Aesthetic Zone Challenges: Severe Anterior Wear, Part 3

Restoratively Driven Interdisciplinary Treatment Planning

INTRODUCTION

The delivery of dental care is rapidly changing with the entire treatment team adding their unique skills. Evolving technologies and materials have created new ways to approach each case. Most often it is the general restorative dentist in charge, acting as the quarterback, calling the shots, planning, coordinating, and ultimately being responsible for delivering the final restorative results.

This article will illustrate how the emergence of aesthetic dentistry in the 1970s set the tone and paved the way for today’s dental standard of care. Patient demand has redirected the dental specialties to a doctrine of facially generated treatment planning calling for the patient’s face (aesthetics) to dictate the treatment.

A Brief Historical Review

In the latter part of the 20th century, we witnessed a dental revolution. Advances in materials and procedures provided results that could closely replicate nature. The bar was raised for every dental specialty. It suddenly became cool to be a dentist, especially if the word “cosmetic” was mentioned.

The dental team learned to work together and patients benefited with spectacular results. How did all this happen? What brought on these changes and paved the way to what many believe is the golden age of dentistry?

For the first 70 years of the 20th century, dentists, for the most part, practiced amalgam, blood, chrome (ABC) dentistry and were looked upon by their patients and the public with fear. Early pioneers preaching dental aesthetics in the 1970s were regarded as traitors and charlatans! Some practitioners thought that these quacks should lose their right to practice. However, inventive aesthetically driven treatment planning and subsequent patient demands led to creative new ways of thinking which spread throughout the entire dental profession.

Orthodontics used to be regarded as only for children! However, adult orthodontics has now become common. Orthodontists have learned to use their skills not only to straighten teeth but also to align tissue levels, treat periodontal defects, and to place teeth in exacting position to accommodate a proposed restoration. Periodontal treatment traditionally focused on gum disease. However, elective periodontal plastic surgery, treating the defect and not the disease, is now routinely used to reposition gingival and bone levels to which they aesthetically belong. Dental implants are no longer placed randomly but are precisely positioned to have the same emergence profile, contour, and function as natural teeth.

Clearly it has been the focus on aesthetics that has opened the door to the dental revolution. Knowledge of dental aesthetics requires dentists to have knowledge of occlusion, periodontics, orthodontics, materials, etc. As a result, continuing dental education has flourished. In addition, the focus on aesthetic dentistry has also brought about the development of many new procedures, technologies, and materials. We now talk about facially generated treatment planning, with the actual treatment being coordinated among all specialties. We are no longer practicing in G. V. Black’s and E. H. Angle’s world, because the old conventional rules and standards of the dental profession have been, and are still being, rewritten. Here are some of the milestone dates in the development of modern dentistry:

• 1900 to 1970: ABC dentistry—“Hollywood smile”
• 1955: Buonocore—acid-etch adhesive dentistry
• 1960: Bowen—composite resins
• 1972: Rochette—porcelain bonding
• 1976: American Society for Dental Aesthetics
• 1979: Smigel—ABC television network’s “That’s Incredible”
• 1983: Porcelain veneers, Horn (foil) Calamia (refractory)

Cerastore Crown, no metal/opaque
• 1984: Kokich—Orthodontic intrusion for aesthetics
• 1985: Dicor—First translucent crown;
Willi-Glass—First porcelain veneered crown
• 1986: Guided bone regeneration
• 1986: Miller—periodontal plastic surgery;
Treating tissue levels, not disease
• 1990: In Ceram and Empress
• 1991: Kanca—dentin bonding
• 1990s: “Cosmetic (Aesthetic) Dentistry”

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- 2000s: "Pink Aesthetics"
- 2010s: "Facially Generated Treatment."

For more than the first half of the 20th century, dentists focused on placing amalgams, extracting teeth, and replacing them with bridgetwork or dentures. Charles Finsch spoke of the “Hollywood smile” in the 1920s. However, placing porcelain caps for the purpose of improving aesthetics was not common for the average dental patient.

The development of resins that could be bonded to teeth led to the formation of the American Society of Dental Aesthetics. In 1979, Dr. Irwin Smigel bonded a patient’s anterior teeth on ABC television network’s “That’s Incredible.” New aesthetic materials were subsequently introduced, leading to new ways of performing dentistry and changes to the entire dental profession.

