

ADULT ORTHODONTICS

The demand for adult orthodontics is increasing. There are really two distinct groups of adults that request orthodontic treatment:

- 1- The first group is looking for comprehensive treatment, having for whatever reason, missed out on orthodontics as a child. With dental awareness growing, an increasing demand for improved dental aesthetics and better social acceptance of orthodontic appliances, more adults are willing to wear appliances.
- 2- The second group of adults requires orthodontic treatment to facilitate restorative and/or periodontal care.

SPECIFIC PROBLEMS IN ADULT ORTHODONTIC TREATMENT

In many ways the approach to treatment in adult patients follows the same process as that for children. There are however some problems that are specific to adult patients.

1. **Lack of growth:** Although growth continues at a very slow rate throughout adulthood, the majority of growth changes have occurred by the end of puberty. This means that there is no scope for growth modification, so skeletal discrepancies can only be treated with either orthodontic camouflage, or combined orthodontics and orthognathic surgery.
2. **Periodontal disease:** Adult patients are more likely to be suffering, or have suffered from periodontal disease. A reduced periodontium is not a contraindication to orthodontic treatment, but it is vital that any active periodontal disease is treated and stabilized before orthodontic treatment can begin.
3. **Missing or heavily restored teeth:** Tooth loss may lead to drifting and/or tilting of adjacent teeth and overeruption of opposing teeth into the space. In addition, atrophy of the alveolar bone can occur, leading to a narrowing or 'necking' in the site of the missing tooth or teeth. This can make tooth movement into these areas more difficult.

Heavily restored teeth are more common in adults and may complicate the orthodontic Treatment. The choice of extractions may be determined by prognosis of the restored Teeth, and bonding to certain restorative materials is more difficult than bonding directly to enamel.

The patient needs to be warned that the restoration may be damaged when removing the fixed appliance. For this reason, if possible, it is best to leave any definitive restorations until after the orthodontic treatment.

4. **Physiological factors affecting tooth movement:** There is a reduced tissue blood supply and decreased cell turnover in adults, which can mean that initial tooth movement is slower in adults, and may be more painful. Lighter initial forces are therefore advisable.

5. **Adult motivation and attitude towards treatment:** Adults have the potential to be excellent, well-motivated patient. Physiological factors might suggest that adult treatment should take longer than it does in children; however the increased cooperation may compensate for slower initial tooth movement. Adults tend to be more conscious of the appearance of the appliance, so there has been a drive towards more aesthetic orthodontic appliance.

ORTHODONTICS AND PERIODONTAL DISEASE

Periodontal disease is more common in adults, and is therefore an important factor that must be considered in all adult orthodontic patients. Periodontal attachment loss is not a contraindication to orthodontic treatment, but active periodontal disease must be treated and stabilized before treatment begins. The presence of plaque is the most important factor in the initiation, progression and recurrence of periodontal disease. Teeth with reduced periodontal support can be safely moved provided there is adequate plaque control.

Loss of periodontal support can lead to pathological tooth migration of a single tooth or a group of teeth e.x: labial migration and spacing of the incisors. The teeth lie in an area of balance between the tongue lingually and the lips and cheeks buccally. The forces from the tongue are higher than those exerted by the lips and cheeks, but a normal healthy periodontium resists these proclining forces from the tongue. If however periodontal attachment is lost as a result of

disease, then the teeth will be proclined forwards. In addition, if posterior teeth are lost then this lack of posterior support produces more pressures on the labial segment, leading to further proclination of the incisors.

Once the periodontal disease has been fully stabilized, and the patient is able to maintain a good standard of oral hygiene, treatment can begin. Lighter forces are required, due to the reduced periodontal support, and ideally bonds rather than bands should be used on the molars to aid oral hygiene.

Due to the reduced alveolar bone support the center of resistance of the tooth moves apically giving a greater tendency for teeth to tip excessively, so this must be carefully controlled with appropriate treatment mechanics

At the end of treatment, with reduced periodontal attachment there will always be a tendency for the forces of the tongue to procline the incisors. These cases require permanent retention, often in the form of bonded retainers, and the patient must be taught how to maintain excellent oral hygiene around these retainers

ORTHODONTIC TREATMENT AS AN ADJUNCT TO RESTORATIVE WORK

Orthodontic treatment in these cases does not necessarily require comprehensive correction aiming for an ideal occlusion. The aims of adjunctive orthodontic treatment are to:

- Facilitate restorative work by appropriate positioning of teeth.
- Improve the periodontal health by reducing areas that harbour plaque, and making it simpler for the patient to maintain good oral hygiene.
- Position the teeth so that occlusal forces are transmitted along the long axis of the tooth, and tooth wear is more evenly distributed throughout the arch

The following are examples of problems that benefit from a joint approach between the orthodontist and the restorative dentist:

- Uprighting of abutment teeth: following tooth loss, adjacent teeth may drift into the space. Uprighting these abutment teeth can facilitate the placement of replacement prosthetic teeth.
- Redistribution or closure of spaces: following tooth loss it may be possible to close the remaining space, or move a proposed abutment tooth

into the middle of an edentulous span, in order to aid construction of a more robust prosthesis. If implants are required then the roots may need to be repositioned to permit surgical placement.

- Intrusion of over-erupted teeth: one of the side effects of tooth loss is over-eruption of the opposing tooth. This can interfere with restoration of the space, so the over erupted tooth can be intruded using orthodontics.
- Extrusion of fractured teeth: sometimes it is necessary to extrude a fractured tooth to bring the fracture line supragingivally to allow placement of a crown or restoration. There is a limit to this, as excess extrusion will reduce the amount of root supported by bone.

