

ORTHODONTICS IN ADULT PATIENTS

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Abstract

There is a rising influx of adult patients seeking orthodontic treatment in the recent era. 20-25% of orthodontic patients are reported to be adults. This trend is rising as society becoming more esthetic and health conscious. Hence, it is imperative to explore and understand various aspects of orthodontic treatment where adults need special considerations. Though acceptable esthetics is an integral part of treatment goal at any age, but function, stability and health of dentition are given paramount importance in adults. Adult patients have many preexisting conditions that are usually not present in adolescent patients. Hence, additional treatment objectives are established at the outset of the treatment.

Key Words Adult orthodontic treatment, Adjunctive treatment, Comprehensive treatment, Interdisciplinary orthodontics

INTRODUCTION

Since the past 30 years a major change have seen in orthodontic practices. Changed lifestyles and patient awareness have increased the demand for adult orthodontic treatment. Interdisciplinary dental therapy has allowed better management of the more complicated and unique requirements of the adult patient population, thereby, greatly improving quality of care and treatment prognosis. Dental care for adults should provide a permanent dentition with a healthy periodontium, optimal chewing function, and pleasant esthetics.

Etiology of malocclusion in adults:

Age related change in the skeleton: The skeleton is in dynamic state undergoing continuous changes. Throughout life, bone remodeling occur in the skeleton. A sequence of events of bone resorption and deposition occurs. Rate of bone resorption become higher than rate of deposition with age. This may occur due to changes in the hormonal balance, disease or medication. Besides the reduction of the bone volume, there are also decrease bone strength and increase risk of fractures¹.

Age related change in the craniofacial skeleton: Prognathism of the both jaws along with anterior rotation of mandible may occur with age. This may results in the reduction of lower facial height. This reduction of facial

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height may be due to tooth loss. Forward and downward displacement of the hard tissue pogonion and retroclination of the lower incisors was reported by some authors. They demonstrated that age related changes in the craniofacial skeleton occur more frequently in case of class II or class III molar relation than class I molar relation¹.

Age related change in the local environment: This is a predominant factor which leads to development or aggravation of malocclusion in adulthood. The decrease in periodontal support is frequently the underlying reason. A modest but generalized reduction of marginal bone level occur who do not have periodontal disease¹.

Age related deterioration of dentition : With a reduced periodontium, the center of resistance of the tooth or group of teeth is displaced apically. So, functional forces acting on the crown may generate moments leading to migration of tooth. The migration of anterior tooth will lead to spacing, increase overjet and overbite. Lower incisor crowding is one of the age related change of dentition. Another reason for development of secondary malocclusion is the unavoidable extraction of one or more permanent teeth due to caries or its sequelae. The loss of continuity of dental arch also lead to migration of the adjacent tooth if no replacement is done and so possible collapse of bite occur. Loss of posterior tooth often leads to extrusion of the opposing tooth and tipping and rotation of adjacent tooth. Loss of posterior tooth may result in increased activity of tongue which can result in the development of anterior spacing¹.

Adult orthodontic treatment can be classified as adjunctive and comprehensive. Adjunctive treatment is the movement of tooth to facilitate other dental procedures necessary to control disease or restore function². Comprehensive treatment on the other hand is the effort to improve the dental and facial appearance, occlusion, stability so as it will

improve the quality of life³.

Goal of adjunctive treatment³:

- 1) Repositioning tooth that have drifted after extraction or bone loss so that fixed or removable partial denture can be fabricated or implant can be placed.
- 2) Alignment of anterior teeth to allow more esthetic resonance or successful splinting while maintaining good interproximal bone contour and embrasure form.
- 3) Correction of crossbite if this compromises jaw function
- 4) Forced eruption of badly broken down tooth to expose sound root structure on which crown is placed.
- 5) Improve periodontal health by eliminating plaque harboring areas and improve the alveolar ridge contour adjacent to the teeth
- 6) Establish favorable crown to root ratio and position the tooth so that forces are transmitted along the long axis of the tooth.
- 7) Facilitate restorative technique by positioning the tooth

Adjunctive treatment procedure:

Uprighting posterior tooth: When a first permanent molar is lost during childhood or adolescence and not replaced, the second molar drifts mesially and the premolars often tip distally and rotate as space opens between them. As the teeth move, the adjacent gingival tissue becomes folded and distorted, forming a plaque-harboring pseudopocket that may be virtually impossible for the patient to clean. Repositioning the teeth eliminates this potentially pathologic condition and has the added advantage of simplifying the ultimate restorative procedures³.

