ORTHODONTICS

د.عاصم عباس

Lec. 1

Etiology of malocclusion

There are types of malocclusion which have an obvious cause and are preventable or readily amenable to treatment at the proper time. There are some forms of malocclusion where the cause is more obscure and the result less ready to respond to treatment unless by prolonged and complicated techniques. Yet others are believed to be hereditary in origin and beyond prevention. Even here, however, the treatment may be more effective if the intervention is timely than if it is delayed until a full malocclusion is established.

For this reason some knowledge of the way in which malocclusion arises is essential, even where the origin of the condition is still obscure. This knowledge will also be necessary if the practitioner is to avoid such action as may cause or exacerbate a malocclusion during the course of routine dental treatment. Malocclusion is more often result from a complex interaction among factors that influence growth and development.

The etiologic factors of malocclusion can be caused by two main factors:

1. Hereditary influence (genetic factors):

A strong influence of heredity on facial features is obvious, it is easy to recognize familial tendencies in the shape of the jaws, certain types of malocclusion run in families (similar malocclusions in parents and their offspring's as in mandibular prognathism seen in the royal Hapsburg family became known as Hapsburg jaw).

Inherited disproportion between the size or shape of the upper and lower jaws will cause improper occlusal relationships. An example of genetic inheritance is cleft lip and palate.

2. Environmental influence (external factors):

A- Intrauterine fetal molding:

Pressure against the developing face prenatally can lead to distortion of rapidly growing areas, like on rare occasions an arm of the fetus is pressed against his face lead to severe maxillary deficiency at birth.

Or occasionally a fetus head is flexed tightly against the chest in uterus preventing the mandible from growing forward normally, this result in an extremely small mandible at birth, usually accompanied by a cleft palate and reduced volume of the air sinuses leading to respiratory difficulty at birth, this anomaly is called Pierre Robin syndrome.

B- Birth injuries:

Trauma can occur to the mandible during birth process particularly from the use of forceps during delivery.

C- Childhood fractures of the jaws:

The falls and impacts of childhood can fracture jaws, especially condylar neck of the mandible leading to mandibular asymmetry due to a deficient growth on the affected side leading to facial asymmetry.

D- Muscle dysfunction:

Losing part of the musculature due to any reason lead to facial asymmetry because the muscle is an important part of the total soft tissue matrix and its absence will affect the growth of the mandible in the affected side leading to asymmetry.

Excessive muscle contraction due to trauma**,** especially those attached to the mandible, will lead also to facial and mandibular asymmetry due to growth restriction at the affected side.

E- Acromegaly and Hemimandibular hypertrophy:

In Acromegaly and due to over secretion of the growth hormone from the enlarged pituitary gland beyond the growth period, this will lead to overgrowth of the mandible which will lead to SK Cl III without any asymmetry. While in hemimandibular hypertrophy the mandible will start to grow beyond its growth period at only one side (affected side) leading to asymmetry.

Factors affecting occlusal development:

I. General factors:

A- Skeletal factors (dental base abnormalities):

Clinical experience suggested that heredity and ethnic origin are strong factors in determining the shape of the facial bones -including maxilla and mandible- and thus their relationship, but also trauma during development can have the same effect, One example is micrognathia of the mandible arising from physical damage to the condylar head, this may occur as a result of damage to the condyle during development..

Dental bases mean the maxillary and mandibular bones (jaws) which bear the alveolar bone within which teeth are held. Jaws relationship must be studied according to their relation to:

1. Cranial base.
2. Each other.
3. Alveolar processes (bones).

We must differentiate between the dental base and alveolar bone, anatomically there is no separation between them, but such relation is of orthodontic importance. It is not necessary to find the alveolar process and their teeth have got the same relation as that of the basal bone, they may differ but with limited range due to the genetic factors or due to the other factor such as the function, size and behavior of the soft tissues surrounding it (tongue, cheek and lips) or due to environmental factors such as the presence of abnormal habits (thumb sucking).

1. Jaws in relation to the cranial base:

Jaws are part of the total structure of the head, and it is possible for each jaw to vary in its positional relationship to other structures of the head, such variation can exist in sagittal (antero-posterior) and vertical planes and with less extent in lateral plane. It is usual in orthodontic diagnosis to relate the jaw positions to the anterior cranial base (cranial base), as the fixed reference point, so each jaw can be assessed independently in its relationship to the cranial base.

2. Jaws in relation to each other:

The relationship of the jaws can vary in three planes of space:

1. *Antero-posterior relationships (sagittal)*:

One of the following relations arises:

- **Skeletal Cl I (SK I)** means ideal antero-posterior relation of jaws to each other.
- **Skeletal Cl II (SK II)** means lower jaw is further backwards (retrognathic) or upper jaw is forward (prognathic) or a combination of retrognathic mandible and prognathic maxilla.
- **Skeletal Cl III (SK III)** means lower jaw is further forward (prognathic) or a backward position of upper jaw (retrognathic) or a combination of prognathic mandible and retrognathic maxilla.

