Lec.8 Orthodontics Dr. Rawaa Saadoon

Crowding and spacing

Crowding occurs where there is a discrepancy between the size of the teeth and the size of the arches. Approximately 60 per cent of Caucasian children exhibit crowding to some degree. In a crowded arch loss of a permanent or deciduous tooth will result in the remaining teeth tilting or drifting into the space created. This tendency is greatest when the adjacent teeth are erupting.

Classification of crowding: The amount of crowding present is often classified as:

- Mild (<4 mm)
- Moderate (4–8 mm)
- Severe (>8 mm)

Late lower incisor crowding:

The etiology of late lower incisor crowding is recognized as being multifactorial, the following have all been proposed as influences in the development of this phenomenon:

✓ mesial migration of the posterior teeth owing to forces from the erupting third molars. The third molar has a weak association with late lower incisor crowding. Furthermore, this crowding can still occur in patients with congenitally absent third molars. Therefore, prophylactic removal of lower third molars to prevent lower labial segment crowding cannot be justified.

✓ uprightening of the lower incisors as a result of forward growth of the mandible when maxillary growth has slowed.

✓ soft tissue pressures being stronger from the lips and cheeks than from the tongue.

✓ reduction in lower inter-canine width: in most individuals' inter-canine width increases up to around 12 to 13 years of age, and this is followed by a very gradual diminution throughout adult life. The rate of decrease is most noticeable during the mid to late teens.

Creating space:

The amount of space that will be created during treatment can also be assessed. The aim is to balance the space required with the space created. Space can be created by one or more of the following:

1. ***Derotation:*** Derotating anterior teeth needs space while derotating posterior teeth creates spaces.

2. ***Uprigtening****:* Uprightening tilted teeth creates space.

3. ***Distal movement of molars:*** Distal movement of molars in the upper arch is possible. This movement can be achieved with headgear. Extra-oral traction using headgear will usually produce up to 2–3 mm per side (creating 4–6 mm space in total). It therefore tends to be used when there is a mild space requirement where extractions may produce too much space. It can also be used in addition to extractions when there is a very high space requirement.
Temporary bone anchorage devices (TADS) offer an alternative to headgear in some cases. Appliances attached to these anchorage devices can be used to distalize upper molars. Distal movement of the lower first molar is very difficult and in reality the best that can be achieved is uprighting of this tooth.

4. ***Expansion:*** Space can be created by expanding the upper arch laterally approximately 0.5 mm is created for every 1 mm of posterior arch expansion. Expansion should ideally only be undertaken when there is a crossbite. Expansion without a crossbite may increase the risk of instability and the risk of perforation of the buccal plate. Expansion of the lower arch may be indicated if a lingual crossbite of the lower premolars and/or molars exists, but management of this type of malocclusion should be undertaken by the specialist. Any significant expansion in the lower arch, particularly the lower inter-canine width, is likely to be unstable.

5. ***Proclination of incisors:*** Space can be created by proclining incisors, but this will be dictated by the aims of the treatment. Each millimeter of incisor advancement creates approximately 2 mm of space within the dental arch.

6. ***Enamel stripping:*** Enamel interproximal reduction or "stripping" is the removal of a small amount of enamel on the mesial and distal aspect of teeth and is sometimes known as 'reproximation'. In addition to creating space, the process has been advocated for improving the shape and contact points of teeth, and possibly enhancing stability at the end of treatment. On the anterior teeth approximately 0.5 mm can be removed on each tooth (0.25 mm mesial and distal) without compromising the health of the teeth. Enamel can be carefully removed with an abrasive strip, then treated topically with fluoride.

7. ***Extraction:*** Before planning extractions of any permanent teeth, it is essential to ensure that all remaining teeth are present and developing appropriately.

