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Management of Midline Diastema

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Orthodontic Management of Maxillary And Mandibular Midline Diastema

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Abstract

A 23 year-old male with the chief complaint of upper and lower central gaps in his teeth. Orthodontic evaluation gave a diagnosis of Angle's Class I malocclusion on Skeletal Pattern 2 with maxillary and mandibular midline diastema, upper and lower anterior spacing, rotated teeth, abnormal frenal attachment, and non-consonant smile. Malocclusion was successfully treated with upper and lower fixed orthodontic appliance therapy. An aesthetic and stable occlusion was achieved at the completion of treatment. Fixed lingual and thermoplastic retainers were used to ensure stability of treatment outcome

Key words: Diastema, Malocclusion, Orthodontics

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Introduction

Midline diastema is characterized by the occurrence of space between the central incisors in the maxilla and less frequently in the mandible.[1]

The prevalence of diastema was found to be 75.3% (Caucasoid), 68.2% (Mongoloids), and 73.9% (Negroids) in the maxilla, while for the mandible it was found to be 24.7% (Caucasoid), 31.8% (mongoloids), 26.1% (Negroids).[2] A Nigerian study found the incidence of midline diastema to be 26.1% (maxilla- 21.0%, mandible- 1.9%, and both arches- 3.2%),[3] while another found it to be 37%.[4] It has been shown that midline diastema is more common in the maxilla than in the mandible, with a slight female preponderance.[3,4,5]

Local factors like abnormal labial frenulum, missing maxillary lateral incisors, ectopic maxillary canines, missing teeth, anterior traumatic bite, tooth size - arch length discrepancies, mesio-distal angulation of the central incisors, inter-arch relationship, oral habits, presence of supernumerary tooth, pathologic lesions of the hard and soft tissue, iatrogenic causes, or physiologic development have been associated with the etiology of midline diastema. In addition to all these, genetic influences also play a vital role in its etiology.[6,7]

Midline diastema is usually considered a thing of beauty in this part of the world.[5] It was found that midline diastemas located in the maxilla, of about 2mm to 3mm in width, are preferred to their larger counterparts.[8] There has been reports of individuals going as far as artificially creating maxillary midline diastema.[9] The decision to treat is usually dependent on patient's preference and presence of any other associated occlusal discrepancies.[5]

The outcome of midline diastemas varies, some

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resolving spontaneously while others may require intervention.[10] Possible therapeutic approaches to the management of midline diastemas requiring intervention may include either orthodontic, restorative, or surgical approach. Various combinations of the therapeutic approaches mentioned above may also be employed.[11]

Diagnosis and Aetiology

A 23 year-old male with the chief complaint of large gaps between the upper and lower front teeth (maxillary and mandibular midline diastema). He was more concerned about the gap in the upper arch and also wanted to close up other spaces between the teeth. He was eager to improve his appearance and self- esteem by undergoing orthodontic treatment. He was in good health with no significant systemic medical history. Extra oral evaluation revealed a concave profile with facial symmetry, good chin-throat support, soft tissue line, and normal vertical proportions. The lips were mildly incompetent with a Jackson's lip pattern of 2 over 1, with a non-consonant smile (Fig 1). Intraoral evaluation revealed a full complement of teeth from the central incisors to the third molar in all quadrants. The molar relationships were Angle's Class I on both sides. Anterior overjet was 3mm and overbite was reduced and complete. The upper midline was coincident with the midline of the face, and a lower midline deviation to the right by 1 mm. There was also the presence of maxillary abnormal frenal attachment (Figure 1).

Examination of the upper arch revealed a moderate upper anterior segment spacing of 6.5 millimeters inclusive of a midline diastema of 4 millimeters (mm), proclined upper incisors, and slight mesiolabial rotations of the upper left central incisors and canine (Figure 1). The lower arch revealed a 3mm midline diastema, 3mm posterior segment spacing, proclined incisors, rotation of the mandibular left canine, and an exaggerated curve of spee.



Figure 1: Pre-treatment facial and intraoral photographs

The panoramic radiograph showed the presence of all the teeth. Presence of periodontal compromise was evidenced by horizontal and vertical bone loss, especially on the mesial and distal root surfaces of the mandibular left second premolar and right second



Figure 2: Pre-treatment panoramic radiograph

molar, as well as the mesial surface of the mandibular left second molar (Figure 2).

Cephalometric analysis showed a Class I skeletal pattern 2 with increased upper and lower incisal angles, proclined upper and lower incisors and reduced interincisal angle (IIA), Frankfort mandibular plane angle (FMA) and lower facial



Figure 3: Pre-treatment cephalometric radiograph

height (LFH) (Figure 3, Table 1).