This relation is completely different from Angle's relation which is merely dental depending on the relation between upper 6 & lower 6 teeth, i.e. it's merely dental. So there are dental relations and skeletal relations.

The variation in the **size of the jaws** can also result in SK II or SK III in addition to their relative position antero-posteriorly.

How can we decide in SK II if it arises from retrognathic mandible or prognathic maxilla or combination?

This can be decided using cephalometric radiography to see the relation of each of the dental bases to the cranium. And this is true for SK I and SK III too.

2. *Vertical relationships*:

Mainly affect the lower jaw; it can be presented with either:

- A high gonial angle of the mandible (the angle between the posterior border of the ramus and the lower border of the mandible) which lead to longer vertical dimension of the face anteriorly this is termed also a high lower facial height [LFH] (measured clinically from a point immediately below the nose to the lowest point on the chin) which lead to an anterior open bite (no overlap between upper and lower anterior teeth on occlusion) which is a true skeletal open bite.
- A low gonial angle which lead to a decrease in vertical dimension of the face & produce the deep bite (the overlapping between the upper and lower anterior teeth is more than normal [2-3 mm]) with decreased lower LFH.

3. *Lateral relationships (transverse)*:

Ideally the jaws match each other when in occlusion, i.e. a buccal occlusion will result, means the buccal and labial surfaces of the upper teeth covers the buccal and labial surfaces of the lower teeth as a reflection of proper

and matching width of both jaws , but with a narrow or wide jaws and with their difference may lead to:

- A cross bite which can be either anterior cross bite (labial surfaces of upper centrals covered by lingual surfaces of lower centrals), or posterior cross bite (upper molars lie lingually to lower molars) which can be unilateral or bilateral, or both anterior and posterior cross bites.
- A scissor bite i.e. lingual occlusion, buccal surfaces of lower molars and premolars are covered completely by palatal surfaces of upper molars and premolars.

This is completely different from dental cross bite where the axial inclination of the teeth according to their dental base is incorrect.

3. Basal bones in relation to their alveolar bones:

The relationship between the upper and lower alveolar bone is not necessarily the same as that between the upper and lower basal bone.

The alveolar bone relationships can only differ from the basal bone relationships within a limited range.

Alveolar bone grows to support the tilted teeth, they may be slightly different in position from the basal bone, however, the teeth cannot be moved completely away from the basal bone during eruption. Therefore it is the basal bone relationships which are most important in occlusal development.

<u>Methods of assessment of skeletal relationship:</u>

1- Clinical:

a. Visual:

Skeletal relationship can be gained simply by observation of the subject in profile. Gross discrepancies may be assessed in this way but less marked discrepancies may be masked by teeth position or by the thickness or posture of the lips.

b. Palpation method (Foster's method):

By using the index and middle fingers (while patient is in profile) in a way parallel to the Frankfort horizontal plane (a plane drown clinically from the external auditory meatus to the lower border of the orbit) and directing the index finger to touch the deepest point of the upper lip while the middle one to touch the deepest point of the lower lip, if both fingers touch then the patient is

SK Cl I, if only the index finger touches then the patient is SK Cl II, if only the middle finger touches the patient is SK Cl III (can be done extraorally or intraorally).

2- Radiographical method:

By using a standardized lateral skull radiographs (Cephalometric radiograph). Depending on some angular measurements specially ANB angle, if it is between 2-4 degrees then the subject has SK Cl I occlusion, if the ANB angle is less than 2 degrees then the subject is a SK Cl III, if the ANB angle is more than 4 degrees then the subject is SK Cl II.

The skeletal relationship in orthodontic treatment:

Orthodontic treatment is confined to tooth movement and has a little effect on the size, shape or relative positions of the basal parts of the jaws, it has a direct effect on tooth position and on the alveolar bone position and form, and as the teeth must be positioned on the basal bones, therefore the skeletal relationship limits the amount of tooth movement which can be achieved (it is difficult to overcome skeletal discrepancies).

Good luck

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Lec. 2

Etiology of malocclusion

B- Muscle factors:

The muscles of the tongue, lips and cheeks are of particular importance in guiding the teeth into their final position, and variation in muscle form and function can affect the position and occlusion of the teeth. Those muscles have their main origins on the basal parts of the jaws, and therefore the position of the jaws must affect the position and action of the muscles which function on the teeth.

The lips:

The several muscles making up the lips can conveniently be considered as a single functional unit. The form and function of the lips can be considered in two planes, vertical and sagittal.

- **Vertical plane:**

In the ideal lip form, the lip muscles in their position of resting posture, the lips meet together with no or minimal muscle contraction this is called *competent lips*.

While *incompetent lips* where the lips don't meet together at rest position unless excessive muscle contraction is made.