Dental implants, elective periodontal surgery, and patient demands for nicer teeth led to cosmetic dentistry being constantly in the media throughout the 1990s. Adult orthodontics also became in vogue, and it became common to see people of all ages with braces. By the turn of the century, the periodontists were also preaching “pink aesthetics.” Aesthetic dentistry had touched every dental specialty!

The Role of the Restorative Dentist

The aesthetic restorative dentist should act as the quarterback and as the treatment coordinator. Communication is key among the entire restorative team—dentist (quarterback), orthodontist, periodontist, oral surgeon, implantologist, and the dental laboratory team. Advances in aesthetic dentistry have led to advancements in all dental specialties!

In their 1997 article, Dr. Vince Kokich (orthodontist) and Dr. Frank Spear (prosthodontist) described the restorative dentist as the team leader and described the following sequence of treatment and the importance of teamwork:

1. Establish realistic treatment objectives (economics, expectations)
2. Create the vision. Use the desired endpoint as the blueprint
3. Determine the sequence of treatment
4. Build up any malformed teeth to ideal proportions
5. Position the teeth to facilitate the restorative treatment
6. Take radiographs during finishing (verify root angles, proximity; is there enough space for implants?)
7. Interact with the restorative dentist (temporize to visualize)
8. Finish orthodontics and continue with treatment sequence.

The Role of the Orthodontist

Historically, orthodontists were not accustomed to dealing with patients requiring restorative intervention as they were mostly treating younger people. Many adolescents today require little or no restoration. However, in the 21st century, orthodontists are often treating adults who have not benefited from preventive dentistry and have serious restorative and/or periodontal needs. The objectives of orthodontic treatment may be different for the restorative patient compared with one with healthy teeth that just look like “bad teeth” because they are out of position. Often orthodontic treatment alone can produce spectacular results (Figures 1a and 1b).

When treatment planning a case in which the patient has a compromised or mutilated dentition, the final restorative vision might require tooth positioning that may be different than the nonrestored, nonabraded adolescent with a full set of teeth. The restorative quarterback must consider and envision the correction of many factors in the planned final restoration:

- Worn or abraded teeth, lower arch discrepancies
- Mishapen and/or malformed teeth, peg laterals, narrow incisors
- Fractured teeth
- Missing teeth, edentulous spaces
- Uneven gingival margins
- Missing papilla
- Periodontal bone loss.

Working together, the restorative quarterback and orthodontist coordinate treatment to a final shared vision:

1. The teeth may have to be positioned by the orthodontist to facilitate the ideal placement of the proposed restoration.
2. The teeth may have to be restored or placed in temporary restorations before, during, or after orthodontics.
3. Orthodontic treatment may be required to correct tooth position that compromises the patient’s ability to maintain adequate oral hygiene.
4. Orthodontic treatment may be performed for elective or required periodontal needs.

The objective of modern orthodontics is to establish a stable and functional occlusion, to enhance the health of the periodontium, and to improve dental facial aesthetics. These goals differ from those before the aesthetic dental revolution.

The Role of the Periodontist

Historically, patients were referred to a periodontist for “salvation” and to treat disease. Periodontal patients were often left “long in the tooth” by radical osseous bone recontouring and apical gingival repositioning. Large gingival embrasures were left and incorporated into restorations to allow the patient to be able to have better access to cleaning. Aggressive periodontal treatment was regarded...
as the last chance before tooth loss and full or partial dentures.

In the mid 1980s, P. D. Miller spoke and published revolutionary concepts on periodontal plastic surgery focusing on treating periodontal aesthetics and not disease. Root coverage and ridge augmentation techniques evolved to place the gingival tissues where they belonged, initiating a movement to “pink aesthetics.” Beautiful porcelain restorations were no longer enough. The tissue became the issue.

Regenerative and reconstructive periodontal surgery is now the norm, and the elective coronally repositioning of gingiva and bone for aesthetic reasons is routine. These procedures would have been considered malpractice just a few years ago.

Thinking outside their specialties and combining knowledge, expertise, and techniques, dramatic changes and results became possible. Orthodontists also realized that they could provide benefits for the periodontal patient.

