Comprehensive Management of Maxillary Midline Diastema with Non-extraction Fixed Orthodontic Mechanotherapy: A Case Report

Dr. Rajasish Dutta

Dr. Rajasish Dutta, Post Graduate Student, Department of Orthodontics and Dentofacial Orthopedics, Rama Dental College Hospital and Research Centre, Kanpur, India.

Abstract

Maxillary midline diastema is a common aesthetic concern with multifactorial etiology, including high labial frenum attachment, tooth size discrepancy, habits, and developmental factors. This case report describes the diagnosis and management of a patient presenting with a midline diastema in the maxillary arch. Clinical and radiographic evaluation identified the underlying cause, guiding the treatment plan. Orthodontic space closure was performed using fixed orthodontic mechanotherapy, followed by retention to prevent relapse. Significant improvement in aesthetics and patient satisfaction was achieved. This report highlights the importance of accurate diagnosis, orthodontic mechanotherapy, and long-term retention in the successful management of midline diastema.

Keywords:midline diastema,fixed orthodontic , space closure, aesthetic, retention .

Introduction

Maxillary midline diastema is defined as a space between the maxillary central incisors and is a frequently encountered clinical condition in dental practice[1]. It may be considered a normal developmental stage during the mixed dentition period, often referred to as the "ugly duckling stage," but persistence into the permanent dentition is usually an aesthetic concern requiring intervention[1,2]. The etiology of midline diastema is multifactorial, including high labial frenum attachment, mesiodens or supernumerary teeth, tooth size–arch length discrepancies, missing lateral incisors[4,5,7].

A thorough clinical and radiographic evaluation is essential to identify the underlying cause and to formulate an appropriate treatment plan[5]. Management strategies vary depending on the etiology and may include orthodontic space closure, frenectomy, restorative procedures, or a combination of interdisciplinary approaches[6]. One of the major challenges in the treatment of midline diastema is the high tendency for relapse, necessitating the use of appropriate retention protocols[3,6].

This case report aims to present the diagnosis and effective management of a maxillary midline diastema, emphasizing the importance of etiological assessment and long-term stability of results.

Case Report

A 21-year-old female reported to the Department of Orthodontics and DentofacialOrthopedics Rama Dental College, Hospital & Research Centre, Kanpur with a chief complaint of gapping in the upper front tooth region.

On Intraoral examination

There was presence of midline diastema of 4mm in the upper arch along with Angles class I molar relationship bilaterally.

On extra oral examination

Patient had a Mesoprosopic facial form with a convex facial profile. There was neither gross asymmetry nor any facial disproportion.

On smile analysis

The amount of incisor exposure was 100 %, with 2 mm of gingival exposure on smiling. On an average the smile line was high with a consonant smile arch. Her upper and lower lip length was normal with a 0 mm of interlabial gap.

Hard tissue examination

- Dentition : Permanent
- Teeth present : All teeth are present in upper and lower arch except third molars
- Shape of teeth :Normal
- Texture of Enamel : Normal
- Upper midline diastema
- Dental arch : U shaped maxilla / mandible

Vertical Relationship

- Open bite: Nil
- Overbite: Nil

Antero-posterior Relationship

- Overjet: 1 mm

Transverse Relationship

- Cross bite: Nil
- Scissor Bite: Nil
- Midline: coincide

Pre-Treatment Extra oral Photograph

Figure 1: A, Frontal View. B, Frontal View With Smile. C, Lateral View. D, Frontal View With Oblique View.

Pre-treatment intraoral photographs

Figure 2: A, Frontal View. B, Maxillary Occlusal View. C Mandibular Occlusal View. D, E, Lateral View.

Pre-treatment radiographs

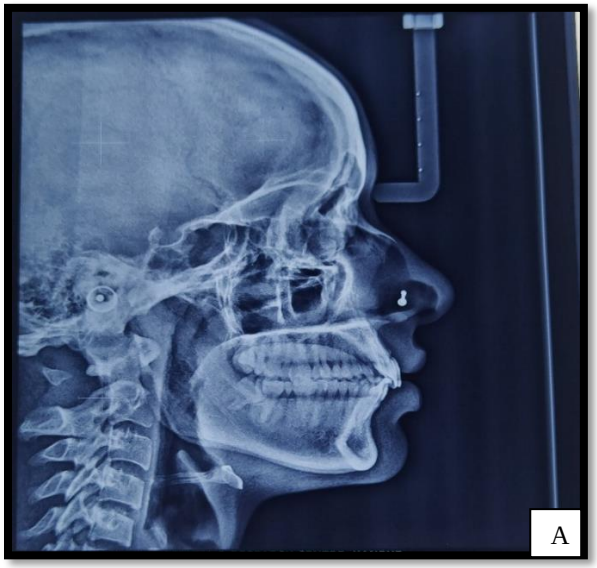

Figure3: Pre-treatment radiographs, A, lateral cephalogram. B, OPG

Table 1: Cephalometric values

Measurement	Pre-treatment
SNA	85
SNB	81
ANB	4
FMA	11
JARABACK'S RATIO	68.14
LOWER 1 TO NB(mm)	7
UPPER 1 TO NA(mm)	3
IMPA	115
Wits Appraisal(Ao-Bo)	2

Diagnosis

It's a case of skeletal class II jaw base relationship with horizontal growth pattern and Angle's Class I molar relationship bilaterally with Rickett's class I canine relation on both right and left side.

