Predictable Planning: Key to a Successful Smile

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Our goal in dental rehabilitation for all dental patients is to regain durable esthetics and masticatory function in conjunction and along with maintainable health of the total masticatory system. The demand for aesthetic restorations is phenomenal, driven by media as well as marketing strategies. This phenomenon is both a bane and boon to the dental profession. Media-driven treatment plans and over the counter products have resulted in patients demanding whitening, veneers and implants. While it is perhaps a good time to be involved in dentistry, it is also a challenging time. Consistent provision of predictable dental aesthetics requires the understanding of latest materials and precise techniques as well as and more importantly a commitment to the patients interest.

Technology has seen great advances in restorative materials, but depending only on technology for success is a sure recipe for disaster. All restorations, ceramics or plastics, implants or partials have to survive in the oral environment; therefore, they have to function in harmony with the masticatory system. The common goal of all dentists whether a prosthodontist or a periodontist, orthodontist or restorative dentist should be to obtain a peaceful neuromusculature. Vision of failure therefore, includes not only fracture of restorative materials but signs and symptoms of occlusal disharmony including mobility, recession, muscle pain and ultimately breakdown in the masticatory system. Most of the failures cannot be attributed only to the technique, but to our inability to plan. Failure to plan is planning to fail. Designing the patient’s smile cannot be a result of stroke of good luck left to guesswork and chance. It encompasses parameters of dental esthetics that have been recognized and reinforced over several decades. Parameters of dental esthetics would include understanding of basic principles and then understanding of macroesthetics and microesthetics prior to performing esthetic dentistry.

Plan to predictable success therefore requires programmed treatment planning and should include comprehensive examinations and records, two-dimensional and three dimensional treatment planning, provisional prototypes, lastly followed by definitive restorations.

Comprehensive Examination:

Every treatment decision should be made with the understanding of the reasons for the problem. There is reason for every position, contour and alignment of the stomatognathic system. There is a reason why muscles become tender, some teeth become loose, while others wear off, some occlusion remains stable while others do not. Dental disease is generally caused as a result of combination of factors. Therefore, it is important to determine the cause of the signs and symptoms, since similar symptoms can result from different causes and different symptoms can result from the same cause. In large rehabilitations in dentistry, especially in full arch constructions most debilitation is generally caused by one common factor, the occlusal interference. Planning in rehabilitation therefore requires a comprehensive understanding of occlusal principles by both the general practitioner and specialist. Dawson
suggests a “Functional- Aesthetic checklist” to develop a protocol that will aid in predictability. The goal of this checklist is to develop a vision for potential solutions to the aesthetic and functional needs of the patient. The critical point to remember is that initiating restorative treatment is indicated only after comprehensively examining the TMJs and carefully satisfying each of the requirements of occlusal stability\(^1\) (Table I). The requirements for occlusal stability should uniformly form the framework for treatment planning for all specialties alike. Examination should link the anatomy of the tooth to that of the temporomandibular joint and the muscles of mastication. In essence, it suggests that optimal esthetic restoration cannot be obtained and sustained if it is not in harmony with the engineering mechanism of the human body. The functional movement of the mandible constitutes the most fundamental basis for ideal occlusal design. The entire context of occlusal harmony is based on a precise relationship of the teeth to how the mandible moves in function versus pathofunction. The assessment begins by evaluating the health of the joints and the requirements of occlusal stability. Only when the occlusal stability is confirmed, should we progress to the broadest principles of smile design followed by narrowing this plan to the specific needs of the patient.

**Table I: Requirements of Occlusal Stability (Peter Dawson)**

- Stable holding contacts on all teeth when condyles are in centric relation
- Anterior guidance in harmony with envelope of function
- Immediate disclusion of all the posterior teeth when the mandible moves forward of centric relation
- Disclusion of all posterior teeth on non-working side
- Non-interference of all posterior teeth on the working side with either lateral anterior guidance or the border movements of the condyles.