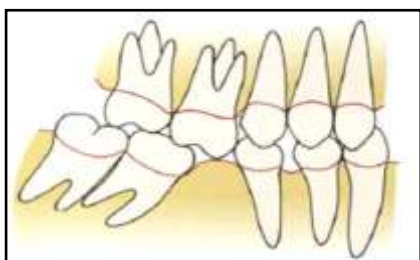


Figure: 1



Figure:2

Figure: 1 and 2: A loss of lower molar can lead to tipping and drifting of adjacent tooth, poor interproximal contacts, poor gingival contour, reduced interradicular bone, and supra-eruption of unopposed tooth. Since the bone contour follow the cemento-enamel junction, pseudopockets form adjacent to the tipped tooth.



Figure : 3



Figure : 4

Figure:3 and Figure:4: Forced extrusion of broken upper left lateral incisor

Deep bite Correction: To correct deep bite in young patients, posterior extrusion is allowed because of compensation made by vertical growth⁴. But overbite correction in adults should be carried out by intrusion of anterior teeth, not by extrusion of posterior teeth. This is because posterior extrusion would encroach in the freeway space due to lack of vertical growth. It would stress the TMJ muscles resulting in downward and backward movement of the mandible, thereby tends to relapse due to instability⁵.

Forced Eruption or tooth elongation : For teeth with defects in or adjacent to the cervical third of the root, controlled extrusion can be an excellent alternative to extensive crown-lengthening surgery³. Forced eruption also allows crown margins to be placed on sound tooth structure while maintaining a uniform gingival contour that provides improved esthetics⁶.

Applications of Temporary Skeletal Anchorage:

1. Intrusion of posterior teeth to close an anterior open bite



Figure: 5

2. Distal movement of maxillary molars (and the entire maxillary arch if needed)



Figure: 6

3. Retraction and intrusion of protruding upper incisors



Figure: 7

4. Positioning individual teeth when no other satisfactory anchorage is available (usually because other teeth have been lost to dental disease).



Figure: 8

Patients with aesthetic demands: In order to improve the aesthetic appearance of the appliance, three possibilities have been achieved⁸.

- a) Altering the appearance or reducing the size of the stainless steel brackets (Mini-brackets)
- b) Positioning the appliance on the lingual surfaces of the tooth (lingual orthodontics)
- c) Changing the materials from which brackets are made (Polycarbonate brackets, Ceramic brackets)
- d) Use of clear plastic aligners (Invisalign)

Patients with periodontal problems: Periodontal problem contribute to the development of malocclusion in a substantial number of adult orthodontic patients. The risk of gingival recession, attachment loss, and probing depth more than 4 mm is increased with age.

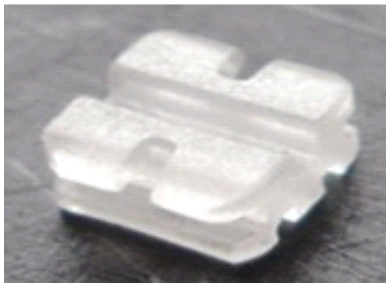


Figure 9: Polycarbonate brackets



Figure 10: Ceramic brackets



Figure 10: Invisalign



Figure 11: lingual orthodontics

Indications of orthodontic treatment in periodontally involved patients¹:

a) Intra-arch problems: Anomalies that interfere with maintenance of optimum oral hygiene or necessary replacement of missing tooth such as adverse gingival topography, poor crown to root ratio, uneven bone level, osseous defects, diastema (flaring), excessive root proximity, crowding, tipping or rotation, poor distribution of the existing tooth.

b) Inter-arch problems: Deviation in occlusion that do not allow normal function. These comprise sagittally: increased overjet or inversion, vertically: both deep and open bite; transversely: cross bite and scissor bite

c) Functional deviation: Malfunction that contribute to aggravation of malocclusion include flared incisors with lip catch, posterior and lateral forced bite reflected in abnormal wear of teeth.

