

OCCLUSAL VARIATIONS

By :

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The occlusion of the teeth is subject to great individual variation. There is a gradual transition from the ideal or perfect concept of occlusion to various recognisable types of malocclusions. This range of occlusal variations can be likened to the naturally occurring variations in hair and eye colour, in body and facial form. Essentially these biological variations occur as a result of the polygenicity of the human race.

It may be postulated that the type of occlusion which an individual is to develop is controlled by three main groups of inherited features, namely.

1. The type of skeletal jaw relationship, the skeletal morphology.
2. The nature of the soft tissue activity taking place around the jaws-the soft tissue morphology.
3. The ratio of tooth size to jaw size.

The interaction of these factors is responsible for establishing the general pattern of occlusion which an individual develops. Various locally operating factors can be superimposed to produce localised disturbances of the occlusion, for instance-supernumerary teeth, absent teeth, abnormal resorption and exfoliation of deciduous teeth, digit sucking habits.

The manner in which these various factors act to produce an 'individual' occlusion is best understood by a discussion of the individually inherited features.

SKELETAL MORPHOLOGY

The jaws are essentially composed of two distinct areas-the teeth and their supporting structures, the dento alveolar structures and the skeletal or basal bone proper. The theoretically u-shaped layer of bone lying immediately between the dento-alveolar structures and the basal bone, i.e. the bone immediately surrounding the apices of the teeth, is termed the Apical Base. The spacial relationship of the mandibular to the maxillary apical base, the apical base relationship is commonly referred to as the Skeletal Pattern. Research has shown that in the majority of individuals this antero-posterior relationship remains constant after the first 3-6 months of life.

When considered in the antero-posterior or profile dimension, three types of pattern occur, namely-

1. Normal
2. Post-normal-when the mandibular apical base is post-normally related to the maxillary apical base.
3. Pre-normal

Variation also occurs in the lateral dimension when there is a facial asymmetry and also in the vertical dimension which influences facial height.

In any given population the prevalence of these skeletal features varies. It appears that just as a particular facial form tends to be a characteristic of a particular family group then so does the skeletal pattern. Certain features are of course more obvious, for instance a large nose of a particularly characteristic outline is possibly a little more obvious and therefore more readily appreciated than a particular type of skeletal pattern.

Skeletal morphology can be studied by the use of standardised lateral skull radiographs. Estimations of a more general nature can be made clinically by simple observation of the face. Gross abnormalities will be obvious whilst less severe variations can only too easily be missed. Greater accuracy can be achieved by the use of a conversion procedure. This method is based on the concept that if the incisors are normally angulated to the apical bases then any abnormality of the incisor relationship is a direct reflection of the apical base discrepancy in the antero-posterior dimension. The child's incisor relationship is noted together with an estimate of the angulation of the incisors. If the incisors are not normally inclined then they are mentally corrected and an attempt made to visualise the incisor relationship which the child would have if the incisors were normally inclined. This 'corrected' antero-posterior incisor relation then represents the Skeletal discrepancy. When the upper incisors are normally inclined and the head is positioned so that the Frankfurt plane is horizontal the labial surfaces of the upper incisors should be vertical. If this is not so then the upper incisors are either proclined or retroclined. The long axes of

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the lower incisors should make an angle of approximately 90° to the mandibular plane. However, this angle varies inversely to the Frankfurt-Mandibular Angle, which should be about 30°.

The possession of a particular Skeletal pattern is the factor responsible for the gross positioning of the two dental arches in relation to each other. However, an abnormal skeletal pattern does not necessarily produce a malrelation of the dental arches; an abnormal skeletal pattern can be overcome by favourable soft tissue factors.

SOFT TISSUE MORPHOLOGY.

The muscular complex which surrounds the jaws exerts pressure on the teeth. During function and at rest the direction and magnitude of these forces vary. A tooth having erupted comes under the influence of these forces and is guided into a position within a state of muscular equilibrium, the teeth lying within the so-called 'neutral zone'. The soft tissues are therefore responsible for a tooth taking up a particular inclination to the apical base. It is believed that soft tissue morphology is to a very great extent controlled by inherited patterns. These two concepts of the patterning a muscular behaviour and the teeth being in a state of equilibrium within a muscular environment are now regarded as fundamental to present day orthodontic theory.

The anatomical knowledge of the origin, insertion and action of the muscles is of little though essential value. Their dynamic action and counter-action both during activity and at rest are of much greater importance. In this context the term 'morphology' is applied. It is convenient to consider this soft tissue morphology under the following headings.

1. Lips
2. Tongue
3. The interplay of lips and tongue during speech and swallowing

THE LIPS

Three main types of lip morphology have been described. Some lips remain sealed during rest and require no contraction of the circumoral muscles to maintain the seal. Such lips are termed 'competent'. In others the seal breaks at rest and can only be maintained by muscle action. These are known as 'incompetent' lips. A third group appear to be competent if it were not for the incisors preventing lip seal; these lips are termed 'potentially competent'.

Variations also occur in the level of the lower lip in relation to the incisor teeth. Ideally, the crest of the lower lip should cover the incisal one third of the upper incisors. The lower lip line can however be relatively high or low. A high lip line tends to favour the development of an increased overbite whilst a low lip line favours an increase in the overjet. The presence of a low lip line in association with an increased

overjet is to be regarded as a poor prognosis feature whilst a high lip line is a favourable feature in such cases.

It is postulated that a child can inherit one of the above types of lip morphology in association with a particular level of lip line.

