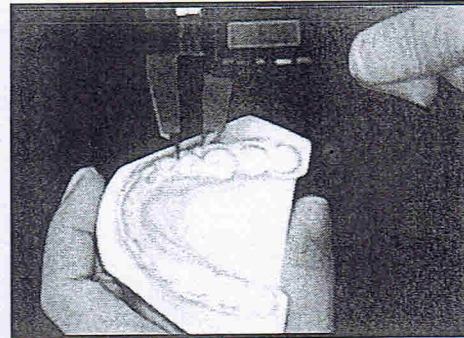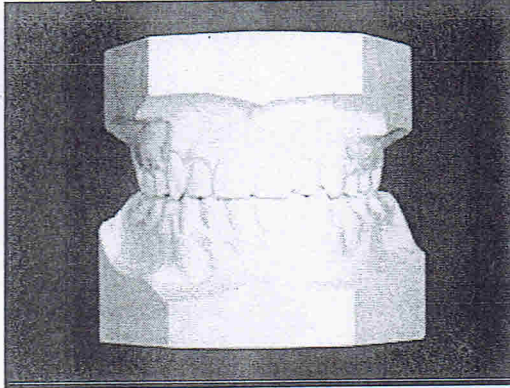## Study Model (Cast) and Study Model Analysis (part 2)

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There are some factors that should be considered during space analysis:

1. Crowding
2. Incisor anteroposterior position change (usually obtaining a normal overjet of 2 mm)
3. Levelling curve of spee
4. Arch contraction (expansion will create space)
5. Correction of upper incisor angulation (mesiodistal tip)
6. Correction of upper incisor inclination (torque)

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1. Crowding

The amount of crowding present can be calculated by measuring the mesiodistal widths of any misaligned teeth in relation to the available space in the arch (Fig. 7.4). The amount of crowding present is often classified as:

- Mild (<4mm)
- Moderate (4-8mm)
- Sever (>8mm)

3

2. Incisor anteroposterior position change

It is often necessary to alter the anteroposterior position of the upper incisors, particularly when reducing an overjet. If incisors are retracted, this requires space; if incisors are proclined then space is created. The aim is to create an overjet of 2 mm at the end of treatment.

Every millimetre of incisor retraction requires 2 mm of space in the dental arch. Conversely, for every millimetre of incisor proclination 2 mm of space are created in the arch.

For example, if a patient presented with an overjet of 6 mm and the incisors needed to be retracted to create a normal overjet of 2 mm, then this would require space. Every millimetre of retraction requires 2 mm of space. So to reduce the overjet by 4 mm would require 8 mm of space.

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3. Levelling curve of spee

Where there is no occlusal stop the lower incisors may over-erupt. This may result in an occlusal curve which runs from the molars to the incisors and is known as a Curve of Spee as seen in Fig 7.5. The amount of space required to level an increased curve of Spee is controversial, as it is affected by a number of factors, such as the shape of the archform and tooth shape. However, as a guide Table 7.1 gives an estimation of the space required. The depth of curve is assessed from the premolar cusps to a flat plane joining the distal cusps of first permanent molars and incisors. Flattening deep curves of spee increasing arch length and labially proclines the incisors teeth.
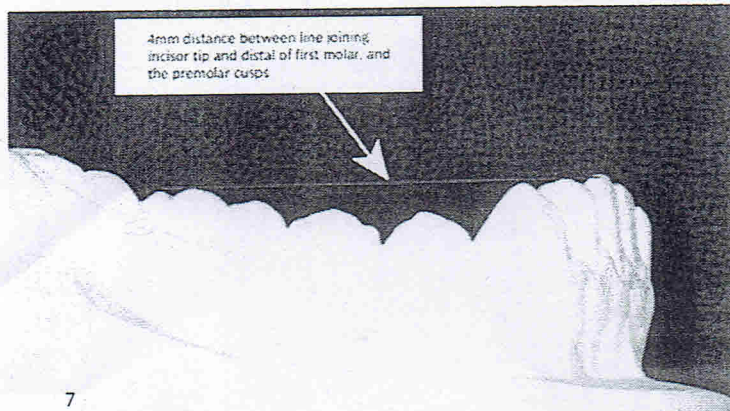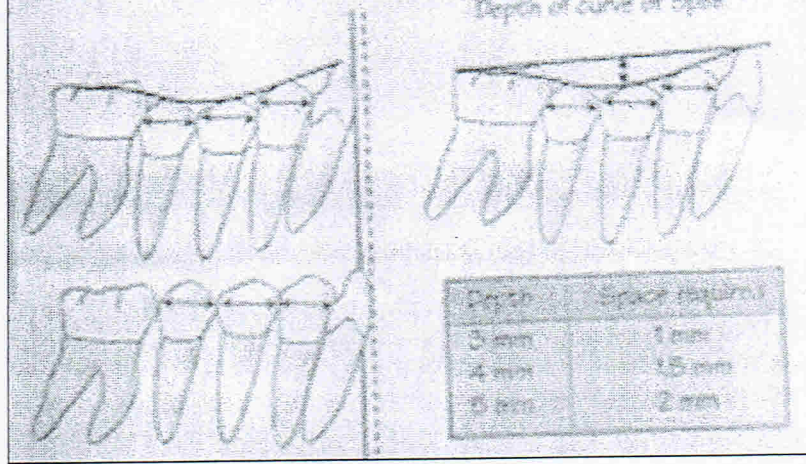
Depth	Space requirement
3 mm	1 mm
4 mm	1.5 mm
5 mm	2 mm

