intra-oral view of the patient after 6th activation (a) Right lateral view (b) view frontal (c) Left lateral view (d) View occlusal jaw above (e) View occlusal jaw below. There is a diastema between the teeth 11-21 corrected

The diagnosis of the case based on Angle's classification is Angle Class I malocclusion, Dewey type 1, accompanied by a central diastema of the upper jaw. The Arch Length Discrepancy (ALD) examination of the upper jaw showed a result of +4 mm and the lower jaw +1 mm. In this patient, the diastema was closed using a removable orthodontic appliance combined with a finger spring on teeth 21 and 22 (Figure 3).

The results of cephalometric tracing before and after removable orthodontic treatment are shown in Table 1. The position of the patient's dental diastema showed improvement (closure) after 6 control visits (Figure 4). After mesialisation of teeth 11 and 12, there was a distal gap at 12 and labial arch activation. During labial arch activation, reduction of the cervical palatal plate of teeth 11, 12, 21, and 22 was performed, and after treatment.

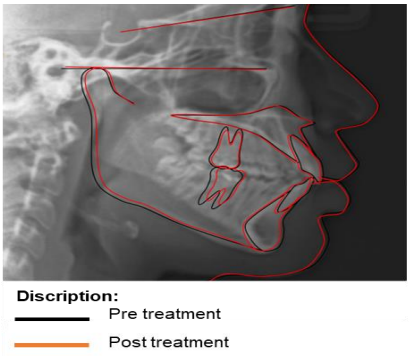

Figure 5. cephalometric superimposition

Table 1. Measurements cephalometry before and after treatment

Measurement	Normal values	Before treatment	After treatment
Facial Angle	82°-95°	90°	91°
Angle of Convexity	-8.5°-10	4°	2°
SNA	82°	80º	80 ^{0}
SNB	80°	76º	76 ^{0}
ANB	2°- 4°	4º	4 ^{0}
Inter II	130°	124°	126 ^{0}
IMPA	81.5°-97°	89°	92°
Overbite	2-4 mm	3.1 mm	3.0 mm
Overjet	2-4 mm	3.4 mm	3.2 mm

The patient has agreed to informed consent for removable orthodontic treatment and appliance insertion on 18 July 2024. The removable orthodontic appliance for the upper jaw consists of a 2 mm thick acrylic base plate with a U-shaped labial arch on teeth 14 and 24, using 0.6 mm diameter wire, and Adam clasps on teeth 16 and 26 with a diameter of 0.7 mm for retention. A combination of finger springs on teeth 11 and 12 with 0.6 mm wire for mesialisation of teeth 11 and 12 to correct the maxillary central diastema, followed by activation of the labial arch for correction of 13 mesiolabialversion (Figure 3). On the lower jaw, an acrylic plate with a medium labial arch on teeth 34 and 44 and Adam clamps on teeth 36 and 46 were used to maintain the regularity of the dental arch. The patient was instructed to wear the removable orthodontic appliance as often as possible except during meals and cleaning, and to attend weekly check-ups for finger spring activation by opening the coil mesially to push the teeth mesially and evaluate treatment progress.

During the next visit on 25 July 2024, the operator performed the first activation on the upper jaw removable orthodontic appliance. The finger spring activation on the distal tooth 11 was activated by opening the coil mesially, thereby pushing the tooth mesially. The second check-up was conducted on 1 August 2024. During this visit, the finger spring on the distal side of tooth 11 was activated by opening the coil towards the mesial side. The third check-up was conducted on 8 August 2024. The objective examination showed that the diastema on the mesial of teeth 11 and 21 had begun to correct itself, as indicated by the narrowing of the diastema on the mesial of teeth 11 and 21 and the presence of a diastema on the mesial of tooth 12.

The fourth control was conducted on 15 August 2024. Based on the objective examination results, there was a narrowing of the diastema on the mesial of teeth 11 and 21, but it had not been completely corrected, so the finger spring activation procedure was repeated on the distal of teeth 11 and 12.

The fifth check-up was conducted on 22 August 2024. The objective examination showed that the maxillary central diastema on teeth 11 and 21 had been corrected, as evidenced by the absence of space between the upper central incisors (Figure 4), while the malposition of tooth 13 had not been corrected, so the upper jaw labial arch was activated.

