Seven Keys to Optimize Interdisciplinary Orthodontics

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Orthodontics has always been the discipline that sets the stage for dentofacial esthetics. With the increasing demand for appeal and appearance, orthodontic treatment of adults has been the fastest growing area in the field of orthodontics. In addition to aesthetics, increased awareness of malocclusion, functional benefits of orthodontic treatment, advances in materials, aesthetically pleasing and biomechanically sound appliances, and interdisciplinary treatment philosophy have all played an important role in making orthodontic treatment popular in adult population. However, in recent years, increased focus on simplified and rapid intervention has created compromises in treatment outcomes. Lack of fundamental diagnosis and systematically sequenced treatment plans are being circumvented by technology and reliance on laboratory assistance. Diagnostic process, essence of treatment planning and biologic base seem to be diminishing in importance. Often orthodontic treatment can be of significant assistance in periodontal and restoratively compromised patients. The primary goal of orthodontic therapy in such clinical situations is to reduce or prevent excessive periodontal surgery by establishing a physiologic alveolar crestal topography and to establish better occlusal relationships for predictable long-term prostheses by customized orthodontic tooth movements. This article explains the philosophy and treatment approach that brings together a diverse group of professionals into a cohesive interdisciplinary team to provide treatment strategies for adult patient. It explains existing and new orthodontic, periodontic, surgical and restorative techniques that provide the best possible solution to complex dentofacial problems.

In clinical practice, orthodontic treatment of adults may be somewhat different from that of most adolescents (1). Compared with adolescents, adults are more likely to have dentitions that have undergone some degree of maturation over a period of time and they may have other problems like missing teeth, restored teeth, periodontally compromised teeth, endodontically involved teeth etc, which demand some alterations in treatment strategy.

In patients with periodontally compromised dentitions with significant bone and attachment loss, conventional approach to orthodontic tooth movement does not produce the desired results, as this may lead to increased tipping of teeth (2). Therefore, in such clinical situations, entirely different biomechanical strategies are required for efficient and desired tooth movement (3). Absence of growth potential in adults as opposed to growing patients is another factor that influences the orthodontic treatment strategy to resolve adult malocclusions.

1) Establish organized approach to diagnostic and treatment planning process

To formulate proper treatment plan, clarity in the final treatment and to prevent any complications and confusion, establishing accurate diagnosis is the most important step. The goal of the diagnostic process in an interdisciplinary treatment is to produce a comprehensive but concise list of patient’s problems and to incorporate various treatment options into a plan that gives maximum benefit to the patient (4). The orthodontist should:

i) recognize the various elements of malocclusion contributing to the development of a problem. This can be achieved by developing a comprehensive but concise database of useful information derived from patient’s history, clinical examination and analysis of diagnostic records (study models, full mouth radiographs and facial and intraoral photographs). (Fig 1)

ii) have comprehensive knowledge of different disciplines of dentistry to generate the pertinent data other than orthodontics.

iii) and finally, define the nature of the problem to design a treatment strategy based on the specific needs and desires of the patient.

This database is then well organized in such a way that it gives a systematic description of the patient’s problems. The team involved can easily refer to this during the treatment planning process. While arranging the database of a complex dentofacial problem in a systematic manner, if the problem list becomes very extensive, it is advisable to classify the problem list into various areas like orthodontic problem list, restorative problem list and periodontal problem list (Fig 2).

2) Define treatment goals

In the management of a patient with multiple dental problems, it is extremely important for a clinician to define finishing goals at the beginning of treatment and to focus on them till the finishing stage, in order to achieve them with a combination of appropriate orthodontic treatment mechanics, restorations and periodontal procedures. The treatment goals are mainly focused on establishing optimal oral health, aesthetics, good stomatognathic function and long term stability.

The clinician should be able to visualize the end result before implementing the definitive treatment plan. This requires clearly defined treatment goals that set the direction to the proposed treatment plan. Ideally, interdisciplinary treatment plan should be the one that addresses maximum number of highest priority problems including the chief complaint and optimizes the treatment results with maximum benefit to the patient with less risk involved.

Since complex dentofacial abnormalities frequently present multifaceted problem list involving...
new interproximal spaces, which may result in a constriction of the interproximal bone due to reduced interradicular distance (Fig. 3). This compromised bone as a result of septal constriction can be a challenge for both periodontists and prosthodontists. Decadency of the dentition by orthodontic tooth alignment widens the interproximal bone, which can significantly enhance local host resistance and improve the prognosis of compromised or infected teeth (Fig. 6).

Other than the aesthetic reasons, the resolution of interproximal tissue constriction and fault facet points and embrasures is the predominant periodontal reason to eliminate dental arch crowding (6).

This integrated orthodontic and periodontal approach as an alveolar development exercise, should be considered as the most compelling periodontal rationale for orthodontic therapy. Hence, it is important to recognize orthodontics to be much more than simply an esthetic domain.

4) Use orthodontic treatment in correction of “Biologic width” violations

Restorative therapies essentially require a healthy and stable periodontium for long-term success. A den-
	
tal unit exhibits a constant interplay of gingival tissues with crown contours, restorative material, its texture and its margins. Biologic width is defined as the dimension of space that the healthy gingival tissue occupies coronal to the alveolar bone (7).

It is further elaborated as a total of supragingival fibers, junctional epithelium and sulcus (8). This concept of existence of a specific width was first published by Gargiulo et al. in 1961 through cadaveric experiments which revealed a mean measurement of a 1 mm of epithelial attachment plus connective tissue attachment to be 2.38 mm (Fig. 7 (9)).

