Orthodontic

Clinical Examination

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Assessment of the skeletal relationship

As the skeletal relationship plays a major part in determining the occlusal relationship, and as it is also a major limiting factor in orthodontic treatment, it is necessary to be able to assess it accurately on the individual patient. The skeletal relationship may be assessed by clinical or by radiographic methods.

Clinical assessment

Some idea of the skeletal relationship can be gained simply by observation of the subject in profile. The gross discrepancies may be assessed in this way, but the less marked discrepancies may be masked by tooth position or by the thickness or posture of the lips. A more accurate impression can

be obtained by palpation of the anterior surface of the basal part of the jaws, with the teeth in occlusion.

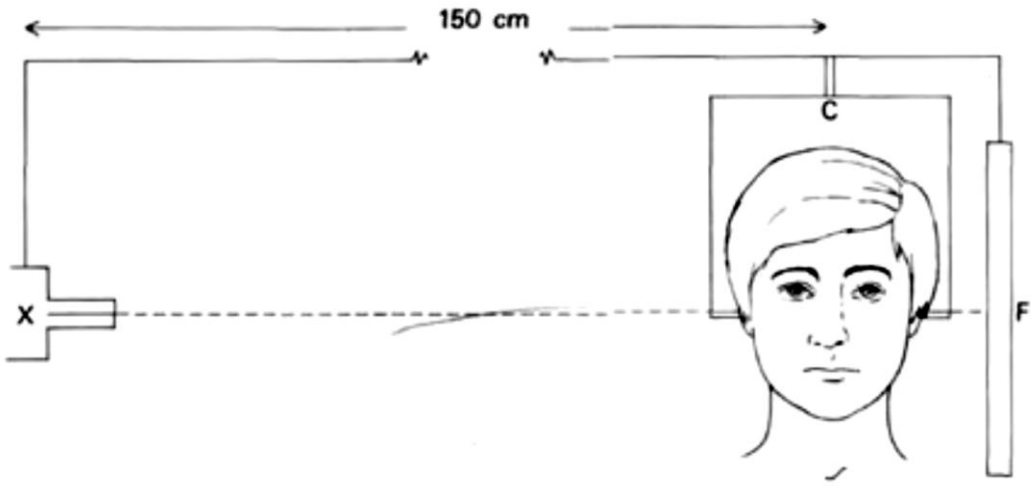
Although the thickness of the lips may interfere with the assessment, this method can give a reasonable impression of the skeletal relationship. A clinical method of assessment in common use is based on a study of the inclination of the incisor teeth and the degree of incisal overjet. It presumes that if the inclinations of the upper and lower incisor teeth are correct, with an ideal skeletal relationship (Class 1) there will be an ideal incisal overjet of about 2 - 3 mm. This assumes that, as the incisor teeth erupt into the mouth, they may be tilted forward or backward by the various pressures to which they are subjected, such as pressures from lips and tongue, but their apices remain in a fairly stable position on the basal bone. If this assumption is correct, then the degree of incisal overjet will depend on: (a) the degree of incisal inclination; and (b) the antero-posterior relationship of the apical bases, i.e. the skeletal relationship.

This method of assessing the skeletal relationship is therefore:

1. Assess the inclination of the upper and lower incisors.
2. Assess the degree of incisal overjet which is present.
3. If the teeth are not in their correct inclinations, assess the degree of incisal overjet which would be present if the teeth were realigned to their correct inclinations, without moving the apices of the teeth. The *'residual overjet'* gives an indication of the skeletal relationship, an excessive residual overjet indicating a skeletal Class 2 and a reduced or reversed residual overjet indicating a skeletal Class 3. The degree of residual overjet also indicates the degree of skeletal discrepancy. The method of residual overjet may give a reasonable assessment of the skeletal relationship in many cases.