Sometimes the lips are competent but their competence is prevented by the proclination of the upper incisors, this is called *potentially competent lips*.

The importance of discrepancies in vertical size or form of the lips lies in the fact that the lips are usually brought together during swallowing and speech movements. If they are of sufficient size to be together at rest then lip closure will not place extra forces on the teeth. If the lips at rest are apart, then muscular contraction will be required to bring them together during swallowing and speech, and such contraction will impose extra forces on the erupting teeth.

- **Sagittal plane:**

The sagittal relationship of the lips is almost entirely determined by the relationship of the basal bone of the jaws, to which they are attached. The lower lip tends to be further back than the upper lip in a skeletal Class II relationship, and further forward in a skeletal Class III relationship. This not only increases the difficulty of putting the lips together, but also may cause the lower lip to modify the eruptive path of the upper incisors.

The lower lip plays more part than the upper lip both in functional movement and in controlling the position of the incisor teeth:

1. In severe skeletal class II cases the lower lip may function completely behind the upper incisors without causing them to procline (fig. 1).

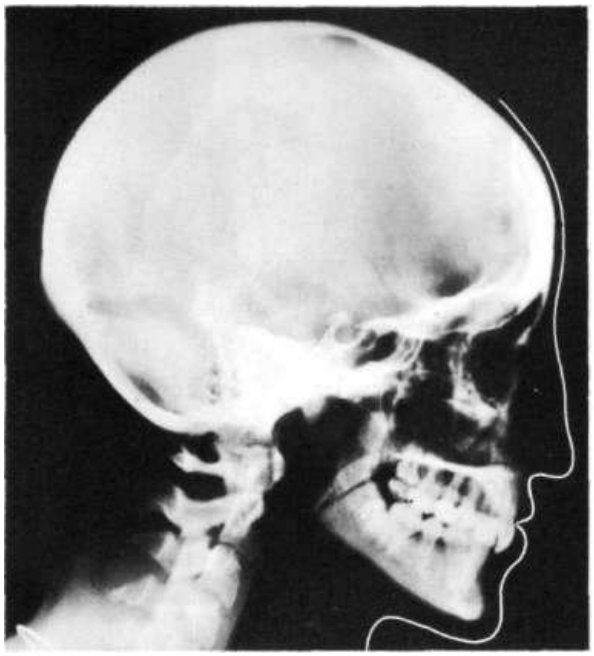
2. In less severe skeletal class II cases the lower lip may function partially behind the upper incisors causing them to be proclined so that the occlusal relationship is more severely Class II than the skeletal relationship (fig. 2).

3. In other instances, with skeletal Class II, the lower lip functions entirely in front of the upper incisors, causing them to be retroclined into the Class II Division II incisor relationship (fig. 3).

4. In Class II Division I cases, anterior oral seal (during breathing and swallowing) is done with tongue and lower lip which will exert pressure on the lower incisors causing them to be retroclined.

(fig. 1)

(fig. 2)



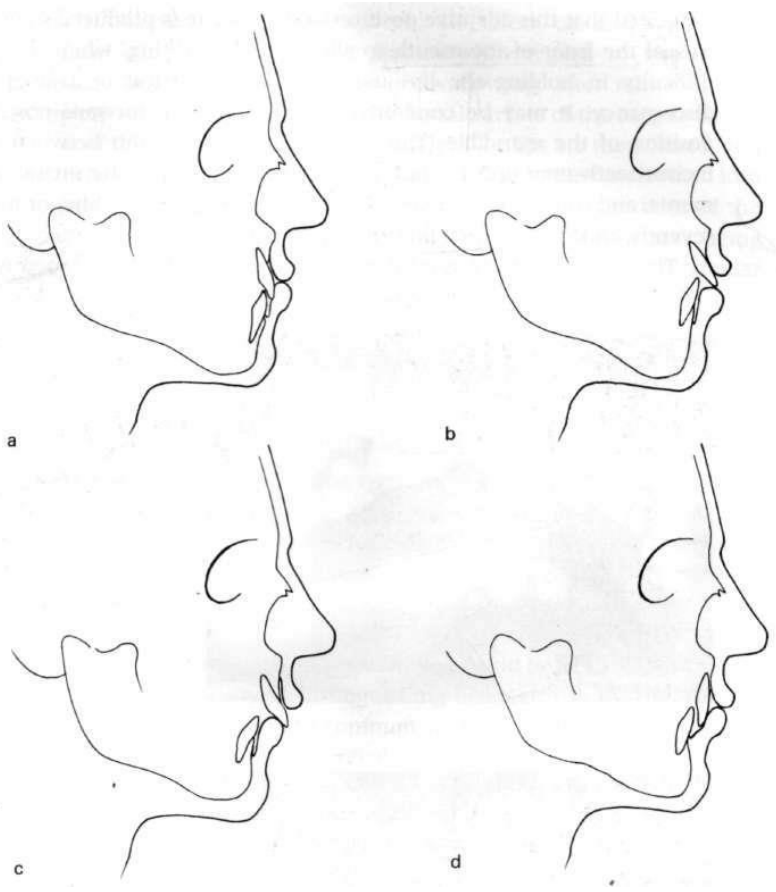
(fig. 3)

The lip line:

Is the level at which the lips meet together in normal function, and its position in relation to the incisor teeth plays a part in controlling the position of those teeth. The ideal level of the lip line is at the junction of the middle and incisal thirds of the crowns of the upper incisor teeth, with the lower lip in front of the upper incisors (fig. 4.a).