Treatment objective

SOFT TISSUE:

To achieve pleasing and harmonious profile.

To enhance facial esthetics

SKELETAL:

To maintain skeletal class II relationship.

DENTAL :

IN THE MAXILLARY DENTITION:

To achieve normal axial inclination and align the teeth in the arch.

To close upper midline diastema.

IN THE MANDIBULAR ARCH :

To achieve a normal axial inclination .

IN OCCLUSION :

To maintain molar class I relation .

To maintain canine class I relationship.

Treatment plan

Fixed mechanotherapy without extraction treatment modality. Where Space closure will be done by continuous arch mechanics in upper arch and levelling and alignment in upper and lower arch. Preadjusted edgewise appliances 0.022 slot (MBT prescription) will be bonded to the maxillary and mandibular arches.

Treatment Progression

Bonding in upper and lower teeth till 2nd premolars, anchorage preservation by transpalatal arch in upper and lingual arch in lower arch, Lace backs & bend backs, Leveling and alignment using 0.014 NiTi, 0.016 NiTi, 0.016 SS, 0.018 SS, 0.017x0.025 NiTi, 0.017x0.025 SS,0.019X0.025 NiTi, 0.019 x 0.025 SS.

Midline diastema closure using E- chain running from 12 to 22 .Hooks were placed distal to lateral incisor in upper arch and active tie back was placed .

Interproximal stripping was done in lower anterior.

Finishing using 0.014 SS and settling using 0.014 NiTi.

At the end of treatment, an optimum over jet and overbite was maintained along with closure of midline diastema. A consonant smile was established by maintaining a proper class I molar and canine class I relation. Fixed retainer was given with respect to upper and lower arch.

Post-treatment extraoral Photographs

Figure 4: A, Frontal view. B, Frontal view with smile. C, Lateral view. D, Frontal view with Oblique view

Figure 5: A, Frontal view. B, Lateral view. C, Maxillary Occlusal view. D, Mandibular Occlusal view.

Discussion

Maxillary midline diastema presents a unique clinical challenge due to its multifactorial etiology and high tendency for relapse. In the present case, careful diagnosis played a crucial role in identifying the underlying cause and selecting an appropriate treatment approach. Literature emphasizes that etiological factors such as aberrant labial frenum, tooth size–arch length discrepancies, and oral habits must be thoroughly evaluated before initiating treatment[1,2]. Failure to address these factors may compromise treatment stability and lead to recurrence of the diastema[5].

Orthodontic space closure using fixed appliances remains the most widely accepted treatment modality for midline diastema, especially when associated with spacing or malalignment[4]. In this case, controlled tooth movement allowed for precise approximation of the central incisors while maintaining proper axial inclination and occlusal relationships. Adjunctive procedures, such as frenectomy, may be indicated in cases with high frenum attachment; however, the timing of such intervention is critical and is often recommended after orthodontic space closure to minimize scar-related relapse[6].

A key concern in the management of midline diastema is relapse, which has been widely documented in the literature. Factors contributing to relapse include elastic recoil of transseptalfibers, persistent etiological factors, and inadequate retention protocols[7]. Therefore, long-term or even permanent retention is often advocated. Bonded lingual retainers or removable retainers can be used effectively to maintain treatment results[3]. In the present case, fixed retention was done, contributing to the stability of the achieved outcome.

Interdisciplinary management may also be required in certain cases, particularly when diastema is associated with missing teeth or tooth size discrepancies, where restorative or prosthetic intervention may be necessary to achieve optimal esthetics[3]. Overall, successful management of maxillary midline diastema depends on accurate diagnosis, individualized treatment planning, and strict adherence to retention protocols. The present case supports existing evidence that a comprehensive and etiologically driven approach can yield stable and aesthetically pleasing results.

Conclusion

Present case report showed with presence of midline diastema in upper arch andwhich was corrected by non-extraction fixed orthodontic mechanotherapy. A correct diagnosis and early intervention of etiology is always necessary for a proper treatment plan with long term/ permanent retention to maintain the stability of the treatment outcome.

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