Radiographic assessment

While clinical assessment, if carefully carried out, can give a reasonably accurate picture of the skeletal relationship, radiographic assessment is without doubt more accurate. It is based on the method of standardized cephalometric radiography .The purpose of this radiographic technique is to produce standardized radiographs of the head, and the equipment consists of a cephalostat, which holds the head in a predetermined position, an X-ray tube and a film. These three components are maintained in a fixed relationship to each other, so that any angulation and magnification is standardized and any films produced by one piece of equipment are comparable with each other. The cephalostat contains two ear-rods which fit into the external auditory meati of the subject, and



the X-ray tube and film are aligned so that, when filming a lateral view of the head, the central beam of the X-rays passes through the two ear pieces and is at right angles to the film. The source of the rays is usually set at a distance of 150 cm from the subject in order to minimize the magnification. The cephalostat can be rotated in the horizontal plane to obtain any view of the head, but for assessment of the skeletal relationship the lateral view is used. Standardized radiographs of this sort are used in longitudinal studies of growth of the head, for comparisons of size and form between individuals or groups and for individual assessment of form, usually in orthodontic treatment planning or in assessing the results of treatment procedures. In the cephalometric assessment, certain carefully defined points are located on the radiograph, and linear and angular measurements are made from these points. The expression of these measurements in various ways produces analyses of skeletal size and form.

Frontal Examination.

The first step in analyzing facial proportions is to examine the face in frontal view. Low set ears, or eyes that are unusually far apart (hypertelorism) may indicate either the presence of a syndrome or a microform of a craniofacial anomaly. If a syndrome is suspected, the patient's hands should be examined for syndactyly, since there are a number of dental-digital syndromes. In the frontal view, one looks for bilateral symmetry in the fifths of the face and for proportionality of the widths of the eyes/nose/mouth. Facial proportions and symmetry in the frontal plane. An ideally proportional face can be divided into central, medial, and lateral equal fifths. The separation of the eyes and the width of the eyes, which should be equal, determine the central and medial fifths. The nose and chin should be centered within the central fifth, with the width of the nose the same as or slightly wider than the central fifth. The inter-pupillary distance *(dotted line)* should equal the width of the mouth.

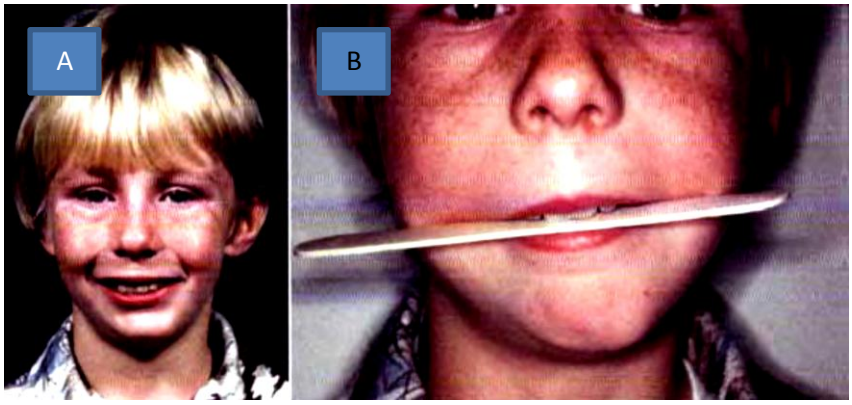
A small degree of bilateral facial asymmetry exists in essentially all normal individuals. This can be revealed most readily by comparing the real full face photograph with composites consisting of two right or two left sides.

Composite photographs are the best way to indicate normal facial asymmetry. For this boy, whose mild asymmetry rarely would be noticed and is not a problem, the true photograph is in the center. On the right is a composite of the two right sides, while on the left is a composite of the two left sides. This technique dramatically illustrates the difference in the two sides. Although the normal asymmetry usually is less than in this boy, mild asymmetry is the rule rather than the exception. Usually, the right side of the face is a little larger than the left, rather than the reverse as in this individual.

