

University of Babylon  
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5<sup>th</sup> stage

# Orthodontics

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## Lec.3

## Space discrepancy & Space Analysis

**Space discrepancy** is define as a difference between the space needed in dental arch and the available space in that arch and is either crowding or spacing caused by an altered tooth / tissue ratio.

Space discrepancy (crowding or spacing) may be mild, moderate or severe. It may be localized to the anterior or posterior region or may affect the entire arch.

**Spacing:** is the presence of extra space in the dental arch associated with spaces between the teeth, and if present in the midline called a median diastema.

**Crowding:** discrepancy between tooth size and jaw size that result in misalignment of the tooth row in the form of rotation or displacement of teeth.

**Arch length:** is a measurement of space available in the dental arch for alignment of teeth

**Arch length deficiency:** defined as a negative difference between the space available in the dental arch and space required to align teeth.

**Arch length discrepancy :** defined as a difference between the space available in the dental arch and space required to align teeth.

## **Space analysis**

is a process that allows an estimation of the space required in each arch to fulfil the treatment aims. It helps to determine whether the treatment aims are feasible, and assists with the planning of treatment mechanics and anchorage control. Space planning is carried out in 2 phases:

- 1- To determine the space required for relief of crowding, overjet correction and creating space for any planned prostheses.
- 2- Calculates the amount of space that will be created during treatment by molar distalization, arch expansion, inter-proximal reduction (IPR) ...etc.

Before undertaking a space analysis, the aims of the treatment should be determined as this will affect the amount of space required or created.

Space analysis can act only as a guide, as many aspects of orthodontics cannot be accurately predicted, such as growth, the individual patient's biological response and patient compliance.

Space analysis requires a comparison between the amount of **space available** for the alignment of the teeth and the amount of **space required** to align them properly.

If Space available – space required = (- ve) → space deficiency (crowding)  
If Space available – space required = (+ ve) → space excess (spacing)

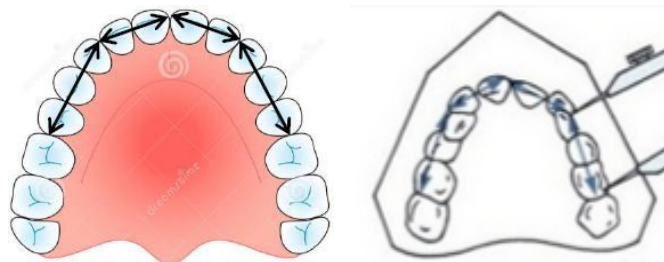
The analysis can be done either directly on the dental casts or by a computer algorithm after appropriate digitization of the arch and tooth dimensions. Digital models make this almost automatic, but whether the space analysis is done manually or in the computer.

**The first step is the calculation of space available.**

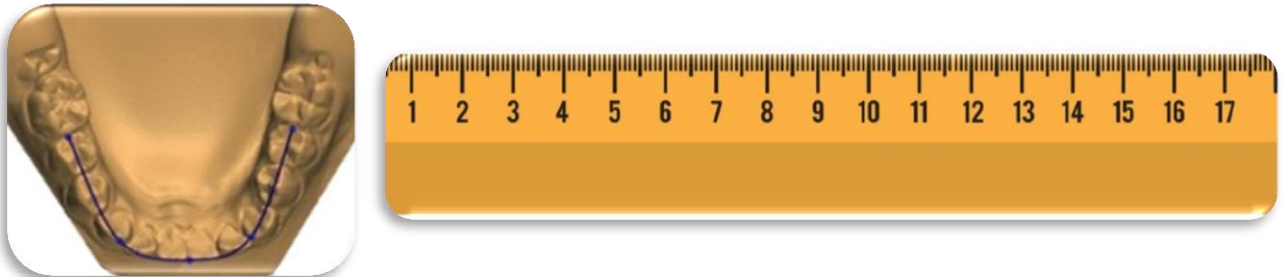
**The space available** means the arch length available to accommodate the present teeth which is measured from the mesial side of 1st permanent molar in one side to the mesial side of the 1st permanent molar in the other side, over the contact points of posterior teeth and incisal edge of anteriors.

There are two basic ways to calculate it manually:

- 1- **Segmental arch length measurement:** By dividing the dental arch into straight line segments. Typically, from the first molars to the canines for the distal segments and between the canines for the anterior segment. Each segment is measured individually with a sharp pointed caliper. The sum of all these segments on both sides represents the available space.



- 2- By using a soft brass wire. The wire is placed touching the mesial aspect of first permanent molar, passed along the arch and continued the same way up to the mesial surface of the permanent 1st molar of the contralateral side. The wire is then straightened to measure the space available on ruler.



We should keep in our mind the following tips during calculate the space available by brass wire method :-

- ❖ In case of proclined incisors, the brass wire should be passed along the cingulum of anterior teeth.
- ❖ In case of retroclined incisors, the brass wire should be passed along the labial surface of anterior teeth.
- ❖ In case of well aligned anterior teeth, the brass wire should be passed along the incisal edges of anterior teeth.



Proclined anterior



Retroclined anterior



Well aligned

**The second step is the calculation of space required for alignment of the teeth.**

This is done by measuring the mesiodistal width of the teeth anterior to the 1<sup>st</sup> permanent molar (incisor, canines & premolars) from contact point to contact point by using pointed caliper and then summing the widths of these teeth together to obtain the required space.

The difference between the arch length (space available) and the actual measured tooth material (space required) gives the space analysis

If the sum of the widths of the permanent teeth is greater than the amount of space available, there is an arch perimeter space deficiency and crowding would occur. If available space is larger than the space required (excess space), gaps between some teeth would be expected.

If Space available – space required = (- ve) → space deficiency (crowding)

If Space available – space required = (+ ve) → space excess (spacing)



Space analysis carried out in this way is based on three important assumptions:

- (1) the anteroposterior position of the incisors is correct (i.e., the incisors are neither excessively protrusive nor retrusive),
- (2) the space available will not change because of growth; and
- (3) all the teeth are present and reasonably normal in size.

All of them must be kept in mind when space analysis is done. With regard to:-

**The first assumption,** it must be remembered that incisor protrusion is relatively common and that retrusion, though uncommon, does occur. There is an interaction between crowding of the teeth and protrusion or retrusion: if the incisors are positioned lingually (retruded), this accentuates any crowding; but if the incisors protrude, the potential crowding will be at least partially alleviated. Crowding and protrusion are really different aspects of the same phenomenon. If there is not enough room to properly align the teeth, the result can be crowding, protrusion, or (most likely) some combination of the two. For this reason, information about how much the incisors protrude must be available from clinical examination to evaluate the results of space analysis. This information comes from facial form analysis (or from cephalometric analysis if available).

**The second assumption,** that space available will not change during growth, is valid for most but not all children. In a child with a well proportioned face, there is little or no tendency for the dentition to be displaced relative to the jaw during growth, but the teeth often shift anteriorly or posteriorly in a child with a jaw discrepancy. For this reason, space analysis is less accurate and less useful for children with skeletal problems (Class II , Class III , long face, short face) than in those with good facial proportions, even in children with well-proportioned faces, the position of the permanent molars changes when primary molars are replaced by the premolars. If space analysis is done in the mixed dentition, it is necessary to adjust the space available measurement to reflect the shift in molar position that can be anticipated.

**The third assumption** can (and must) be checked by clinical and radiographic examination, looking at the teeth as a set rather than as individual units. Anomalies in tooth size have significant implications for space in the dental arches .