Natural Esthetics Through Minimally Invasive Dentistry
A Peer-Reviewed Publication
Written by Dr. Dale Sorenson

Abstract
Everyday dentistry does not typically include full mouth reconstruction. Rather, minimally invasive dentistry, restoring one or two teeth or somewhat more complex cases comprises what we do on a daily basis. Though involvement and complexity can vary, the foundation principles that ultimately dictate success remain the same. A key component is the role that occlusion plays in achieving excellence in anterior esthetics. This presentation will focus on the principles that need to be addressed in order to achieve predictable long term success through an occlusion-based rationale toward natural esthetics.

Educational Objectives:
The attendees will learn to:
1. Identify the cause and effect relationship of functional and parafunctional wear facets
2. Incorporate fundamental occlusal concepts in organizing an optimum occlusal scheme
3. Recreate natural esthetics and balance in a minimally invasive manner.

Author Profile
Dr. Dale Sorenson received his D.D.S. degree from the Indiana University School of Dentistry. He is a member of the Northeast Regional Board of Dental Examiners and served nine years on the Indiana State Board of Dentistry. He is an active member of the American Academy of Fixed Prosthodontics, American Equilibration Society, Fellow in the American College of Dentists, Fellow in the Pierre Fauchard Academy, ADA, IDA, and First District Dental Society. He was recently inducted into the American Academy of Restorative Dentistry. Dr. Sorenson is currently The Pankey Institute’s Director of Essentials Education.

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If we look deeper and consider a definition of esthetics we find that esthetics is actually the study of beauty. Its primary element is an emotional attachment or connection to whatever is being observed. When we see something that is truly esthetic it attracts us and draws us in. We feel excited or inspired. In fact, when we see something that is esthetic we find ourselves not being able to take our eyes away from it. It makes us feel warm, stimulated, and excited. Consider the last time you saw an attractive person, a gorgeous car or a beautiful sunset. It is an engaging, stimulating, and energizing experience. It truly is an emotional event. We discriminate and differentiate that emotional response to what we know is “right”. Ancient philosophers called it Truth Conditions. It is what we believe to be correct or what our mind “tells” us is right. It is very intuitive and impulsive. It is a “gut feeling”. For instance, we can tell if a Christmas tree has an ideal silhouette. We know when a seashell has the model form. We know when a rose has the idyllic shape. We can also distinguish when individual teeth or even a particular smile are pretty or attractive or are a distraction, but it is an instinct and a conditioned response. It is clear that esthetics is not an accident. It is precise; it is so precise that a minute adjustment can make the difference between a distractive presence and an attractive one.

This goes further since there is a natural connection between beauty and effectiveness. It could actually be considered a law of nature. If we consider the neck of the giraffe, a beaver’s tail, or even the trunk of an elephant it is apparent that these are unique and essential anatomical features. The overlying message, then, is that if something works properly it probably looks right for the particular species. The overlying message, then, is that form follows function. Nowhere is this truer than in the relationship between occlusion and natural esthetics. With those tenets in mind, what are the underlying principles that help us identify the objectives when it comes to function? What are the principles for achieving an acceptable physiologic occlusal scheme? Dr. L.D. Pankey’s Principles of Occlusion are an excellent benchmark for identifying simple goals and objectives. In summary, his thoughts were: “When the jaw closes in Centric Relation, all the back teeth hit simultaneously and with equal intensity. When power is applied, no tooth moves and the jaw does not deflect. In any movement away from Centric Relation position, no back tooth hits before, harder than or after the front teeth.”

