

Chapter 1

Definition of orthodontics and factors influencing orthodontic treatment

Orthodontics is a specialised branch of dentistry. The name comes from two Greek words:

- *orthos* – meaning straight or proper
- *odons* – meaning teeth

so the meaning is clear – ‘straight teeth’.

Orthodontics is the study of the variations of the development and growth of the structures of the face, jaws and teeth, and of how they affect the occlusion (bite) of the teeth.

Ideally, there should be the same number of permanent teeth in each arch. Any deviation from the norm is called:

- a malocclusion, if it affects teeth alignment and the bite relationship

Most malocclusions are genetically caused, i.e. they are inherited, e.g. missing teeth or a protruding mandible.

Other malocclusions can be caused by the patient, e.g. digit sucking or trauma.

Orthodontic treatment can correct a malocclusion by putting the teeth into their normal position and occlusal relationship (with surgical help, if needed) so that:

- the bite is fully functioning and the patient can bite and chew properly
- the oral hygiene is made easier, thus helping to prevent caries and gingivitis
- the malocclusion does not cause other damage
- the patient looks better and has better self-esteem

Orthodontic treatment in conjunction with orthognathic (maxillo-facial) surgery can correct an underlying jaw discrepancy or facial asymmetry.

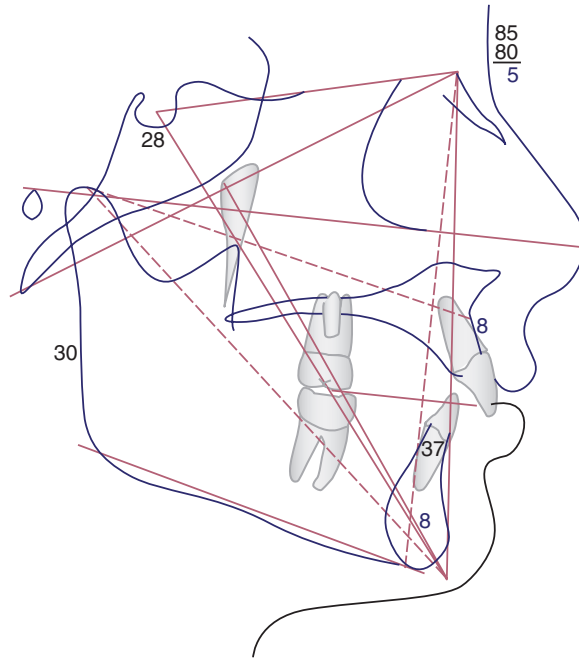


Figure 1.1 Cephalometric tracing.

Orthodontic planning is done in conjunction with the surgeons using clinical and radiographic assessment, with a cephalometric tracing (Figure 1.1) often analysed using computer software program.

So, orthodontists set out to:

- straighten teeth
- improve the bite
- improve the function
- improve oral hygiene (and make teeth easier to clean)
- improve self-esteem of the patient

CLASSIFICATION OF OCCLUSION

When assessing occlusion there are two aspects to classification:

- incisor relationship
- buccal segment occlusion, left and right

Both are recorded on a patient's Orthodontic Assessment Form.

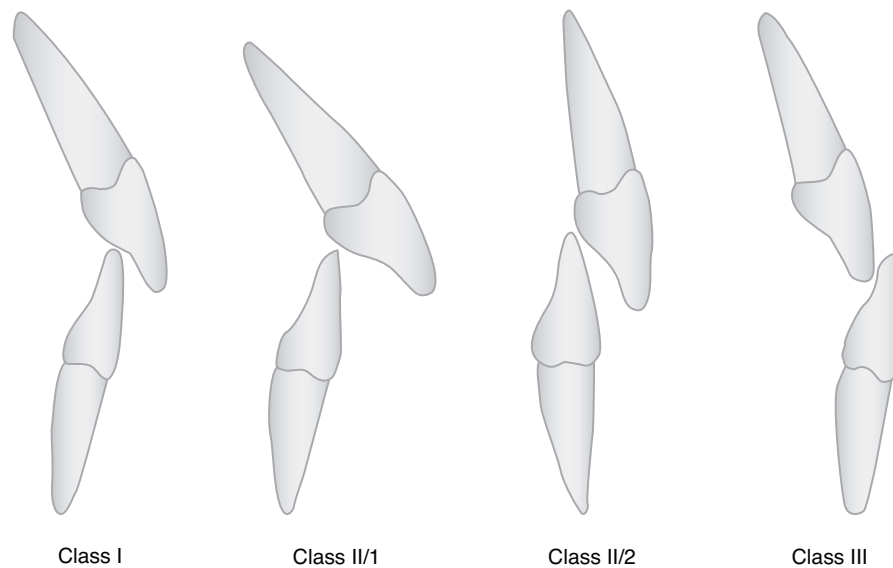


Figure 1.2 Incisor classification.