The lip-line may be low, in which case part of the lower lip may function behind the upper incisors, causing proclination (fig. 4.b). If the lower lip functions completely behind the upper incisors the definition of lip line is not strictly applicable since there is no meeting between lips (fig. 4.c).

The lip-line may be high, in such case the lower lip may function in front of upper incisors causing them to retrocline as is common in Class II Division II occlusal relationship, and the retroclination of the incisors results in the incisors (upper and lower) not meeting correctly, with consequent continued development of upper and lower incisors and related alveolar bone in the vertical dimension leading to the development of deep bite. The upper incisors are thus too far down in relation to the lips, and the lip line is high (fig 4.d).



(fig.4)

The tongue:

The tongue, functioning mainly in conjunction with the lips and cheeks, is the other major guiding force for the erupting teeth. It lies within the arch of the lower jaw, and affects the developing teeth by virtue of its size, its resting posture and its function.

Tongue size:

During rest, the dorsum of the tongue touches the palate, while its tip rests against the cingulae or fossae of the lower incisors. If the lower jaw is larger than the upper jaw, the tongue is too large to fit within the upper dental arch, therefore the tongue will rest between them and will prevent the full vertical development of the dento-alveolar structures resulting in open bite.

Tongue resting posture:

The resting position of the tongue is ideally completely within the dental arches, filling the space enclosed by the teeth.

Sometimes, the tongue takes up an adaptive postural position, slightly protruded between the teeth to touch the lower lip in order to seal the front of the mouth to allow nasal breathing, this adaptive tongue position may prevent full vertical development of the incisal segments, and consequently may produce an incomplete overbite, or more severely an anterior open bite.

Tongue function:

The muscular function of the tongue is particularly concerned with mastication, swallowing and speech. Its effect on the developing dentition can most readily be studied with regard to swallowing function.

The essential features of normal swallowing are:

1. Closure of the lips.
2. Teeth brought into light contact.
3. Tongue elevated to the palate.
4. Momentary clenching of the teeth as food passes into the pharynx.

Humans have 2 types of swallow pattern:

1. Infantile and neonates swallow.
2. Mature or adult swallow.

Tongue thrusting habit:

Is a condition at which the tongue protrudes between the anterior and/or posterior teeth during swallowing with or without affecting teeth position.

Classification of tongue thrusting:

1. Backlund classification:

a. *Anterior tongue thrust:*
   Which is forceful anterior thrust leading to anterior open bite.

b. *Posterior tongue thrust:*
   Lateral thrusting in case of missing posterior teeth leading to posterior open bite.

2. Moyers classification:

a. *Simple tongue thrust (post. Teeth are together):*
   Or called teeth together adaptive tongue swallowing. The buccal teeth are together with a forward positioning of the tongue between the anterior teeth during swallowing, this usually results in production of an incomplete over bite or anterior open bite.

b. *Complex tongue thrust (post. Teeth are apart):*
   Or called teeth apart adaptive tongue swallowing. The buccal teeth are apart during swallowing and the tongue is positioned between them and doesn't fill the upper arch leading to discrepancy in the neutral zone, so pressure of muscles of cheek will cause narrowing of the upper arch leading to buccal cross bite which usually unilateral.

c. *Retained infantile thrust (endogenous tongue thrust):*
   Persistence of infantile swallowing reflex even after permanent teeth erupts. It is a basic neuromuscular mechanism which is mostly associated with an anterior lisp during speech. It cannot be modified by orthodontic treatment, re-positioning the teeth would not be likely to alter the tongue activity, and any open bite caused by this type of tongue thrust would be likely to recur (relapse is very high). It's difficult to differentiate it from the above types since it has the same effect on occlusion, but these are some of its characteristic features:

1. Strong contraction of lips and facial musculature.
2. Anterior and posterior thrusting.
3. Bimaxillary dento-alveolar proclination.
4. Large open bite.
5. Increased facial height.
6. Lisp during speech.
7. Generalized spacing.

The neutral zone:

Although the teeth erupt into an environment of active muscular forces, and are guided into their occlusal positions by muscle movement, it seems reasonable to believe that, once they have reached their occlusal positions, all the forces acting upon them are equalized to maintain the relatively stable situation which we known as the occlusion. This means that the forces exerted on teeth by cheek and lips are equal and opposite to that of the tongue (neutral) and any discrepancy to one of these forces will lead teeth to move with the higher force.