D. Walter Cohen was credited to first coin the term “biologic width.” The significance of this width lies in the fact that it prevents penetration of microbes into periodontology. In 1977, higher recommended a distance of 3 mm minimum to be kept between restorative margins and alveolar crest for adequate gingival health maintenance (10). This 3 mm consists of 1 mm of suprabony connective tissue space, 1 mm of junctional epithelium and 0.5 mm of sulcal depth. Violation of this natural seal disrupts dentogingival apparatus making it susceptible to ingress of oral microorganisms and consequently causing gingival disturbances such as inflammation, recession and alveolar bone loss (11 and 12).

Thus, it is imperative to minimize irritation to this zone. This measure of 3 mm allows for optimum bone attachment. The development of this natural seal is significantly influenced by the interproximal bone level. Therefore, early implant placement poses a greater risk of compromised esthetics in the long term. Several studies on young adults who were treated with implant-supported restorations to replace missing teeth have observed discrepancy between implants and adjacent natural teeth.

In a study that followed the vertical changes of maxillary incisors adjacent to implants in a group of adolescents between 15-20 years of age and adults between 40-55 years demonstrated infraocclusion of the implant-supported restorations, with a vertical step of 0.1 - 1.65 mm and 0.12 - 1.86 mm in adolescents and adults respectively (13).

Therefore, lack of proper occlusion and esthetic situations in the anterior region may be common observation due to jaw growth in patients with implant – supported restorations even if the implants are successfully integrated. The best method to determine the size of facial growth is to superimpose sequential lateral orthopantomograms taken at an interval of six months (Fig. 8). Generally, the implant should be placed after completion of facial growth (around 17 years in females and 21 years in males.)

Establish optimal implant space

Adequate space gained for the restoration of the normal width of missing lateral incisor based on esthetics and occlusion will determine the appropriate size of the implant to be placed. When selecting the size of the implant, it is important to have 15 to 20 mm space between the crowns of the adjacent teeth for the development and maintenance of the papillary (14). After the evaluation of space is completed, it is important to radiographically evaluate the interarch space. The roots of the adjacent teeth should be parallel to slightly divergent with adequate space between the roots for implant placement (Fig. 9 A and B).

Once the optimal space has been gained with appropriate treatment mechanics, acrylic teeth of proper size and color shade can be bracketed and attached to the archwire for esthetic purpose (Fig. 10). If the space gained for the lateral incisor is in excess, this space can be used as a template, which will help determining the residual space closure. Clinical evaluation of the edentulous space and radiographic evaluation of the root position of the adjacent teeth should precede appliance removal.

The final implant restoration is significantly influenced by the position and angulation of implant placement. For proper placement of an implant, the minimum space between the adjacent teeth roots is usually 3 mm, providing enough room for small diameter implant placement, leaving about 0.7-0.9 mm of space for the bone between the implant and the adjacent roots (15).

Position adjacent teeth to facilitate restorative treatment

It is a common observation that when an orthodontist is opening up the space for missing lateral incisor, as the force is applied on the crowns of the central and canine teeth, the roots get tipped into the lateral incisor region. This leads to an adequate crown space but the space between the adjacent roots gets reduced, making it impossible for the surgeon to place an implant (Fig. 11).

It is equally important to take sufficient space of the implant.

Figure 20: (A) Pre-treatment vertical gingival discrepancy between 21 and 22 caused mainly by supra-eruption of 21. (B) Mid-treatment photograph demonstrating resolution of this discrepancy by differential vertical orthodontic tooth movements.
6) Optimize pre-restorative orthodontics

Often management of adult patients necessitates modification from usual treatment patterns. Orthodontic treatment is usually started earlier in life, at a younger age. This may be due to the development of new techniques or due to the increasing demand for aesthetic treatment. In most cases, orthodontic treatment is initiated prior to the implant placement.

Orthodontic treatment in young patients is usually started earlier in life, at a younger age. This may be due to the development of new techniques or due to the increasing demand for aesthetic treatment. In most cases, orthodontic treatment is initiated prior to the implant placement.

The best way to achieve this is to plan for the implant placement as soon as possible in the treatment process. This allows for the optimal positioning of the teeth in the arch, which can improve the aesthetic outcome and reduce the treatment time.

7) Use customized orthodontic treatment to maximize esthetics

Contrary to traditional orthodontics that is focused solely on improving occlusal and aesthetic outcomes, modern orthodontics takes into account the overall health of the patient and the surrounding tissues. This modern approach to orthodontic treatment is called “biologic orthodontics.”

In biologic orthodontics, the focus is on maintaining the natural shape and size of the teeth, as well as the surrounding soft tissues. This is achieved by using specialized orthodontic techniques and appliances that are designed to minimize the movement of the teeth and the surrounding tissues.

The main goal of biologic orthodontics is to achieve a natural-looking smile that is both functional and esthetic. This is achieved by using a combination of orthodontic treatment and restorative procedures, such as placing implants or crowns.

The author would like to acknowledge Dr. Ramdas Patil for providing restorative treatment for the patients and Dr. Anil Jagdale for her assistance in preparing this manuscript.

Conclusion

The integration of orthodontic and restorative treatment provides the possibility for treating patients in a multidisciplinary approach. This approach allows for the optimization of the treatment results and enhances patient satisfaction.

Acknowledgements

The author would like to acknowledge Dr. Ramdas Patil for providing restorative treatment for the patients and Dr. Anil Jagdale for her assistance in preparing this manuscript.

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