Seven Keys to Optimize Interdisciplinary Orthodontics

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Orthodontics has always been the discipline that sets the stage for dento-facial esthetics. With the increasing demand for aesthetic 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 systematic treatment planning results in poor outcomes. Treatment planning has become crucial by technology and reliance on laboratory assistance. Diagnostic process, essence of treatment planning and biologic basis seem to be diminishing in importance. Often orthodontic treatment can be of significant assistance in periodontally and restoratively compromised patients. The primary goal of orthodontic therapy in such clinical situations is to reduce or prevent excessive periodontal destruction by establishing a physiologic alveolar crestal topography and to establish better occlusal relationships for predictable long-term prognosis 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 patients. It explains existing and new orthodontic, periodontic, surgical and restorative techniques that provide the best possible solution to complex dento-facial problems. In clinical practice, orthodontic treatment of adults may be somewhat different from that of most adolescents. 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. 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:

- 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).
- have comprehensive knowledge of different disciplines of dentistry to generate the pertinent data other than orthodontics.
- 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 problem. The team involved can easily refer to this during the treatment planning process. While arranging the database of a complex dento-facial 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. 1).

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 dento-facial abnormalities frequently present multifaceted problem list involving...
3) Recognize ‘minor dental priority cases.’ (Fig. 3). Figure 4 illustrates 11-point procedure performed by one of the in such a way that each treatment and treatment priority. Here, patients’ chief complaint, is then regarded as final and definitive treatment. All specialists involved able reference tool during the course of treatment. A specialist is involved in formulating the treatment plan for the patients before providing solutions to individual problems based on their own areas of expertise, and no problem should be treated as less important. Provisional treatment plans are then compared with respect to their overall effects, and the plan that enhances the treatment and provides maximum benefit to the patient, considering the patient’s chief complaint, is then regarded as final and definitive treatment plan.

The treatment planning process almost always follows the same events; however, the treatment sequence varies significantly from patient to patient due to various factors in morphological configurations and treatment priority. Hence, it is critical to organize the sequence of various treatment procedures in such a way that each treatment procedure performed by one of the specialists from the interdisciplinary team facilitates the next in order (Fig. 3). Figure 4 illustrates 11-point treatment protocol for interdisciplinary cases.

4) Use orthodontic treatment in correction of ‘biologic width’ violations.

Restorative therapies essentially require a healthy and stable periodontium for long-term success. A dentogingival unit exhibits a constant interplay of gingival tissues with crown contour, 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 fiber, junctional epithelium and sulcus (8). This concept of existence of a specific width was first published by Gansneck in 1976 through cadaveric experiments, which revealed a mean measurement of 1.5 μm of epithelial attachment plus connective tissue attachment to be 2.3 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 periodontium. In 1977, higher recommended a distance of 3.5 mm minimum to keep between restorative margin and alveolar crest for adequate gingival health maintenance (10). This 3.5 mm consists of 1 mm of supragingival connective tissue, 1 mm of junctional epithelium and 1 mm of sulcular depth. Violation of this natural seal disrupts dentogingival apparatus making it susceptible to invasion of subgingival 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 3.5 mm allows for optimum biological healing of the root cementum and successful integration of the implant. A well-conserved 0.2-0.3 mm of initial crestal bone is recommended for adequate primary stability (13 and 14).

5) Improve implant site with orthodontics.

There are several orthodontic procedures employed to improve implant site for predictable restorations.

Determine the timing of implant placement.

Facial growth is the determinant of the age for implant placement for adolescent patients. The osseointegrated implant’s lack of eruptive potential makes it to behave like an anchored tooth, often causing a discrepancy in the occlusal plane due to continuous eruption of the adjacent teeth. 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 implant and adjacent teeth. In a study that followed the vertical changes of maxillary incisors adjacent to implants in a group of adolescent between 15-20 years of age and adults between 40-50 years demonstrated infraocclusion of the implant-supported restorations, with a vertical step of 0.15-1.5 mm and 0.02–0.1 mm in adolescents and adults respectively (15).

Therefore, lack of proper occlusion and esthetic situations in the anterior region may be common obstructions due to jaw growth in patients with implant – supported restorations even if the implants are successfully integrated. The best method to determine the status of facial growth is to superimpose sequential lateral cephalometric radiographs 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 15-20 mm space between the central and canine teeth, as this space allows for the crown of the central and canine teeth, as the force is applied on the crown 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. 9).

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 architecture for esthetic purpose (Fig. 10). If the space gained for the lateral incisor is in excess, this excess space can be used as a template, which will help determine the residual space. 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 tooth roots is usually 3.5 mm, providing enough room for small diameter implant placement, leaving about 0.5 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. 9).

It is equally important to take sufficient...
client care to make sure that there is adequate interocclusal space for the implant restoration. It is, therefore, critical to establish optimal inter nal, coronal and interradicular spaces, even in esthetic regions specifically (Fig. 12) respectively, for proper implant placement and long-term predictable restoration.

It is best to place an implant during the finishing stage of orthodontic treatment which allows finer manipulation of space and sufficient time for osseointegration by the time application of the abutment. The implant placement procedure is planned after the removal of orthodontic appliances and the space should be maintained during the retention phase.

Consider biologic augmentation

One of the prerequisites for placing an implant and subsequent good self-integration for more esthetic and predictable restoration is to have an excellent alveolar ridge. It is a common clinical observation that ridge morphology generally tends to exhibit compromised bone levels due to alveolar bone resorption. Recent studies have shown that the maxillary anterior teeth are extracted from 10% to 30% over a period of 5 years (16).

Orthodontic implant site development is a process involving the root movement that creates adequate alveolar ridge width through stretching root parallelism of the abutment teeth, etc. as guided by localized restorative occlusal forces, coordination of teeth for subsequently planned interdisciplinary treatment and minimization of the potential irregularities displayed by previous pathological episodes. Interdisciplinary treatment requires a close collaboration with orthodontics due to anesthetic tooth eruption which is a common clinical observation with well-coordinated upper and lower arches. This unique approach to manage pathological tooth eruption can be amalgamated with orthodontic treatment to refine aesthetic potential.

White and pink harmony

White and pink esthetics is the process of aligning of teeth constitutes perfection of white esthetics within a smile. However, when implemented regularly, this collaborative approach results in very efficient protocols and executions that patients appreciate and benefit from.

The author has, since the initial days of orthodontic practice, developed the professional collaboration with specialists from other disciplines of dentistry in a fruitful career and continues to maintain professional enthusiasm with them. This interdisciplinary management of complex clinical problems will certainly inspire readers to engage in their own interdisciplinary situations and, advance the philosophy of orthodontics among the patient and community at large.

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References