**Three dimensional treatment planning:**

This offers the opportunity to envision the smile and determine the appropriate treatment plan. Two critical decisions are required to produce any smile that is in harmony with function i.e. position of each anterior tooth and contour of each anterior tooth. The rule to ultimate predictability is there can be no shortcuts. This would include two sets of diagnostic casts; casts mounted with the face bow record and centric relation records. The first set of diagnostic casts serves as a reference throughout the treatment and the second is used to prepare prototypes for the final restorative treatment. Properly mounted diagnostic casts with appropriate records are important because horizontal condylar axis is the determinant of the arc each lower tooth travels as the jaws opens or closes. Mounted casts are the only certain way of knowing the correct relation of the lower incisal edges to the upper anterior teeth. After centric relation, the anterior guidance is the most important determinant when occlusion is restored. Since anterior guidance must start at centric relation to achieve posterior disclusion, functional smile design cannot be achieved until a decision is made regarding how to ensure that the posterior teeth do not interfere with the condyles in centric relation or the anterior guidance. The diagnostic wax up is the process of converting a programmed treatment plan into a three dimensional visualization.\(^2,3\) Reductive reduction and/or additive waxing may be done which act as blueprint for the prototypes. This wax up may be tried and
conformed on the articulator to customize the anterior guidance and harmonize it with the envelope of function. The envelope of function is that the functional movements of the mandible that occurs within the envelope of motion and cannot be determined by recording the border movements of the condyle. The anterior teeth play a dominant role in establishing the functional path that the mandible can travel. This means the position, inclination and lingual contour of the upper anterior teeth are critical in determining the ideal envelope of function. The best appearance, best function, best phonetics and best long term stability can be achieved if the upper incisal edges are in harmony with the envelope of function.\textsuperscript{3,5} The envelope of function is directly related to the neutral zone positioning of the anterior teeth. The mandible has a favoured path way of function and if teeth interfere with this favored path, there will be a price to pay in deformation or dysfunction. The weakest link will be the focus of destruction. Placing anterior teeth in a relationship that restricts the horizontal envelope of function is a common error made by restorative dentists and orthodontist alike and is a cause for extensive wear, mobility or forced movement of anterior teeth. The plan therefore includes developing stable centric stops on all anterior teeth, group function in protrusion and ideal stress distribution in lateral excursions. This would require checking of cast on the articulator in excursive movements to check for balancing and working interferences and the best possible options for creating posterior disclusion. The obtained prototypes should duplicate the contour and shape of the final restoration and satisfy both function and aesthetics. Phonetically, the length and position of the incisors must be tested to the patient’s tolerance in speaking. Four key views help to determine the vertical and horizontal position of the incisal edges. The first determination is that of the horizontal position of the incisors. The incisal edges are within the wet and dry zone of the lower lip which facilitates lip closure path and neutral zone. The second determination is the vertical position of the incisors. A youthful smile will display 2-4 mm of tooth structure while a mature smile will display 1-3 mm. The F sound will help to determine if the anterior teeth are too long.

**Provisional Prototypes:**

The dentist’s ability to create artistic functional provisional opens the door to achieving predictable and beautiful lifelike esthetic restorations and patient satisfaction. The prototypes are invaluable in evaluating form, function, contour, colour, tissue level and pulpal response, and determine if any modifications are necessary before permanent ceramic restorations are fabricated. Once prototypes are placed they serve as a “testing ground” and establishes why temporization is critical to a final treatment plan. (Figure I, IIA, IIB, III)

*Figure I: Pre-operative view of the patient*
Definitive Restorations:

Once the prototypes are approved by the patient, the dentist simply makes models and takes photographs and passes the information to the laboratory. An incisal edge matrix and a custom guide table are two matrices which a technician should fabricate to reproduce and duplicate the contours of the provisional and transfer the same in the definitive restorations (Figure IV). There should be no surprises in the definitive restorations and most of the time and effort is relegated to improving the microesthetics of the restorations.

Conclusions:

The fundamentals of programmed treatment planning are consistent even for the most complex, multidisciplinary esthetic issues. The key to establishing a treatment plan is to be able to visualize the ideal end point of treatment and relate it to the patient’s current condition.

References:
