

VITAL GUIDE SERIES

9 An introduction to orthodontics

- What is orthodontics?
- Who should receive orthodontic treatment?
- Which dental professionals are involved with orthodontics?

9

VITAL GUIDE TO

Orthodontics

Welcome to the ninth article in the Vital Guide Series. Here, **Anthony Ireland**,¹ **Sarah Bain**² and **Jonathan Sandy**³ summarise orthodontics, discussing how patients are selected and when treatment should be carried out.

Introduction

Although orthodontics can be defined as 'the branch of dentistry concerned with the growth of the face, development of the occlusion and prevention and correction of occlusal anomalies',¹ it is probably most commonly perceived, by the general public, as being almost exclusively associated with the use of braces to correct the bite. Certainly each year in England and Wales well over 130,000 patients, most of whom are children under the age of 18 years, have fixed braces fitted under the NHS.² Such braces, once fitted, usually remain in place for between 18 and 24 months with regular adjustments being made every six to eight weeks, which is likely to reinforce this view.

Who should receive orthodontic treatment?

Currently, those patients who can receive orthodontic treatment under the NHS are determined through the use of the Index of Orthodontic Treatment Need (IOTN). This was developed by Brook and Shaw in 1989³ and comprises two scales. The first is the

Dental Health Component, which is divided into five categories, with category 1 being no need for treatment and category 5 being a very great need for treatment. The second scale is a ten point visual scale known as the Aesthetic Component, which comprises intra oral photographs of different occlusions.⁴ Photograph 1 is of a well aligned occlusion and photograph 10 shows a crowded, malaligned occlusion. Treatment is limited to those patients in IOTN dental health component categories 3 to 5 and with those in category 3 having to have an Aesthetic Component score of at least 6 or greater.

Using the dental health component of this index, it is known that approximately 33% of 11 to 12-year-old children in the UK would benefit from orthodontic treatment.⁵ A more recent survey in 2003 confirmed that approximately 35% of 12-year-old and 19% to 25% of 15-year-old children in England and Wales were assessed as having a need for orthodontic treatment using both the aesthetic and dental health components, either together or alone. This is because in general those patients with a high need, as assessed using the dental health component, also had a high aesthetic need.⁶

What are the benefits of orthodontic treatment?

The potential benefits of orthodontic treatment include improvements in appearance, function and health. The principal reason most patients seek orthodontic treatment is undoubtedly to improve their appearance, and certainly the changes that may

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Figs 1a-1b The changes in the alignment of the teeth as a result of orthodontic treatment

be achieved can be dramatic (Figs 1a-1b). These appearance changes are not limited to the teeth themselves, but can affect the facial appearance too. Functional or health reasons for treatment are more often recognised by the dentist and are less common. An example might be a deep overbite, where there is stripping of the gingivae labial to the lower incisors and/or palatal to the upper incisors (Figs 2a-2b). Another example is the presence of impacted, unerupted teeth such as ectopically positioned canines and also missing teeth (Fig. 3).

What is the best time to carry out orthodontic treatment?

Although treatment with braces is a large part of what is thought of as orthodontics, monitoring occlusal development and knowing when to perform shorter interceptive procedures, such as a simple extraction, are equally important and may simplify or even remove the need for later treatment with braces. For example, early loss of an upper deciduous canine in the mixed dentition can lead to a shift in the upper centreline to the same side. The timely removal of the deciduous canine on the opposite side of the same arch can lead to spontaneous correction of the centreline without the need for braces. Correction of such a centreline shift in the permanent dentition using fixed appliances can take many months. Similarly, the timely extraction of a deciduous canine where the permanent unerupted canine is becoming ectopically positioned can encourage the latter tooth to erupt into the correct position within the dental arch (Figs 4a-4b). Failure to extract the deciduous canine at the appropriate time in this instance can lead to the permanent canine becoming more ectopically positioned. Treatment then becomes complex,

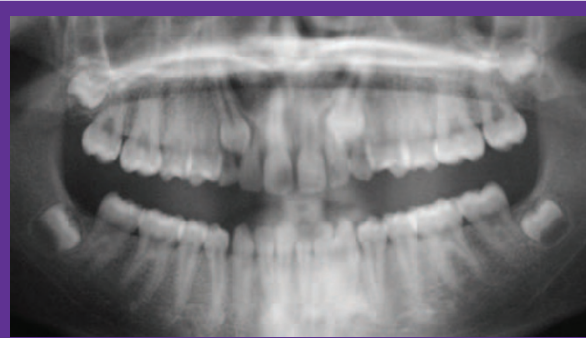


Figs 2a-2b These pictures show that the presence of a deep overbite may not only hide the lower incisors when the patient is in occlusion, but can also result in stripping of the gingivae labial to the lower incisors



Fig. 3 This OPG radiograph shows a patient with multiple missing permanent teeth, namely all four second premolars, both upper permanent canines and the upper right lateral incisor

involving surgical exposure and the application of traction to the tooth using a brace over a protracted period of time, and often in the mid to late teens when patients may be less than enthusiastic about wearing braces. Therefore orthodontic assessments should begin earlier than the 11 to 12-year-old age group; indeed they may begin as early as when the teeth first begin to appear in an infant's mouth. It is when the deciduous teeth are being shed and replaced by their permanent successors that short interceptive orthodontic procedures might take place. Full correction of the malocclusion is usually only possible when the permanent teeth have erupted.



