

## Orthodontic-Prosthodontic Interface in Different Clinical Situations

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### ABSTRACT

**Background:** Interdisciplinary and intra-disciplinary management of patients requires co-ordination and co-operation amongst the different specialists involved. In dentistry team approach promotes continuity of care that is comprehensive, convenient, cost effective and efficient result in the best treatment result for the patients. This review will focus on the clinical conditions that affect the common operating area of the specialities of Orthodontics and Prosthodontics so as to achieve a stable morphological, functional and esthetic treatment goal.

**Keywords:** Orthodontics, Prosthodontics, Clinical decisions.

### INTRODUCTION

Clinical conditions in Prosthodontics that require supplemental orthodontic intervention or vice versa, are essentially related to-Esthetics, Occlusion, Temporomandibular joint & Muscles of face and mastication. Orthodontists are primarily responsible for realignment and displacement of the malaligned craniofacial units. Prosthodontists concern themselves primarily with the replacement and recontouring of missing or distorted craniofacial units. The specialty of orthodontics is predominantly a field of endeavour dedicated to the improvement of oro-facial esthetics and function. In this review, various clinical conditions are described which explain the conditions which requires combined orthodontic and prosthodontic role necessary for improved esthetics and functional of patients.

**Missing teeth: space closure v/s prosthetic replacement**

Congenital tooth agenesis of one or more teeth also known as selective tooth agenesis (STHAG) is the most common abnormality of human dentition.<sup>1</sup> The oral rehabilitation of patients presenting with congenitally missing dentition is challenging because of the need for a multidisciplinary approach. Orthodontic space closure is an alternative when there is a concomitant malocclusion that has to be treated. A combination of factors representing a typical orthodontic indication may include increased overjet; marked crowding; poor inter digitation of posterior teeth to name a few.<sup>2,3</sup> Different treatment alternatives, such as canine substitution, resin-bonded fixed partial dentures, conventional fixed partial dentures and single tooth implants are available for treatment of missing maxillary lateral incisors in adults.

#### Pre-prosthetic molar uprighting

Partial loss of first molar extraction space hinders the fabrication of a good prosthetic

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replacement. This loss of space usually occurs because of the mesial tipping of the 2<sup>nd</sup> molar into the extraction space. When this happens not only does the extraction space contract mesio-distally, but also the eccentric occlusal loading causes reduction in the biochemical loading capacity of the second molar hence, such a situation requires pre-prosthetic uprighting of the second molar using appropriate mechanics.

When planning molar uprighting, the following factors are considered.

1. If the 3<sup>rd</sup> molar is present, whether both 2<sup>nd</sup> and 3<sup>rd</sup> molar should be uprighted.
2. Whether to upright the tipped teeth by distal crown movement,
3. Whether slight extrusion of a tipped molar is permissible or whether the existing occlusal height must be maintained as the uprighting occurs.
4. Whether the premolars are to be repositioned.

Different appliance that can be used for molars uprighting are-Uprighting springs, T- Loop ,NiTi open coil spring, or by using mini implants

#### **Orthodontic forced eruption: an adjunct to prosthodontic treatment planning**

Removal of teeth in many situations ends up in ridge deficiencies which may necessitate hard/soft tissue augmentation to achieve the desired esthetics. Procedures like vertical ridge augmentation in extraction site are not always met with favourable results. Incorporation of a treatment approach like Orthodontic Forced Eruption (OFE) in the prosthetic treatment plan gives an alternative to the clinician which can be initiated prior to the extraction of the compromised tooth to favourably alter the ridge topography. 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 Procedure.<sup>4</sup> Forced eruption allows crown margins to be placed on sound tooth structure while maintaining a uniform gingival contour that provides improved esthetics.

#### **Orthodontic - Prosthodontic approach for managing TMD patients**

Etiology for TMD is multifactorial, it may be different for orthodontic point of view and different for prosthodontics, but the common cause that considered in both branches are occlusal interference. Similarly management will be different for orthodontist and prosthodontist but occlusal therapy by occlusal splints can be given by both the speciality for TMD management.

