Orthodontic and Periodontal Multidisciplinary Care

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Abstract: Patients who are at risk of, or have a history of, periodontal disease requesting orthodontic treatment require careful multidisciplinary management in order to achieve optimal orthodontic and periodontal outcomes. An understanding of the periodontal tissues and the disease processes that can affect the periodontium is required by the orthodontist to ensure that patients are managed appropriately.

CPD/Clinical Relevance: This paper discusses the multidisciplinary management of periodontal patients who require orthodontic treatment and methods for ensuring optimal outcomes.

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It is important that the orthodontist and those involved in the orthodontic management of patients have an understanding of periodontal tissues, diseases of the periodontium, how orthodontic treatment can affect the periodontium, and how the periodontist and orthodontist can work together to manage patients successfully. General dental practitioners have multiple roles within the multidisciplinary team, including identifying patients who may benefit from orthodontic treatment, as well as ensuring that patients are dentally fit and have received appropriate preventive advice.

Those involved in the orthodontic management of patients should have an awareness of the diagnosis of periodontal diseases and their management. Periodontal diseases are classified according to the *1999 International Workshop for the Classification of Periodontal Diseases and Conditions*.[1] There are a large number of possible diagnoses of the periodontal tissues. However, the most common conditions that are likely to be encountered by the orthodontist are plaque-induced gingivitis, chronic periodontitis and, less commonly, aggressive periodontitis. Further discussion regarding the diagnosis and classification of periodontal conditions can be found in the review paper by Armitage.[2]

Chronic periodontitis is highly prevalent. *The Adult Dental Health Survey 2009* found that 45% of adults in England and Wales had periodontal pocketing exceeding 4 mm.[3] As more adults are now seeking orthodontic treatment, it is important that those patients with existing periodontal disease are diagnosed and managed appropriately prior to embarking on orthodontic treatment. Failure to identify the presence of periodontal disease risks further loss of attachment and ultimately loss of teeth.[4-6] Although periodontitis is less common in children and adolescents, it is important that they are also screened prior to orthodontic treatment.[7]

Periodontal treatment prior to orthodontics

Diagnosis and management of periodontal disease

All patients considering orthodontic treatment should have a periodontal diagnosis, and it should be managed accordingly. Patients should also be risk assessed for future disease, particularly considering the potential for orthodontic appliances to increase risk due to the increased demands on oral hygiene.[8,9] Orthodontic treatment should only be considered where the risk of disease is considered low and where orthodontic treatment will not tip the balance in favour of disease. An audit carried out by the authors on adult orthodontic patients found that screening for evidence of periodontal disease was often not carried out by the orthodontist and that records indicated that evidence of disease was often missed at the orthodontic assessment appointment.[10]

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As patients are usually seen by the orthodontist on referral from a general dental practitioner, it would be hoped that screening for disease and management, including prevention, would be carried out prior to referral.[7,11] However, our audit found that patients with risk factors for, and evidence of, periodontal disease were often referred without a diagnosis or adequate preventive measures carried out. With this in mind, orthodontists should consider the possibility of periodontal disease as part of their management and screen accordingly. Risk factors for dental disease, including periodontal disease, should be assessed and, where necessary, preventive measures instigated, usually in conjunction with the general dental practitioner.[12] Often this will involve postponing consideration for orthodontic treatment until the disease has been managed and the patient has demonstrated stability of the oral tissues and adherence to preventive advice.

Patients with periodontal disease may present with aesthetic concerns. Teeth with a reduced periodontal support are subject to secondary occlusal trauma which may manifest with drifting of teeth, sometimes referred to as pathologic tooth migration.[13] Adults who have previously had stability of their dentition who present with evidence of drifting should be screened for periodontal disease as well as the potential for occlusal factors (Figure 1). Where periodontal disease is the underlying cause, management should be instigated. It is outwith the scope of this paper to discuss the management of periodontal disease but guidance is available.[12]

Patients who present with aesthetic concerns may not expect a periodontal diagnosis, therefore careful counselling and explanation is required. They should have the management options and the expected timeframes for periodontal treatment explained. This is important for all patients, but particularly where their presenting aesthetic concerns may not be addressed for many months, perhaps years. Where patients feel the drifting is worsening, construction of retainers can be considered to prevent further drifting of the teeth, although this needs to be balanced against the presence of a foreign body in the mouth, with increased plaque retention, and the impact this may have on the periodontal management.