In clarifying these principles, the first consideration would be having the joint in the right place. Looking at the joint from an orthopedic perspective, the TM joint has a musculo-skeletally-stable position very similar to every other mobile joint in the body. Just like any other joint in the body, it is ideal for it to be in its most physiologic...
correct place. This ideal, proper orthopedic position of the seated condyle-disc assembly in the fossa, is referred to as Centric Relation. Secondly, the back teeth should hit evenly, at the same time and with the same intensity so that the forces can be evenly distributed. The contact areas on the teeth should ideally be located either on cusp tips, marginal ridges, or central fossa areas that should be flat receiving areas called “centrums”. Having the back teeth contact equally and balanced and on flat receiving areas (centrums) causes the vectors of force to be directed along the long axis of the tooth which make those forces the least destructive to the teeth. Lastly, just as the steering for a car should be in the front, it is preferable to have the “steering” for the occlusal scheme accommodated by the front teeth. This facet of the functional scheme is referred to as anterior guidance. Ideally, the front teeth are shaped so they are in harmony with what the patient does with them so the back teeth can move harmlessly against one another. The teeth should not be fighting against one another. Consequently, having the front teeth separate the back teeth during any lateral or excursive movement would be considered optimal. The overall principle is that when back teeth touch it allows the major muscles of mastication to fire and contract. Creating adequate anterior guidance minimizes the muscle forces that can possibly be generated in the system. Dr. Pete Dawson made the statement that “adequate anterior guidance is critical to the success or failure of many restorative treatments”. When the anterior teeth separate the back teeth in any excursive movement, it creates a low energy, optimal relationship. From an engineering and neurophysiological perspective this is ideal.

From a physics perspective the masticatory system is classified as a Class 3 lever system with the temporomandibular joint being the fulcrum. Consequently, creating ideal anterior guidance moves the forces farther away from the fulcrum, weakening the lever system, creating the most favorable relationship. In accomplishing these objectives of occlusion, they can be applied appropriately for each individual patient. As Dr. Pankey said, “Treat people appropriately according to their needs and wants”.

Taking a closer look at optimal form, what parameters or objectives should be considered when it comes to excellence in form? Magne and Belser in their book: “Bonded Porcelain Restorations in the Anterior Dentition”, identified some of the specific guidelines when it comes to esthetic principles. Their Biomimetic approach referred to recreating or re-establishing natural esthetics. Revisiting their guidelines or esthetic checklist makes it clear that there is a complex dynamic to the consideration of esthetics. (Figure 1)

First of all, one must look at more than just the teeth. It is important to remember that no matter how magnificent a painting is, it must be held in a frame of beauty or the actual art piece gains no significance. The message is that one must look at both “white and pink esthetics”. There must be an appropriate frame for our picture in order to have a good result with proper anatomy and balanced gingival architecture, then the teeth parameters come into play. Attention to incisal length, width, characterization, and texture can then begin. The individual components must fit together and be woven into an artistic piece—an esthetic display that demonstrates harmony, balance, and synergy. We could never expect each component to be perfect. Perfection is certainly not natural. It is important to balance the visual tension that we see, identifying the individual components that may be inexact reading the smile presentation and feeling the emotional response it gives us. Creative license can then be used to modify those components appropriately, moving towards more natural parameters and making smiles less distracting and more inviting—more esthetic.

In this patient, one can identify many different pieces that are incorrect or imperfect (Figure 2).

We have put them together and balanced them to create a beautiful result. Below are some clinical examples of achieving natural esthetics through minimally invasive dentistry. Looking at the first patient we see a unique presentation. She is a 34 year-old mother of four. Her initial concern was that she had just chipped her upper right front tooth (Figure 3).
She was very concerned about her appearance but even more so about the long-term health of her teeth. Upon examination, the unique presentation of the edges of the mandibular anterior teeth tells a story (Figure 4).

They give us great insight into what she is doing with her teeth and how they got that way. By taking a closer look at the functional path we find the facets matching each other and actually creating one another (Figure 5).

The significant wear facets and fractured incisal edges match up like pieces of a puzzle in a definitive cause and effect relationship. It was obvious that she had parafunctional or bruxism activity. Consequently, bite splint therapy was going to be a primary focus of our early treatment regimen. By examining the rationale and indications for splint therapy we find many physiologic validations and justifications for bite splint therapy. They accomplish many different objectives but in the end make our treatment more predictable and stable. In addition, there are many behavioral indications for splint therapy as well. In this situation, our main objectives for splint therapy were to verify the patient’s Centric Relation position, manage her bruxism activity, and, most importantly, use it as a patient education tool by raising awareness of the effects of her habits on the dentition.

