

# Orthodontic Limitations in Adults: A Review

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## ABSTRACT

The scope of orthodontics has broadened in the current era. It is no longer limited to the treatment of children and adolescents but includes the treatment of adults that are non growing thereby extending the age limit. The number of adults seeking orthodontic treatment has considerably increased over the past few years as people have become aesthetically conscious and aware of treatment modalities available through channels like internet and social media. While treating adult patients, a multidisciplinary approach should be adopted, taking into consideration several factors like systemic diseases and psychological factors so as to formulate a holistic treatment plan. Orthodontists face challenges in treating older adult patients whose growth is already completed. There are various elements that differentiate adult orthodontic treatment from that of children or adolescents. Therefore, this article highlights the constraints or challenges faced by an orthodontist in treating adult patients.

**Keywords:** Osteoporosis, Periodontal disease, Perception, Self-concept

## INTRODUCTION

Atypical alignment of teeth and jaws is common. Dentofacial aesthetics is one of the important aspects of orthodontic treatment to boost the social and psychological well-being of the patient. It contributes to physical attractiveness, physical health, and beauty lying on the fact that self-perception and self-confidence are influenced by one's physical attractiveness. Perception of dental appearance, both of oneself and by others is therefore of major importance in Orthodontics. Orthodontic treatment can be done in young as well as adult individuals. Orthodontics in adults (non growing individuals) is not new [1].

During recent times, an increase in adult patients that are non growing has been seen in orthodontic practice. Approximately, 80% of the adults seeking orthodontic treatment is due to the aesthetic norms of the society rather than health or function [2]. It necessitates a disparate approach to the treatment of non growing adults than that of growing adolescent individuals due to varied reasons. Growth modification procedures in adults are not applicable due to lack of growth potential in them and thus foists certain constraints or limitations to their treatment which may be challenging for an orthodontist though similarities exist in the management of adults and adolescent orthodontic patients [3].

### Limitation in Adult Orthodontics

The limitations in Adult Orthodontic Patients can be Analogous to [4]

#### Biology:

- Dental status- Pertaining to dental status, the number and the quality of teeth are essential that encompass the absence or presence of any periapical pathology or active caries and the remaining natural tooth substance. Thus, the prognosis of each individual tooth should be taken into consideration [4].
- Periodontal status- In regard to periodontal status, the absence or presence of clinically active gingivitis and periodontitis is important to move teeth without further worsening its periodontal support [4].
- General health- General health is crucial for bone modelling that is generated by orthodontic forces. This is applicable to all patients but the proportion of adult patients with deviations in bone turnover has to be considered while orthodontic treatment planning that is higher in adults than among young patients [4].

#### Configuration:

- Orthodontic technique- Orthodontic technique in deteriorating dentitions in older adult patients is characterised by a well-defined movement of individual teeth or groups of teeth that can be achieved with continuous arch treatment [4].
- Anchorage- In consideration to the anchorage, thickness of the cortical bone and the density of the trabecular bone in addition to the thickness of the mucosa are factors that affect the prospects of orthodontic treatment. [4].

### Reasons for Increased Number of Adults Patients [5]

- Proximity to aesthetic treatment options like lingual orthodontics and invisalign.
- Revolution in recent materials like ceramic brackets and tooth-coloured wires.
- Effective management of skeletal malocclusion with the help of advanced orthognathic surgical procedure.
- Role of dentists in the family.
- Role of social media and visual aids.
- Improved socio-economic status.
- Greater acknowledgement of health and aesthetic concerns.
- Enhanced desire of patients and dentists for treatment of mutilated problems using orthodontically induced tooth movement and fixed prostheses rather than removable restorations.
- Decreased periodontal complications as a result of improved tooth and occlusal function relationship.

### LIMITING FACTORS FOR ADULTS IN ORTHODONTIC TREATMENT [6]

Major reasons for the dramatic rise in adult orthodontic treatment include increased social awareness of the availability of orthodontic treatment for adults, an increased appreciation of how orthodontics can facilitate other dental treatment to maintain the dentition, and improvements in orthodontic appliances. A considerable finding in adult patients is that they are apprehensive about enhancing their social acceptance and appearance than function as well as increased social acceptability of appliance therapy [5].

There are various factors among non growing individuals which require special considerations [6].

