Australian Society of Orthodontists

THE UNIVERSITY OF SYDNEY

The Benefits and Risks of Orthodontic Treatment

Creating Brighter Futures

The Benefits and Risks of Orthodontic Treatment

Orthodontic therapy can create balance and harmony of and between the face and teeth. A pleasing smile and improvement in overall oral health can result. Such positive results can best be achieved by timely intervention [1] with patients who are cooperative, well informed and with realistic expectations.

BENEFITS

Improvement in Facial Aesthetics and Psychological Well-being

Dentofacial appearance of patients may improve notably with orthodontic treatment, often resulting in improved self- esteem and a higher quality of life [2-6].

Correction of Occlusal Relationships

Individuals who exhibit poor occlusion, such as an anterior open bite may find it difficult and embarrassing to eat or speak clearly (Figure 1). As a result, orthodontic correction of the anterior open bite can significantly improve the patients' oral function. Correction of posterior cross bites can resolve facial asymmetries and improve occlusal function.

Figure 1a: Anterior open bite

Figure 1b: Anterior open bite corrected with orthodontic treatment

Interceptive Benefits

Young children with malocclusions inhibiting or disturbing mandibular or maxillary growth or the development of the normal dental arch (i.e. cross bite, reverse overjet and increased overjet) should be treated at an early stage [7,8,9].

Studies have shown that children with an overjet larger than 9mm were twice as likely to injure their anterior teeth [10]. The greater the overjet, the higher the risk of dental trauma [10]. Therefore, early orthodontic treatment to reduce a large overjet is recommended [11] (Figure 2).

Other benefits of early orthodontic treatment include maintaining space following the early loss of primary teeth to prevent future complications [12] and interceptive treatment for the prevention of canine impaction that may reduce the risk of canine impaction and root resorption of neighbouring teeth [13, 14].

Figure 2a: 11 year old female with severe 15mm overjet.

Figure 2b: Patient undergoing treatment to correct overjet.

Periodontal Health

There are specific malocclusions where orthodontic treatment may assist in preventing periodontal breakdown. The correction of a traumatic anterior cross bite or a deep traumatic overbite may minimize further periodontal damage [15, 16]. In addition the correction of poorly angled

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or crowded teeth can improve periodontal health as can the reduction of pocket depth with specific orthodontic tooth movement.

Obstructive Sleep Apnoea (OSA) Management

General dentists and orthodontists can play an important role in screening patients for potential OSA. The gold standard of care is to refer the patient to a sleep physician for polysomnography (a sleep test) prior to undertaking any treatment. After appropriate diagnosis, the sleep physician may recommend treatment such as a Mandibular Advancement Splint (MAS), a tongue stabilising device, rapid maxillary expansion or orthognathic surgery such as maxillomandibular advancement. MAS may be an alternative to CPAP due to its low cost, relative comfort, and ease of use, resulting in greater patient compliance. One MAS study demonstrated a successful outcome in 62% of patients [17] (Figure 3).

Figure 3: Mandibular advancement splint

Restorative Outcomes

Adjunctive orthodontic treatment may improve the quality of periodontal and restorative treatment outcomes. Adjunctive treatment may facilitate the establishment of a favorable crown-to-root ratio and vertical orientation. Successful placement of implants is often easier and more successful if the adjacent teeth are initially repositioned [18]. Adjunctive orthodontic treatment can also extrude teeth with a poor prognosis to improve bony support for eventual implant placement [19-21]. It can also extrude teeth to allow a proper crown margin to be established.

RISKS

All treatment carries with it certain risks and limitations. Fortunately, with orthodontics, complications are infrequent and generally of only minor consequence. Nevertheless, they must be fully understood to enable an informed decision on whether or not to proceed with treatment.

Demineralisation/Caries

Enamel demineralisation is a common complication in orthodontics. Nearly 50% of cases demonstrate a degree of demineralisation, typically on the labial of anterior teeth [22] (Figure 4). While reinforcement of oral hygiene and dietary education should be performed at each orthodontic and dental visit [22], adjuncts such as fluoride mouthwashes, toothpastes and/or Tooth Mousse can also be used to minimize the risk of demineralisation and/or remineralise white spot lesions. In severe cases, frank cavitation may require restorative intervention.

Figure 4: Demineralization and white spot lesions after orthodontic treatment

Enamel Damage

Removal of either metal or ceramic orthodontic brackets may result in enamel fracture [23-25]. Patients with demineralised enamel or porcelain crowns are more at risk. Enamel wear (abrasion) against ceramic brackets may occur especially in patients with deep bites or during space closure [26].

Root Resorption

A degree of root shortening is almost inevitable in all patients treated with fixed appliances [27]. Fortunately, this is usually minimal, affecting the apical 1–2 mm and does not normally compromise the long-term health of the teeth [27]. Severe resorption involving more than a quarter of the root length, occurs in less than 3% of patients [28] (Figure 5). Recognition of specific risk factors such as thin pipette roots, previous trauma or a genetic predisposition, as well as accurate interpretation of radiographs at the outset of treatment are important to minimise the risk of root resorption [27, 28]. Currently, no patient is immune from the risk of root resorption.