After successful splint therapy, her centric prematurity was demonstrated and documented with a precise Centric Relation bite record and study casts mounted on a semi-adjustable articulator with a face-bow transfer (Figure 6).

This facilitated evaluation of her functional pathways, in function and para-function. Most importantly, this captured her working and balancing interferences that were leading to her breakdown and significant wear. After duplicating her models, we were able to complete a diagnostic trial equilibration on the duplicated set by doing cautious modification to the stone models.

The trial equilibration provided the opportunity to create some ideal centric stops on flat receiving areas or cusp tips and an improved anterior guidance functional scheme (Figure 7).

In addition, with the help of a sharp Bard parker surgical blade the stone models were modified, recreating the natural contours of the teeth.

The result was the creation of a more ideal mandibular incisal edge plane that would give the upper teeth a flat platform or level table on which to transfer smoothly and also give the muscles a place to rest (Figures 8 and 9).
We were then able to show the patient before and after models that demonstrated the changes that we intended to make and the benefits she would experience and get her approval to move forward (Figure 10).

Figure 10.

Her treatment plan consisted of nothing more than a full mouth occlusal equilibration, reestablishing an acceptable occlusal scheme and esthetic re-contouring of her anterior teeth.

After successful splint therapy, her first point of contact in centric relation was very easily reproduced (Figure 11).

Figure 11.

Upon further investigation, she demonstrated significant energy in her excursive movements with all the lateral forces in the posterior teeth (Figure 12).

Figure 12.

In accordance with the diagnosis and treatment plan, using proper bi-manual guidance we were able to complete a full-mouth occlusal equilibration. This resulted in the development of excellent centric stops and the establishment of ideal anterior guidance on the canines and smooth protrusive function as well. This was accomplished with minimal adjustment to the teeth (Figure 13).

Figure 13.

By using sharp, flame-shaped 12-fluted and 16-fluted carbide burs, we were able complete esthetic recontouring creating more natural, esthetic contours with simple enameloplasty. It allowed the opportunity to adjust the length of the lateral incisors, refine and smooth the edges, and create proper, more feminine incisal embrasures giving the presentation more definition (Figure 14).

Figure 14.

This resulted in an excellent esthetic result, one that she was very pleased with and one that mimicked the diagnostic workup models.

Most importantly, her anterior guidance was improved with an ideal transition from her canines to a smooth, stable crossover position on her lower anterior edges. This movement mirrored the smooth transition she experienced and expected after her successful bite splint therapy (Figure 15).

Figure 15.

If we examine the opposite side, again we see a very smooth transition. Her anterior guidance begins on her canine and transfers immediately from the canine smoothly onto her mandibular central incisors without a bumping, chattering or uneven movement (Figure 16).

Figure 16.

We see a tremendous improvement in her esthetic arrangement much more in line with natural shape and contours. As a result, that leads to an improved smile that is more natural, softer, more defined, attractive, and feminine. The basis for the improvement began with a fundamental development of an ideal physiologic occlusal scheme allowing the opportunity for more natural and desired esthetics. By creating a level mandibular incisal plane, we have created both an esthetic improvement and functional improvement. We have certainly changed the perception or “visual tension” since the teeth now look straighter and more pleasing. More importantly, we have created a flat, even level platform or table
to allow for a balanced, smoother crossover and protrusive function (Figure 17).

In essence, we have created a stable, long-term predictable result. The result followed our philosophy of reestablishing natural contours and ideal natural esthetics that were driven by first correcting and idealizing her functional occlusal scheme. Re-creating and enhancing the natural beauty of this patient was superior to any restorative option we could have chosen. The case truly demonstrates the principle that form follows function. The anterior and posterior determinants of occlusion can be blended together with aesthetic considerations to result in a very pleasing outcome.

Our second patient was in her late 50’s and her initial concern was that she wanted an esthetic improvement. She felt very uncomfortable and self-conscious about her smile for some time and wanted to change it (Figure 18).