- I. Absence or lack of growth.
- II. Perio-restorative problems.
- III. Anchorage control
- IV. Closure of extraction spaces
- V. Temporomandibular Disorders
- VI. Psychological factors
- VII. Age changes of varying degree
- VIII. Treatment Time
- IX. Stability
- X. Role of Drugs

Orthodontist substantially considers the problem list as the diagnosis. Diagnosis entails the development of a comprehensive database of relevant information. The standard diagnostic methods consist of clinical diagnosis, skeletal diagnosis, temporomandibular joint and periodontal diagnosis. During clinical examination, age should be considered as salient as both lip length and lip thickness are related to age [7]. Also, less upper tooth substance is visible with increasing age. Following dental examination, periodontal status should be meticulously examined as adults usually have reduced bone level and are frequently seen with periodontal pockets, gingival recession or loss of attachment. The American Board of Orthodontics now recommends evidence of pretreatment periodontal condition for all adult patients [8]. An orthodontist treating adult or non growing patients has a key role in diagnosing skeletal as well as temporomandibular joint complications that may worsen with age.

Adult patients require a distinct treatment approach from adolescents due to the following limiting factors:

### Absence or Lack of Growth

Appliances for growth alterations (myofunctional appliances) including activator, bionator, twin block or Frankel Regulator cannot be used while treating adult or non growing patients as growth is already complete and limited scope is left for growth manipulation [5]. The treatment of non growing patients will result in differences in response to mechanotherapy [9]. Therefore, the treatment modalities are confined to dentoalveolar corrections, camouflage treatment or surgical corrections. The force delivery used for treating adults varies in several respects from that used in young growing individual. Skeletal discrepancies cannot be treated by any bone modification as growth is completed. Skeletal malocclusions have to be treated by orthognathic surgery or camouflage. The main consideration in adults is the insubstantial scope for growth modification and functional appliances [6].

Dysfunction of the stomatognathic system can result in excessive wear and abrasion of the dentition causing reduction in lower anterior facial height and deepening of the bite. Also, posterior tooth extraction or extrusion is avoided in adult patients as they can be one of the main etiologic factors of deepening of bite. Relative intrusion of incisors or extrusion of molars is avoided in adult patients with skeletal deep bite as there is a high chance of relapse of this movement. This is because adults have a strong jaw musculature on account of which molars return back to their original position [4].

Thus, it is important to highlight that at adult stage of life there is high potential to relapse during the orthodontic treatment, due to the cessation of growth and reduced ability to adapt to perioral muscles and temporomandibular joint to the new dental positions [10].

### Perio-restorative Problems

Adults have pre-existing conditions that might not be present in young growing patients. Before beginning orthodontic treatment in adults, quantitative and qualitative evaluation of bone and periodontal support should be done as they need special consideration while planning anchorage [11]. In adolescents, there is usually mild periodontal tissue destruction and is localised to certain teeth, but there is increasing loss of periodontal support with increasing age. Also, posterior tooth extraction should not be done as it causes supra-eruption of the opposing tooth that disrupts the occlusion. This situation causes increased risk of periodontal problems and patient may also lose chewing ability [4].

Periodontal disease is highly prevalent in patients with diabetes mellitus and there is an inter-relationship between the two with poor glycaemic control in diabetic patients with periodontal disease and periodontal tissue destruction diabetic patients [12]. Lalla E et al., found the prevalence of periodontitis among different age groups [13]. It was 4.8 times higher among diabetic patients than non diabetic patients. Periodontal inflammation can cause disruption of the periodontal fibres and alveolar bone which may disturb the dental equilibrium causing rotation, tilting or drifting of the teeth [14].

Adult patients have heavily restored teeth or endodontically treated teeth including placement of porcelain or metallic crowns, amalgam fillings which pose difficulty during placement of orthodontic appliance [15]. Hence, bonding has to be taken into consideration. Bond strength of porcelain may be enhanced by using 9.6% hydrofluoric acid or 1.23% acidulated phosphate fluoride gel, along with silane primers and highly-filled composite resin. Then teeth can be temporarily restored with composite which makes bonding easier [16]. Also, any excess adhesive material around the orthodontic attachments should be removed as the surface roughness of adhesive causes more retention of plaque [3]. There must be reinforcement of strict oral hygiene procedures as patients with periodontal problems face difficulty to clean such areas. Every restoration must be polished to diminish plaque accumulation. Stainless steel ligature wires must be used instead of elastomeric modules for being less retentive to plaque. Alternatively, self ligating brackets can be used in such situations, as they are designed to be discrete, easy to clean and comfortable, without use of elastic ligature ties or modules which accumulates more plaque [17].

### Anchorage Control

Anchorage in orthodontics is a sensitive matter independent of technique or philosophy followed by a clinician. Unwanted side-effects of loss of anchorage are often seen and inadequate anchorage is an important limiting factor of the orthodontic treatment [4]. Poor anchorage control can be due to poor perio-restorative status or missing teeth.

