Orthodontic Intervention in Adult Patients as an Adjunct to Prosthetic and Restorative Dentistry


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Abstract

Combined orthodontic-prosthodontic procedures will enhance the results of restorative treatment in adult patients. Restoration of malposed teeth using prostheses alone will fail both esthetically and functionally. Rotation, spacing or crowding and tipped teeth will compromise the final restoration if left untreated. Correction of axial inclination will prevent pulp exposure during preparation, as well as improving the periodontal status of the involved teeth. Cooperation between the orthodontist and the prosthodontist will ensure a more favorable final result.

Cases treated in this manner are presented, illustrating the orthodontic treatment and the successful end results.

Introduction

Adjunctive orthodontic treatment involves tooth movement designed to enhance the success of other dental procedures necessary for the control of disease and to restore function[1].

If existing tooth positions make it impossible or difficult to insert dental restorations, and if there is a possibility that these restorations will produce a pathologic situation unless tooth positions are altered, then orthodontic treatment should become part of the treatment plan.

AMSTERDAM[2] states that physiologic occlusion, which is not necessarily an ideal Class I occlusion, is one that adapts to the stress of function and can be maintained indefinitely. He also points out that a pathologic occlusion is one that cannot function without contributing to its own destruction. In the presence of a pathologic occlusion, one can observe abrasion of the teeth, TMJ problems, pulpal changes and periodontal damage.

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Patient Evaluation:

An organized and coordinated approach to diagnosis and treatment planning is needed for a successful result. The patient’s need for periodontal, orthodontic, prosthetic, and endodontic treatment and surgery should be evaluated carefully. In order to obtain this information, cephalometric, panoramic or periapical radiographs, study casts and intraoral-extraoral pictures should be taken. Besides these patient records, a clinical examination should be performed.

In the presence of periodontal inflammation, thorough root-planing and curettage must be done to eliminate all inflammation before commencing orthodontic treatment. Caries elimination, endodontic therapy and extraction of incurable teeth should be carried out prior to orthodontic treatment.

Treatment Objectives:

Malposed teeth should be moved orthodontically in order to make them better abutments for prosthetic restorations. Such procedures include the closing of diastemas, making teeth upright or parallel, gaining of sufficient pontic space, correction of anterior or posterior cross-bite, and rotation, intrusion or extrusion of teeth.

Properly aligned teeth are able to withstand functional and parafunctional forces more readily than malposed teeth. Attempts made to correct malposed teeth using prostheses alone will fail both esthetically and periodontally.

If any questions arise concerning the choice of treatment, collaboration between the orthodontist and prosthodontist is imperative.

When molars are missing, the adjacent teeth tend to tip into the extraction site over time (Figs. 1a and 1b). Uprighting or paralleling of these tipped teeth prior to prosthetic restoration has numerous advantages as listed below:

1. Elimination of periodontal problems which occur in the presence of tipped molars.
2. Uprighting of tipped teeth will improve the distribution of occlusal forces, and the teeth may optimally withstand these forces.
3. Improvement of crown/root ratios of periodontally involved molars.

Fig. 1a Loss of a lower molar may lead to tipping and drifting of adjacent teeth and supra-eruption of unopposed teeth
Fig. 1b Creation of pontic space by uprighting the tipped molars and improvement of the bone contour
4. Provision of the shortest possible span, thus reducing flexing of bridgework and reducing undesirable forces transmitted to the abutment teeth.


6. Paths of bridgework will be parallel to the long axis of the roots.

If restorations are performed without uprighting or paralleling of teeth, compensations have to be made in crown height and contour to avoid periodontal damage. Upon achieving the desired goals, the dentition will also be more amenable to oral hygiene techniques, improving the long-term prognosis.

Sometimes there may be periodontal pockets and infrabony defects on the distal aspects of mesially inclined molars, and this situation will be worsened by uprighting if left untreated\(^6\). In some instances during distal uprighting, the molar may be surrounded distally by heavy fibrotic tissue, which should be removed surgically.

During molar uprighting, occlusal trauma can be prevented by a combination of selective grinding and posterior disarticulation using a Hawley bite plane\(^4,6\). However, in some cases, occlusion of teeth might be necessary to prevent further extrusion during mechanotherapy, and the use of a bite plane would not be indicated.

The maxillary molar should be ground first before reducing the lower molar which is being uprighted. Further extrusion of the unopposed maxillary molar can be prevented by a Hawley appliance.

Clinical probing and preoperative radiographic examination will indicate if the tooth to be moved requires forced eruption to correct certain osseous defects and improve the clinical crown to root ratio\(^4,10\).