Figs 4a-4b These two OPG radiographs show how upper permanent canines can sometimes be encouraged to erupt more favourably following the loss of the upper deciduous canines

Sometimes definitive orthodontic treatment may be started in the mixed dentition. A particular example might be the use of functional appliances (Fig. 5). These appliances are often prescribed when there is an increased overjet and part of this is due to a Class II jaw relationship, with the lower jaw appearing to be set back in the face relative to the upper jaw. The aim might be to reduce the overjet and to encourage the lower jaw to come forwards. A recent randomised controlled trial has shown that in such cases approximately 73% of the reduction in overjet is due to tooth movement and only 27% is due to changes in the actual jaw relationship,⁷ which equates to an average reduction of 1.9 mm. Nevertheless this treatment, if performed when a child is rapidly growing at the time of their pubertal growth spurt, can be a very effective means of correcting the overjet.

Most orthodontic treatment is performed in the early permanent dentition, at around 12 to 14 years of age, with up to 72% being treated using fixed braces.⁶ As part of this treatment, teeth may be extracted for the relief of crowding and this is the case in around 20% of cases in the USA. The commonest extraction pattern is the loss of four first premolars.⁸

Treatment may also be carried out in adult patients, but there are limitations and one of these is a lack of facial growth. This can make the correction of aspects of the occlusion, such as a deep overbite, challenging and occasionally impossible. In adults, where the jaw relationship is the main feature contributing to their malocclusion, a combined orthodontic and surgical approach to their treatment is sometimes required. The patient may undergo pre-surgical orthodontics to align the teeth, which often appears to make the bite worse, before they then undergo jaw surgery and a final post-operative phase of orthodontic treatment to finely tune the bite. In this case it



Fig. 5 The Clark Twin Block appliance is an example of a functional appliance being used in the late mixed dentition



Fig. 6 An upper removable appliance



Fig. 7 Upper and lower fixed appliances

is important the patient has all but finished facial growth prior to the surgical phase.

What are the risks of orthodontic treatment?

Orthodontic treatment is not without risks and patients should be warned of these as part of informed consent to treatment. The obvious risks are toothache and pain due to soft tissue trauma. If the patient does not maintain an excellent standard of oral hygiene then they are at risk of gingivitis and periodontal disease. They are also likely to suffer from decay and indeed between 2%

Cut along the dotted line and keep!



and 96% of patients have some evidence of early decay, usually in the form of a white spot lesion, following a course of orthodontic treatment.^{9,10} The first two risks are manageable and the latter two are preventable. What is unpredictable is root resorption. It is thought that all teeth that are moved with braces undergo some loss of root tissue as a consequence and in most instances this is of no clinical relevance. However, occasionally the resorption is on a macroscopic scale and a large percentage of the root disappears. Fortunately the risk of clinically significant macroscopic root resorption is low, but incisor teeth appear to be the most susceptible, and there are reports that between 0.4% and 1% of incisor teeth lose a third or more of their root length during orthodontic treatment.^{11,12} In addition to a loss of root tissue it is thought there is also a small amount of bone loss at the alveolar crest of the tooth socket. Loss of around 1 mm has been reported,¹³ but this is not a universal finding.¹⁴

Who can have orthodontic treatment?

Almost anyone can have orthodontic treatment. Some patients will benefit from treatment using an interceptive approach during growth and development to reduce the need for future treatment, whilst others will benefit from active appliance therapy. The limitations on the latter group include patient factors, such as the ability to comply with the treatment eg the wearing of headgear or elastics; the ability to maintain a good standard of oral health during treatment; facial growth and whether or not it is still occurring, but also financial factors – particularly in a public funded health service where treatment is restricted to those in greatest need.

What types of braces are available?

The main types of braces that are available include conventional removable braces (Fig. 6), clear positioner type braces eg Invisalign®, functional appliances and the most commonly used appliance, namely the fixed appliance⁶ (Fig. 7). The latter has the advantage of good three-dimensional control of tooth movement.

Who can perform orthodontic treatment?

A number of different members of the dental team are able to carry out orthodontic treatment procedures. As part of dental undergraduate training, students are taught to recognise malocclusion, how to perform a straightforward orthodontic diagnosis and to know when to refer for specialist advice and treatment. However, they are also taught how to handle simple removable appliances aimed at either maintaining space, as part of an interceptive procedure, or to perform simple tooth movements such as pushing a single incisor over the bite. Some general dental practitioners have undertaken additional part-time training in simple orthodontics using fixed appliances and are known as Dentists with a Special Interest (DwSI). They often provide treatment in consultation with a specialist in orthodontics who may provide the initial diagnosis and treatment plan. There are also those specialists who have undertaken a full time three-year training programme in orthodontics and may provide treatment in the primary care setting on the high street or in the community dental service. Some of these specialists will have then spent a further two years of additional training to enable them to practise in the secondary care setting of a hospital as a consultant.

Very recently a new group of clinical DCPs called orthodontic therapists have started training at both Bristol and Leeds dental schools (see *Vital* winter 07 pages 26-28). Both courses are one year in duration and on completion these DCPs will be able to treat orthodontic patients under supervision, with the principal limitations being diagnosis and treatment planning. This follows many years of lobbying by the profession and some groundbreaking work by Bristol in the mid 1990s to establish the optimal training structure.¹⁵

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