Initial stability is essential for maintaining anchorage, but problems associated with oral health in adults like compromised periodontium, loss of bone or reduced bone density or problems associated with systemic alterations of bone metabolism which can be due to a disease or any medication, compromise the anchorage control thus limiting the orthodontic treatment in adults [4].

Also, adults may be reluctant to wear extra-oral anchorage control devices like headgear and it may be necessary to use other methods of anchorage control such as palatal arches, two step space closure with frictionless mechanics can be used to reduce strain on anchorage or temporary anchorage devices like mini-implants including infrazygomatic implants, mini-plates can also be used to gain anchorage from bone and avoid depending on teeth for anchorage purpose [18].

## Closure of Extraction Spaces

Adults usually present with loss of permanent teeth (mostly first molar) with the remaining extraction space. Adults mostly have less bone apposition with reduced vertical bone height in areas of extraction sites and these sites tend to narrow buccolingually. Thus, closure of such sites in itself poses a challenge to the orthodontists and requires reshaping of the cortical bone which responds more slowly than the cancellous bone [6].

Space closure can be difficult in the maxillary posterior region with low sinus as tooth movement through low sinus is restricted. Orthodontic treatment is extended and requires great control of mechanics with missing or extracted tooth. Furthermore, malocclusions in adults may be complicated due to migration of adjacent teeth into the old extraction sites, so functional and aesthetic results can be accomplished with the combination of orthodontics, surgery, and prosthodontic rehabilitation. Other than ancient extraction sites, space closure of recently extracted sites have better predictable results [19].

## Temporomandibular Disorders

The role of occlusion in the development of Temporomandibular Disorders (TMD's) has been investigated thoroughly in orthodontic literature and is a debatable topic. TMD is common in people whether orthodontic treatment is carried out or not. There is no evidence to support the theory that orthodontic treatment causes TMD or cures it, since the cause of TMD is generally being accepted as multifactorial [20]. In the general untreated population, 26–59% adult population have been shown to report at least one symptom of TMD [21]. According to McNamara JA et al., [22] with increase in age, signs and symptoms of TMD surge, therefore TMD that arises during the orthodontic therapy may not be related to the undergoing treatment. As there is higher risk of developing TMD in adult patient, even though it may or may not be related to orthodontic treatment, adults may seek orthodontic treatment due to TMD. Therefore, a thorough examination needs to be done for the signs of TMD in adults and explain that the disorder that is developing may not be associated to the orthodontic treatment [22].

## Psychological Factors

Grown up patients have high expectations and treatment desires. Also, they are hesitant in accepting the orthodontic appliances that are visible. Tayer BH and Burek MJ found that nearly 74% of adults reveal that they had initial fears with regard to peer reaction to treatment [23].

Prolonged treatment duration, multifaceted nature of treatment, number of visits makes a curious about the details of orthodontic treatment. Patients even demand aesthetic brackets, aligners or lingual brackets mainly for social reasons. With the advancement in technology, it is possible to meet the aesthetic demands of the patient as they prefer less visible bracket system. These include tooth-coloured brackets with Teflon or epoxy coated or Nitanium tooth tone plastic coated archwires. Lingual appliances that are not seen on the labial surface at all. Lately, there has been an increasing demand for clear aligner therapy that has highlighted the public perception of aesthetic consideration offering the greatest advantage of being removable appliance. People adhere more to the guidelines given by the orthodontist like cleanliness, versatile wear, maintaining hygiene. Thus, it is necessary to advise adult patients about the restrictions or do's and don'ts and unpredictability of the treatment, expanded treatment time and high backslide potential of relapse [24].

## Age Changes of Varying Degree

Orthodontic tooth movement as a result of bone modelling and remodelling depends greatly on age related changes of the skeleton. According to Behrents RG, growth in the craniofacial region, is a continuous process that occurs even into later ages of life [25]. On application of orthodontic force, adults are more vulnerable to root resorption as with increasing age, vascularisation in periodontal membrane decreases, becomes narrower and more inelastic and the cementum becomes thicker.

Also, the apical third of the root is firmly anchored in adults, posing difficulty in the movement of teeth, predisposing to resorption [26]. Changes associated with age include gingival recession, loss of attachment, formation of black triangles or open gingival embrasures. Along with changes in gingiva, age related changes are seen in periodontium and bone as well [3].

Which includes reduced number of fibroblasts with enhanced irregular pattern, increased number of elastic fibres and reduced organic matrix production.

Cortical bone becomes denser while spongy bone reduces with age and structure of bone changes from that of honeycomb appearance to lace network. Also, Haversian canals increase in size making the bone porous [6]. Apical displacement of marginal bone level is a local factor that influences the biological backgrounds of tooth movement in adults. Therefore, mild forces should be used in adults and adult patients must be informed prior about the risk of root resorption and thoroughly examined for presence of any systemic disease, TMD, perio-restorative problems to check the susceptibility of root resorption [27].