Good luck

ORTHODONTICS

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Lec. 3

Etiology of malocclusion

Most common bad oral habits:

Habit is defined as a fixed or constant practice established by frequent repetition, its formed reaction that is resistant to change, whether useful or harmful depending on the degree to which it interfere with the child's physical, emotional and social function.

1. Thumb and finger (digit) or pacifier sucking:

It's the placement of thumb or digit or one or more finger in varying depth in the mouth. It's an innate activity starts very early in childhood, being evident within a very short time after birth, and there is evidence to suggest that it may begin before birth.

The effects of sucking habit on occlusal development are variable, and depend on:

1- Frequency: number of times per day habit is practiced.

2- Duration: amount of time spent on practicing the habit.

3- Intensity: amount of force applied on teeth during sucking.

This sucking habit causes a mild displacement of primary teeth with an anterior open bite, which is usually asymmetrical, being more pronounced on the side on which the thumb is sucked, if the tongue is also protruded the open bite tends to be larger. It causes also proclination of upper incisors and retroclination of lower incisors leading to increased OJ. There is also often a unilateral crossbite. It is thought that the crossbite is brought about by the slight narrowing of the upper dental arch resulting from the reduced intra oral air pressure, possibly combined with the activity of the buccal musculature.

As long as the habit stops before the eruption of the permanent incisor, most of the changes resolve spontaneously but it become a problem if persist into the period of the permanent dentition. It is unlikely that these habits affect

the growth of the basal parts of the jaws, their effects being confined to the teeth and the alveolar processes of the jaws.

"Sucking" is different from "Suckling" which is the normal method of infant feeding, in sucking a reduced intra oral air pressure is created with increased extraoral muscle force (which not happen in normal suckling) leading to malocclusion.

Management:

a- Extraoral method:

1- Trying to persuade the child to give up the habit with rewarding him.
2- Painting the child's finger with an unpleasant tasting substance.
3- Taping or gloving the offending digit.

b- Intraoral method:

- Removable appliance:

1- Tongue guard.
2- Tongue cribs.

- Fixed appliance:

1- Quadhelix.
2- Fixed tongue cribs.
3- Fixed tongue guard.

2. Mouth breathing habit:

It's a habitual respiration through the mouth instead of the nose, hypertrophy of the pharyngeal lymphoid tissues (adenoid) and deviated nasal septum are some of the etiologic factors leading to this habit.

It's obvious that an altered respiratory pattern, such as breathing through the mouth rather than the nose, could change the posture of the head, jaw, and tongue. This in turn could alter the equilibrium of pressures on the jaws and teeth and affect both jaw growth and tooth position. In order to breathe through the mouth, it is necessary to lower the mandible and tongue, and extend (tip back) the head. If these postural changes were maintained, the following characteristic features (of adenoid face) will appear:

1. Increased facial height.
2. Super-eruption (over-eruption) of posterior teeth.
3. The mandible would rotate down and back.

4. Anterior open bite.
5. Increased over jet.
6. Increased pressure from the stretched cheeks might cause a narrower maxillary dental arch (posterior cross bite).

3. Lip habits:

a. Lip sucking:

This habit can cause increased over jet and flattened and crowded lower anterior teeth. Management is done with Lip bumper.

b. Lip biting:

Involve either of the lips, features seen are cuts, abrasions and marks of the incisors along the lips with redness.

4. Tongue thrusting habit: (see previous lecture).

c. Dental factors affecting occlusal development:

The size of the dentition in relation to jaw size:

Ideally, there should be adequate space for the teeth to erupt into the mouth without crowding or overlap. In the primary dentition the ideal situation exists when there is spacing between the anterior teeth, there being then a better chance that the permanent teeth will not be crowded. In the permanent dentition, contact between adjacent teeth is regarded as correct. Primary teeth with intimate contacts is called potential crowding since the permanent teeth will not have enough space to erupt and crowding may result.

The etiology of dental arch crowding:

First theory:

There is an evolutionary trend towards a diminution in size of the jaws without a corresponding diminution in tooth dimensions. The dietary factors may be involved, the modern diet needing less chewing and therefore providing less stimulus to jaw growth than the more primitive diets.

Second theory:

The present-day populations represent a mixture of peoples from various ethnic backgrounds, and such interbreeding of people with different physical characteristics leads to skeletal and dental disharmonies.

The effects of excessive dentition size:

1. Overlapping and displacement of teeth:

When the dental arch is too small for the dentition, teeth erupting into the arch tend to become displaced by teeth already in the arch. This particularly affects the last teeth to erupt in any group, the lateral incisors, second premolars, canines and third molars. These conditions interfere with functional and artificial cleansing of the teeth.

2. Impaction of teeth:

Impaction of teeth occurs when eruption is completely blocked by other teeth due to crowding. Again, it tends to affect the last teeth to erupt in each segment.

