Resolving mandibular arch discrepancy through utilization of leeway space

MATRISHVA B. VYAS, NA VIN HANTODKAR

Abstract
Space management through utilization of leeway space represents one of the most critical aspects of interceptive orthodontic treatment in mixed dentition based on its potential to prevent crowding in the permanent dentition. Lingual arch is the most frequently used space maintaining device for preserving leeway. Case reports of patients in whom potential space discrepancy in mandibular arch was managed through preservation and utilization of leeway space are presented.

Keywords: Leeway space, lingual arch, space maintenance

Introduction
For more than a quarter century, dental profession has encouraged increased interest in the prevention-oriented oral care. Today prevention-oriented services are anticipated for majority of our patients, in stark contrast to rehabilitative nature of similar programs a generation ago. This is reflected by recent interest in early interventional treatments.

Space management through utilization of leeway space represents one of the most critical aspects of orthodontic treatment in mixed dentition based on its potential to prevent crowding in the permanent dentition.

Lingual arch is the most frequently used space maintaining device to preserve leeway in the mandibular arch.

Leeway is the difference between the combined mesio-distal widths of the primary cuspid and molars and their permanent successors. According to Nance,[1,2] this difference is 1.7 mm in the mandible and 0.9 mm in the maxilla, in each quadrant. The normal leeway according to Moyers[3] is 2.6 mm in the maxilla and 6.2 mm in the mandible. However, this varies considerably and should be measured in each patient. The greatest difference exists between the mesio-distal width of second primary molar and second bicuspid[4] and is often referred to as ‘E’ space.

Leeway could be measured by variety of methods including conventional radiographs,[5] mathematical calculations,[6,7] probability charts[8] and so on. For the present clinical study, Moyers probability chart[8] was used for calculating leeway. This is a simple method in which by calculating the sum of mesio-distal widths of lower incisors, the sum of mesio-distal widths of unerupted cuspid–bicuspid could be predicted.

Loss of leeway space resulting from mesial migration of first permanent molar after exfoliation of second primary molar constitutes the most significant decrease in arch length from 4 to 17 years. Moorrees[9] has demonstrated that arch perimeter decreases approximately 3.5 mm in boys and 4.5 mm in girls during the transition to permanent dentition.

So by preserving leeway, potential for eliminating incisor crowding exists. And it is this potential that has been explored in the presented cases.

Mandibular arch—limited potential
The management of mandibular leeway space is more critical, as it is this arch where fewer therapeutic possibilities exist. This is because of its limited expansion possibility, unstable labialization of incisors and difficulty in molar distallization.

The normal eruption sequence in the mandibular arch is cuspid, first bicuspid, followed by second bicuspid. This normal cuspid–bicuspid eruption sequence provides maximum opportunity for space preservation.

Case selection
Cases in mixed dentition with class I permanent molar relationship, clinically showing mild to moderate amount of space discrepancy in mandibular arch in the form of incisor crowding or potential danger of space discrepancy due to premature loss of deciduous teeth, were selected.

In all the cases, leeway space was assessed by prediction chart[8] to find out whether it is sufficient or near sufficient for resolving the space discrepancy.
Case Reports

All the patients reported with primary complaint of either crowding or proclination in upper anterior teeth during mixed dentition for orthodontic treatment. Incidentally the necessity for leeway preservation in mandibular arch for correction of anterior discrepancy was envisioned. So, to preserve leeway, fixed lingual arch soldered to molar bands was cemented in all cases. Omega loop in second deciduous molar region was incorporated for adjustments if any. Molar tubes were welded on the bands for second phase of mechanical correction if needed.

Patients were kept under observation till complete permanent dentition erupted, without any orthodontic mechanics. Deciduous teeth were extracted in a sequential manner to guide the eruption of permanent teeth.

Case 1
An 11-year-old girl reported with chief complaint of crowding in upper anteriors during mixed dentition. On perusal of her mandibular arch, it was revealed that the left deciduous cuspid had exfoliated, and the space between permanent lateral incisor and deciduous first molar appeared to be 25% of its original width. Mild crowding in lower anteriors was also seen [Figure 1a]. This type of appearance can mislead many clinicians to believe that there is a severe space discrepancy and might prompt an early serial extraction decision involving extraction of first bicuspid.

Leeway was assessed and was found to be only 1 mm less than required to correct the space discrepancy. Lingual arch was cemented. Orthopantomogram (OPG) revealed that left cuspid, and first and second bicuspid were erupting more or less simultaneously and hence left deciduous first and second molars were extracted [Figure 1b]. Right deciduous second molar was also extracted at the same time. The space thus provided by leeway space allowed uneventful eruption of left cuspid, and first and second bicuspid [Figure 1c]. Some amount of crowding was visible in left lateral cuspid segment after eruption of permanent teeth. However, considering the fact that left second bicuspid was rotated, its derotation would provide some space needed to correct crowding. The case was thus well managed with leeway space preservation, leaving only a minor discrepancy to be corrected using orthodontic appliance.

Case 2
A 12-year-old boy reported with complaint of over-retained maxillary deciduous cuspid and labially erupting successors. Perusal of his mandibular arch revealed 4 mm crowding in anteriors. Second deciduous molar on left side was present, whereas on right side it had just exfoliated. Cusp tips of erupting second bicuspid were visible. The ‘E’ space was clinically evident on the right side [Figure 2a].

Lingual arch was cemented and left second deciduous molar was extracted. Six months later, self-correction of crowding in anterior region was visible [Figure 2b]. This was due to the distal drifting of first bicuspid in ‘E’ space. Eruption of second bicuspid led to the utilization of ‘E’ space on right side, whereas it was still visible on left side.

After another 7 months, the alignment further improved [Figure 2c], thus demonstrating the positive, continuous, and progressive influence of leeway preservation toward maintenance of harmony.

Case 3
A 10-year-old girl reported for orthodontic correction of rotations in upper anteriors. Lower arch had lingually erupted left lateral incisor; left first deciduous molar was about to
exfoliate and cusp tip of successor was visible clinically [Figure 3a]. Her OPG revealed that there was lack of space for eruption of left lower cuspid and due to same it was rotated [Figure 3b]. Leeway was calculated and found to be only 1.5 mm less than required to align complete permanent dentition.

Lingual arch was cemented, and deciduous cuspid and first molar on left side were extracted. Four months later, second deciduous molars were also extracted. After 14 months of observation period, complete permanent dentition had erupted mesial to first molar with marked improvement in crowding. Only 1.5 mm of crowding was seen in left lateral incisor cuspid region [Figure 3c]. This minor discrepancy was well within the bounds of short-term orthodontic correction.

Case 4
This case depicts a classic example of physiologic drift of teeth in the space provided by extraction of adjacent teeth.[10]

A 9-year-old boy reported with crowding in lower anteriors during mixed dentition [Figure 4a]. After cementation of lingual arch, deciduous cuspids on both sides were extracted. Four months later, crowding in lower anteriors unraveled with utilization of extraction space of deciduous cuspids [Figure 4b].

At this stage, first deciduous molars of both sides were extracted. After 2 months, OPG was taken to assess the
eruption of cuspid–bicuspids. It revealed; first bicuspid were erupting ahead of cuspid [Figure 4c]. This sequence of eruption may lead to blocked out cuspid as there is a possibility of first bicuspid erupting mesially into the cuspid space. To avert such situation, decision was made to extract second deciduous molars at this stage. This allowed distal drifting of first bicuspid into ‘E’ space due to eruptive force of cuspid and resulted in proper eruption of cuspid and bicuspid. Lower incisor crowding was remarkably resolved with utilization of leeway space [Figure 4d].

Many clinicians will be tempted in such cases to bond orthodontic appliances to correct crowding. But it is very vital to resist such temptation and provide nature a chance to take her care. Such natural corrections are not only non-traumatic to the periodontium but also are stable.

**Conclusions**

Indication for this type of intervention in the mixed dentition is the space analysis that indicates that there is adequate space in the arch if molars do not move mesially. In other words, the space is adequate if it is managed. The objective is to allow the teeth to erupt and align without any arch perimeter shortening.

Lack of appreciation of this fundamental mechanism of accommodation may lead to prolonged, less desirable orthodontic correction.

**References**

1. Nance HN. The limitations of orthodontic treatment; mixed dentition diagnosis and treatment. Am J Orthod 1947;33:177-223.
2. Nance HN. The limitations of orthodontic treatment; diagnosis and treatment in the permanent dentition. Am J Orthod 1947;33:253-301.
3. Moyers RE. Handbook of orthodontics. 4th ed. Ann Arbor, Michigan: Year book medical publishers Inc; 1988. p. 127.
4. Proffit WR. Contemporary Orthodontics. 2nd ed. St. Louis, Missouri, USA: Mosby Year book; 1993. p. 83.
5. Graber TM, Vanarsdall RL. Orthodontics: Current principles and Techniques. 2nd ed. St. Louis, Missouri, USA: Mosby Year book; 1994. p. 329.
6. Hunter WS. Application of analysis of crowding and spacing of the teeth. Dent Clin North Am 1978;22:563.
7. Huckaba GW. Arch size analysis and tooth size prediction. Dent Clin North Am 1964;11:431-440.
8. Moyers RE. Handbook of Orthodontics. 4th ed. Ann Arbour, Michigan: Year Book Medical Publisher; 1988. p. 238.
9. Moorrees CF, Reed RB. Changes in dental arch dimensions – expressed on the basis of tooth eruption as a measure of biologic age. 1965;44:129-41. (Cited from Graber TM, Vanarsdall RL. Orthodontics: Current Principles and Techniques. 2nd ed. Ann Arbour, Michigan: Mosby year book; 1994. p. 318.
10. Papendreas SG, Buschang PH, Alexander RG, Kennedy DB, Koyama I. Physiologic drift of the mandibular dentition following first premolar extractions. Angle Orthod 1993;63:127-34.

**How to cite this article:** Vyas MB, Hantodkar N. Resolving mandibular arch discrepancy through utilization of leeway space. Contemp Clin Dent 2011;2:115-8.

**Source of Support:** Nil. **Conflict of Interest:** None declared.