Supportive periodontal care for the orthodontic patient

When periodontal stability has been achieved, orthodontic treatment can be considered. The exact timeframe for how long stability should be demonstrated prior to embarking on orthodontic treatment is subject to debate, and should be evaluated on a case-by-case basis. However, 2–6 months following completion of active periodontal treatment has been advocated.[14] In addition to demonstration of periodontal stability, the patient should be carefully risk assessed for future disease and the impact that the presence of orthodontic appliances may have. All patients who have had a history of periodontal disease should have a tailored supportive periodontal programme and be screened on a regular basis for evidence of re-occurrence of disease.[8]

Patients with reduced periodontal support can successfully undergo orthodontic treatment with due consideration to the periodontal tissues (Figure 2).[4,5,15] However, there is scope for increased risk and patients should be carefully counselled on these risks in order to gain informed and valid consent. Patients with a history of periodontal disease considering orthodontic treatment may require their maintenance plan to be adjusted to account for the increased risk. Careful monitoring for re-occurrence of active disease during orthodontic treatment is important and orthodontic treatment may need to be discontinued if the periodontal tissues become unstable.

Orthodontic treatment to facilitate periodontal treatment

Malocclusion and periodontal disease

There is debate on the impact of tooth malposition on the risk of periodontal disease. It would seem logical that irregular or crowded teeth will be more difficult to clean and, accordingly, the risk of disease will also increase and that this risk would reduce with correction of the malocclusion. However, there is a lack of strong evidence to support this. Studies have found both a correlation and no correlation between tooth irregularity and periodontal disease.[16-18] This may be because many other factors need to be considered, such as patients' ability to remove plaque deposits and their inherent susceptibility to periodontal disease.

Sadowsky and BeGole assessed patients who had undergone orthodontic treatment, with the results indicating better functional occlusion outcomes compared with untreated patients. Both groups showed a similar periodontal status, suggesting that there is no beneficial effect of orthodontic treatment on future periodontal health.[19]

Orthodontic appliances and periodontal disease

Plaque accumulates more readily on orthodontic appliances and therefore these appliances may impede the maintenance of good oral hygiene, which is necessary to maintain a healthy periodontium.[8,13] Pender found that inflammation of the palatal gingivae occurred more frequently with removable appliances compared with fixed appliances.[20] Paolantonio *et al* found a greater frequency of the periodontal pathogen *Actinobacillus actinomycetemcomitans* (subsequently renamed *Aggregatibacter actinomycetemcomitans*) in patients with fixed appliances.[21]

Orthodontic management of the periodontal patient

Oral health promotion

All patients should have achieved, and be able to maintain, an adequate level of oral hygiene prior to starting orthodontic treatment and plaque scores can be a useful aid in quantifying this and monitoring it throughout treatment. Methods of supporting this have been discussed in the literature and it is recommended that plaque-retentive complex bracket designs and auxiliary wires are avoided in those that are susceptible.[22] Gray and McIntyre's systematic review in 2008 examined the effectiveness of oral health promotion and found that there was a short-term (up to 5 month) reduction in plaque and improvement in gingival health for patients with fixed appliances who were given oral health advice. However, they suggested that further studies were needed due to the heterogeneity in outcome measures in the different studies.[23]

Figure 1. Patient with a history of treated periodontal disease with concerns regarding drifting and spacing of teeth.

Figure 2. Patient in Figure 1 following orthodontic treatment.

Orthodontic mechanics

Once a periodontal patient has a stable periodontium, the orthodontist can embark on orthodontic treatment. However, considering what types of appliances and mechanics to use at the treatment planning stage, and endeavouring to keep the orthodontic treatment as short as possible, will help improve the outcomes for patients. Although this may not always be possible, certain components of a fixed appliance may be altered to help prevent the periodontal condition worsening. Banded teeth have been shown to be associated with greater loss of attachment compared with bonded teeth.[24] Therefore, it is recommended that the orthodontist should avoid placement of bands where possible, particularly in periodontal patients.

The orthodontist may also need to consider bracket positioning and favourable mechanics to ensure optimal tooth movement. Loss of alveolar bone causes apical movement of the centre of resistance, therefore teeth are more prone to tipping movements. Periodontal patients with areas of bone loss will provide reduced anchorage to aid orthodontic mechanics. Anchorage reinforcement may be required by incorporating a greater number of teeth in the appliance or by using other methods of anchorage reinforcement, such as temporary anchorage devices. The orthodontist should use lighter forces as this will reduce the anchorage requirements and help limit root resorption. The risk of apical root resorption needs consideration in orthodontic treatment and all patients need to be carefully consented for this. The impact an average amount of root resorption will have on patients with normal roots and a healthy periodontium is likely to be minimal. However, in patients with an already reduced periodontium, shortening of the roots could result in an increase in mobility and, in some cases, hasten the loss of teeth. This could be considered a disappointing outcome for patients who have complied with periodontal treatment and achieved periodontal stability.