THE TONGUE

The tongue may be regarded as being normal when in the presence of a normal occlusion it is contained within the dental arches during rest and activity. In certain cases this is not so and the tongue is seen to escape from the confines of the arches. The commonest occurrence of this state of affairs is when there is an anterior open bite or incomplete incisor overbite and the tongue is seen to lie between the incisors at rest. There exists in such cases a tip of tongue to lip contact. There appears to be two types: in one type the tongue lip contact is simply occurring because the abnormal incisor relationship allows it; in the other there is an actual forceful tongue lip contact which has caused the teeth to take up a position which allows the contact to occur. The former is regarded as an adaptive habit tongue lip contact which disappears following correction of the incisor relationship. The latter is the true anterior tongue thrust which is regarded as an inherited characteristic and which will not respond to treatment. This type of endogenous tongue thrust is very rare. The habit type is more frequently seen and is often associated with a digit sucking habit.

Variations have also been described in the general height of the dorsum of the tongue in relation to the palate as seen on a lateral skull radiograph. A so-called 'low tongue' position appears to be associated with a bilateral crossbite relationship of the buccal segments. A high tongue position occurs in relation to the more severe Class II division 2 type occlusions.

It is thus postulated that there are essentially two types of tongue activity which can be inherited, a normal tongue or a tongue thrust type, together with a high or low tongue position.

THE INTERPLAY OF LIPS AND TONGUE DURING SPEECH AND SWALLOWING

During speech and swallowing it is frequently necessary to form a lip seal, if the lips are incompetent muscle action will be constantly required to seal the lips. Thus, during speech and swallowing there will be intermittent contraction of the circumoral muscles.

If a tongue thrust is present the tongue will be constantly thrusting forwards against the lips. During speech this thrusting forwards of the tongue gives rise to an interdental 's' sound, the substitution of 'th' for 's'. It would appear that this is a Pathognomonic of a true tongue thrust.

When the combination of incompetent lips and tongue thrust occurs an increase in overjet results. In the presence of competent lips the tongue thrust tends to produce an anterior open bite. In a similar manner the presence of crowding can cause proclination of the maxillary incisors in the presence of incompetent lips, especially if there is a low lip line. If the lips are competent the tendency is for a normal incisor relationship to develop but with the maxillary canines crowded out of the arch or for generalised incisor crowding to develop.

THE TOOTH SIZE RATIO

This may be regarded as the spacing or crowding factor. Clinically, it is quite obvious that a particular dentition is simply crowded or spaced, if the hypothetical apical base could be taken and laid out in a straight line and if the teeth were then laid out mesio-distally their respective lengths could be compared. In a crowded dentition the row of teeth would be too long for the apical base; in a case of generalised spacing of the teeth the row of teeth would be too short. In an ideal relationship both would match. This is only a relative relationship; it is not possible to claim that either the teeth or the apical base is at fault. It is postulated that this ratio of tooth size to apical base is inherited. An individual dentition can thus possess one of three possible alternative tooth size to apical base relationships viz. 'normal' 'crowded' or 'spaced'.

It must be recognised that this is not the only explanation of crowding. Essentially crowding is a discrepancy in the space available in the arch at the coronal level and the space required for alignment of the crowns of the teeth. A discrepancy between tooth size and apical base size can account for

this state. It can also be explained by the teeth being moulded by the soft tissues into a small arch form.

Crowding can manifest itself in a variety of ways; in mal-alignment of the teeth; space closure following premature loss of deciduous teeth; proclination of the maxillary incisors in the presence of unfavourable soft tissue factors. Crowding does not develop; it is or is not present right from the beginning if only its manifestations are recognised.

SUMMARY OF THE INTERACTION OF MORPHOLOGY FEATURES.

The inheritance of a particular skeletal pattern establishes the general arch relationship, whilst the soft tissues are responsible for moulding the teeth into a particular occlusal position. Hence, in the presence of a normal skeletal pattern and normal patterns of soft tissue activity the tendency will be for the development of a normal occlusion. This will develop if the dentition is not crowded and if there are no localised disrupting factors present. If there is a tooth size discrepancy, i.e. if the dentition is crowded, then there will be a tendency for a generalised irregularity of the teeth to develop. For instance, the incisors may be generally irregular, or the canines may be crowded buccally. The presence of a post-normal skeletal pattern will favour development of a Class II type of occlusion, for instance an increased overjet. Whilst a prenormal skeletal pattern favours development of a Class III occlusion, i.e. a reverse overjet. A high Frankfurt mandibular plane angle favours establishment of a minimal overbite or even an anterior open bite. With a reduced angle there is a tendency for the overbite to be increased.

OBITUARY



Lt. Col. Harbans Singh Puri was born in Pattoki, Dist. Lahore (West Pakistan) on 17th Feb, 1917 and did his L.S.M.F. from Punjab in 1941 and L.D.S. in 1943 from de' Mont Morency College of Dentistry Lahore. He passed away on 10th Oct. 1994 at New Delhi.

We pray to the Almighty God to grant eternal peace to the departed soul.

OBITUARY



The International College of Dentists has lost an eminent fellow from Sri Lanka Dr. Ranaraja Gooneratne Jasinghe. He was born on 15th Feb. 1933 at Colombo. He did his L.D.S. from Ceylon and he was attached to Eastman Dental Hospital London from 1959-60 and he was also in general practice at London from 1961-1964 and since 1964 he was in private practice in Sri Lanka.

We pray to the Almighty God to grant eternal peace to the departed soul.