3. Space closure after extractions:

It is accepted that space closure is dependent mainly on the relationship between dental arch size and dentition size. If the dentition is small in relation to the dental arch, little or no space closure will occur as a result of loss of teeth. The dental arch may be spaced, and the spaces would not be expected to close after full development of the occlusion. If, on the other hand, the dentition is large in relation to dental arch size, tooth movement will occur to close any spaces.

The most important factor in controlling the amount and rate of space closure is the degree of crowding of the dental arch, in crowded arch it takes less time for extraction space to be closed than in normal arch.

Good luck

ORTHODONTICS

د.عاصم عباس

Lec. 4

The effects of early loss of primary teeth

The primary dentition has for long been the subject of difference of opinion regarding its value and the need for its preservation.

It is necessary to examine the effects which have been claimed following premature loss of primary teeth. These effects can be considered under the following headings:

1. Effects on function and oral health:

Early loss of primary teeth may affect masticatory function, but, with the modern diet, the effects are likely to be small unless most or all of the teeth are lost.

There may be slight effects on speech following loss of anterior primary teeth, but these are likely to be transient.

2. Over-eruption of opposing teeth:

When a tooth is lost from the dental arch, excessive eruption of the opposing tooth, or excessive vertical dento-alveolar development, frequently occurs. This can be seen following loss of primary teeth, but on the whole this effect is transient. The eventual eruption of the successional teeth, together with continued alveolar growth, usually result in the establishment of the correct occlusal plane, provided the successional teeth meet in occlusion.

3. Psychological effects on child and parent:

The loss of anterior primary teeth alters the appearance of the child, which in some cases may produce undesirable psychological effects.

4. Effect on mandibular posture:

The loss of all primary molars before the eruption of the first permanent molars may result in forward posture of the mandible, since the chewing and masticatory function may be transferred to the incisors.

5. Effect on the position of permanent teeth:

The most important result of premature loss of primary teeth is space closure, but this does not mean that premature loss is necessarily a disadvantage to the ensuing occlusion; this space loss has two main effects:

a) Effect on the shape of the dental arch "collapse".

b) Effect on the size of the dental arch.

How premature loss of primary teeth can affect the position of the permanent teeth?

1. When there is ample space in the dental arch to accommodate all the successional teeth:

Little or no space will be lost by spontaneous movement following loss of primary teeth, and no crowding of the permanent teeth is likely to ensue.

2. When there is just enough space for the successional teeth to erupt without crowding:

The loss of even a small amount of space by movement of teeth into an extraction space will result in crowding of the permanent teeth.

3. When there is slight crowding potential in the dental arch for the successional teeth:

It can only be relieved by the loss of permanent teeth. It is usually desirable in this circumstance to remove teeth symmetrically from each side of the arch. Therefore slight crowding of the permanent teeth in one arch would normally be corrected by the loss of two permanent teeth from that arch. This may result in the creation of more space than is necessary to relieve the crowding. The premature loss of primary teeth in such conditions of slight crowding potential will result in partial space closure, and an increase in the crowding potential. However, the extraction of two permanent teeth from the arch would probably be sufficient to relieve the crowding, and it is likely that there would be no adverse effect on the position of the permanent teeth from loss of primary teeth in this situation.

4. When there is severe crowding potential in the dental arch for the successional teeth:

The eventual removal of a permanent tooth from each side of the dental arch may barely provide sufficient space for the remaining teeth. In such

circumstances the premature loss of primary teeth can be expected to result in marked movement of teeth into the extraction space with consequent aggravation of the crowding potential.

The effects of asymmetric loss of primary teeth:

In a crowded arch, if the loss of primary teeth occurs only on one side of the arch the resultant distal movement of teeth anterior to the extraction space can lead to an asymmetry of the dental arch, with deviation of the centre, which can be difficult to treat. Therefore, in a crowded arch it is best to plan for lateral symmetry of extraction of primary teeth if any primary teeth have to be lost.

Space maintenance (in deciduous and mixed dentition):

Premature loss of primary tooth or teeth results in the adjacent tooth to tip or migrate into the edentulous space; this in turn results in decrease in the dental arch length.

Space maintainers are defined as appliances that prevent the loss of dental arch length and which in turn guide the permanent teeth into correct position in the dental arch.

Ideal requirement of space maintainers:

1. Maintain the desired mesio-distal dimension of the space.
2. Not interfere with the eruption of permanent teeth.
3. Maintaining occlusal function.

Types of space maintainers:

A) Removable space maintainers (Partial dentures):

Advantages:

1. Most economic.
2. Most useful for bilateral posterior space maintenance when more than one tooth has been lost per segment.
3. Replacing occlusal function.
4. Useful for long span teeth loss.
5. Benefit esthetically (ant. teeth replacement).