Based on these findings, the patient was diagnosed with Angles Class I malocclusion on Skeletal Pattern 2, complicated by maxillary and mandibular midline diastema, severe upper anterior segment spacing, mild lower posterior segment spacing. Also diagnosed were, proclined maxillary and mandibular incisors, low maxillary frenal attachment, lower midline deviation, mild rotations and exaggerated curve of spee in the mandible .

Treatment Objectives

The orthodontic treatment objectives for this patient were to (1) close up the maxillary and mandibular midline diastema as well as other spaces (2) retrocline proclined upper and lower incisors (3) correct mandibular midline deviation (4) derotate rotated teeth (5) level the mandibular curve of spee (6) achieve lip competence and (7) achieve a consonant smile. These objectives were to be achieved while maintaining the stable occlusion, and the Class I molar relationship with the ultimate aim of improving the patient's appearance and self-confidence.

Treatment Alternatives

The primary complaint of the patient was the midline diastema in the mandibular and maxillary arches. Based on literature review, the following treatment options where recommended:

1. Fixed appliance therapy, pre-adjusted edgewise; the non-extraction treatment. The options of using either the metal or ceramic Roth 022 slot and space closure on 019 X 025 stainless steel wire was suggested. This will be followed by frenectomy to reposition the frenal attachment at the end of space closure.
2. The use of aligners without extractions followed by the frenectomy procedure was the second option. This option is more aesthetic than the previous option. A major drawback to this option was the high cost of treatment relative to option 1.

The Retention plan was to use fixed lingual and thermoplastic retainers in the upper and lower arches.

After explaining the pros and cons of each alternative to the patient, he selected the first option for treatment.

Treatment Progress

Treatment began with oral hygiene prophylaxis and



Figure 4: Intra treatment photographs



Figure 5: Post treatment facial and intraoral photographs

periodontal management of the periodontally compromised teeth. This was followed by bonding the teeth from the incisors to the second molars in all quadrants. Bondable buccal tubes were used on the molars instead of bands due to the presence of periodontal pockets around the molars at presentation. Levelling and alignment was achieved by sequential use of nickel titanium wires (014, 016, 018, 020 inches) and 020 inches stainless steel wires.

The midline diastema and other intra arch diastema were closed by the use of elastic chain and active tie backs on 019 by 025 inches stainless steel wire.(Figure 4)

Active treatment took 19 months. Fixed lingual and thermoplastic retainers were used to maintain the positions of the teeth after treatment.

Treatment Results

The teeth were well aligned and leveled at the end of treatment. The Class I molar and canine relationships were maintained. Lip competence was achieved with a satisfactory consonant smile (Figure 5)

Complete closure of the mandibular and maxillary midline diastema as well as other spaces within the area was achieved (Figure 5). There was correction of the mandibular midline deviation, derotation of rotated teeth and leveling of the exaggerated curve of spee in the mandible.

The post treatment cephalometric analysis showed that the normal mandibular and maxillary incisal angles were achieved with satisfactory soft tissue balance. (Figure 6, Table 2).

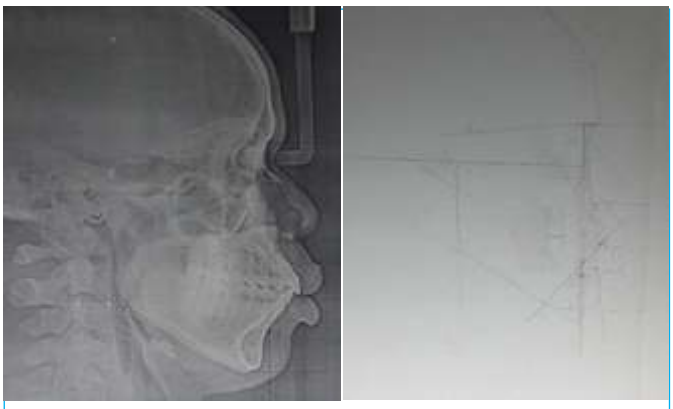


Figure 6: Post treatment cephalometric radiograph

Root parallelism was achieved and there was significant root resorption from the evaluation of the post treatment panoramic radiograph (Figure 7).

Table 1: Pre-treatment cephalometric measurements

Measurement	Pre-treatment values	Range for Nigerian norms	Comment
SNA	87.5°	85.5 ° ±3.5	Normal
SNB	82.5°	82.7 ° ±3.0	Normal
ANB	5°	2-4 °	Increased
U1 TO FP	128°	119-127 °	Increased
L1 TO MP	108°	96-104 °	Increased
IIA	101.5°	108-116 °	Reduced
FMA	23°	24-26 °	Reduced
LFH	53%	55%	Reduced