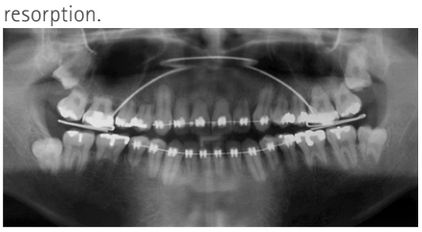

Figure 5: Orthopantogram showing root resorption

Periodontal Damage

Patients who have had orthodontic treatment do not have a long term increased predisposition to periodontal disease [29]. However, following placement of fixed appliances there is gingival inflammation in almost all patients (Figure 6). Fortunately, this is generally transient and resolves after debanding. It rarely results in attachment loss [30, 31] (Figure 7). While oral hygiene instruction is obviously essential, the use of adjuncts such as electric toothbrushes, waterpiks, inter-proximal brushes, regular professional cleaning and even chlorhexidine mouthwashes may become necessary[22].

Figure 6: Patient with gingival inflammation during orthodontic treatment

Figure 7: Patient with gingival hyperplasia during orthodontic treatment

Orthodontic treatment is not contraindicated in patients with pre-existing periodontal disease, provided the disease is well-controlled and the patient is sufficiently motivated and dextrous to maintain excellent oral hygiene during treatment [32]. For these patients three-monthly periodontal checks and routine debridement are recommended [32]. The orthodontist will often modify the mechanics for these patients by utilising lighter forces in view of the reduced bone support. Other patients who require close attention are those with systemic diseases such as poorly-controlled diabetes or epilepsy managed with phenytoin- based drugs [33].

Physical trauma

Patients may suffer from mouth ulcers due to rubbing of the lips and cheeks on brackets or wires. Fortunately most patients become accustomed to fixed appliances and their oral tissues quickly adapt to the new appliance. The use of wax adapted to the appliances for "padding" may however provide temporary relief [33].

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TMD

The onset of TMD symptoms commonly occurs during adolescence, however TMD may develop regardless of orthodontic treatment [34-38]. Orthodontic treatment neither causes TMD nor cures it [39, 40]. Pre-existence of TMD symptoms should be recorded at the initial examination, and the patient advised prior to commencing treatment that orthodontic therapy will likely not improve their condition.

Pulp Damage (Pulpitis)

Orthodontic patients may suffer from transient pulp ischaemia, causing pain and discomfort in the first few days after insertion or adjustment of the orthodontic appliances. However, it usually settles within a week [33]. Very occasionally, however, irreversible pulpitis may occur. In such cases the affected tooth will need to undergo endodontic therapy before orthodontic treatment can continue.

Ankylosis

Another rare complication that may occur during treatment is ankylosis, especially with impacted or traumatised teeth. This is a serious complication that will prevent ideal alignment of the affected teeth perhaps necessitating extraction of the ankylosed tooth [41].

Headgear Injury

Headgear can cause injury if it is displaced either during sleep or rough play as the headgear bow is sharp and covered in oral bacteria [33]. Eye injury from headgear is very infrequent, but if it does occur it may result in a serious infection and has resulted in loss of sight [22].

Allergies

Allergy to orthodontic components is very rare however as with all other dental materials allergic reactions can arise. Nickel allergy can be triggered by nickel-titanium and stainless steel based wires, bands, brackets and headgear. Intra-oral signs are variable and may appear as erythematous areas or severe gingivitis in the absence of plaque [42]. Latex sensitivity may be aggravated by latex gloves or elastomeric modules or elastics, however alternative non-latex modules and elastics are available [33].

Prolonged Treatment

Some individuals continually damage their appliances leading to extra and unscheduled appointments and prolonged treatment times [33]. Poor cooperation in wearing elastics and other appliances, as well as missing scheduled appointments, can lengthen treatment. Incorrect treatment planning and management can also increase treatment times. Poor, unexpected or delayed growth can also adversely affect treatment time. Some medications and medical conditions can also affect the speed of treatment.

Treatment Failure

Failure to complete a course of orthodontic treatment is frustratingly common (4–23%) [43]. Treatment may fail through poor patient compliance and/or initial poor diagnosis and management of the patient. This may be minimised through evaluation of a patient's motivation and commitment to orthodontic treatment, as well as a thorough examination and diagnosis to prepare an individualised treatment plan [33].

Profile Changes

Soft tissue changes occur naturally with age, regardless of orthodontic intervention [44]. While extraction of premolars has been condemned by some there is very little evidence that this adversely alters the facial profile [45]. Studies have indicated that in appropriately treated cases orthodontists, general dentists and the public could not distinguish between extraction and non extraction treatment by looking at profile alone [46, 47]. However in a clinical setting, patients may attribute profile changes to the decision toextract or not extract teeth.

Relapse

Several long-term reviews of patients 20 years after orthodontic treatment demonstrate that, even with orthodontic treatment of a high standard and with the teeth placed in seemingly stable positions, teeth will still move [48]. It is important that patients understand that teeth move throughout life; this is a physiological process not related to relapse. For teeth to remain well-aligned, some form of indefinite retention is required [48].

Conclusion

Before starting orthodontic treatment, the referring practitioner, patient and orthodontist should reflect on the risks and benefits of treatment. There are a number of potential risks to the patient during orthodontic treatment, however, severe damage is rare. On the other hand, not seeking orthodontic treatment may also result in psychosocial or physical damage. In the vast majority of well-planned cases, the benefits of orthodontic treatment outweigh the possible risks.

References upon request