

Australian Society  
of Orthodontists



University of Sydney



Adult Orthodontics

*Creating Brighter Futures*

# Adult Orthodontics

Recent years have seen a dramatic increase in the demand for orthodontic treatment amongst adults<sup>1,2</sup> who now comprise 15-20% of the average orthodontist's patient caseload.<sup>3</sup> In general, adults who seek treatment make highly motivated patients, as they have a genuine interest in improving the appearance and longevity of their dentition.<sup>4-7</sup> Factors such as function, facial balance and appearance are as relevant to them as they are for younger patients. The aim of treatment may be to either correct a malocclusion that has existed since childhood, or to correct one that has developed consequent to ageing changes, tooth extraction, advancing periodontal disease or orthodontic relapse.<sup>8</sup>

Orthodontic therapy has become more socially acceptable for adults<sup>9</sup> thanks largely to advances in aesthetic appliances such as clear aligners, ceramic brackets and lingual fixed appliances.<sup>10</sup> Further, some malocclusions that were previously thought to be untreatable in adults without surgery or extra-oral appliances are now treated intra-orally with the aid of new technologies such as skeletal anchorage systems.

## Treatment Planning Considerations for Adult Cases

### Objectives of adult orthodontics

Realistic treatment objectives must be established with the patient. These objectives must be occlusally, restoratively and economically realistic.<sup>11</sup> Traditional treatment objectives of dentofacial aesthetics, stomatognathic function, stability and Class I occlusion, may not be as achievable.

### The interdisciplinary approach

Adults often present with a multitude of dental problems requiring an interdisciplinary approach to treatment planning. Members of the interdisciplinary team, in addition to the general dentist, may include:

- Orthodontist
- Periodontist
- Prosthodontist
- Oral Surgeon
- Sleep Physician
- Endodontist
- Oral Radiologist

Importantly, prior to considering any orthodontic treatment, all pathology (including caries, abscesses, periodontal disease and retained roots etc) must be eliminated. The malocclusion's aetiology and dentition's prognosis both with and without treatment must be determined<sup>12</sup> and the need for long-term maintenance and retention of the orthodontic, restorative, and periodontal outcome advised.<sup>13</sup>

All members of the interdisciplinary team must be aware of these objectives and agree to the common goal.

## How Adult Orthodontic Treatment Differs from Adolescent Treatment

Physiologic differences between adolescent and adult patients tend to influence the orthodontic treatment approach in these two groups.<sup>14-16</sup> Some conventional adolescent treatment mechanics cannot be simply and routinely used with adults. For example, some adolescent corrections will be achieved by differential maxilla-mandibular growth<sup>17</sup> while a different approach will be required with non-growing adults.

### Reduction of growth

In general, adults do not experience any substantive growth during treatment so growth modification appliances are not an option. Instead, orthodontic options are limited to tooth movement, surgical correction and dento-alveolar camouflage.

The extrusive nature of orthodontic tooth movement combined with the lack of compensatory ramal growth makes control of the vertical dimension in the adult more difficult. In an adolescent, condylar growth and vertical development of the alveolar process will partially compensate for extrusion of the posterior teeth. In an adult, on the other hand, posterior extrusion will lead to downwards and backwards rotation of the mandible, increasing the overjet and lower anterior face height.<sup>8</sup>

### Reduced cell turnover and vascularity

The tooth supporting tissues in a growing child are in a state of proliferation whereby large numbers of connective tissue cells are actively involved in alveolar growth and remodeling. A rich blood supply exists within the cancellous bone of the alveolus and large marrow spaces exist in the medullary region. Together, this facilitates osteoblastic and osteoclastic activity<sup>18,19</sup> needed for tooth movement.

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In contrast, the supporting tissues of the adult have a reduced cell turnover rate<sup>20,21</sup>, the blood supply is scarcer and the bone denser. Consequently, osteoblastic and osteoclastic activity is reduced, and there is a delayed response to mechanical forces.<sup>22-24</sup>

### Systemic conditions

Adults more often present with an array of medical conditions, some of which are managed with medications. This is an important part of medical history taking and must not be overlooked. Medications such as bisphosphonates, oestrogen and indomethacin have been shown to slow down the rate of tooth movement.<sup>25</sup> Slower tooth movement often leads to increased treatment duration, which predisposes to root resorption, decalcification, non-compliance and possibly failure to complete treatment.

For these patients it is important to establish the complexity of the case and set specific treatment objectives. Complex treatment plans involving extractions and closure of large edentulous spaces should perhaps be avoided so as to ensure timely removal of orthodontic appliances.