The treatment goal for orthodontic treatment for such patients is to establish an occlusion that allows necessary oral rehabilitation and maintenance. In addition the treatment should aim an esthetically satisfactory result. Patient's chief complain should be the consideration.

Clinical examination:

1. Oral hygiene status
2. Presence of bleeding on probing
3. Amount of bone loss
4. Clinically probing pocket depth
5. Gingival recession and presence or absence of interdental gingiva
6. Tooth position: whether crowded or spaced and if the latter, stable or progressive

7. Tooth anatomy: squire versus triangular tooth shape, amount of root exposure, presence and extension of dental abrasion, thickness of incisal edges and crown to root length ratio.

8. Dental restoration: overhanging fillings, incongruous prosthetic restoration

Management of periodontally compromised patient:

Procedure performed before orthodontic treatment:

Patient with mild to moderate periodontitis without significant occlusal trauma or deep periodontal pockets:

- **Oral hygiene motivation :** Proper instruction regarding oral hygiene maintenance should be given to the patient. Use of toothbrush, floss, interdental toothbrush are recommended. Regular follow up is required to control plaque and supra and subgingival calculus. Patients is asked to stop or reduce smoking¹.
- **Prophylaxis to control inflammation :** Scaling and root planning is performed to remove calculus, necrotic cementum and bacteria until root surface is clean, smooth and hard. This serves to maintain healthy periodontal state with reduced bleeding and probing depth. After this primary therapy, the patient is re-evaluated and the need for possible surgical therapy is assessed¹.

Patient with moderate to severe periodontitis:

- Oral hygiene motivation
- Prophylaxis to control inflammation
- Loss of attachment leads to apical shift of centre of resistance thereby increasing distance from centre of resistance to point of force application. It leads to increased tipping moment produced by the given force. Therefore greater counterbalancing moment

- is required to balance this greater tipping moment to translate periodontally compromised tooth⁹. If occlusal trauma and tooth mobility are present especially in upper anterior sextant, a modified hawley's appliance with anterior bite plane is recommended to temporarily disclude the teeth¹⁰.

- When there is infrabony pockets, open flap debridement may be indicated in sited where scaling and root planning have not eliminated complete inflammation¹

- Surgery to eliminate deep pockets: If periodontal status is controlled, orthodontic tooth movement can be done even in case of advanced loss of marginal periodontium. If there is deep pocket (more than 4-5mm) with persistent clinical sign of disease, it is necessary to perform periodontal surgical therapy after completion of scaling and root planning before initiating orthodontic treatment¹.

- Procedure for periodontal regeneration, e.g guided tissue regeneration, in combination with the use of grafting materials and enamel matrix protein improve the periodontal status of affected anterior teeth undergoing periodontal surgery¹.

- Frenectomy: It is indicated in patients with high labial frenum when permanent dentition is complete¹.

Patients will be ready to start orthodontic treatment when

- The plaque level is satisfactory
- Periodontal status is healthy
- Motivation is high

Procedure performed during orthodontic treatment :

- Prophylaxis to control inflammation
- Surgical exposure of impacted tooth
- Consider the light force
- Tooth reshaping: Sometimes it is beneficial to perform gross modification of the tooth anatomy before orthodontic treatment is initiated. In case of open embrasure and black triangle particularly between upper central incisors, the length of the teeth and the thickness of the incisal edge is modified first. Then, the contact points are opened to allow elimination or reduction of black triangle. The created interdental space is closed with orthodontics.