At the sixth control, the objective examination showed that the maxillary central diastema on teeth 11 and 21 had been corrected, as evidenced by the absence of space between the upper central

incisors (Figure 4), and the malposition of tooth 13. The plan for further treatment is to install a Hawley retainer to maintain the arch and tooth position.

DISCUSSION

The midline diastema is a space (or gap) between the maxillary central incisors.The difference in tooth size caused by an excessively large upper jaw (rather than small teeth) or bone abnormalities that inhibit the movement of the incisors, may be the cause of this diastema. Management of this maxillary central diastema case involves removable orthodontic treatment.[6] Removable orthodontic appliances have the advantage of being removable by the patient themselves, are easy to clean, ensuring good oral hygiene, and can provide tipping movement.[12] However, in this case, the indications for treatment using removable orthodontics are met. The operator's consideration for orthodontic treatment was based on the objective examination findings in this case, which revealed teeth with normal mesiodistal dimensions. If restorative treatment were performed, teeth 11 and 21 would appear wide and less aesthetically pleasing. In this case, the operator also performed a blanch test, which yielded a negative result, indicating that the central diastema in this patient was not caused by a high frenulum.

Disproportionate dental arch length and mesiodistal tooth size can be one of the aetiological factors of diastema. This causes excessive dental arch length to accommodate the teeth, resulting in diastema between the teeth. Tooth size discrepancy is a disharmony between the mesiodistal width of the maxillary teeth and the mesiodistal width of the mandibular teeth. Tooth size discrepancy is assessed using Bolton analysis. Bolton analysis is performed by comparing the width of the lower teeth to the width of the upper teeth, which is then compared to the Bolton Index value to determine which dental arch is causing the discrepancy.[4]

Removable orthodontic appliances consist of active components, retentive components, and an acrylic base. In this case, a removable orthodontic appliance was used, consisting of a finger spring with a diameter of 0.6 mm on the distal surfaces of teeth 11 and 12 as the active component, a medium-type labial bow with a 0.6 mm diameter U-loop on teeth 14 to 24 as passive components, 0.7 mm Adam clasps on teeth 16 and 26 for retention and stability of the appliance, and an acrylic plate. The use of finger springs as active components in this case aims to produce tipping movement on teeth 11 and 12 towards the mesial so that the central diastema in the patient can be corrected. The tipping movement generated by finger springs in removable orthodontic appliances is a type of uncontrolled tipping, which is a simple type of tooth movement where applying force to the crown of the tooth causes the crown to move in the direction of the force and the root to move in the opposite direction.[13,14] In general, the optimum force required to achieve tipping movement is 35-60 grams.[15,16] The success rate of orthodontic treatment using removable appliances in diastema cases is highly dependent on the patient's motivation and discipline in using the appliance.[17,18] The use of removable orthodontic appliances can correct mild diastema within 3-6 months. In this case, the closure of the central diastema on the mesial of tooth 11 occurred in less than 3 months of treatment. Further treatment involved the placement of a retainer to maintain the corrected dental arch and prevent

relapse. The type of retainer used was a Hawley Retainer.[19,20]

Instructions procedure use of retainers in patients includes :

a. The retainer is worn during the first three months, both during the day and at night, as well as during sleep. The retainer is removed only during tooth brushing and after meals for cleaning, with monthly check-ups to ensure the treatment is progressing well.
b. Second 3-month period: If there is still tooth movement or the retainer feels tight after the first 3 months, regular use is extended for another 3 months.
c. Third 3-month period: If there is no longer any tooth movement or tightness, the patient is instructed to continue using the retainer only during nighttime sleep and to attend monthly check-ups.
d. Fourth 3-month period: If the retainer no longer feels tight during use after the third 3-month period, its use can be discontinued, and a final examination is conducted after the following 3 months.

CONCLUSION

Removable orthodontic treatment is effective for treating maxillary central diastema cases. The results obtained after six check-ups showed that the diastema between teeth 11-21 and the mesiolabial malposition of tooth 13 had been corrected, as evidenced by the absence of space between the upper central incisors and the malposition of individual tooth 13.

Recommendations for the patient in this case report include the use of a retainer to maintain the corrected dental arch and prevent relapse.

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