### Clinical management

Adults in today's society tend to lead very busy lives. They often have a tight schedule, balancing work commitments with their family lives. Appointment scheduling can be difficult with increased duration between adjustments. Initially, adults tend to lack adaptability to their orthodontic appliances, with difficulties in speech and tolerance. Their pain tolerance levels are often lower than adolescents and consequently adjustment visits can take longer. It is important to schedule sufficient time for adult patients, particularly when complex mechanics are required to complete the case.

### Periodontal changes

Periodontitis is one of the leading causes of tooth loss in our society. Although adolescents can present with aggressive forms of the disease, chronic generalised periodontitis more frequently occurs in the adult population. Orthodontic problems may occur in a periodontally compromised patient as a consequence of collagen fibre destruction and reduced alveolar bone support.<sup>26</sup> Common orthodontic problems that occur include<sup>27,28</sup> (Fig 1):

- Proclination of the maxillary anterior teeth
- Irregular interdental spacing
- Rotation
- Overeruption
- Tooth migration
- Loss of teeth in traumatic occlusion



Fig 1: Periodontal patient presenting with proclination of the maxillary anteriors, rotation of 22 and 12, irregular interdental spacing, and tooth migration.

Studies have shown that patients with reduced but healthy periodontium can undergo orthodontic treatment without adverse effect<sup>29-34</sup>, provided the periodontal condition is in fact stable. Any tooth movement in an uncontrolled periodontium is likely to accelerate bone loss at a very rapid rate.<sup>35-38</sup>

Active periodontal treatment should always be completed with the patient in a period of maintenance for at least 3-4 months before orthodontic treatment is commenced. Regular maintenance throughout treatment will be necessary.

### Biomechanics

Extrusive forces should be avoided in the adult patient to avoid increasing the vertical dimension.<sup>8</sup> When treating the adolescent, intermaxillary and intramaxillary elastics are often employed for sagittal correction and space closure. When treating the adult, segmental mechanics and skeletal anchorage systems tend to be used more often rather than excessive elastic wear. This involves the use of lingual/transpalatal arches to stabilise the anchor unit, and crimpable hooks attached to the archwire/teeth to be moved to apply force closer to the centre of resistance and thereby achieve more bodily tooth movement.

In the periodontally compromised patient, the alveolar bone surrounding the teeth is diminished, resulting in the centre of resistance (CR) of the teeth migrating more apically (Fig 2).<sup>8,39,40</sup> Consequently, these teeth are more prone to tipping when a force is exerted on the crown. Lighter forces with increased moment-to-force ratios should be utilised throughout the course of treatment. In addition, alternative anchorage requirements may be needed to achieve the final orthodontic objectives. This may involve the use of skeletal anchorage systems.

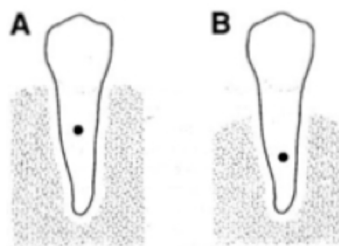


Fig 2: The centre of resistance is located more apically in a periodontally compromised tooth (B) compared with a tooth with normal periodontal support (A)

### The "Black Triangle"

Subsequent to bone and gingival loss, adult patients are likely to have or develop "black triangles" between their teeth (Fig 3).<sup>41</sup> Studies have shown that the further away the interdental contact point is from the alveolar crest, the less likely the interdental space will be completely filled with the papilla.<sup>42-46</sup> Thus, for example, when this distance is increased by 7mm, the interdental space will be completely filled only 25% of the time.<sup>45</sup>

Several methods can be used to reduce the size of the black triangles, particularly between the upper central incisors.<sup>41,47</sup>

These include:

- 1) Mesial movement of the adjacent teeth
- 2) Mesial root tip
- 3) Interproximal reduction
- 4) Veneers

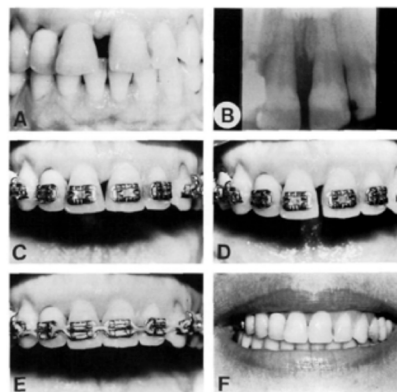


Fig 3: Patient with a history of periodontal disease displays a loss of interdental papilla between the teeth. The upper central incisors were moved together (C) and their mesial surfaces were reshaped (D), thereby reducing the size of the black triangle (E, F)<sup>48</sup>

Although black triangle reduction may be achieved in the finishing stage of orthodontic treatment, it is important that the patient is pre-warned as to the likelihood of black triangles appearing prior to the commencement of treatment.

