

## Review Article

### Ortho - Perio Interrelationship: A narrative review

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#### ABSTRACT:

**Background:** The necessity of a multidisciplinary treatment approach cannot be overstated in this day and age, when a large percentage of patients seeking orthodontic treatment are adults. Involvement of a periodontist is almost inevitable in individuals undergoing orthodontic treatment due to the increased susceptibility to plaque formation. In addition, orthodontic therapy typically causes unfavorable periodontal alterations that must be addressed right once. Orthodontics has recently been utilized in conjunction with periodontics to improve connective tissue support and alveolar bone height. The goal of this article is to examine the adverse consequences of orthodontic therapy on periodontal tissues, as well as the mutually beneficial interaction that exists between the two professions.

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#### INTRODUCTION

In the late 1800s, Kingsley claimed that age isn't a limiting factor when it comes to tooth movement. However, orthodontists have limited their services to children and adolescents for a long period. In the 1960s and 1970s, however, the primary motivation for obtaining orthodontic treatment was to prevent oral disorders such as caries and periodontal disintegration. Adults have been able to have orthodontic treatment since then.<sup>1</sup> Interactions between orthodontics and periodontics are mutually advantageous. In many cases, the combination therapy can significantly improve periodontal health and dentofacial aesthetics. Periodontal therapy's major goal is to restore and maintain the health and integrity of the teeth's attachment apparatus. Orthodontic treatment strives to provide a functional and aesthetic occlusion with the use of proper tooth movements. These movements are tightly correlated to the interactions between teeth and the periodontal tissues that support them.<sup>2</sup> If orthodontic treatment is employed to reduce plaque collection, rectify incorrect gingival and osseous forms, improve aesthetics, and facilitate prosthesis replacement, it might be justified as part of periodontal therapy.<sup>3</sup> Orthodontic patients are divided into four groups:

those who have good oral health, those who have periodontal disease and/or have lost permanent teeth, and those who have serious skeletal discrepancies. Patients in the following scenarios require a multidisciplinary treatment that includes an orthodontist and a periodontist. Both specialists should be involved in treatment planning for such patients, and treatment progress should be evaluated and shared.

#### MECHANISMS OF TISSUE RESPONSE AND ORTHODONTIC FORCE

The application of controlled forces on teeth causes tooth movement induced by orthodontic force. The applied force causes the dental and periodontal tissues to remodel. On one side, orthodontic force compresses the alveolar bone and the periodontal ligament, whereas on the other side, the periodontal ligament is stretched. On the compressed side, the bone is selectively resorbed, whereas on the tension side, it is deposited.

Periodontal ligament ischemia occurs with simultaneous bone resorption and deposition, resulting in continuous tooth movement. Light orthodontic force, defined as force less than capillary blood pressure, causes periodontal ligament ischemia

with simultaneous bone resorption and deposition, resulting in continuous tooth movement. Periodontal ligament strangulation occurs as a result of moderate orthodontic forces exceeding capillary blood pressure, resulting in delayed bone resorption. Strong or heavy orthodontic forces, i.e. forces that are significantly greater than capillary blood pressure, cause ischemia and degeneration of the periodontal ligament on the compressed side, resulting in hyalinization and a longer time for tooth movement. Crowding, pathologic tooth migration, mesially tilted molar, closure of midline diastema, and other periodontal disorders are the most prevalent periodontal problems that can be treated by minor orthodontic procedures.

### **MUCOGINGIVAL CHANGES DURING ORTHODONTIC TREATMENT**

According to Lang and Loe's findings, 2 mm of keratinized gingiva is sufficient to preserve gingival health.<sup>6</sup> Batenhorst discovered that incisor tipping, extrusion, and bodily movements result in apical displacement of the labial gingival edge and loss of attachment in monkeys.<sup>7</sup> According to Steiner, stress in the marginal tissue caused by orthodontic forces could be a major contributor to gingival recession. This suggests that the thickness of the gingival tissue on the pressure side, rather than the apico-coronal width, is a sign of likely recession. To test this hypothesis, monkeys were used in an experiment.<sup>8</sup>

### **ORTHODONTIC TREATMENT AS AN ADJUNCT TO PERIODONTAL THERAPY**

Correction of crowded or malpositioned teeth allows the patient to clean all surfaces of his or her teeth more easily. The establishment of correct arch form and proximal contact also reduces or eliminates food impactions.<sup>9</sup>