Disadvantages:

1. Thick acrylic base leading to difficult speech.
2. Not useful in uncooperative patient.
3. Interfere with the erupted permanent teeth.

Note:

Anterior space maintenance is unnecessary because arch circumference generally is not lost even if the teeth drift and redistribute the space, so replacement of missing anterior teeth is done solely to improve appearance. This has social advantages even for young children.

B) Fixed space maintainers:

1. Band and loop:

It is a unilateral fixed appliance indicated for space maintenance in the posterior segments. The simple cantilever design makes it ideal for isolated unilateral space maintenance. Because the loop has limited strength, this appliance must be restricted to holding the space of one tooth and is not expected to accept functional forces of chewing.

If a primary second molar has been lost, the band can be placed on either the primary first molar or the erupted permanent first molar. Some clinicians prefer to band the primary tooth in this situation because of the risk of decalcification around any band, but primary first molars are challenging to band because of their morphology, which converges occlusally and makes band retention difficult. A more important consideration is the eruption sequence of the succedaneous teeth. The primary first molar should not be banded if the first premolar is developing more rapidly than the second premolar, because loss of the banded abutment tooth would require replacement of the appliance.

Before eruption of the permanent incisors, if a single primary molar has been lost bilaterally, a pair of band and loop maintainers are recommended instead of the lingual arch that would be used if the patient were older. This is advisable because the permanent incisor tooth buds are lingual to the primary incisors and often erupt lingually. The bilateral band and loops enable the permanent incisors to erupt without interference from a lingual archwire.

2. Lingual arch, Transpalatal bar and Nance button:

A lingual arch is indicated for space maintenance when multiple primary posterior teeth are missing and the permanent incisors have erupted. A conventional lingual arch, attached to bands on the primary second or permanent first molars and contacting the cingula of maxillary or mandibular incisors, prevents anterior movement of the posterior teeth and posterior movement of the anterior teeth.

Maxillary lingual arches as space maintainers are not familiar but are contraindicated only in patients whose bite depth causes the lower incisors to contact the archwire on the lingual of the maxillary incisors so either the Nance lingual arch or a transpalatal arch can be used.

Nance arch is an effective space maintainer, but soft tissue irritation can be a problem. The best indication for a transpalatal arch is when one side of the arch is intact and several primary teeth are missing on the other side. In this situation, the rigid attachment to the intact side usually provides adequate stability for space maintenance.

3. Distal shoe:

The distal shoe is the appliance of choice when a primary second molar is lost before eruption of the permanent first molar. This appliance consists of a metal or plastic guide plane along which the permanent molar erupts. The guide plane is attached to a fixed band.

Unfortunately, this design limits the strength of the appliance and provides no functional replacement for the missing tooth. If primary first and second molars are missing, the appliance must be removable and the guide plane is incorporated into a partial denture because of the length of the edentulous span.

To be effective, the guide plane must extend into the alveolar process so that it contacts the permanent first molar approximately 1 mm below the mesial marginal ridge, at or before its emergence from the bone.

This design is contraindicated in patients who are at risk for subacute bacterial endocarditis or are immuno-compromised.

Good luck

ORTHODONTICS

د.عاصم عباس

Lec. 5

II. Local Factors

1. Median diastema:

The most common causes of median diastema are:

a) Physiological ugly duckling stage.
b) Congenitally missing lateral incisors.
c) Peg shaped lateral incisors.
d) Small teeth in large jaws (spaced dentition).
e) Supernumerary teeth (conical type).
f) Proclination of the upper labial segment.
g) High frenum attachment.

Abnormal labial frenum:

In the primary dentition the labial frenum can frequently be seen to be attached to the alveolar process between the upper central incisors. With normal dento-alveolar growth, the upper alveolar process grows down and the labial frenum attachment becomes progressively higher on the jaw. Some fibers may persist between the maxillary central incisors, these fibers may persist between these teeth are capable of preventing the two contra lateral central incisors from coming into close approximation.

Management:

It's better to wait until the permanent canines have erupted to give maximum chance of spontaneous closure. If it persists a stable correction of the diastema almost always requires surgery to remove the interdental fibrous tissue and reposition the frenum (frenectomy).

It is an error to surgically remove the frenum at an early age and then delay orthodontic treatment in the hope that the diastema will close spontaneously. If the frenum is removed while there is still a space between the central incisors, scar tissue forms between the teeth as healing progresses, and a

long delay may result in a space that is more difficult to close than it was previously.

The diastema space should be closed at least partially (with orthodontic movement) then we do the frenectomy, and the orthodontic movement to bring the teeth together should be resumed immediately after the frenectomy, so that the teeth are brought together quickly after the procedure. When this is done, healing occurs with the teeth together, and the inevitable postsurgical scar tissue stabilizes the teeth instead of creating obstacles to final closure of the space.