She presented with a very unique and unaesthetic arrangement that made for a distracting, masculine appearance. Her maxillary anterior teeth exhibited sharp, irregular edges. They were uneven, of different lengths with a rough appearance which was in direct conflict with her personality. Her smile did not fit her as a person. Using a black photographic background, the relative imbalance becomes quite apparent and the discrepancies become rather profound. (Figure 19)

From a functional perspective, she displayed a compromised occlusal scheme with heavy working and balancing interferences on both sides. My suspicion was that her poor functional system was contributory and possibly resulted in the lost buccal cusp on tooth #3 that she had not yet restored. Examination of her occlusion quickly revealed the cause of her appearance.

She exhibited a compromised functional scheme as well demonstrating heavy posterior interferences in both working and non-working sides (Figure 20 and 21).

Similar to the first case, bite splint therapy was indicated for comparable reasons. After successfully completing splint therapy, we were able to demonstrate and document her centric relation premature contacts with accurately mounted diagnostic casts that clearly represented her situation. The centric relation premature contact noted on the models was identical to what was noted clinically. The functional pathways observed on the models clearly demonstrated the cause and result of her condition that were demonstrated clinically (Figure 22).
Completing the diagnostic trial equilibration on a duplicate set of mounted study casts yielded more ideal centric stops and improved anterior guidance. By altering the casts with a sharp surgical blade, we were able to reconstruct more ideal esthetics, proportions and embrasures. Triad® composite resin was added to a couple of the lower anterior incisal edges since that provided the ability to create a more level and esthetic mandibular incisal plane (Figure 23).

After successful bite splint therapy, we were able to easily reproduce and document her centric relation prematurity. Following the diagnostic work up, full mouth occlusal equilibration was completed, which provided ideal simultaneous centric stops on flat receiving areas or cusp tips and the creation of an improved, smoother, more refined anterior guidance scheme (Figure 24).

Esthetic re-contouring provided more ideal and proper proportions, corrected the incisal edge lengths, and proper incisal embrasures that were more natural in appearance. By adding composite to the lower anteriors, we were able to recreate an improved incisal edge plane by paying special attention to the pitch and bevel and recreating proper leading and trailing edges (Figure 25).

A comparison of the before and after photos demonstrates an improved, balanced esthetic presentation that has more symmetry and harmony, accomplished by simply recreating natural esthetic contours (Figure 26).

The specific differences and changes that were made to individual teeth resulted in more refined, softer, feminine nuances that made her teeth look more attractive and balanced. Clinically, we can see the functional improvement as she slides down the cuspid and then easily transfers and glides over, smoothly engaging the lower anteriors. The same effect can be visualized on the other side. Tip to tip contact of the canines occurs quickly in lateral excursion, and there will be smooth engagement and transfer onto the flat, even central incisors into the crossover position (Figure 27).

She demonstrated intense energy in the pre-operative photographs. A balanced, even result with ideal anterior guidance and stable centric stops was achieved. An improved, smoother, level mandibular incisal plane yields a more stable
and balanced protrusive function. By improving and refining her occlusal function to a more stable and physiologic scheme, we could then create more ideal esthetic parameters and recreate a more pleasing and esthetic smile. A stable, long term, predictable result was achieved for this patient (Figure 28). 

Figure 28.

We should truly appreciate and respect our creative and artistic talents and see the potential capabilities in our patients and the changes we can make for them. We must first understand and appreciate that optimum form and excellent esthetics is generated from and maintained by achieving an optimal functional scheme. If we want pretty teeth we have to have proper function. In essence, the overriding tenet is that form follows function. Treatment for our patients should always be appropriate for that individual with special consideration to their needs and wants.

We must always keep in mind our primary intention to be as conservative as possible and consider minimally invasive treatment options. Natural beauty cannot be duplicated. Occlusal equilibration and esthetic recontouring should be a viable tool in our repertoires. It is an opportunity to provide comprehensive care and treatment with very little involvement. Our goal should be to do the least amount of dentistry for maximum longevity. If we look closely, many times in dentistry, less is more.

