

**Original article:**

## Mean Leeway space in Indian population

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### Abstract:

**Introduction:** During normal occlusal development, the change of the buccal segment starts approximately at the age of 9  $\frac{3}{4}$  in girls and 10  $\frac{1}{2}$  in boys and finishes 1  $\frac{1}{2}$  years later when the permanent canine of the maxilla erupts, varying individually. Literature shows many research studies carried out on various populations to know the mean leeway space. But there is no study reported in Indian literature regarding mean Leeway space measurements in Indian population. This study hence is aimed to measure the mean Leeway space in Indian population. The aim of this study was to calculate the mean leeway space in Indian population.

**Material and methods:** 124 OPG of age group 6 to 13 year exhibiting mixed dentition were initially selected. These 124 OPG were further screened and 35 OPG which were fulfilling the following criteria were finally selected for the study.

**Result:** The average Leeway Space found in girls is around 0.94 mm in the upper jaw and approximately 1.96 mm in the lower jaw. In boys the average Leeway Space is around 1.04 mm in the upper jaw and 1.98 mm in the lower jaw.

**Conclusion:** The results of this study states that the leeway space in Indian population is much less than that what was anticipated. Thus the clinicians will have to depend on other procedures for gaining space along with leeway space in treating borderline cases.

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### Introduction:

During normal occlusal development, the change of the buccal segment starts approximately at the age of 9  $\frac{3}{4}$  in girls and 10  $\frac{1}{2}$  in boys and finishes 1  $\frac{1}{2}$  years later when the permanent canine of the maxilla erupts, varying individually. The space occupied by the primary canines and molars is greater than that required for the corresponding permanent teeth, i.e. canine and premolars. This size difference of the primary and permanent teeth is known as the "LEEWAY SPACE". On average 0.7 - 1.3 mm excess space exist in each upper quadrant and 1.6 - 2.7 mm in the lower quadrants with significant individual variation.<sup>1, 2, 3</sup>The Leeway Space is available particularly because the second primary molars are on average 2 mm larger than the second permanent premolars.<sup>4</sup> To align a

crowded dentition, space is necessary. In the mixed dentition, one mechanism for gaining space for alignment is to preserve the leeway space, which can be as much as 4.3 mm.<sup>5</sup>

The Leeway Space becomes important during the change of dentition and the occlusal development. Precise knowledge of the available Leeway Space forms the basis for decisions about possible orthodontic treatment. A common question/dilemma is whether there is enough space for all teeth or does one have to consider tooth extractions. Space deficit, called physiological crowding, in the lower front area is typical once the permanent incisors have erupted. The Leeway Space can be utilized to solve this crowding simply by preventing the mesial drift of the lower 1st molars by a lingual arch placed before the

exfoliation of the 2nd primary lower molars. A great part of the Leeway Space in the upper jaw is used up by the permanent canines which are usually 1mm wider than their predecessors.<sup>4</sup>

Literature shows many research studies carried out on various populations to know the mean leeway space. But there is no study reported in Indian literature regarding mean Leeway space measurements in Indian population. This study hence is aimed to measure the mean Leeway space in Indian population. The aim of this study was to calculate the mean leeway space in Indian population.

#### **Material and methods:**

The study was conducted in Department of Orthodontics & Dentofacial Orthopaedics, C.S.M.S.S. Dental College & Hospital, Aurangabad. 382 OPG which were taken for some dental purpose were screened initially for age. 124 OPG of age group 6 to 13 year exhibiting mixed dentition were initially selected. These 124 OPG were further screened and 35 OPG which were fulfilling the following criteria were finally selected for the study.

#### **Inclusion criteria:**

1. OPG showing C, D and E in all the quadrants with successors 3,4 and 5 seen .
2. OPG showing no proximal or fillings with C,D, E as it can reduce or increase tooth size.
3. OPG showing no pathologies that affect the enamel or the dentin of C,D,E i.e. all types of Amelogenesis imperfecta and Dentinogenesis imperfecta reduce tooth size.
4. No cleft palate.
5. No therapeutic slicing.

#### **Exclusion criteria:**

1. OPG showing missing deciduous canine or molars.
2. OPG showing proximal carious tooth or crowns.
3. OPG showing missing permanent canine or premolar.
4. OPG showing cyst or tumours of either jaws or other pathology.
5. OPG showing rotations with C,D,E or 3,4,5.
6. OPG in which crowns of 3,4,5 were not completely formed.

Crowding or other abnormalities in tooth position were not relevant for this study and were not exclusion criteria as the Leeway Space is derived from the sum of the mesiodistal width of each tooth, measured separately, at their greatest width and not at the points of mutual contact. A total of 35 OPG of age group 6 to 12 years(19 males and 16 females ) having C, D and E in all the quadrants with successors 3,4 and 5 seen were finally selected for the study. Using a digital calliper, we measured the mesiodistal width of deciduous canine and molars and permanent canine and premolars in all four quadrants that is all together 24 measurements were made on 1 panoramic radiographs taken with a PAX i UNIT VERSION 1.O.O. GYEONGGI-DO,KOREA. All measurement were done by the same operator and twice to avoid any error. Digital callipers which were used in the present study reduce the personal bias in reading the value and it is also possible to give the results with two decimal places rather than only one. Repeated measurements of the same teeth assure a higher reliability .<sup>6</sup> Some state that the computer assisted measurements have higher accuracy and reproducibility,<sup>7</sup> others conclude that measurements with callipers show higher reliability<sup>8</sup> or that the results of the computer assisted measurements over-estimated the actual dimensions . The

magnification factor was 1.3 constant.i.e if actual size of object was 100 mm, on OPG, size of object was 130 mm. So the formula used to calculate the actual mesiodistal width of deciduous canine and molar and permanent canine .