Incisor classification

- Classes have roman numerals, e.g. I, II, III
- Divisions do not, e.g. Class II/1 or Class II/2

The incisor classification (Figure 1.2):

- relates to the bite of the tip of the lower central incisors onto the back of the upper central incisors
- is divided into three horizontal sections and where the lower incisor occludes will determine the classification

Class I

- The incisal edge of the lower incisors bites on or below the cingulum plateau of the upper incisors

Class II/1

- The upper incisors are proclined or upright (Figures 1.3 and 1.4)
- The lower incisors bite behind the cingulum plateau of the upper incisors
- The position of these front teeth means they can be damaged more easily because of their vulnerable position



Figure 1.3 Large overjet.



Figure 1.4 Side view of severe overjet.



Figure 1.5 Bite stripping lower gingivae.

Class II/2

- The upper incisors are retroclined
- The lower incisors bite behind the cingulum plateau
- The position of the teeth can, when closed, lead to trauma to the lower labial gingivae and the upper palatal gingivae (Figures 1.5–1.7)

Figure 1.6 Damage to labial gingivae caused by bite.



Figure 1.7 Bite causing trauma to the palate.



Figure 1.8 Class III.



Class III

- The bite is edge to edge or reversed
- The incisal edge of the upper incisors can bite into the back (lingual) surface of the lower incisor (Figure 1.8)
- A horizontal overlap is called **overjet**
- A vertical overlap is called **overbite**

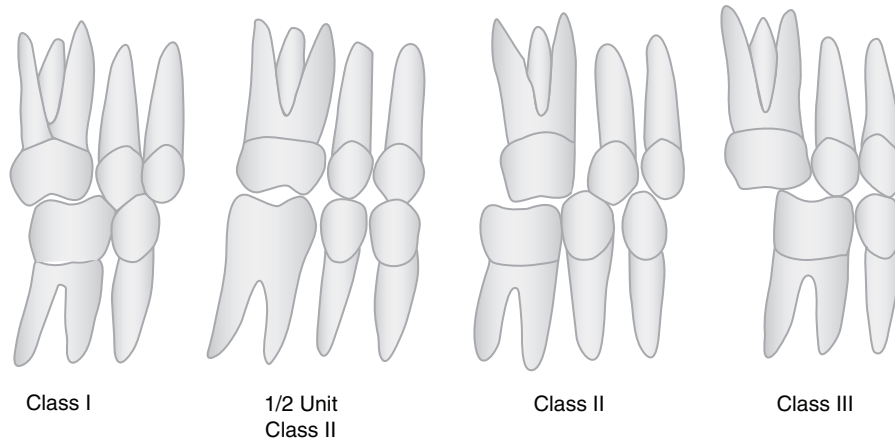


Figure 1.9 Diagram of buccal segment occlusion.

Buccal segment occlusion

The buccal segment occlusion (Figure 1.9):

- was devised by Edward Angle in 1890
- is still widely used today
- is based on the occlusion between the first permanent molar teeth, which erupt when the patient is about 6 years old

There are three classes:

- **Class I** – This is as near to the correct relationship as you see
- **Class II** – This is at least half a cusp width behind the ideal relationship
- **Class III** – This is at least half a cusp width in front of the ideal relationship

THE MIXED DENTITION

Sometimes parents see their child's perfectly straight deciduous (baby) teeth fall out only to be replaced by a 'jumble' of crowded permanent teeth (Figure 1.10).

A combination of full-sized teeth in a face that still has a lot of growing to do often prompts parents to request an early orthodontic opinion. Permanent teeth can look huge in little faces.

The average times for permanent tooth eruption are:

- Age 6
 - 1/1 lower central incisors
 - 6/6 lower first molars
 - 6/6 upper first molars



Figure 1.10 Mixed dentition.

- Age 7
 - 1/1 upper central incisors
 - 2/2 lower lateral incisors
- Age 8
 - 2/2 upper lateral incisors
- Age 11
 - 3/3 lower canines (cuspids)
 - 4/4 lower first premolars (bicuspid)
 - 4/4 upper first premolars (bicuspid)
- Age 12
 - 3/3 upper canines (cuspids)
 - 5/5 lower second premolars (bicuspid)
 - 5/5 upper second premolars (bicuspid)
 - 7/7 upper second molars
 - 7/7 lower second molars
- Age 18–25
 - 8/8 upper third molars (wisdom teeth)
 - 8/8 lower third molars (wisdom teeth)

Normally, patients begin orthodontic treatment between 10 and 13 years of age. At 10–11 years, they are still in the mixed dentition with:

- some deciduous teeth
- some permanent teeth
- some teeth yet to erupt

INDICATIONS FOR TREATMENT

Clinical indications for orthodontic treatment may be because the teeth:

- are overcrowded
- may have erupted out of position



Figure 1.11 Lower incisor trapped outside the bite.

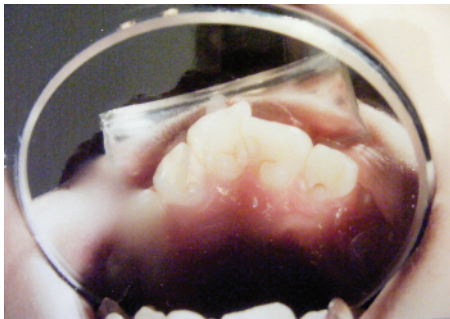


Figure 1.12 Caries between overlapping teeth.

