Australian Society of Orthodontists

THE UNIVERSITY OF SYDNEY

AFTER ACTIVE
Orthodontic Treatment

Creating Brighter Futures

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AFTER ACTIVE Orthodontic Treatment

Once active orthodontic treatment is completed, there are several factors the clinician must consider to ensure the patient receives ongoing optimal care in both the short and long term. In 'After Active Orthodontic Treatment' we will explore some of those factors.

Retention and relapse

Orthodontic retention is important to help stabilise the orthodontic corrections achieved[1]. Teeth tend to return to their former positions due to a variety of factors such as: soft tissue pressures, reorganisation of gingival fibres, and occlusal forces. Orthodontic treatment disturbs supporting bone, periodontal and gingival tissues which require time to remodel[2]. Retention allows this remodelling to occur, aiming to minimise the relapse tendency. Almost all orthodontic movements require some form of retention.

Fig.1 Fixed retainers are commonly used for long term retention.

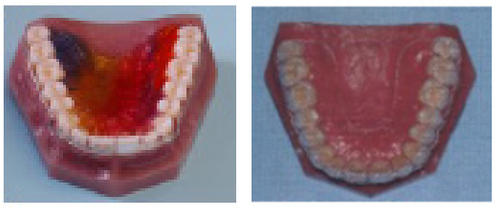

Fig. 2 Removable retainers

Commonly used retainers include bonded fixed retainers and removable retainers. The retention protocol should be customised for the patient based on their malocclusion, compliance and preferences. Complications that can arise with bonded retainers include[3]:

- Failure due to debonding
- Fracture of the retainer wire
- Distortion of the retainer wire
- Unwanted tooth movement with retainer in situ
- Periodontal health compromise
- Site for food impaction
- Soft tissue irritation

Complications with removable retainers include:

- Appliance breakage or distortion
- Loss of appliance
- Ill-fitting appliance resulting from tooth movement, eruption or growth
- Poor compliance due to retention fatigue

For these reasons, fixed and removable retainers require periodic maintenance and occasional replacement for as long as retention is required. Permanent retention is now commonly prescribed as teeth continue to move throughout life[1].

If change does occur, the cause should be investigated and the patient reassessed to determine if they require a further phase of orthodontic correction. This may involve minor tooth movement or more comprehensive treatment, especially if they have grown and matured unfavourably into adulthood. This management may involve active removable appliances, including sequential plastic aligners, partial or full fixed appliances and even orthognathic surgery – especially in the case of Class III patients.

Third molars

Third molar eruption and lower anterior crowding is a controversial topic as it is unclear if there is a direct association or whether the relationship is coincidental. A number of researchers have looked at this question with varying conclusions[4-6]. Nevertheless, the current consensus is that, in general, third molars do not cause crowding, although in a smaller number of cases they may be implicated. A Cochrane review in 2012 confirmed there is no evidence that third molars cause lower incisor crowding, rather it has a multifactorial aetiology[7].

The current evidence indicates there are several other orthodontic factors contributing to late crowding including: mesial drift, late mandibular growth and occlusal forces. The removal of third molars purely to reduce or prevent lower incisor crowding therefore cannot be justified.

The third molars however still require monitoring. If the third molar has a communication with the oral cavity, pericoronitis can develop and this may require intervention and perhaps third molar removal. In rare situations they can cause resorption of the second molar.

Fig.3

Third molar resorbing the second molar.

White spot lesions

White spot lesions (WSLs) are a common sequalae of orthodontic treatment, with a reported incidence up to 61% in individuals undertaking comprehensive orthodontic treatment, even if some lesions are very minor[8]. They occur around both fixed brackets and sequential plastic aligners where plaque can accumulate. WSLs occur due to demineralisation which increases subsurface porosity. Some surface remineralisation can occur from saliva, however this is a limited and slow process. WSLs appear opaque and are unaesthetic and can persist for 5-12 years[9]. Poor oral hygiene, poor diet and reduced salivary flow are some of the contributors to their formation. High doses of fluoride have been recommended during and after orthodontic treatment to arrest areas of decalcification and preventing WSLs from progressing to carious lesions. This results in an increase in remineralisation of the outer enamel and a decrease in demineralisation of the inner enamel, with a nett mineral gain.

Some authors warn against the use of high concentrations of fluoride because they suggest remineralisation occurs mainly in the superficial part of the WSLs[10].

Fig.4

White spot lesions after orthodontic treatment

A systematic review by Chen[10] assessed evidence regarding mode of action and effectiveness of remineralising agents on post-orthodontic WSLs. These remineralising agents include fluoride and Tooth Mousse (CPP-ACP/CPP-ACFP).

The active agent of Tooth Mousse, casein phosphopeptide-amorphous calcium phosphate (CPP-ACP), is thought to stabilise and localise calcium, fluoride, and phosphate at the tooth surface in a slow-release amorphous form, thus enhancing deeper remineralisation of WSLs. Micro abrasion has also been used to remove WSLs after active orthodontic treatment, in conjunction with CPP-ACP or resin infiltration.

However, Chen found a lack of reliable evidence to support the effectiveness of remineralising agents for the treatment of post-orthodontic WSLs. A randomised control trial by Huang[11] found remineralising agents did not appear to be more effective than normal home care for improving the appearance of WSLs over an 8-week period.

Gingival Hyperplasia

Gingival inflammation and hyperplasia during fixed appliance treatment is common and poor oral hygiene is the major contributor[12]. Some patients demonstrate hyperplasia even with excellent oral hygiene which may suggest some type of irritational or allergic type reaction may be a contributing factor. Fortunately, gingival inflammation is nearly always transient and resolves after a few weeks once the appliances are removed. When the tissues are enlarged, the tooth surfaces become difficult to access, which inhibits good oral hygiene and further exacerbating the inflammation and bleeding. Fortunately it usually presents as a pseudo-pocket without attachment loss[12].