**True length of object/radiographic length of object × Radiographic width of teeth**  
 True length of object/radiographic length of object= 100/130=0.77

The ratio of original length of object to radiographic length of object is constant.i.e 0.77.so Actual width of tooth=0.77× Radiographic width of tooth

The actual total mesiodistal width of permanent canine and premolar was subtracted from actual total mesiodistal width of deciduous canine and

molar and leeway space was calculated .The data obtained was statistically evaluated to obtain mean leeway space in each quadrant in both the upper and lower jaw.

**Result:**

The average Leeway Space found in girls is around 0.94 mm in the upper jaw and approximately 1.96 mm in the lower jaw. In boys the average Leeway Space is around 1.04 mm in the upper jaw and 1.98 mm in the lower jaw. The standard deviation is around 0.2 mm in all cases. The computed mean Leeway Space together with standard deviations for the true Leeway Space in both upper and lower jaw can be found in Table 1 for girls and in Table 2 for boys.

GIRLS	Mean Leeway Space	Standard Deviation
Upper jaw	0.94 mm	0.218mm
Lower jaw	1.96 mm	0.196mm

Table 1 Mean Leeway Space with Standard Deviation for girls

BOYS	Mean Leeway space	Standard Deviation
Upper jaw	1.04	0.144
Lower jaw	1.98	0.236

Table 2 Mean Leeway Space with Standard Deviation for boys

	GIRLS	BOYS
Upper quadrant leeway space	0.94mm	1.04mm
Lower quadrant leeway space	1.96mm	1.98mm

Table 3 Comparison of Mean Leeway Space for boys and girls.

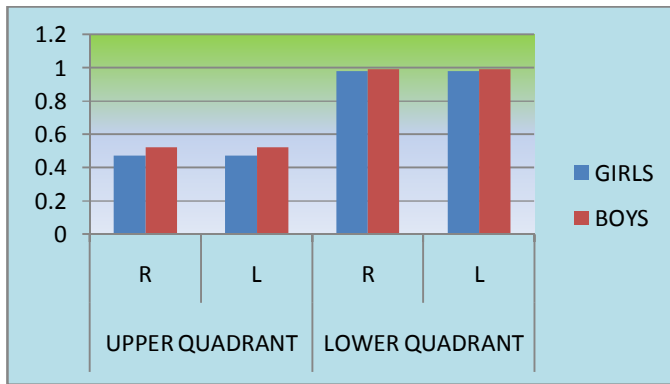


Figure 1: Distribution of the Leeway Space for girls (blue) and the boys (red) for each quadrant.

**Discussion:**

**Mean leeway space in Indian population:**

The mean Leeway Space found in girls was 0.94 mm and 1.96 mm and in boys 0.94 mm and 1.94 mm in the upper and lower jaws, respectively. The difference of leeway space between left and right quadrant is minor and not statistically significant. In general small individual variations of the Leeway Space were found. Out of the 35 subjects, i.e. 140 leeway values. The standard deviation was around 0.2 mm in all cases. Even though 0.2 mm variation is quite small, it may become clinically important.

When compared between the maxillary and mandibular arches it was found that leeway space in maxillary arch was less than the mandibular. The study was conducted on Iranian population to predict the size of permanent canines and premolars. It was found that size of permanent canine and premolar were larger in maxilla than mandible.<sup>10</sup> Our study also shows that size of permanent canine and premolar were larger in maxilla than mandible leading to less leeway space in maxilla as compared with mandible.

**Comparison of leeway space between the genders:**

Furthermore, in both sexes the Leeway Space in the lower jaw is statistically

significantly larger than in the upper jaw. When compared it was found that the mean Leeway Space found in girls was 0.94 mm and 1.96 mm and in boys 1.04 mm and 1.98 mm in the upper and lower jaws, respectively. The study showed that leeway space was larger in boys as compared with girls. This is in controversy with previous studies carried out by Nance, Moorrees, Stokl and also differ from studies on other populations like Zurich.

**Comparison with other population:**

The results of this study were 0.94 mm and 1.96 mm in girls and in boys 1.04 mm and 1.98 mm in the upper and lower jaws, respectively. The values obtained in this study lie between the values from Nance and Moors.<sup>1,2</sup> The leeway space found in Indian population is much smaller than that found in other population. This is in controversy with the results of study conducted by Bishara,<sup>11</sup> Moors, where they have found a leeway space of much larger dimension.

**Conclusion:**

From birth until adulthood and beyond, dental occlusion undergoes significant changes. Changes are more drastic in mixed dentition stage.<sup>12</sup> The early treatment of nonskeletal and skeletal orthodontic anomalies in the deciduous and early mixed dentition is intended to prevent the development of pronounced anomalies in the late

mixed and permanent dentition with the ultimate aim of reducing or even eliminating the need for later orthodontic treatment .<sup>13</sup>

Leeway space as stated by Nance has been considered vital source of space for treatment of cases with anterior crowding. This holds particularly true in the lower dental arch where space issue is commonly more critical than in the upper dental arch. Extraction vs nonextraction has always remained a debate in orthodontic treatment

of borderline cases. Clinicians of the opinion of nonextraction depended on the leeway space for alignment of incisor crowding or proclination. The results of this study states that the leeway space in Indian population is much less than that what was anticipated. Thus the clinicians will have to depend on other procedures for gaining space along with leeway space in treating borderline cases.

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