Maxillary Midline Diastema

Maxillary midline diastemas are an esthetic concern for many patients. Diastema seen in many children as part of normal development in mixed dentition, disappears naturally in most cases as dental development proceeds. It may however persist either because if its width or other associated factors. If it is to be closed satisfactorily by orthodontics an understanding of aetiology is essential.

Summary

- Orthodontic management of diastema closure is determined by **size of diastema** and the **underlying causes**.
- Following active treatment, **retention** by **bonded lingual retainers** is often needed in association with **removable retainers**.
- Any relapse of a midline diastema post0treatment is of concern to patients.

Common Causes of Midline Diastema

Physiological (normal development)

- Diastema appears as a **consequence of growth** in width of the jaws in preparation for permanent teeth eruption.
- The maxillary unerupted permanent canines lie superior and distal to apices of lateral incisor roots, and as they erupt, they tend to force the incisors towards the midline, closing the space.
- In most cases, a diastema <2mm will close spontaneously, unless patient has generalized spacing of dentition.
- The incidence of diastemas varies with age group and race studied.

Incidence at Age 14	
12%	White Girls
17%	White Boys
19%	Black Girls
26%	Black Boys

83% of patients with diastema at 9 years old had no diastema at 16 years.

Mesio-distal angulation of incisors

- **Root convergence:** distally inclined incisors (crowns) ➔ diastema with space positioned towards the incisal edges of incisors.
- **Root divergence (black triangle):** mesially inclined incisors (crowns) ➔ coronally positioned contact point ➔ gingivally placed diastema.
  - Associated with reduced papilla infill.
  - 40% of crowded maxillary incisors are expected to produce a black triangular space at midline after fixed appliance treatment (unless something is done to close space before appliances are removed)
  - There is high incidence of **concave mesial surfaces** in crowded maxillary incisors, making the black triangle more apparent as teeth are de-crowded orthodontically.
    - Distance ≤ 5mm the papilla was usually present
    - Distance = 6mm the papilla was present 56%
    - Distance ≥ 7mm the papilla was present 27%

Proclination of anterior teeth

- Results in greater arch circumference leading to **anterior spacing**

Tooth size or shape discrepancy

- Most common: **small lateral incisors**
- Associated shape discrepancies: **central incisors** that are excessively **triangular** or have mesial surfaces that are either concave or convex
- Bolton Analysis may be used to compare tooth size discrepancies
- Most amenable to restorative and prosthetic solutions

Abnormal Labial Frenum

- A frenum that is exhibiting **excessive thickness** and alveolar attachment **between central incisors** with a **large incisive papilla.**
- There is a broad consensus, that when there is a v-shaped radiolucency (notch) in crestal bone, on x-ray combined with a large diastema (2mm) and a thick fleshy frenum, then a **frenectomy** is indicated.
- Clinical sign, blanching of incisive papilla when pulled upward and outward.

Missing Maxillary Lateral Incisors

- Allow **maxillary central incisors** to **drift distally.**
- No physiological pressures placed on these teeth to close together as canines erupt.

Tooth tissue/arch size ratio discrepancy

- Size discrepancy between teeth and jaws can result in **generalized spacing** in patients with good occlusions.

Ectopic maxillary canines

- Absence of canines from their normal positions can facilitate **distal drift and tilt of incisors with space opening** and there is associated lack of physiological pressures to upright the lateral and central roots that normally closes the diastema.

Pathology

- Midline cyst is a rare cause of a midline diastema in children.
- Adults, more commonly, present with spacing and diastema secondary to **periodontal disease** and **bone loss**.

Less Common Causes of Midline Diastema

Hypotonic Lips

- Because of reduced lip pressure on labial aspect on teeth, labial segments may procline and space

Habits (thumb/digit sucking)

- Tendence to procline the maxillary labial segment which may lead to spacing and diastema in some patients

Development (supernumerary mesiodens)

- Maxillary midline supernumerary is a rare cause of midline diastema in children.

Iatrogenic

Treatment

Many patients seek closure of diastema for aesthetic reasons, speech and following periodontal disease.

1. Normal Physiological Development

- Diastemas <2mm in 9-year-old children generally close spontaneously.
  - If they do not, small diastemas can be closed with **finger springs** on **removable appliance**.
  - In adults with wider diastemas, **fixed appliances** are required for correction so that crown and root angulations are controlled.

2. Tooth Size / Shape Discrepancy

- In patients with small maxillary laterals, restoration of these teeth is best aided by **movement of laterals mesially** so that most restorative build-up takes place on their distal aspect to simulate morphology of normal lateral incisors.
- In cases where build up of small central incisors is also needed, **mesial crown and root movement** will facilitate restorative build up on distal aspect for better aesthetics.
- Tooth Shape Discrepancies require modification of crown morphology. This involves **disking of mesial surface** or **restorative measures** to modify the defect.

3. Tooth tissue/arch size Ratio Discrepancy

- In patients with generalized spacing, **co-operation** between orthodontists and dentist is advised so that teeth can be positioned for maximum restorative effect.
  - **Closing some spaces** and **opening of others** so that good aesthetic crown contour can be established.
  - **Prolonged retention** is a requirement in these patients.

4. Mesio-distal Angulation of Incisors—root divergence

- Dramatic aesthetic and functional effects may be achieved by **moving crown contact point gingivally**, controlling movement of crowns and roots to optimal position.
  - Central incisor roots are **uprighted** towards each other, shortening the vertical height of gingival embrasure
  - Unsightly black triangle can be eliminated, and papillary growth stimulated.
    - Contact point between incisors is **orthodontically moved closed to alveolar crest bone** between teeth.

5. Abnormal Labial Frenum

- Ideally, frenectomy should be carried out at the end or near the end of orthodontic treatment.
  - It is an error to close it early and hope that diastema may close. In fact, early frenectomy my cause scar tissue that might prevent space closure.
  - Occasionally, however, surgery may be required during the treatment (if frenum tissues become inflamed while teeth are approximating)
  - A study found **strong potential relapse** after orthodontic closure in diastemas wider than 2mm

6. Retention

- A **bonded palatal fixed retainer** is advisable in majority of cases to stabilize the result post treatment.
- In wider diastemas, this retention should be permanent.
- As with all bonded retainers, patients should be instructed in **good oral hygiene** including use of **floss threaders**.
- It is also recommended to provide patients who have bonded retainers with a **removable Hawley Retainer** to be worn at night for first few years.

7. Restorative Treatment

- There are restorative solutions to cases **without orthodontic intervention**. However, care must be taken for hygiene problems and crown width/length ratio.
- In cases of combined orthodontic—restorative treatment, orthodontist and restoring dentist should collaborate at diagnostic phase.
- Maxillary midline spacing can be reduced or temporarily closed with **composite resin directly** on proximal surfaces of teeth adjacent to space without bonding agent, prior to orthodontics. It may then be removed as tooth movement proceeds.