4mm distance between line joining incisor tip and distal of first molar, and the premolar cusps

Table 7.1 Approximate space requirement to flatten a curve of Spee

Depth of curve (mm)	Space requirement (mm)
3 or less	1
4	1.5
5 or more	2

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4. Arch contraction

Upper arch lateral expansion is undertaken to correct posterior crossbite and is useful in providing space for the relief of crowding . Every 1mm of lateral expansion creates approximatlly 0.5mm of space within the arch while arch contaction requires space.

5. Correction of upper incisor angulation (mesiodistal tip)

The space required to correct incisors angulation is usually minimum.
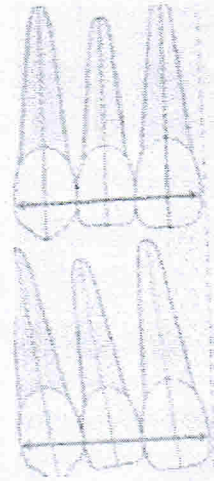
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6. Correction of upper incisor inclination (torque)

Changing the incisors inclination (torque) has space implications. When incisors are proclined, the overjet increases and space required to normalise this increase. When proclined incisors are retroclined, every 5 degree of retroclination will reduce the overjet by 0,5mm and requires 1mm of space.

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BOLTON ANALYSIS OF TOOTH SIZE DISCREPANCE

A tooth size discrepancy is a disproportion amongst the sizes of individual teeth and is a reason why it is impossible to achieve an ideal occlusion orthodontically (overbite,overjet and interdigitation).

Bolton evaluated the ideal ratio of tooth material between maxillary and mandibular arch of 55 cases with excellent occlusions.The maxillary tooth material should approximate desiarable ratios, as compared to mandibular tooth material. Bolton analysis helps to determine the disproportion between the size of maxillary and mandibular teeth.

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- He described two ratios for ideal occlusion:
- The first for the rario of tooth widths associated with anterior teeth (anterior ratio) and the second for the whole arch from first molars forwards (overall ratio)

$$\text{Overall ratio} = \frac{\text{sum of the mesiodistal widths of the mandibular 12 teeth}}{\text{sum of the mesiodistal widths of the maxillary 12 teeth}} \times 100$$

$$\text{Anterior ratio} = \frac{\text{sum of the mesiodistal widths of the mandibular anterior 6 teeth}}{\text{sum of the mesiodistal widths of the maxillary anterior 6 teeth}} \times 100$$

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1. Overall ratio: the sum of the mesiodistal widths of the 12 mandibular teeth should be 91.3% the mesiodistal widths of the 12 maxillary teeth. If the overall ratio is greater than 91.3% then the mandibular tooth material is excessive; but if the overall ratio is less than 91.3% ratio then the maxillary tooth material is excessive.

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2. Anterior ratio: the sum of the mesiodistal widths of the 6 mandibular anterior teeth should be 77.2% the mesiodistal widths of the 6 maxillary anterior teeth. If the anterior ratio ratio is greater than 77.2% then the mandibular anterior tooth material is excessive; but if the anterior ratio is less than 77.2% ratio then the maxillary anterior tooth material is excessive.

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