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Correspondence is welcome and should be sent to:

Department of Orthodontics  
University of Sydney  
Sydney Dental Hospital  
2 Chalmers Street,  
Surry Hills NSW 2010

## AUTHOR & EDITORS

Dr Elise McConnell  
PRINCIPAL AUTHOR

Dr Chrys Antoniou  
Dr Dan Vickers  
Prof M Ali Darendeliler  
Dr Ted Peel  
Dr Ross Adams  
Dr Susan Cartwright  
Dr Vas Srinivasan

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## The restored dentition

Adults often present with a dentition that has been subject to wear and tear over a period of time. Orthodontics can be beneficial in achieving a more favourable outcome when restoring a deteriorating dentition<sup>49,50</sup> but will require an interdisciplinary approach to treatment planning.<sup>8</sup>

### Bonding

Often molars are bonded rather than banded to avoid the accumulation of plaque in a heavily restored adult dentition.<sup>51</sup> However bonding can be difficult in a restored dentition, and additional chemical agents such as hydrofluoric acid, as well as silane primers are often required to achieve adequate bond strength.<sup>52</sup>

### Space redistribution

Occasionally space needs to be redistributed within the dental arch. Space redistribution is often required following the drifting of abutments or adjacent teeth before placement of bridges or implants (Fig 4). Even with the narrowest implant diameter, a minimum of 5mm between the roots of adjacent teeth is required for adequate preservation of the interdental papilla.<sup>53</sup>

Space may also be required for the build-up of small teeth such as peg laterals (Fig 4). Not only will this improve the aesthetic outcome, but will also correct the Bolton's (tooth size) discrepancy and enable a well interdigitated occlusion.

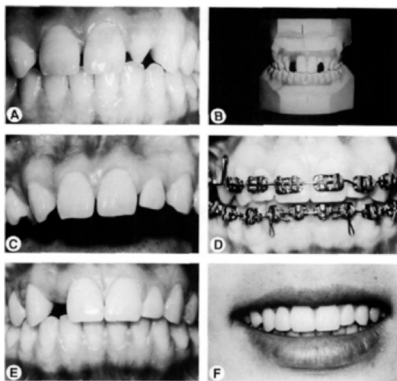


Fig 4: Adult case with peg shaped 22 and missing 12 with mesial drift of 13 (A). A diagnostic wax-up was made (B) and a provisional build-up of 22 was performed (C). Full fixed appliance treatment was undertaken (D) and sufficient space was created for 12 replacement (E). Orthodontics was completed and final restorative work was performed (F).<sup>54</sup>

### Extrusion

Orthodontic extrusion can be used to facilitate tooth restoration or replacement. When combined with pericision, extrusion of a fractured tooth can be used to create supragingival margins for a coronal restoration (Fig 5).<sup>55</sup>

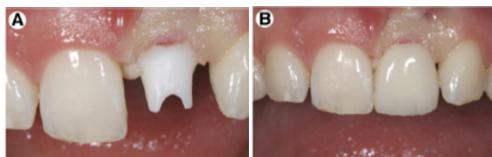


Fig 5: Extrusion of tooth 21(A) to facilitate coronal restoration (B).<sup>53</sup>

Orthodontic extrusion can also facilitate implant site preparation through the bone formation that accompanies the extrusive movement<sup>56</sup> (Fig 6).



Fig 6: Extrusion of tooth 21 (A) for alveolar development prior to implant placement (B, C).<sup>53</sup>

### Intrusion

Sometimes teeth will over erupt, either as a result of occlusal wear over time or due to extraction of the opposing tooth. Orthodontic intrusion can facilitate the creation of adequate vertical dimension for a satisfactory restorative outcome (Fig 7).

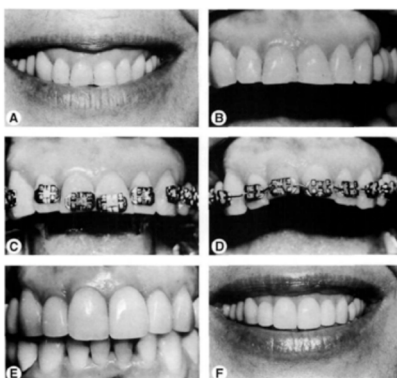


Fig 7: Patient with abraded upper central incisors and a 'gummy smile' (A, B). Upper central incisors were intruded to improve the level of their gingival margins (C, D), and facilitate final restorative work (E, F).<sup>54</sup>

## Conclusion

Adult orthodontics is a complex field of the specialty that should be performed by those who have a clear understanding of biomechanics. Adult orthodontic treatment differs from adolescent treatment, both from a biological and a biomechanical perspective. Achieving an optimal outcome, both from the patient's and clinician's perspectives, will often involve an interdisciplinary approach to treatment planning. Without excellent communication, as well as a clear understanding of the

objectives of the case, the envisioned outcome is unlikely to be achieved.

## References available on request