Uprighting the tilted molars with orthodontics has several advantages: The distal moving tooth allows alveolar bone to be deposited on the mesial defect. On the mesial side, this also eliminates gingival folding and plaque retentive area.<sup>10</sup>

For shallowing intraosseous abnormalities and extending the clinical crown length of single teeth, orthodontic extrusion of teeth may be recommended. Extrusion causes the intact connective tissue attachment to be positioned coronally along the tooth, as well as bone deposition.<sup>11</sup> If OTM is desired in a patient with periodontitis, Tulloch<sup>12</sup> believes that fixed appliance therapy is the better option. Teeth can be easily splinted to achieve solid anchoring with a fixed appliance. He also emphasizes the significance of lowering force magnitude and using counteracting moments to reduce stress on periodontal ligament fibres. When attempting tooth movement in a height-reduced periodontium, Lijian<sup>13</sup> lists the many precautions to be considered, including ensuring secure anchorage and long-term periodontal maintenance treatment.

### **PERIODONTICS AS AN ADJUNCT TO ORTHODONTIC TREATMENT**

The periodontium also isn't harmed by properly applied orthodontic forces. Insufficient width of the connected gingiva, on the other hand, is thought to predispose the development of recession. A 2-mm width of keratinized gingiva is sufficient to maintain optimal gingival health.

Gingival recession is caused by tension on the gingival margin during orthodontic force application. Orthodontic incisor proclination increases the likelihood of recession and attachment loss, especially in locations with little gingiva and bone support. In many cases, orthodontics simply will not provide a stable and aesthetically pleasing result without the use of periodontal procedures. A high labial frenum attachment, for example, is thought to be a cause of midline diastema. In such circumstances, frenectomy is indicated because the fibres are supposed to hinder the central incisors from migrating mesially. The timing of periodontal intervention, on the other hand, has been a point of conflict.<sup>14</sup> According to Vanarsdall, surgical removal of a maxillary labial frenum should be delayed until after orthodontic treatment unless the tissue prevents space closure or becomes painful and traumatized. To accommodate the new tooth positions, orthodontic tooth movement causes restructuring of collagenous fibres, elastic fibres, and the periodontal ligament. The teeth must be preserved in order to avoid orthodontic relapse and promote proper supporting tissue rearrangement. Even after 4-6 months of retention, Sharpey's fibres of the newly produced bundle bone, as well as supraalveolar and transseptal fibres, undergo reorganization, especially after rotation correction. As a result, the teeth must be kept for at least 12 months to allow for complete fibre remodelling. Circumferential supracrestal fiberotomy is commonly recommended to lessen the risk of relapse. Fiberotomy is typically done near the completion of active orthodontic therapy, a few weeks before the orthodontic appliance is removed. Crown lengthening is frequently done on teeth with a shorter clinical crown to help with orthodontic appliance placement. Prior to orthodontic bonding procedures, crown lengthening is commonly accomplished with gingivectomy or an apically repositioned flap in combination with gingivectomy.<sup>15,16</sup> Crater, hemiseptal defect, three-wall defect, and furcation lesion are the most common reasons for preorthodontic osseous surgery. Osseous craters are two-wall interproximal abnormalities that do not respond to orthodontic treatment alone. During orthodontic therapy, some shallow craters (pocket depth of 4-5 mm) can be preserved without surgery. By modifying the bone defect, large craters can be removed. This makes it easier for the patient to keep these interproximal areas clean during orthodontic treatment.<sup>3</sup> Gingival "black holes" are missing interdental papilla that can be caused by a variety of

reasons including over-divergence of adjacent roots and advanced periodontal disease with loss of the interdental alveolar crest. To treat these issues, an orthodontic periodontic multidisciplinary approach is frequently recommended. The gummy smile is caused by apical migration of the gingival margins that has been delayed; aesthetic gingival surgery is usually recommended in this case. A gummy smile can also be caused by vertical maxillary excess. In adult patients, a LeForte I osteotomy with maxillary impaction is commonly recommended; however, "initial bicuspid extractions followed by attachment of a high pull J-hook headgear to the premaxillary segment" helps to prevent the development of this condition in growing patients.<sup>17</sup>