1. Aligning crowded or malposed anterior teeth
2. Vertical orthodontics to improve osseous defects
3. Improving the aesthetics of the gingival margins
4. Forced eruption of fractured teeth
5. Regenerating lost papilla
6. Improved implant placement position.

**CASE REPORT**

**Diagnosis and Treatment Planning**

Our patient presented in a desperate state (Figures 2a and 2b). Throughout the years, she had been noticing that her front teeth were getting progressively shorter. Although she was only age 34 years, the aesthetics of her anterior dentition made her feel much older. Her teeth were also getting extremely sensitive, since the loss of the incisal 50% had caused wear deep into dentin; the wear was approaching the pulp chamber and nerves. In addition, the progressive wear of the incisal portion resulted in
the subsequent supereruption of the teeth; what was once the middle of the tooth, was now the incisal edge! The gingival margins and underlying alveolar bone of the teeth had also moved incisally, creating a “gummy smile” and tissue levels that were not in aesthetic harmony.

Various treatment plans had been presented involving elective endodontics and osseous surgery. However, these solutions would require removing so much bone that her crown-to-root ratio would be extremely poor and would leave devitalized, fragile teeth. After evaluating several high-powered sales pitches and doing a bit of dental research herself, she felt that this approach would only lead to major problems in the future, and even the eventual loss of her teeth. She decided to search for a more natural and less destructive alternative.

The key to establishing a treatment plan is to be able to visualize the ideal endpoint of treatment and then compare it with the patient’s current dental situation. Usually I compare the patient’s study model with the typodont model that we were given in dental school. This model serves as my reference for the way teeth are supposed to appear. Sometimes we tend to overlook the ideal vision of a healthy natural dentition and make compromises. Using a typodont model for comparison keeps me honest.

If the study models of the patient’s dentition do not resemble the typodont model, the aesthetic restorative dentist must assess what steps are needed to restore the teeth to “ideal,” and in what order treatment should be performed. Using the philosophy that the face dictates the treatment, we always plan our cases by evaluating aesthetics first. This philosophy has been described as facially generated treatment planning. The quarterback (restorative dentist) then uses his players (specialists and lab team) to help the patient achieve his or her goals in a planned and efficient manner. It is imperative to understand that, although the final aesthetic outcome is the priority, all the necessary steps have to been taken to achieve health and harmony before the final restoration is undertaken.

Consistently maintaining the philosophy that “people want to look like other people,” we try not to outthink or outdo mother nature. We aim to return every dentition to the ideal state. We plan to recreate the shape, form, angles, contour, color, and emergence profile of the teeth. We create pathways of incisal guidance that are nondestructive, adhering to the basic principles of a cuspid guided occlusion.

A diagnostic wax-up was fabricated for the teeth we deemed necessary to restore (Figure 3). Using the patient’s physical height, the size of the adjacent healthy teeth, and Bolton’s principles as a guide, we chose central incisors 10.5 mm long as our initial reference. The length of the patient’s worn centrals measured barely 5 mm. We were more than doubling their length! The diagnostic wax-up allows us to be able to actually visualize the teeth in their restored state, aiding us in assessing the steps that are required to return the patient’s teeth to the way we want them. We also use the diagnostic wax-up to create a putty matrix for bis-acryl tem- porization and to create transparent preparation guides.

Being able to visualize the ideal tooth position from our wax-up, and knowing that one of our treatment goals was to avoid endodontic treatment, we concluded that forced orthodontic intrusion was best suited to initially reposition the teeth apically. This would create an anterior open bite, thus allowing adequate space for our restoration to recreate the incisal portion without requiring endodontics. Intruding the teeth would also move the gingiva and underlying alveolar bone apically.

Orthodontic Intrusion

A valuable recipe from our dental cookbook is the use of orthodontic intrusion of teeth as a tool to modify gingival and bone levels to recreate aesthetic harmony. Forced orthodontic intrusion is a technique for soft- and hard-tissue augmentation based on osteophysiologic and orthodontic principles. Orthodontic intrusion is able to alter the position of the gingiva and the underlying crestal bone. The ability to change the gingival position via the intrusion of teeth gives the clinician the tooth, bringing the crestal bone along with it into a new position. The gingiva follows the vertical movement of the tooth and bone. The presence of the tooth allows us to modify the position of the bone and gumline.