As part of an orthodontic patient's treatment the orthodontist may choose to upright a tipped molar tooth or extrude a tooth with a bony defect. By moving a tooth away from the osseous defect, the bony defect can be shallowed out, providing better gingival contour and increased ease of plaque removal.[25-27]

Where periodontal disease has occurred, the gingival margin level may be high due to previous bone loss, however, intruding a tooth orthodontically may not improve the gingival margin. Periodontal patients may also be concerned about black triangles which were not visible prior to periodontal treatment. Although these patients may now have a healthy periodontium, having lost the crestal bone between the teeth means the papilla becomes absent, resulting in poor aesthetics with a black triangle visible between the teeth.[28] The orthodontist may consider recontouring the surfaces of the adjacent teeth to lengthen the contact point and move it apically towards the interproximal gingivae. This may not eliminate the black triangle but may improve aesthetics.

A patient may attend with a presenting complaint that appears to be gingival in nature, but is a result of orthodontic treatment or occlusal trauma. Patients with a deep and traumatic bite may present with extensive gingival stripping of the tissues, which can be exacerbated by poor oral hygiene. For these patients simple periodontal management will not suffice and the occlusal trauma may need to be eliminated, either with orthodontics alone or with orthognathic treatment. Patients may also present with ulceration or suppuration where an orthodontic appliance, such as a band, is impinging on a periodontal pocket, making it difficult for the patient to clean. It is necessary to ensure that any gingival trauma is limited by correct placement of appliances.

Orthodontic retention also needs to be planned carefully as fixed retainers are often preferred in periodontal patients to removable retainers. Removable retainers exert jiggling forces on teeth as they relapse during the day and are moved back into position at night-time. This has been shown to have an impact on alveolar bone support and mobility of teeth, although not thought to result in loss of attachment unless inflammation is present.[29,30] Fixed retainers may be advantageous as they distribute occlusal forces amongst several teeth and jiggling forces are not applied. However, the patient needs to be able to maintain a good level

of oral hygiene around the retainer and long-term maintenance is required.

Adjunctive periodontal treatment options for orthodontic patients

Gingival recession post-orthodontic treatment

Orthodontic treatment as a causal factor in recession has been suspected for many years, although the evidence is not strong.[31] Avoidance of excessive proclination and expansion, particularly outside the alveolar envelope, is considered sensible. Mathews and Kokich suggested a free gingival graft should be considered, prior to orthodontic treatment, if labial tooth movement is planned and there is thin attached mucosa <2 mm and alveolar bone dehiscences.[32]

Although every effort should be made to avoid orthodontic-related recession, recession can still occur. An assessment by a periodontist is warranted to decide on the need for further management. Options include keeping the defect under observation following careful oral hygiene instruction with the aid of records, such as photographs and study models, and consideration for mucogingival surgery. A full discussion on the management of recession is beyond the scope of this paper. However, in many cases, recession can be managed non-surgically. Where the recession shows evidence of continuation despite preventive measures, or where the patient has other signs or symptoms that cannot be managed non-surgically, mucogingival surgery can be considered. The likely outcome of surgical management is directly related to the morphology of the recession defect, classified by Miller.[33] A wide range of procedures have been suggested for the surgical management of recession. However, the coronally advanced flap in conjunction with a subepithelial connective tissue graft is considered to be the 'gold standard'.[34,35]

Frenectomies

Attached frenal fibres migrate apically with normal growth of the alveolar process. However, failure of this results in a residual band of tissue. A strong correlation between an abnormal frenum, vertical osseous cleft and median diastema has been reported.[36] Some orthodontists advocate a frenectomy for patients with a median diastema and abnormal frenum to help prevent orthodontic relapse, however, some suggest that relapse is not as common as previously believed.[37] An orthodontist will assess each patient clinically and may suggest a frenectomy, particularly if there are other factors of concern, such as oral hygiene issues in the frenal area and loss of gingival tissue from frenal pulling. A frenectomy can be carried out prior to orthodontic treatment, when there is easier access for the surgeon but risk of scarring may compromise the orthodontic result, or after orthodontic treatment when the scarring may potentially help retain closure of a median diastema.

Conclusions

The general dental practitioner, periodontist and orthodontist, and many others within the dental team, need to work closely, particularly for those orthodontic patients with a history of, or at risk of, periodontal disease. Multidisciplinary management of periodontal patients requiring orthodontic treatment is key to ensuring that the health of the periodontium is maintained long term whilst optimizing orthodontic outcomes.

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