PRACTICE

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VERIFIABLE CPD PAPER

IN BRIEF

- Careful patient assessment is the most important part of treatment
- The extra-oral examination is conducted first
- The skeletal relationship must be assessed three-dimensionally
- The teeth lie in a position of soft tissue balance
- Habits such as thumb sucking can induce a malocclusion
- There is no proven association between TMJ dysfunction and orthodontics

Orthodontics. Part 2: Patient assessment and examination I

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The patient assessment forms the essential basis of orthodontic treatment. This is divided into an extra-oral and intra-oral examination. The extra-oral examination is carried out first as this can fundamentally influence the treatment options. The skeletal pattern, soft tissue form and the presence or absence of habits must all be taken into account.

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The most important part of orthodontic treatment is the patient assessment. Once a particular treatment strategy is started subsequent changes are often difficult. If it is decided that extractions are needed and since the process is irreversible, they must be carefully considered in the treatment planning process. Inappropriate orthodontic treatment can produce adverse results and it is essential that full examination of skeletal form, soft tissue relationships and occlusal features are performed prior to undertaking treatment. It is sensible to carry out the assessment in a logical order so that none of the steps are missed. A simple assessment should include the following:

- Medical history
- Patient's complaint
- Extra-oral examination
- Intra-oral examination
- Radiographs
- Orthodontic indices
- Justification for treatment
- Treatment aims
- Treatment plan

This section concentrates on the extra- and intra-oral examination of the patient.

EXTRA-ORAL EXAMINATION

It is helpful to follow the examination sequence outlined:

- Skeletal pattern
- Soft tissues
- Temporomandibular joint examination

Skeletal pattern

Patients are three-dimensional and therefore the skeletal pattern must be assessed in anterior-posterior (A-P), vertical and transverse relationships. Although the soft tissues can tip the crowns of the teeth the skeletal pattern fundamentally determines their apical root position. The relative size of the mandible and maxilla to each other will determine the skeletal pattern. The smaller the mandible or the larger the maxilla the more the patient will be Class II. Conversely with a bigger mandible or smaller maxilla the patient will be more Class III. The bigger the size discrepancy between the maxilla and mandible, the more difficult treatment becomes and the less likely it is that orthodontics alone will be able to correct the malocclusion. Although some orthodontic appliances have a small orthopaedic effect, treatment is generally most easily accomplished on patients with a normal skeletal pattern and a normal relationship of the maxilla to the mandible.

Anterior-posterior (AP)

Although precise skeletal relationships can be determined using a lateral cephalostat radiograph, many practices do not have this facility and it is important to be able to assess the skeletal relationships clinically.

To assess the AP skeletal pattern the patient has to be postured carefully with the head in a neutral horizontal position (Frankfort Plane horizontal to the floor). Different head postures can mask the true relationship. If the head is tipped back the chin tends to come further forward and makes the patient appear to be more Class III.

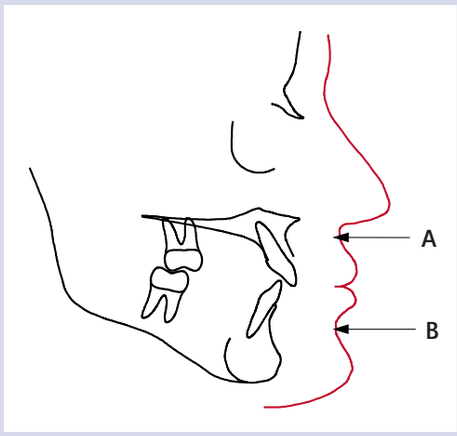

Fig. 1
A tracing of a lateral cephalostat radiograph identifying soft tissue points A and B

Fig. 2 Shows a patient with a skeletal III pattern where a tracing of the lateral cephalostat radiograph has been superimposed on the photograph. The soft tissue masks to some extent a significant skeletal III pattern

Conversely, if the head is tipped down the chin moves back and the patient appears to be more Class II. Sit the patient upright in the dental chair and ask them to occlude gently on their posterior teeth. Ask them to gaze at a distant point; this will usually bring them into a fairly neutral horizontal head position. Look at the patient in profile and identify the most concave points on the soft tissue profile of the upper and lower lips (Fig. 1).

The point on the upper lip is called soft tissue A point and on the lower lip soft tissue B point. In a patient with a class I skeletal pattern B point is situated approximately 1 mm behind A point. The further back B point is, the more the pattern is skeletal II and the more anterior, the more skeletal III it becomes. Figure 2 shows a patient with a skeletal III pattern where the outline of the hard tissues has been superimposed on the photograph. This demonstrates that although we are examining the soft tissue outline this also gives an indication of the underlying skeletal pattern. Obviously the soft tissue thickness may vary and mask the A–P skeletal pattern to some degree but generally the thickness of the upper and lower lips is similar. The underlying skeletal pattern is therefore often reflected in the soft tissue pattern. The more severe the skeletal pattern is the more difficult treatment of the resulting malocclusion becomes. Figure 3a and b, shows an adult with an obvious skeletal III pattern and a malocclu-

Fig. 3a Profile of an adult who has an obvious skeletal III pattern

Fig. 3b Malocclusions of the same patient in Figure 3a. The patient has a Class III malocclusion which is beyond the scope of orthodontics alone

sion that is clearly beyond the scope of orthodontic treatment alone.