Bibliography:
1. Washingtonian; Melissa Romero 
3. Dr. Pankey’s book with Dr. Bill Davis 

Author Profile
Dr. Dale Sorenson received his D.D.S. degree from the Indiana University School of Dentistry. He is a member of the Northeast Regional Board of Dental Examiners and served nine years on the Indiana State Board of Dentistry. He is an active member of the American Academy of Fixed Prosthodontics, American Equilibration Society, Fellow in the American College of Dentists, Fellow in the Pierre Fauchard Academy, ADA, IDA, and First District Dental Society. He was recently inducted into the American Academy of Restorative Dentistry. Dr. Sorenson is currently The Pankey Institute’s Director of Essentials Education.

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Notes
Questions

1. Between 2009 and 2010, Americans spent:
   a. 1.8% less on food.
   b. 10% less on entertainment.
   c. 2.3% more on breast augmentation.
   d. 24.4% more on butt lifts.

   a. $4 billion
   b. $8 billion
   c. $10 billion
   d. $12 billion

3. Since 1997, the number of cosmetic procedures completed has increased:
   a. 78%
   b. 123%
   c. 136%
   d. 197%

4. The most sought after Continuing Education topic in dentistry is:
   a. Endodontics
   b. Esthetics
   c. Radiology
   d. Oral Surgery

5. Our connection to sensing beauty is primarily:
   a. Visual
   b. Spiritual
   c. Emotional
   d. Physical

6. We discriminate and differentiate beauty by what ancient Philosophers referred to as:
   a. Golden proportions
   b. Truth conditions
   c. Absolute truth
   d. Law of Nature

7. Our interpretation of beauty:
   a. Occurs from reason
   b. Is intuitive
   c. Is cautious
   d. A measured response

8. The paramount principle in the natural connection between beauty and effectiveness is:
   a. Function follows form
   b. Form follows function
   c. Form and function are independent
   d. Form and function are subservient to nature

9. According to Dr. Pankey’s Principles of Occlusion, which of the following are not goals or objectives for an acceptable physiologic occlusal scheme:
   a. When the jaw closes in Centric Relation, all the back teeth hit simultaneously and with equal intensity.
   b. When power is applied to the system, no tooth moves and the jaw does not deflect.
   c. In any movement away from centric closure, no front tooth hits before, harder or after the back teeth.
   d. The jaw should close in Centric Realation.

10. Centric relation defines:
    a. An orthopedic relationship of the condyle in the fossa
    b. A positional relationship of the teeth in occlusion
    c. A mechanical relationship of the joint
    d. A physiologic relationship of the teeth and muscles

11. Cusp tips should ideally contact opposing teeth on:
    a. Lingual inclines
    b. Flat landing areas
    c. Oblique ridges
    d. Cusp inclines

12. Centrums:
    a. Are any receiving area on the tooth surface
    b. Allow the direction of occlusal forces to be along the long axis of the teeth
    c. Help distribute forces be even and equally distributed
    d. Are undesired and should be removed

13. Anterior guidance:
    a. Defines the “steering” for the occlusal scheme
    b. The most posterior tooth that separates the back teeth
    c. Maximizes the muscle forces that can be delivered to the system
    d. Helps with improving chewing efficiency

14. From a physics perspective, the masticatory system is considered to be a:
    a. Class 1 lever system
    b. Class 2 lever system
    c. Class 3 lever system
    d. A combination of Class 1 and 2 lever systems

15. Creating ideal anterior guidance:
    a. Moves the forces closer to the fulcrum
    b. Makes the system stronger
    c. Strengthens the lever system
    d. Creates a low energy, optimum system

16. Tissue considerations become important:
    a. When considering the correct size of the teeth
    b. When describing the importance of the white esthetics
    c. When creating or recreating natural esthetics
    d. Only after the correct shade and shape of the teeth is determined

17. Observing incisal edges and identifying wear facets gives us good insight into:
    a. Possible parafunctional activity
    b. The patients habit of fingernail biting
    c. The hardness of the patient’s enamel
    d. Whether composite bonding would be a treatment of choice

18. Bitesplint therapy:
    a. Creates an additional revenue stream for the practice
    b. Is a subtractive procedure
    c. Helps verify the centric relation position of the joint
    d. Should only be completed on large cases