Spacing

Generalized spacing is rare and is due to either hypodontia or small teeth in well-developed arches. Orthodontic management of generalized spacing is frequently difficult as there is usually a tendency for the spaces to re-open unless permanently retained. In milder cases it may be wiser to encourage the patient to accept the spacing, or if the teeth are narrower than average, acid-etch composite additions or veneers can be used to widen them and thus improve aesthetics. In severe cases of hypodontia a combined orthodontic–restorative approach to localize space for the provision of prostheses, or implants, may be required. Localized spacing may be due to hypodontia; or loss of a tooth as a result of trauma; or because extraction was indicated because of displacement, morphology, or pathology. This problem is most noticeable if an upper incisor is missing as the symmetry of the smile is affected.

Hypodontia

Hypodontia is defined as the congenital absence of one or more teeth. The prevalence in a Caucasian population (excluding the third molars) has been reported as being between 3.5 to 6.5 per cent. The third molars are missing in approximately 25–35% of the population. The next most commonly missing teeth are the second premolars (3%) followed by the upper lateral incisors (2%).

Management of missing upper incisors:

Upper central incisors are rarely congenitally absent. They can be lost as a result of trauma, or occasionally their extraction may be indicated because of dilaceration. Upper lateral incisors are congenitally absent in approximately 2% of a Caucasian population, but can also be lost following trauma. Both can occur unilaterally, bilaterally, or together. Whatever the reason for their absence, there are two treatment options:

- closure of the space (and camouflage the adjacent teeth).
- opening of the space and placement of a fixed or removable prosthesis.

The choice for a particular patient will depend upon a number of factors:

✓ Skeletal relationship: for a Class II division 1 pattern space closure may be preferable as it will aid overjet reduction.

✓ Number and site of missing teeth. Are incisors missing unilateral or bilaterally?

✓ Presence of crowding or spacing.

✓ Color and form of adjacent teeth: if the permanent canines are much darker than the incisors and/or particularly canine form in shape, modification to make them resemble lateral incisors will be difficult; also, if a lateral incisor is to be brought forward to replace a missing single upper central incisor, an aesthetically pleasing result will only be possible if the lateral is fairly large and has a broad gingival circumference.

✓ The inclination of adjacent teeth, as this will influence whether it is easier to open or close the space.

✓ The desired buccal segment occlusion at the end of treatment; for example, if the lower arch is well aligned and the buccal segment relationship is Class I, space opening is preferable.

✓ The patient's wishes and ability to co-operate with complex treatment: some patients have definite ideas about whether they are willing to proceed with appliance treatment, and whether they wish to have the space closed or opened for a prosthetic replacement.

✓ Long-term maintenance/ replacement of a prosthesis.

Auto transplantation:

This is the surgical repositioning of a tooth into a surgically created socket within the same patient. It is successful to transplant open apex premolars from crowded arches into the sockets of uvulsed central incisors.

Management of Median diastema:

A median diastema is a space between the central incisors, which is more common in the upper arch. A diastema is a normal physiological stage in the early mixed dentition when the frenal attachment passes between the upper central incisors to attach to the incisive papilla. It is important to take a periapical radiograph to exclude the presence of a supernumerary tooth which, if present, should be removed before closure of the diastema is undertaken. As median diastemas tend to reduce or close with the eruption of the canines, management can be subdivided as follows:

✓ Before eruption of the permanent canines: intervention is only necessary if the diastema is greater than 3 mm and there is a lack of space for the lateral incisors to erupt. Care is required not to cause resorption of the incisor roots against the unerupted canines.

✓ After eruption of the permanent canines: space closure is usually straightforward. Fixed appliances are required to achieve uprighting of the incisors after space closure. Prolonged retention is usually necessary as diastemas exhibit a great tendency to re-open, particularly if there is a familial tendency, the upper arch is spaced or the initial diastema was greater than 2 mm. In view of this it may be better to accept a minimal diastema, particularly if no other orthodontic treatment is required. Alternatively, if the central incisors are narrow a restorative solution, for example veneers, can be considered.

If it is thought that the frenum is a contributory factor, then frenectomy should be considered. Opinions differ as to whether this should be done before treatment; during space closure; or following completion of closure of the diastema. There is currently no strong evidence upon which to base the timing of this procedure