The buccolingual width of the trabecular bone may be narrowed by loss of dentition. Although tooth movement through cortical bone is possible, the disadvantages of root resorption, dehiscence and prolonged treatment time should direct us away from this option.

As adult orthodontics have become more socially accepted, adults have been accepting orthodontic therapy more readily. Patient preparation and education should involve the explanation of why orthodontic treatment is needed and information about the minor annoyances involved in orthodontic therapy. Physiologically, no change induced by growth of the adult patient is expected. Vascularity and cell structure decrease with age, and thus slower tooth movement is gained by orthodontic force application\(^11,12\).

Pathologic changes and hormonal and systemic problems may limit treatment objectives or alter the course of treatment.

After the completion of orthodontic treatment, the patient must wear retainers until the final restorations are placed. Fixed orthodontic appliances can also be used passively as retainers prior to prosthetic replacement.

The following cases illustrate the results achieved through collaboration between the orthodontist and prosthodontist.

**Case one:**

A 21-year-old woman was found to have congenital absence of the lower third molars and the bilateral first molars were missing (Figs. 2a and 2b). After routine
diagnostic investigation, it was decided to upright the second molars distally while moving the premolars mesially. Fixed orthodontic appliances were inserted, as shown in Figs. 3a and 3b and molar uprighting mechanics were utilized\cite{4,6,11}. A retainer was then placed immediately following the removal of orthodontic appliances. Figures 4a and 4b show the fixed bridgework in the mouth.

**Case two:**

A 22-year-old woman was referred to our clinic by her dentist. Her lower left second premolar was missing and the first and second molars were tipped mesially creating a dental Class III relationship on the left side (Fig. 5). After evaluating the case, it was decided to distally upright the first and second molars and thus create enough pontic space for a bridgework. The lower left third molar was extracted in order to enhance distal tooth movement. Figure 6 shows the orthodontic treatment mechanics described by Ricketts\cite{13} used to distally upright the first and second molars simultaneously. After uprighting the molars and gaining enough pontic space, the fixed appliances were used passively for retention. Figure 7 shows the final metal-ceramic bridgework.

**Case three:**

A 25-year-old man had congenitally absent upper lateral incisors (Fig. 8). The upper central incisors had drifted laterally, creating a 10-mm midline diastema. Cephalometric evaluation showed a mild Class III tendency and some labial flaring of the lower anterior teeth. Since the cortical bone between the central incisors was present, it was decided to move these teeth into lateral incisor positions while bringing the upper canines into a Class I relationship. Meanwhile, the lower anteriors were slightly retracted to bring them into a more upright position and to close the diastemas. Figure 9a shows fixed appliances kept in place for retention and acrylic central incisors (Fig. 9b) ligated to the archwire in order to keep the space gained and to obtain a better smile at this point. A six-unit bridgework was constructed extending to the canines. Figure 10 shows the final metal-ceramic restorations in place.

**Case four:**

A 27-year-old woman expressed concern about the esthetic appearance of her front teeth. The patient had a maxillary central incisor missing and the remaining central incisor was situated in the middle of the upper arch (Fig. 11). An anterior open-bite of 2 mm was measured between the arches. Periapical radiographs revealed a radiolucent area situated at the apex of this unesthetic discolored central incisor. A preorthodontic diagnostic set-up was performed considering possible extraction of the upper central incisor and moving the lateral incisor towards the midline and reshaping them as central incisors (Fig. 12).

The orthodontic treatment was carried out according to this set-up (Fig. 13). At the completion of the treatment, a Class II molar occlusion was established and restorations were needed in the anterior section to give the patient an esthetic smile. The four anterior teeth were restored with metal-ceramic crowns, eliminating the slight open bite (Fig. 14).
Summary and Conclusions

Orthodontic treatment as an adjunct to prosthodontic and restorative dentistry can significantly enhance a favorable result. The cases presented in this article show only a few of the treatment options available to the dental team. In cases of uncertainty about the choice of treatment, one must seek the expertise of another. If patients are to be provided with the highest level of care, collaboration with other specialists is necessary.

References

Figs. 3a and 3b  Initiation of orthodontic treatment a) Right side b) Left side

Figs. 4a and 4b  Fixed bridgework a) Right side b) Left side

Fig. 5  Pretreatment intraoral photograph

Fig. 6  Fixed orthodontic appliances

Fig. 7  Final metal-ceramic bridgework

Fig. 8  Pretreatment intraoral photograph
Fig. 9a Acrylic incisors ligated to the archwire

Fig. 9b Acrylic central incisors

Fig. 10 Final restorations in place

Fig. 11 Pretreatment intraoral photograph

Fig. 12 Preorthodontic diagnostic set-up

Fig. 13 Initiation of orthodontic treatment after extraction of the central incisor

Fig. 14 Final restoration in place