2. The presence of supernumerary teeth:

Supernumerary teeth occur more frequently in the premaxilla than in any other part of the jaws. They appear to be an inherited feature. It occurs in approximately 2% in the permanent dentition and less than 1% in the primary dentition, and it occurs in males more than females.

Supernumerary teeth can be classified according to their morphology or position in the arch.

According to morphology:

1. Supplemental:

This type resembles a tooth and occurs at the end of a tooth series. For example an additional lateral incisor, second premolar or forth molar.

2. Conical:

The conical or peg-shaped supernumerary most often occurs between the up*per* central incisors.

3. Tuberculated:

This type is described as being barrel-shaped, but usually any supernumerary which doesn't fall into the conical or supplemental categories is included.

4. Odontome:

This variant is rare. Both compound and complex forms have been described.

According to position:

Supernumerary tooth can occur within the arch, but when they develop between the central incisors they are often described as a *Mesiodens*. A

supernumerary tooth distal to the arch is called a *Distomolar*, and one adjacent to the molars is known as *Paramolar*.

Effects of supernumerary teeth and their management:

1. Failure of eruption:

The presence of supernumerary tooth is the most common reason for non-appearance of maxillary central incisor. Management of this problem is done by removal of supernumerary tooth and make sure that there is enough space to accommodate the unerupted tooth in the arch. If the tooth doesn't erupt spontaneously within one year, then an operation to expose it and apply orthodontic traction may be required.

2. Displacement:

The presence of supernumerary tooth can be associated with displacement or rotation of an erupted permanent tooth, management involves firstly removal of the supernumerary usually followed by fixed appliances to align the affected tooth or teeth.

3. Crowding:

This is caused by the supplemental type and is treated by removing the most poorly formed or more displaced tooth.

4. No effect:

Occasionally a supernumerary tooth is detected as a chance finding on a radiograph and has no effect. It can be left in situ under radiographic observation.

3. Congenitally missing teeth:

Congenital absence of teeth results from disturbances during the intial stages of formation of a tooth.

Anadontia is the total absence of teeth, while *oligodontia* is the congenital absence of many but not all teeth. *Hypodontia* is the absence of only few teeth.

The primary tooth bud gives rise to the permanent tooth bud; therefore there will be no permanent tooth if its primary predecessor was missing, it's possible however for the permanent predecessor to be present and for some or all the permanent teeth to be absent.

Anadontia and oligodontia are usually associated with a systemic abnormality like ectodermal dysplasia; those patients have thin, spare hair and an absence of sweat glands in addition to their characteristically missing teeth. Occasionally oligodontia occurs in patients with no apparent systemic problem or congenital syndrome. Hypodontia may also affect the size of teeth specially lateral incisor that will be peg-shaped.

The most common congenitally missing teeth are:

a) Third molar (16%):

The absence of the third molar doesn't seriously affect the occlusion but it may influence orthodontic treatment when the decision has to be made whether or not to extract other permanent tooth especially other molar.

b) Lower second premolar (4.4%):

The absence of this tooth is more often found in the lower jaw, in such cases the second deciduous molar is often retained well beyond its usual time for shedding and occasionally it may be decided to retain this deciduous tooth as long as possible. In other cases it may be decided to extract the retained deciduous tooth specially in case of crowding.

c) Upper lateral incisor (1.7%):

The absence of this tooth will have one of three effects on the dentition. The space may remain open and local in which case it may be filled by a suitable prosthetic replacement. Secondly it may close completely in which case the upper canines may well be trimmed to simulate the lateral incisor. Thirdly and most commonly the condition may close partially with spacing between the two centrals and sometimes between the canine and first premolar in which other options will be considered.

4. Dilaceration:

Is a distortion or bend in the root of a tooth. There appear to be two distinct etiologies:

a) Developmental:

This anomaly usually affects an isolated central incisor and occurs in females more often than males. The crown of the affected tooth is turned upward and labially and no disturbance of enamel and dentine is seen.

b) Trauma:

Intrusion of a deciduous incisor leads to displacement of the underlying developing permanent tooth germ. This causes the developing permanent tooth crown to be deflected palatally and the enamel and dentine forming at the time of the injury are disturbed giving rise to hypoplasia, both sexes are affected equally.

Management:

Dilaceration usually causes failure of eruption, where the dilaceration is severe there is often no alternative but to remove the affected tooth.

5. Gemination and Fusion:

Occasionally, tooth buds may fuse or geminate (partially split) during their development. *Fusion* results in teeth with separate pulp chambers joined at the dentin, whereas *gemination* results in teeth with a common pulp chamber.

The differentiation between gemination and fusion can be difficult and is usually confirmed by counting the number of teeth in an area. If the other central and both lateral incisors are present, a bifurcated central incisor is the result of gemination. On the other hand, if the lateral incisor on the affected side is missing, the problem probably is fusion of the central and lateral incisor buds.

Normal occlusion, of course, is all but impossible in the presence of geminated, fused or otherwise malformed teeth.

Good luck