19. Evaluating study casts mounted on semi-adjustable articulator with a face-bow transfer and centric relation bite record does not allow for:
    a. Evaluation of first point of contact
    b. Evaluation of functional and para-functional pathways
    c. Evaluation of working and balancing interferences
    d. Evaluation of lip line and facial esthetic proportions

20. Completing a trial equilibration on study casts allows the opportunity to:
    a. Move the teeth into different positions
    b. Create ideal cusp tips on inclines
    c. Modify the anterior guidance scheme
    d. Leave the esthetic plane as it is

21. A level mandibular incisal plane is preferred for:
    a. Better transition to crossover position
    b. Better chewing efficiency
    c. Improved ability to floss
    d. Better photographic potential

22. Esthetic enamoplasty is best accomplished with:
    a. Thin flame-shaped fine diamond
    b. Fine diamond wheel
    c. Flame-shaped carbide burs
    d. Parallel-sided fine diamond

23. Ideal anterior guidance should allow for:
    a. Unbalanced protractive function
    b. Immediate separation of the posterior teeth
    c. Deliberate transition onto the crossover position
    d. Increase of lateral forces on the posterior teeth

24. Natural esthetics and ideal contours:
    a. Must first be considered and achieved prior to any occlusal considerations
    b. Are best realized by first correcting and idealizing a functional scheme
    c. Usually can only be achieved with artificial restorative options
    d. Have no connection with the determinants of occlusion

25. Lack of an acceptable anterior guidance scheme allows for possible posterior interferences resulting in:
    a. Fractured teeth
    b. Muscle health
    c. Immobile teeth
    d. Minimizing muscle forces

26. Esthetic re-contouring:
    a. Cannot correct incisal lengths
    b. Helps create proper embrasures
    c. Can improve tooth position
    d. Does not play a role in the incisal edge plane

27. Occlusal equilibration:
    a. Is an additive procedure
    b. Is a subtractive procedure
    c. Can be both an additive and subtractive procedure
    d. Should only be completed on large cases

28. Minimally invasive dentistry should be considered:
    a. When the patient does not have insurance coverage
    b. When the patient is a younger patient
    c. Only after larger treatment plans have been rejected
    d. When considering comprehensive care

29. Natural beauty:
    a. Is perfect in every way.
    b. Is achieved by blending and balancing imperfections
    c. Cannot be achieved without restorative treatment
    d. Is achieved only by selecting the absolute proper shade

30. A level mandibular incisal plane:
    a. Creates purely an esthetic improvement
    b. Plays a major role in proper phonetics
    c. Allows for better chewing efficiency
    d. Allows for smooth crossover function
Natural Esthetics through Minimally Invasive Dentistry

Educational Objectives

1. Identify the cause and effect relationship of functional and parafunctional wear facets.
2. Incorporate fundamental occlusal concepts in organizing an optimum occlusal scheme.
3. Recreate natural esthetics and balance in a minimally invasive manner.

Course Evaluation

1. Were the individual course objectives met? Objective #1: Yes No Objective #2: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

2. To what extent were the course objectives accomplished overall? 5 4 3 2 1 0
3. Please rate your personal mastery of the course objectives. 5 4 3 2 1 0
4. How would you rate the objectives and educational methods? 5 4 3 2 1 0
5. How do you rate the author’s grasp of the topic? 5 4 3 2 1 0
6. Please rate the instructor’s effectiveness. 5 4 3 2 1 0
7. Was the overall administration of the course effective? 5 4 3 2 1 0
8. Please rate the usefulness and clinical applicability of this course. 5 4 3 2 1 0
9. Please rate the usefulness of the supplemental webography. 5 4 3 2 1 0
10. Do you feel that the references were adequate? Yes No
11. Would you participate in a similar program on a different topic? Yes No
12. If any of the continuing education questions were unclear or ambiguous, please list them.

13. Was there any subject matter you found confusing? Please describe.

14. How long did it take you to complete this course?

15. What additional continuing dental education topics would you like to see?

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Identify the cause and effect relationship of functional and parafunctional wear facets.
2. Incorporate fundamental occlusal concepts in organizing an optimum occlusal scheme.
3. Recreate natural esthetics and balance in a minimally invasive manner.

Please photocopy answer sheet for additional participants.