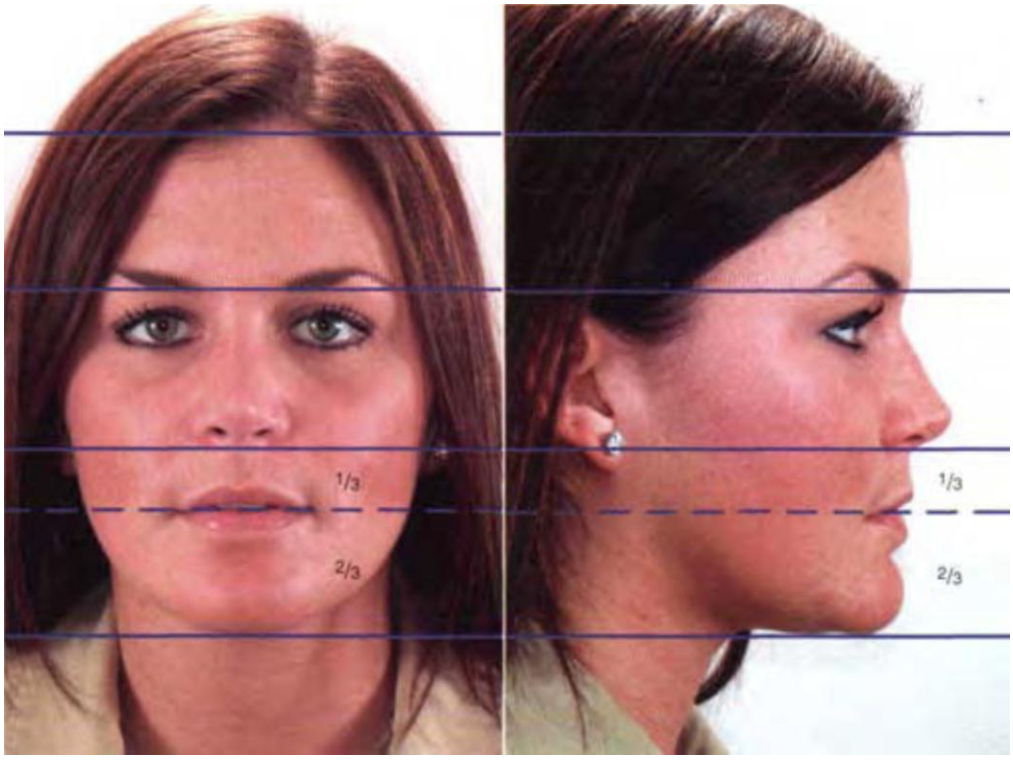
This "normal asymmetry," which usually results from a small size difference between the two sides, should be distinguished from a chin or

nose that deviates to one side, which can produce severe disproportion and esthetic problems for an example:

.A, Facial asymmetry developed in this boy after fracture of the left mandibular condylar process at age 5, because scarring in the fracture area prevented normal translation of the mandible on that side during growth B, Note the cant to the occlusal plane, which develops as failure of the mandible to grow vertically on the affected side restricts eruption of both maxillary and mandibular teeth. Trauma is the most frequent cause of asymmetry of this type.