Vertical dimension

This dimension gives some indication of the degree of overbite. The vertical dimension is usually measured in terms of facial height and the shorter the anterior facial height the more likely it is that the patient will have a deep overbite. Conversely the longer the facial height the more the patient is likely to have an anterior open bite. Deep overbites associated with a short anterior facial height and open bites with long face heights are difficult to correct with orthodontics alone. The greater the skeletal difference the more likely it is that the patient will need a combination of orthodontics and orthognathic surgery to correct the occlusion and the underlying skeletal discrepancy.

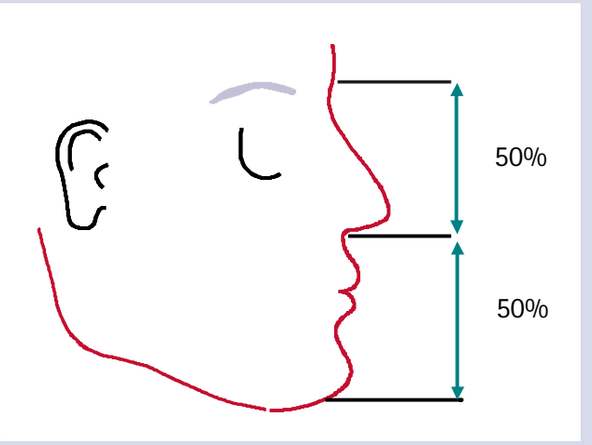

Fig. 4 Assessment of facial proportions. The upper and lower anterior face heights should be approximately equal

Fig. 5 Profile of a patient with a much reduced lower anterior facial height

Fig. 6 Occlusion of the patient shown in Figure 5. The reduced lower anterior face height is often associated with a deep bite as shown

There are various ways of measuring the vertical dimension, one of the most common is to measure the Frankfort Mandibular Planes Angle. This is not a very easy clinical angle to measure and the problem is compounded by the fact that not many clinicians can identify the Frankfort Plane correctly. A more practical way of assessing this is simply to measure the vertical dimension as indicated in Figure 4.

The lower anterior facial height is the distance from the base of the chin to the base of the nose. The upper anterior facial height is the distance from the base of the nose to a point roughly between the eyebrows. These dimensions can be measured with a ruler although the index finger and thumb will do almost as well. The lower and upper facial heights are usually equal. If the lower anterior facial height is reduced, as illustrated in Figure 5, this can result in a deep overbite that can be difficult to correct (Fig. 6). Conversely, if the lower anterior facial height is greater than 50% this can produce an anterior openbite (Fig. 7).

Transverse dimension

To assess this dimension, look at the patient head-on and assess whether there is any asym-

Fig. 7 Anterior open bites are often associated with an increase in lower anterior face height

Fig. 8 A centre line shift where the lower centre line is to the left

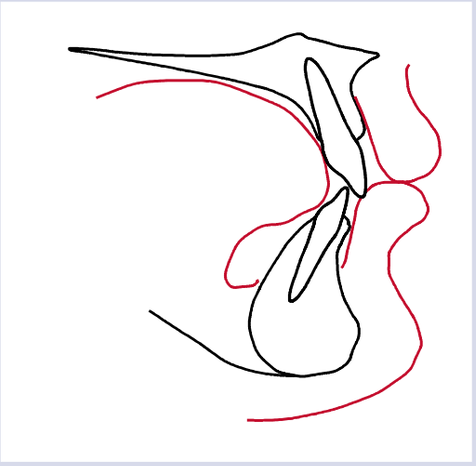

Fig. 9 Teeth are in soft tissue balance between the tongue and the lips

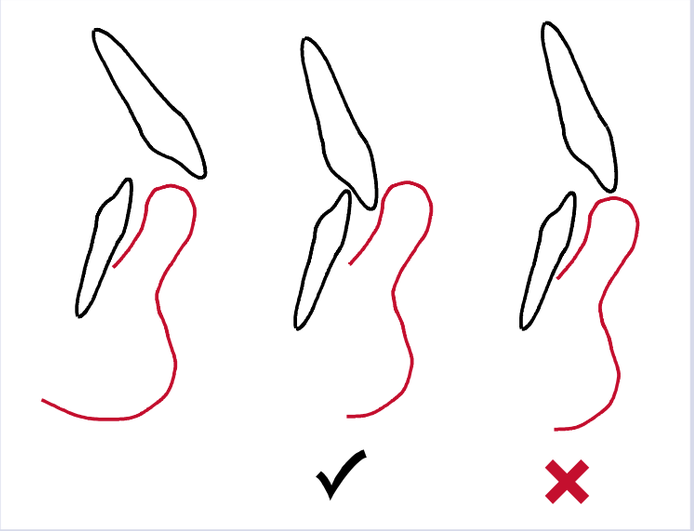

Fig. 10 These diagrams show how partial reduction of the overjet does not allow the lip to cover the upper incisors. The upper incisors are then quite likely to return to their pre-treatment position