#### **The role of articulators in orthodontics and prosthodontics**

An articulator provides a means of reproducing the relationship of a patient's maxilla to mandible in intercuspal contact position (ICP) and for lateral and protrusive jaw movements outside the mouth, and is an indispensable aid for the fabrication of crowns & bridges and orthodontic appliances. May be clinical conditions are different for orthodontics and prosthodontics but use of these devices are important aspect for both the speciality.

Articulators are used to<sup>5</sup>:

- study the way the teeth occlude for diagnosis and treatment planning
- allow the formation of the occlusal surfaces during the laboratory preparation and adjustment of fixed and removable prostheses and indirect dental restorations.
- In planning orthognathic surgery.
- Where a significant discrepancy (>2 mm) exists between the retruded contact position and the inter-cuspal position. Diagnosis will be assisted by knowledge of the magnitude of the discrepancy, which can be measured on the articulator.
- Orthodontic cases with multiple missing teeth, in which a stable inter-cuspal relationship cannot be recorded.
- Cases undergoing maxillary and bimaxillary orthognathic procedures.

#### **Orthodontic-prosthodontic implant interaction**

Implants are commonly used in both orthodontics and prosthodontic patients for different applications, considered best anchorage in orthodontics where as best supportive unit in prosthodontics. Osseointegrated implants, immobile by definition, can be used to reposition natural teeth, and can be used to increase treatment options for some partially edentulous conditions, such as malpositioned teeth that are supraerupted and/or tilted secondary to nonaxial loading.<sup>6,7</sup> Clinicians can expand treatment options by combining the established principles of conventional orthodontics and prosthodontics with the emerging principles of endosseous implants.<sup>8,9</sup>

Preprosthetic corrections of tilted abutments are not unusual. Adequate anchorage for tooth movement is often impossible when there are several missing teeth. Realignment of molars by using the remaining teeth is complicated because of limited support. Implants facilitate uprighting the abutment teeth at the end of a long edentulous ridge.<sup>10</sup> If carefully planned, dental implants used to upright teeth can be restored as implant supported prostheses in edentulous areas.<sup>11</sup>

#### **Orthodontic extrusion for alveolar regeneration for development of implant site (orthodontic tissue regeneration)**

When a subgingival lesion such as crown fracture occurs, the general practitioner must consider orthodontic extrusion of the tooth to allow for prosthetic rehabilitation. However, because this therapeutic approach is not appropriate in all cases, each tooth must be carefully analyzed before treatment. The amount of force applied depends on the desired effect. Orthodontic extrusion can also be used to augment bone and tissue in the course of preparing an implant site.<sup>12</sup>

Orthodontic extrusion, which preserves or regenerates the volume of bone in the ridge, makes the placement of dental implants more favourable. Conservation of the ridge allows placement of the dental implant within the thickness of the bone in a suitable axis. It also optimizes the potential for a guided bone regeneration technique. Finally, the newly keratinized tissue improves the esthetic appearance at the site.<sup>13</sup> More specifically, extrusion is appropriate for teeth with average bone loss and when esthetics is a determining factor.

During the orthodontic extrusion, mechanical stresses exerted onto the alveolar bone led to activation of angiogenic growth factors, which would contribute to the formation of new support tissue: Gingival and periodontal fibers, and deposition of new bone via osteoblastic activity at the alveolar crest.<sup>14</sup> As tooth movement occurs in the coronally direction, the gingiva and the bone attached by the periodontal ligaments migrate in the same direction of the movement, resulting in a coronal shift of the bone at the base of the defect.

#### **The role of orthodontics & prosthodontics in managing cleft lip & palate patient**

The management of cleft lip and palate presents a great challenge not only because it involves face that is the most exposed organ of the human body but also because of associated various anatomical and functional problems, which continue to show up with age. Usually an interdisciplinary team approach to provide integrate cleft care is mandatory. The CLP rehabilitation team consists of Orthodontists, plastic surgeons, oral and maxillofacial surgeons, speech therapists, E.N.T surgeons, Paediatric dentists, Prosthodontists and Psychologists.