Table 2: Post-treatment cephalometric measurements

Measurement	Post-treatment values	Range for Nigerian norms	Comment
SNA	87.5°	85.5 ° ±3.5	Normal
SNB	83°	82.7 ° ±3.0	Normal
ANB	4.5°	2-4 °	Increased
U1 TO FP	124°	119-127 °	Normal
L1 TO MP	101°	96-104 °	Normal
IIA	112°	108-116 °	Normal
FMA	24.5°	24-26 °	Reduced
LFH	54%	55%	Reduced

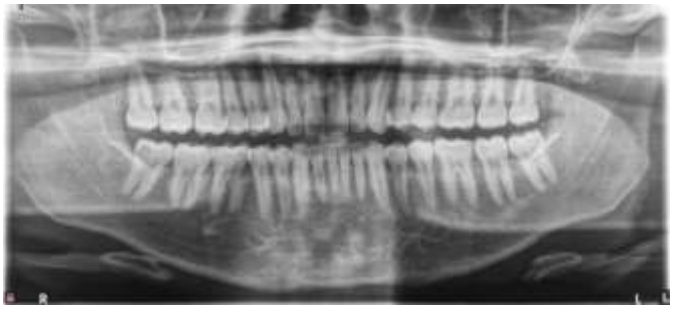


Figure 7: Post treatment panoramic radiograph



Figure 8: Pre and post treatment facial and intraoral photographs

Discussion

The presence of a midline diastema may pose both an aesthetic and psychological problem due to its prominent position in the dental arch, hence the constant request for correction by the patients, especially wide diastemas. Although multiple developmental, genetic and environmental factors have been incriminated in the aetiology of midline line diastema, it is believed to be mainly a multifactorial phenomenon.[6,7] Nonetheless, for effective management, accurate diagnosis and aetiology is required, putting into consideration also if it occurs as a single entity or in conjunction with other dental or occlusal anomalies. [6,12,13]

Management of midline diastema is usually interdisciplinary in approach; with treatment options ranging from simple or complex restorative treatment to orthodontic and surgical procedures depending on the aetiology. In this case report, the aetiology was a combination of tooth size-arch length discrepancy and high frenal attachment. Orthodontic treatment was considered due to the existence of other occlusal anomalies which were of concern to the patient, followed by frenectomy at the completion of orthodontic space closure.

In the orthodontic management of this patient, the use of bands as attachment on the molars were avoided to prevent further plaque accumulation, bacterial colonization and aggravation of the existing periodontal disease. Separator placement and band cementation have been associated with bacteremia.[14]

Treatment outcome in the case report was successful. The maxillary and mandibular midline diastema was closed at the end of treatment. Upper and lower spaces were closed and incisor proclination were corrected. Derotation of teeth was carried out and overbite corrected. Lip competence and a consonant smile achieved. Most importantly, the periodontal health of the patient was preserved at the end of orthodontic treatment as seen in the post orthodontic treatment panoramic radiograph (Figure. 7).

The patient however declined the frenectomy procedure after completion of orthodontic treatment despite being informed extensively of the risk of relapse if not carried out. A fixed lingual retainer in conjunction with thermoplastic retainer was therefore employed as the retention protocol.

Retention protocol of midline diastema is of extreme importance for long term stability of treatment outcome, with aetiology of importance in this decision making.[7]

Conclusion

Orthodontic treatment is a treatment option for the management of midline diastema. This case reports a case of maxillary and mandibular midline diastema occurring in conjunction with other occlusal anomalies. The aetiologic factors implicated were tooth size- arch length discrepancy and abnormal frenal attachment. It was successfully treated using a fixed orthodontic appliance. The treatment outcome was satisfactory.

Authors' Contributions

All the authors contributed to the conceptualization, design, and write-up of the manuscript.

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Conflict of Interest

Nil

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A short text of about 150 words depicting the condition with color photographs (vide infra) is needed.

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Introduction

The introduction must clearly state the question that the author(s) tried to answer in the study. It may be necessary to briefly review the relevant literature.

Only cite those references that are essential to justify the proposed study.

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Acknowledgements

In acknowledgements section, it is suitable to list all contributors who do not meet the criteria for authorship, such as a person who provided purely technical help, writing assistance, or a department head who provided only general support. Financial and material support should also be acknowledged.

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List all authors when 6 or less. When 7 or more, list only first six and add et al. Ngan P, Yiu C, Hu A, Hagg U, Ei SHY, Gunel E. Cephalometric and occlusal changes following maxillary expansion and protraction. Eur J Orthod 1998; 20: 237-254.

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Each table should be typed in double-space on a separate sheet of paper. Tables not submitted as photographs must be numbered consecutively (Arabic numerals) in the order of their first citation in the text, with a brief but self explanatory title for each.
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The full term for which an abbreviation stands should precede its first use in the text unless it is a standard unit of measurement. Year, month, day, hour, minute and second should be abbreviated as yr, mon, d, h, mm, and s in tables respectively.

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