AESTHETIC ORTHODONTIC APPLIANCES

Although aesthetic orthodontic appliance are not restricted to adult patients, the drive for less visible appliances has come from adults. This demand has led to the development of a number of orthodontic appliances with improved aesthetics.

A- Aesthetic orthodontic brackets and wires

Aesthetic orthodontic brackets are made of clear or tooth coloured material. Although not invisible, they can significantly reduce the appearance of fixed appliances. They can either be made of ceramic materials or polycarbonate (plastic) brackets. At the present time ceramic brackets are preferred. Despite their aesthetic advantages, ceramic brackets do have some potential disadvantages:

1. Frictional resistance. Ceramic brackets offer more friction to sliding of the archwire, than standard metal brackets, which may increase the treatment time.
2. Bracket breakage, particularly of the tie-wings, is more common with ceramic brackets.
3. Iatrogenic enamel damage. Ceramic brackets are harder than enamel, so if these brackets are in occlusal contact with the opposing teeth there is a significant risk of enamel wear. Hence, these brackets should be avoided in the lower arch if there is a possibility of occlusal contact.
4. Debonding. Removing metal brackets at the end of treatment is not usually a problem, as they are relatively pliable and the base can be easily distorted. Ceramic brackets are more rigid and the sudden force used to debond brackets can shatter the bracket, or on occasion, may cause enamel fractures.

Both stainless steel and nickel titanium wires are available coated form but the coating can become discoloured and wear off during clinical use.

The elastomeric modules that holds the wire in the place have a good appearance initially, but discolour with time, usually due to food colouring in the diet. Therefore, self-ligating aesthetic brackets have recently been developed to overcome this problem, as they require no elastomeric modules.

B- Clear orthodontic aligners: the Invisalign concept

The use of clear plastic appliances was first described using plastic retainer materials. Mildly irregular cases were treated by producing a series of patient casts with the teeth cut off and progressively repositioned until the teeth were in the correct position. A series of clear plastic tooth positioners, or aligners, were fabricated over these casts. The patient would then wear this series of clear plastic appliances to move the teeth. This technique was demanding and labour intensive, until the process was computerized by Align Technology in the late 1990s and the Invisalign concept was created. There are now several companies offering variations of this clear aligner treatment.

Accurate impressions are taken to allow the construction of precision casts which can be scanned to produce a virtual 3-D model. This 3-D model can then be manipulated by the orthodontist and the malocclusion 'virtually' corrected using software.

A series of clear plastic aligners are produced that gradually correct the malocclusion towards the clinician's goals. Each aligner is worn for 2 weeks, and is only removed for eating, drinking, brushing and flossing. Each aligner will move the teeth approximately 0.25 mm.

The potential advantages of Invisalign® are:

1. Excellent aesthetics.
2. Ease of use and comfort for patient.
3. Ease of care and oral hygiene.

Potential disadvantages are:

1. Limited control over root movement.
2. Limited intermaxillary correction (limited anteroposterior changes) without the use of elastics between the aligners.
3. Cost

The limited control over root position means that movements such as root paralleling, correction of severe rotations, tooth uprighting and tooth extrusion, are more difficult. This makes space closure more challenging, so in general Invisalign is better at treating simple to moderate non-extraction alignments, rather than corrections requiring extractions.

At the present time, Invisalign is most effective at treating milder malocclusion presenting with malalignment, but it may be used successfully in combination with techniques to treat more complex cases. The other treatment techniques may include restorative work, such as veneers, and even a short phase of fixed appliances. In more complex cases clear aligner treatment may not replace the use of fixed appliance, but it may reduce the amount of time the patient needs to wear less aesthetic labial fixed appliances.

C- lingual orthodontics

Lingual appliances in many ways offer the ultimate in aesthetic appliances, as the whole system is bonded to the lingual aspect of the teeth. After much attention in the early 1980s their popularity fell, partly due to the introduction of ceramic brackets., but also due to a number of problems with the appliance. Recent technological improvement and an increased demand for 'Invisible' appliances have led to a recent increase in interest in lingual orthodontics

Advantages:

1. Aesthetics
2. No risk to the labial enamel through decalcification
3. Position of the teeth can be seen more accurately as it is not obscured by the appliance

Disadvantages:

1. Speech alteration
2. Discomfort to the patient's tongue
3. Masticatory difficulties
4. More technically demanding for the operator, which increases the chair-time and therefore the cost of this approach
5. Operator proficiency in indirect bonding is required and rebonding failed brackets can be difficult
6. More difficult to clean

7. Initial alignment can be more challenging in more crowded cases due to reduced interbracket span
8. Increased bracket loss

The majority of tongue discomfort is related to the mandibular arch, so patients may choose to have a lingual appliance in the upper arch, where aesthetics is more crucial and a labial appliance in the lower.

Lingual orthodontics can range from simple alignment of the upper labial segment using round wires, to comprehensive treatment using appliances made using state of the art computer assisted design/manufacture (CAD/CAM) technology.

CAD/CAM has allowed the production of fully customized appliances, with individualized production of brackets and wires. One of the challenges of aligning teeth from the lingual aspect is the unique morphology of the lingual aspect of teeth, and the range of bucco-lingual thickness of teeth. Customization of appliances overcomes these problems, improving the fit of the appliances, increasing the finishing control, as well as reducing speech problems and tongue irritation. Also if the customizes brackets debond during treatment they can be rebounded directly, as the bracket base-to-tooth fit is so good that incorrect positioning is unlikely.

Work Hard in Silence, Let Your Success Make the Noise

GOOD LUCK