Very often an Orthodontist/Prosthodontist/Dentist many be called to prepare a feeding appliance palate to help to feed the child. The intervention of the orthodontist in the infant with cleft lip and palate can be required to facilitate surgery by aligning displaced maxillary segments. Maxillary arch collapse and posterior cross bite can be identified during deciduous dentition stage itself. Although it is possible at this stage to correct the cross bite by orthopedically moving the maxillary segment with an expander appliance, expansion is usually deferred until transitional dentition period. Prosthesis used in Cleft Palate Patients are (i) Feeding obturator, (ii) premaxilla positioning appliances, (iii) palatal lift prosthesis, (iv) speech aid or speech bulb prosthesis (3<sup>rd</sup> and 4<sup>th</sup> given in adult patient also).

#### **Orthodontic/prosthodontic devices for obstructive sleep apnoea**

Sleep apnoea is another clinical situation where orthodontic and prosthodontic overlaps, as both the speciality can fabricates the appliances for

treating this patients. Multiple devices have been developed for the treatment of obstructive sleep apnea. There are basically two major types – those that advance the tongue and those that advance the mandible.

The goal of any oral appliance for the treatment of snoring or OSA is to enlarge the airway or at least reduce the collapsibility between the soft palate and the posterior pharyngeal wall.<sup>15</sup> Different Types of Devices given in OSA are Mandibular positioning (advancing) devices, Tongue-retaining device and Palatal lifting devices.

### **Post orthodontic management of aesthetic problems with veneering**

Porcelain laminate veneers have been applied to compensate for the limitations of orthodontic treatment. Various clinical situation where veneering can be indicated to improve esthetics are-

1. Enamel Decalcification / White Opaque Lesions
2. Physical damages on enamel (Enamel Wear / Enamel Fractures)
3. Diastema spaces and small lateral incisors
4. Enamel Hypoplasia.

### **Recent advancement in orthodontic prosthodontic interface**

Over the years, occlusal analysis has involved a lot of guesswork for dentists. Historically, most methods employed (such as the use of articulation paper, waxes, pressure indicator paste, etc), were all that doctors have had to diagnosis, evaluate, and balance occlusal forces. Tekscan developed the T-Scan System to help dentists meet the challenges of using less accurate methods of occlusal analysis.

One of the goals of orthodontic treatment is to improve occlusion achieving proper bite force. The use of T-scan before and after orthodontic treatment for every patient helps to attain the goal of correcting malocclusion and maintaining the proper bite force.<sup>16</sup> Replacement of single or multiple teeth with crown, bridge, complete or partial denture is routinely performed in dentistry to attain proper function and esthetics. Improper occlusion is a major challenge. The T-Scan system was found to be clinically useful as a diagnostic

screening method for occlusal stability of intercuspal position.<sup>17</sup> T-Scan occlusal analysis system is helpful to meet the needs of patients for reliable measurement of occlusal biting forces. It also plays a major role in determining the accuracy of occlusion after orthognathic surgery.

### **CONCLUSION**

Merging orthodontics and restorative dentistry should be integral part of esthetic dentistry in dental practice; combined plans of orthodontic and prosthodontic treatment are underused. Indications for a collaborative effort include preservation of integrity of the dental arch, biomechanical factors, limitations in design of prosthesis, esthetic appearance, periodontal considerations, prevention of malocclusion, and better retention of position of teeth. When planning prosthodontic treatment, the dentist should embrace a dynamic view of tooth position and determine whether restorative treatment can be enhanced by tooth movement. Improved tooth position can eliminate potentially pathologic occlusion and create a healthier periodontal environment that is easier to maintain. In addition, it permits the dentist to place restorations that often require less natural tooth reduction during preparation, and are more esthetic, functional, stable, and durable.

### **CONFLICT OF INTEREST**

No potential conflict of interest relevant to this article was reported.

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