- are protruding – Class II/1
- are in a reverse bite
- are in a self-damaging bite (Figure 1.11)
- are spaced
- are absent – hypodontia
- are damaged

Where there is a mild malocclusion, i.e.:

- with only very small irregularities
- where the tooth position does not compromise oral hygiene
- which does not interfere with function, e.g. biting off food, eating

orthodontic treatment may not be indicated, as it may not be seen to significantly improve dental health.

Those cases, e.g.:

- with overcrowded, protruding teeth
- with rotated teeth which make oral hygiene difficult and cause problems with caries (Figure 1.12)
- which visually deviate from average, e.g. a reverse bite
- which look unattractive and affect the smile
- which seriously affect function, e.g. makes chewing food difficult

are classed as malocclusions warranting treatment.

UNDERLYING CAUSES OF MALOCCLUSION OF THE TEETH

There may also be:

- underlying skeletal abnormalities
- facial asymmetries

These can be:

- hereditary (run in families, e.g. tendency to be Class III)
- a result of injury
- a result of illness affecting facial or skeletal growth
- a result of a syndrome or cleft

These may require orthodontic treatment as part of a multi-disciplinary care treatment pathway.

MULTI-DISCIPLINARY APPROACH

Some patients require orthodontic treatment in conjunction with other dental specialties.

These include:

- restorative (e.g. hypodontia patients needing implants/bridges or microdontia patients needing veneers or crowns)
- surgical (e.g. patients needing an osteotomy)
- cleft (e.g. patients needing alveolar bone grafting)

These patients have their orthodontic treatment in coordination with the other specialties.

Problems when the arch is not intact

One of the aims of orthodontic treatment is to have each tooth in its correct place within the dental arch.

If a tooth is malaligned (out of its correct position), it is not necessarily an isolated problem; it has a domino effect.

The teeth on either side of it may also be out of their correct position and the opposing tooth does not have the correct occlusion (bite).

If there is no tooth to oppose it, a tooth may supra-erupt. Contact points are lost, teeth rotate and, because they are no longer self-cleansing, food traps are created, where fibres can get lodged or packed.

As a consequence of this, plaque is encouraged to accumulate:

- which inflames the gingivae (gums)
- which encourages periodontal pockets

In the young patient this is not too drastic, as it probably has not yet become a significant issue.

In adult patients, however, following orthodontic treatment, it may be necessary to restore incisal edges or fill cervical abrasion cavities, which only become apparent when the teeth have been corrected.

BRUXISM

- Young patients, towards the end of the deciduous dentition, can often present with teeth almost ground down to gingival level. It may continue into the mixed dentition and is often quite noisy and noticeable when it occurs in sleep
- For some older patients with severe bruxism, an occlusal guard can be made to be worn overnight during sleep. This attempts to limit the damage that is done to the incisal and occlusal surfaces of the teeth
- Anxious patients also grind and clench their teeth during the day when under stress

DIGIT SUCKING

Some patients continue to suck their fingers or thumbs well beyond the age when their deciduous teeth have been replaced by their permanent successors. A prolonged habit is one which exists beyond the age of 7 years.

It may adversely affect the bite and position of the anterior teeth and can produce a unilateral buccal crossbite, an asymmetrical anterior open bite (where the digit enters the mouth) (Figure 1.13) or an increased overjet. How much damage is caused depends on for how long the thumb or finger is sucked and how strong the habit is.

These patients may try really hard to break this habit.



Figure 1.13 Anterior open bite due to digit sucking.

It is possible to fit a removable upper anti-habit appliance, which is worn full-time or sometimes when they are asleep.

It is an upper removable appliance that has prongs in the centre of the palate, which act as a positive deterrent for the thumb or finger. This usually breaks the habit.

DENTAL HEALTH

Some problems are caused by:

- diet – too much sugary or acidic food or drink (dental caries)
- tooth brushing – the wrong technique, too hard a brush
- acid reflux – symptom of bulimia
- medication – side effect of some medication inhalers

Damage to teeth resulting in tooth surface loss comes under the general headings of:

- Attrition – bruxists (patients that grind their teeth, often during sleep)
- Abrasion – excessive wear, e.g. overenthusiastic tooth brushing
- Erosion – acid attack on the enamel, found in fresh fruit juice, diet drinks and stomach acids (reflux in eating disorders)
- Abfraction – a tooth being ‘high on the bite’ and being overloaded

CONDITION OF THE SURROUNDING SOFT TISSUES

Lips

Lips can be:

- competent – when they are at rest they come together easily and form a good oral seal
- incompetent – when at rest they do not close, or if they are closed, the lips are strained, often as a result of posturing. This closure is only temporary

Tongue

- The tongue works with the lower lip to form a seal when swallowing
- A tongue which tends to thrust can push forward and ‘splay’ the front teeth out

The position of the teeth and the form of the dental arches are determined by the balance of the soft tissues between tongue and lips/cheeks.