## Treatment Time

Commencement of tooth movement takes longer time in adults in contrast to growing patients. Bone remodelling accompanying tooth movement is slow in adults causing decrease in the movement of the teeth. Activation of appliance in adults is done mostly in 3-6 weeks than in adolescents in which activation is done in 2-4 week's time. Increased treatment time is also found to be associated with iatrogenic effects like root resorption, white spot lesions and gingival inflammation which are interlinked to orthodontic appliances [28].

The delayed response to mechanical stimulus is suggested to be caused by insufficient source of preosteoblasts as a result of decreased vascularisation with increasing age. The duration of orthodontic treatment in adults mainly depends on patient compliance. Total treatment duration can take a little longer or can be at par in non growing patients, if patients cooperate appropriately with the orthodontists, which makes up slower tooth movement initially during tissue reaction [29].

Bisphosphonates (BPN) possibly stimulate the osteoblast activity and inhibit the osteoclastic activity. They are used in the prevention and treatment of osteoporosis in postmenopausal women to increase the bone mineral density and reduce the fracture rate [30]. But high doses of I.v. BPN appear to increase the risk of Osteoradionecrosis in the jaws. Thus, careful oral evaluation for active dental problems and guiding the importance of maintaining oral hygiene after the start of treatment is helpful in limiting the development of osteoradionecrosis [31]. BPNs can hinder tooth movement and set back the treatment time. Teeth under orthodontic treatment can be retained and anchored by topical application of BPN [32].

There are potential age-related changes that constantly occur throughout life including minute changes in the relationship between the maxilla and mandible and the changes in the pressure of soft tissues on the dentition. Therefore, dentition is a biological environment where changes are constantly occurring and there



is potential for changes to occur in the alignment of occlusal relationships and alignment throughout the life and these changes are perhaps considered as normal age changes thus increasing the chances of relapse in adults [33].

Orthodontic treatment should be followed-up for at least five years so that long term stability of the results can be considered in relation to aging, periodontal status, caries, duration of therapy, cost invested, efforts and tooth restorations [34]. Also, informed consent should be taken prior to the treatment. An important aspect of informed consent is the need for the patient to completely understand the long-term risk associated with relapse, and appreciate the procedures to minimise the risk.

## Stability

Stability is attained only after death. Biological changes occur continuously throughout life. But changes occurring after orthodontic therapy are a combination of the tendency towards the return to the pretreatment situation, which occur mainly in the early post-treatment period, and life-long age-related development [4]. It is important to achieve an adequate periodontal and functional condition before finalising the treatment. Teeth may be splinted and permanent retention is usually needed to prevent spontaneous migration of teeth into the extraction space or missing tooth space. Traditional retainers may not be indicated in case of severe periodontal bone loss or mobile teeth. This is mainly due to the fact that, marginal bone loss might have displaced the centre of resistance of the teeth further apically, leading to absence of equilibrium between the forces and the resistance [35].

Adults exhibit higher relapse tendencies compared to adolescents, either due to the tendency of the teeth to move back to their original position or the ageing process that is continuous throughout life, requiring permanent retention in most of the cases [36] like periodontically compromised patients. Also, as in adult patients, movement of teeth is to be accommodated in non growing arches, they have greater incidence of post-treatment relapse [37].

## Role of Drugs

Systemic diseases may have a positive or negative effect on tooth movement in adults. During the course of the treatment, medications may be prescribed for pain or TMDs but apart from these, patients may also consume vitamins and minerals for various systemic diseases [Table/Fig-1] [38].

Drugs retarding rate of tooth movement	Drugs accelerating rate of tooth movement
1. NSAID's	1. Thyroid hormone
2. Fluorides	2. Corticosteroids
3. Bis-phosphonates	3. Relaxin
4. Oestrogen	4. Prostaglandins
5. Calcitonin	5. Vitamin D
	6. Parathyroid hormone

**[Table/Fig-1]:** Showing role of different types of drugs in orthodontic treatment. NSAID's: Non steroidal anti-inflammatory drugs

## CONCLUSION(S)

Adults tend to be excellent orthodontic patients, due to their high motivation and co-operation. Since expectations may also be high, the limitations of orthodontic treatment must be made clear. In the current era, more consideration is paid to understand the orthodontic limitations in adults. While treating an adult for orthodontic concerns, an individualised custom-made treatment plan according to the patient's requirement and condition that is crucial for proper outcome and accomplishment of treatment on the basis of careful assessment of complex interaction of various biological, mechanical and psychological factors.

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