Procedure performed during and/or post orthodontic treatment:

Fibrotomy and curettage: Supracrestal circumferential fibrotomy is done to reduce the risk of relapse in rotation correction immediately after orthodontic treatment. Intrasulcular fibrotomy and curettage is performed during orthodontic forced extrusion. This permits clinical crown lengthening of the tooth by minimizing migration of the gingival

and the attachment of the alveolar bone toward the occlusal surface of the tooth.

Supportive therapy: It consists of monitoring of periodic periodontal and hygiene check-ups.

Procedure performed After orthodontic treatment: Patient with bone loss should be monitored for life by periodontist or general dentist.

Patient with temporomandibular disorder :

Possible risk factor for TMD:

- Gender/hormonal factors
- Depression/somatization
- Multiple pain condition/widespread pain
- Bruxism/oral parafunction
- Trauma
- Generalized joint hypermobility

Occusal variables:

- Anterior open bite
- Unilateral crossbite
- Overjet more than 6-7mm
- More than 5-6 missing teeth
- RCP (retruded contact position)-ICP (maximum intercuspation) slide more than 2 mm
- Dental wear

In patients with temporomandibular disorders, occlusion should be established after splint therapy which corresponds to the mandibular position when the patient is symptom free. Mandibular position is maintained in correct condyle - fossa relationship. Occlusal adjustment should not be done before mandibular position is established.

Orthodontics-Prosthetics interaction: Adults presenting for comprehensive orthodontic treatment often also have dental problems that require restorations. Such problems include loss of tooth structure from wear and abrasion or trauma, and missing teeth that require replacement with either conventional prosthodontics or implants³.

Missing Teeth : Space Closure versus Prosthetic Replacement :

Old Extraction Sites: In adults, closing an old extraction site is difficult. The problem arises because of resorption and remodeling of alveolar bone and thereby decrease in the vertical height of the bone and buccolingual narrowing of the alveolar process. So, in adults, uprighting the teeth adjacent to the missing tooth and then bridge or implant placement is the treatment of choice in most of the cases with missing tooth.

Tooth Loss Due to Periodontal Disease : It is better



Figure 12: Radiograph of tilted molar.



Figure 13: Molar uprighted and restoration placed with roots parallel

to move teeth away from such an area because of the risk that normal bone formation will not occur as the tooth moves into the defect. An exception is the aggressive periodontitis patient, in which periodontitis differentially occur in first molars and incisors and is characterized by the presence of a specific microbe, *Actinobacillus actinomycetemcomitans*. Although bone around the first molars is often totally destroyed, neither the second molar nor the second premolar is significantly affected in most patients. So, it is possible to orthodontically close the first molar extraction sites. The second molar brings its own investing bone with it, and the large bony defect disappears.

Considerations regarding treatment time: Tissue remodeling associated with tooth movement is slow leading to slow rate of tooth movement making the treatment time longer^{11,12}. Initiation of tooth movement takes longer time as compared to adolescents. The delayed response to mechanical stimulus is due to insufficient source of preosteoblasts as a result of reduced vascularization with increasing age¹³. After delayed initial tissue reaction, rate of tooth movement in adults is not that much different as compared to that in adolescents. Total treatment time can be a little longer in adults.

Considerations regarding final detailing and retention: Final finishing is done with archwires & then stabilized with immediately placed retainers. Positioners are less often indicated as finishing devices especially for adults with moderate to severe bone loss. Eventual detailing of occlusal relationships is done in adults by equilibration, tooth reshaping, incisal edge equilibration and also marginal ridge reduction¹⁴. Healthy adults end up treatment with stable occlusion. High relapse tendency is reported in adults in contrast to adolescents. So, prolonged retention is required due to reduced cellular activity along with increase in lag time for tissue remodelling in adult patients. Periodontally compromised patients may need permanent retention^{15,16}. Splinting may be required either short term being occlusal splint, wraparound retainer, a suckdown plastic wafer or long term using cast restorations.

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