metry in the facial mid-line. If there appears to be any mandibular asymmetry this may be reflected in the position of the teeth as shown in Fig. 8. If there is asymmetry it is important to distinguish between false and true asymmetry. A false asymmetry arises when occlusal interferences force the patient to displace the mandible laterally producing a cross-bite in the anterior or buccal region. If the displacement is eliminated then the mandible will return to a centric position. A true asymmetry arises as a consequence of unequal facial growth on the left or right side of the jaws. In these cases elimination of any occlusal cross-bites (which can be very difficult) is unlikely to improve the facial asymmetry.

SOFT TISSUE EXAMINATION

The soft tissues comprise the lips, cheeks and tongue and these guide the crowns of the teeth into position as they erupt. Ultimately, the teeth will lie in a position of soft tissue balance between the tongue on one side and the lips and cheeks on the other (Fig. 9).

In patients with a Class I incisor relationship the soft tissues rarely play an important part unless there is an anterior open-bite. The anterior open-bite may be caused by a digit sucking habit, a large lower anterior facial height, localised failure of eruption of the teeth, proclination of the incisors or to an endogenous tongue thrust. The latter cause is very rare and is usually identified by a large thrusting tongue that seems to permanently sit between the upper and lower incisors. This type of anterior open-bite is extremely difficult to correct. It is usually possible to reduce it, but on completion of treatment the tongue invariably pushes between the teeth and they move apart once again.

An important aspect of lip position is seen in patients with an increased overjet. If the upper incisor prominence is reduced, stability usually depends on the lower lip covering the upper incisors in order to prevent the overjet increasing post-treatment. Therefore, careful examination of the position of the lower lip in relation to the upper incisors is important. If the lower lip does not cover the upper incisors sufficiently after treatment, relapse of the overjet may occur. Similarly, if the overjet is to be reduced, full reduction is very important in order to give the lip the best possible chance of stabilising the incisors. Figure 10 illustrates the point; partial reduction of the overjet does not allow the lip to cover the upper incisors and they are likely to return to their pre-treatment position.

Whilst many young children have incompetent lips, this is often just a normal stage of development. As they pass through puberty, the lip length increases relative to the size of the face and the degree of lip competence gradually improves (Fig. 11).[1]

Lip incompetence can be caused by either a lack of lip tissue or an adverse skeletal pattern. If

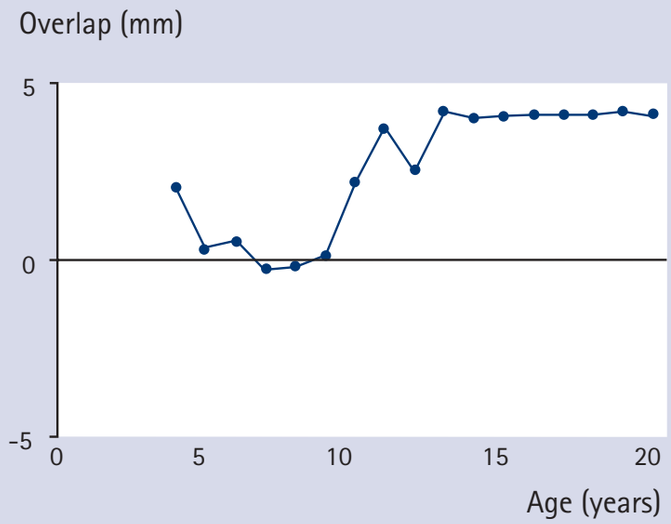

Fig. 11 Lip length is thought to increase as children pass through the pubertal growth spurt. This will aid retention of overjet reduction

the skeletal pattern is unfavourable in either the vertical or anterior-posterior position then even with normal lip length the soft tissues are still widely separated.

HABITS

Digit sucking is a well-known factor in producing anterior open-bite, proclined upper incisors and buccal cross-bites. If the habit ceases while the child is still growing then the incisors are very likely to return to their normal position. However, once the teenage years are passed and facial growth slows down, spontaneous resolution becomes increasingly unlikely. If the habit persists into adult life it may be necessary to use appliance treatment to correct the habit induced anterior open-bite. Buccal cross-bite possibly produced by digit sucking habits, rarely resolve spontaneously on cessation of the habit because of occlusal interferences. These buccal cross-bites often need to be corrected with active appliance treatment.

TEMPORO-MANDIBULAR JOINT PROBLEMS

A comprehensive review of the literature by Luther[2,3] failed to demonstrate any conclusive association between TMJ dysfunction, malocclusion and orthodontic treatment. However, it is important that the joints are palpated and assessed for signs and symptoms of TMJ dysfunction. Patients who present with TMJ pain seeking an orthodontic solution to correct the problems should be treated with caution.

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