### **ORTHODONTIC TREATMENT IN ADULTS**

In recent years, there has been an increase in the number of adult patients seeking orthodontic treatment. Adult orthodontics requires special care in various areas, including psychosocial, biological, mechanical, and age-related variables such as tissue ageing, loss of growth potential, TMJ condition vulnerability, and root resorption. During the early stage of orthodontic therapy, Lindhe (1989) recommended using an intermittent force of 20-30 g in adults. Depending on the amount of surviving alveolar bone and the degree of marginal bone loss, the force may be raised up to 50-80 g in physical movement and 30-50 g in tipping, equating to a distance of movement of 0.5-1.0 mm per month.<sup>18</sup>

### **CORTICOTOMY ASSISTED ORTHODONTICS**

Corticotomy-assisted orthodontic treatment is a well-known and effective orthodontic method that has recently been the focus of many studies. It has steadily grown in favour as an additional treatment option for individuals undergoing orthodontic treatment. It involves performing selective alveolar decortication in the form of decortication lines and dots around the teeth to be relocated. It's done to cause a rise in tissue turnover and a brief period of osteopenia, which is followed by a higher pace of orthodontic tooth movement. This approach provides a number of benefits, including faster tooth movement, shorter treatment times, safer expansion of confined arches, improved post-orthodontic treatment stability, and a larger tooth movement envelope.<sup>19,20</sup>

### **PERIODONTALLY ACCELERATED OSTEOGENIC ORTHODONTICS**

Wilcko et al. established periodontally accelerated osteogenic orthodontics (PAOO), often known as Wilckodontics, in 2001. It's a corticotomy-assisted approach that involves a full-thickness labial and lingual flap elevation, followed by selective surgical scarring of the labial and lingual cortical bones (corticotomy), graft material implantation, surgical closure, and orthodontic force application.

RAP was first reported by Frost in 1983, however numerous histomorphometrists have been aware of the phenomena since 1966. Frost observed that the initial damage sped up the typical healing processes in the region. The regional acceleratory phenomenon is responsible for this acceleration. RAP is a condition that happens after a fracture, arthrodesis, osteotomy, or bone-grafting treatment, and it involves the recruitment and activation of precursor cells for wound healing that are localised at the injury site. RAP is not a distinct healing event, but it can speed up the hard and soft tissue healing stages by two to ten times. RAP increased normal regional healing processes by short bursts of hard- and soft-tissue remodelling, as Shih and Norrdin demonstrated when intraoral cortical bone was damaged by corticotomy.<sup>21,22</sup>

### **PIEZOCISION ASSISTED ORTHODONTICS**

Piezocision-assisted orthodontic treatment is a snipping, minimally invasive surgical method that aids in the quick movement of teeth. In the buccal gingivae, microsurgical interproximal holes are produced to allow the piezoelectric knife to create the bone injury that will lead to transitory demineralization and rapid tooth movement. Incisions were done simultaneously at the maxilla and mandible when this method was first described. In recent years, the technique has evolved to a more staged approach, with chosen sections or segments of the arch demineralized at certain stages during orthodontic treatment to aid in the achievement of specific goals.

### **CONCLUSION**

Periodontal health is necessary for any type of dental therapy, particularly orthodontic treatment. On the one hand, orthodontic therapy works in two ways. It gives some protection to periodontal tissues. The gingiva, the bone, and the periodontium are all kept in place by the periodontium. Having the periodontal ligament in good working order, but On the other side, it has a negative impact on the periodontium surroundings are gingivitis, gingival recessions, and Dehiscence of bones, etc. In periodontally compromised individuals with crowding, orthodontic treatment can proceed only when periodontal inflammation has been controlled and stable periodontal conditions have been attained following significant decrease of periodontal pockets. After periodontal therapy, orthodontic treatment helps to preserve periodontal homeostasis. The patient's ugly dentition (due to migrated teeth subsequent to periodontal breakdown and inflammatory periodontium) is transformed into an attractive dentition with a dazzling smile by combining patient education and motivation with an interdisciplinary approach. Because orthodontic therapy and periodontal health are intertwined, recognizing the ortho-perio relationship aids in achieving the best potential results in underserved individuals.

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