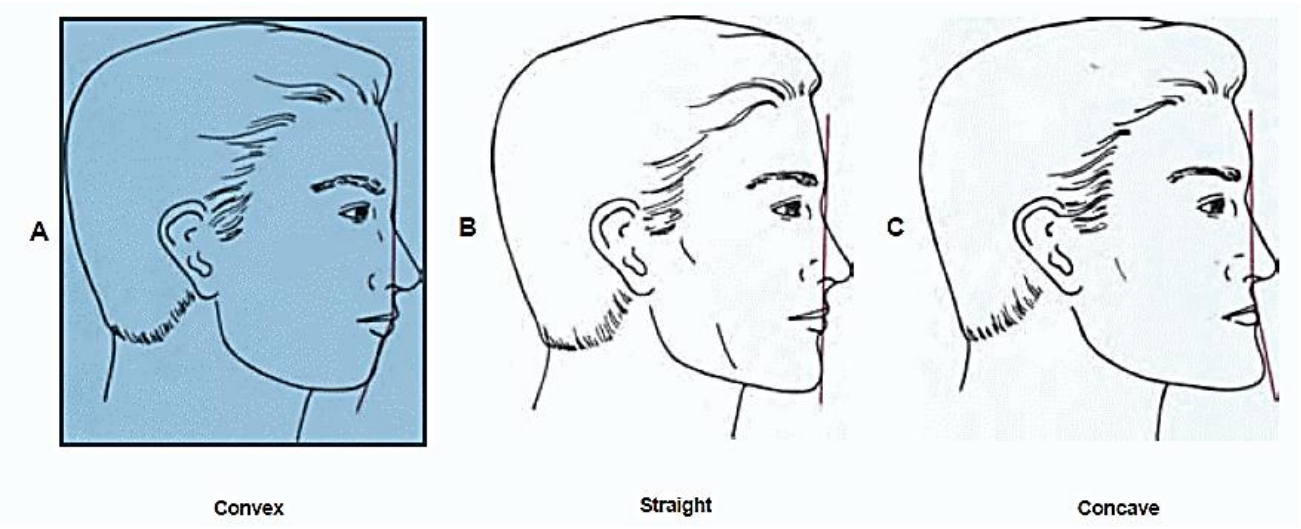


Vertical facial proportions in the frontal and lateral views are best evaluated in the context of the facial thirds, which the Renaissance artists noted were equal in height in well-proportioned faces. In modern Caucasians, the lower facial third often is slightly longer than the central third. The lower third has thirds: the mouth should be one-third of the way between the base of the nose and the chin.



There goals of facial profile analysis:

1. **Establishing whether the jaws are proportionately positioned in the anteroposterior plane of space.** This step requires placing the patient in the physiologic natural head position, the head position the individual adopts in the absence of other cues. This can be done with the patient either sitting upright or standing, but not reclining in a dental chair, and looking at the horizon or a distant object. With the head in this position, note the relationship between two lines, one dropped from the bridge of the nose to the base of the upper lip, and a second one extending from that point downward to the chin.



These line segments should form a nearly straight line. An angle between them indicates either profile convexity (upper jaw prominent relative to chin) or profile concavity (upper jaw behind chin). A convex profile therefore indicates a skeletal Class II jaw relationship, whereas a concave profile indicates a skeletal Class I I I jaw relationship. If the profile is approximately straight, it does not matter whether it slopes either anteriorly (anterior divergence) or posteriorly (posterior divergence) Divergence of the face (the term was coined by the eminent orthodontist- anthropologist Milo Hellman6) is influenced by the patient's racial and ethnic background. American Indians and Asians, for example, tend to have anteriorly divergent faces, whereas whites of northern European ancestry are likely to be posteriorly divergent. A straight profile line, regardless of whether the face is divergent, does not indicate a problem. Convexity or concavity does.

Divergence of the face is defined as an anterior or posterior inclination of the lower face relative to the forehead. Divergence of a straight profile line does not indicate facial or dental disproportions: all the individuals pictured here have normal dental occlusion and an acceptable dental and facial appearance. To some extent, facial divergence is a racial and ethnic characteristic. It must be distinguished from the profile convexity or concavity that does indicate disproportions. A, Despite this boy's posteriorly divergent profile, he has only minimal overjet and no complaints about facial esthetics. This facial pattern is particularly likely in northern Europeans. B, A straight profile produces a strong chin and a more masculine appearance. It is seen more frequently in whites of eastern and southern European descent, and is the usual finding in those of Asian and African descent. C, An anteriorly divergent profile is uncommon in whites but often is seen in those of Asian and African descent. It is quite compatible with normal dental occlusion.

2. Evaluation of lip posture and incisor prominence.

Detecting excessive incisor protrusion (which is relatively common) or retrusion (which is rare) is important because of the effect on space within the dental arches. If the incisors protrude, they align themselves on the arc of a larger circle as they lean forward, whereas if the incisors are upright or retrusive, less space is available. In the extreme case, incisor protrusion can produce ideal alignment of the teeth instead of severely crowded incisors, at the expense of lips that protrude and are difficult to bring into function over the protruding teeth. This is *bimaxillary dentoalveolar protrusion.*

BIMAXILLARY DENTOALVEOLAR PROTRUSION

Bimaxillary dentoalveolar protrusion is seen in the facial appearance in three ways: (1) **A, Excessive separation of the lips at rest (lip incompetence)**. The general guideline (which holds for all racial groups) is that ***lip separation*** at rest should be not more than 4 mm. (2) B, ***Excessive effort to bring the lips into closure (lip strain)***. (3) ***Prominence of lips in the profile view*** (as in both A and B). Remember that all three soft tissue characteristics must be present to make the diagnosis of dental protrusion, not just protruding teeth as seen in a cephalometric radiograph (C, the ceph for the same girl). Different racial groups, and individuals within those groups, have different degrees of lip prominence that are independent of tooth position. As a result, excessive dental protrusion must be a clinical diagnosis. It cannot be made accurately from cephalometric radiographs.