The duration of orthodontic treatment significantly influences the occurrence of gingival enlargement. Oral hygiene instructions and motivational activities therefore should target adolescents and young adults undergoing orthodontic treatment[13].

In very rare instances, where there is no spontaneous resolution several months after appliance removal, and despite efforts to improve oral hygiene, periodontal treatment may be required. Procedures such as gingivectomy or crown lengthening, to remove the hyperplastic tissue, and re-establish a more optimal gingival margin which is both more aesthetic and easier to clean may be appropriate.

Fig.5

Gingival hyperplasia after braces removal usually resolves quickly with good oral hygiene.

Diastemas and frenectomies

In young children, diastemas are considered normal and are present in 98% of 6 to 7 year olds, whereas by age 12 to 18 years only 7% still have a diastema[14]. With age frena relocate apically as the alveolar process grows vertically and most midline diastemas close of their own accord following the eruption of the six anterior teeth. Failure of the frenum to migrate apically can result in a residual fibrous tissue band between the maxillary central incisors. Gardiner reported that 80% of upper midline diastemas were accompanied by large frena[15]. In addition to large frena there are other factors which may contribute to the reopening of maxillary anterior diastemas following orthodontic treatment[16], including:

- Improper axial inclination of roots of central incisors
- Tooth size discrepancies (Bolton's Discrepancy)
- Habits (thumb sucking or forward tongue position)
- Occlusal patterns or lateral forces in excursions
- Anatomy of teeth
- Muscular imbalances

Frenectomies, and their timing, remain controversial. A pre-orthodontic frenectomy may allow faster space closure, however, it may also result in the formation of scar tissue which may prevent or retard both natural and orthodontic diastema closure[17]. If after orthodontic treatment a prominent frenum remains there is a high risk of the diastema reopening when retention is discontinued. In a sample of 162 diastema patients treated orthodontically and retained for 16-22 months, when retainers were removed 38% diastema relapse occurred in patients with normal frena, and 84% diastema relapse occurred in patients with abnormal frena[16].

Therefore, if a prominent frenum remains after orthodontic closure of a diastema a frenectomy should be considered, especially before retention is discontinued. However, with the increasing popularity of long term or 'lifetime' fixed lingual retainers, there may now be less need for frenectomy[18] after active orthodontic treatment.

Orthodontically induced inflammatory root resorption (OIIRR)

A degree of external root resorption is often associated with orthodontic treatment, although the extent cannot be predicted. Prior to orthodontic treatment, 15% of teeth in adults radiographically displayed mild resorption. The incidence increased to 73% post orthodontic treatment[19]. Fortunately, only a very small percentage had a shortening of more than 2mm, with the majority only having very minor resorption.

There are predisposing factors which increase the risk and extent of root resorption, including heavy forces, history of trauma, pulpal necrosis, prolonged treatment and tooth movements such as intrusion or torque. Radiographs are often used to diagnose root resorption, although there is potential distortion which can be misleading. Periapical films are useful however the increased use of CBCT may be more accurate.

Once a tooth is subjected to root resorption, some cementum repair and healing may occur. However, apical root resorption results in permanent loss of root length[20]. When orthodontic forces cease so does the resorption[21].

Resorbed teeth are still functional and there are few reports of tooth loss from severe apical root resorption after orthodontic treatment. It has been estimated that 3mm of apical root loss is effectively equivalent to 1mm crestal bone loss[20]. It is therefore important to maintain the long-term periodontal health of such teeth after active orthodontic treatment. Care should be taken if further orthodontics is to be considered in a patient with past root resorption.

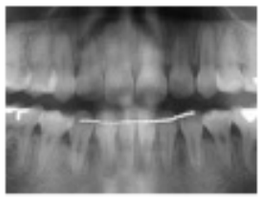

Fig.6

Apical root resorption associated with orthodontic treatment (aainfo.org)

Tempero-Mandibular Disorder (TMD)

TMD may develop regardless of orthodontic treatment. There is no evidence for increased risk of TMD in orthodontic patients and orthodontic treatment does not increase the odds of developing TMD later in life[22]. There is also little evidence that orthodontic treatment can prevent TMD[23]. Patients who undergo orthognathic surgery may be at an increased risk of developing TMD[24].

It is important that thorough pre-treatment records are obtained, especially regarding any pre-existing TMD, and patients should be informed that orthodontic treatment alone is unlikely to improve their symptoms. TMD can still develop despite the accomplishment of a stable post treatment occlusion.

Devitalisation of a tooth

During or following orthodontic treatment it is possible to develop pulpal obliteration or necrosis which can, on rare occasions, be related to the orthodontic forces experienced by the tooth. Usually the orthodontic force is only a contributing factor following trauma to the tooth from, for example, a single or repetitive accident or knock of some kind. If the pulpal canal is reducing in size the tooth will become yellower as more reparative dentine is deposited. The tooth will remain vital but often requires bleaching or veneering to improve its appearance.

If a tooth becomes non-vital a root canal therapy will be required and follow up bleaching may be appropriate management.

Conclusion

Orthodontic treatment can result in some undesirable side effects such at white spot lesions, gingival hyperplasia, pulpal damage and root resorption. Clinicians must be aware of these conditions and understand how they can be managed.

Retention is required post-orthodontic treatment; however post-treatment changes have a multifactorial aetiology which cannot always be prevented. Third molar extraction is not justified for the prevention of lower anterior crowding. The management of enlarged frena are most often managed post active orthodontic treatment with fixed retainers used to maintain diastema closure.

References upon request

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