Orthodontic brackets were placed, and low intensity extrusion forces of 15 g were placed on the targeted teeth to move their margins and the surrounding gingival tissue apically. Once the maxillary and mandibular teeth were intruded to the point where we believed we had adequate room to restore the incisal edges, we chose to stop intruding further so we did wish to cause apical root resorption. Why push our luck when, at this point, we could perform a simple and conservative osseous crown lengthening procedure that would give us predictable instant results? The intrusion produced 5.0 mm of space, allowing us to add 3 mm of incisal length to the maxillary incisors and 2 mm to the lowers (Figures 4a to 4c).

Periodontal Plastic Surgery

To electively reposition the anterior gingiva, several essential criteria must be respected. By first verifying the patient’s radiographs, we must assess if we have adequate root length and if the root anatomy is conducive to removing some of the supporting alveolar bone. We do not want to compromise the tooth and the patient.

When the alveolar bone is reduced by elective periodontal osseous crown lengthening, we must be left with a clinical situation where the connective tissue and the epithelial attachment each occupies one mm or slightly more. This combined periodontal attachment of approximately 2 mm is referred to as the biologic width. There should always be a free gingival margin remaining of at least 3 mm of keratinized tissue and an interproximal papilla height 4.5 mm above the level of alveolar bone.

The lower orthodontic brackets were first removed (Figure 5) and, using the clear plastic stent fabricated from the parameters of our wax-up, a flap was raised (Figure 6). The teeth were then prepared using the clear plastic guide to place them in ideal position to accommodate the proposed restoration (Figure 7). The exact placement of the margin clearly indicates exactly where the biologic width correction should be. The alveolar bone was adjusted to create a biologic width of 2.0 mm.

The attached gingiva was then sutured into a position designed to preserve the interdental papilla. Less than 5 mm existed from the adjusted bone height to the desired papilla height, assuring that no papilla
would be lost, resulting in what has been referred to as “black triangles.”

A one-piece, 4-unit Luxatemp (DMG America) provisional was fabricated using the putty template created from the diagnostic wax-up. The provisional allows us to confirm that the gingival position of the new preparations are at the desired level. The provisional was then fixed with Temp-Bond Clear (Kerr) (Figure 8).

After the lower teeth were determined to be in aesthetic harmony, the upper anterior teeth were addressed. When an architect designs a building, the foundation must be in place before the upper levels are constructed; dentistry is no different. Using the clear plastic preparation guide fabricated from the wax-up (Figure 9), the maxillary gingival and biological width were adjusted accordingly, sutured to place, and the bis-acryl (Luxatemp) provisional was placed using a clear temporary resin cement (TempBond Clear) (Figures 10a and 10b).

Two weeks later, when the remainder of the sutures were removed (Figure 11), the patient expressed how delighted she was with her course of treatment thus far. She had experienced very little discomfort, and she really appreciated that her crown preparations and osseous repositioning were done at the same appointment. This not only eliminated multiple procedures but gave her immediate aesthetic satisfaction. She was so content with the provisional that she had no issue leaving it in her mouth for 6 months to allow adequate time for the surrounding gingiva to adapt and mature and for the orthodontically intruded teeth to stabilize in the alveolar bone.

**Completing the Restorative Procedures**

Six months later, when the provisional restorations were removed, we observed that healthy, fibrous attached tissue encircled the teeth. The preparations were refined, and a final impression taken with vinyl polysiloxane putty and light-body materials (Honigum [DMG America]). An accurate lower impression was taken using an alginate substitute (Status Blue [DMG America]), and an extremely accurate bite registered with a rigid bis-acryl bite material (Luxa bite [DMG America]). New bis-acryl (Luxatemp) provisional were fabricated, refined/reshaped until the patient was satisfied. After cementation (TempBond Clear) of the new and revised provisional impressions, impressions of the provisional were then taken with the alginate substitute material. A VITA shade (Vident) was taken using a color-corrected light (Optident Trueshade [Ilykel]). A digital photograph was taken of the chosen shade with the natural teeth as a reference (Figure 12). The ceramist was then instructed to follow the shape and form of the provisional, as they satisfied all the desired criteria.

Lithium disilicate (IPS e.max [Ivo-clar Vivadent]) crowns were prescribed as we felt that this material possesses both the strength and beauty required in this case. An LT BL2 ingot was pressed and then cut back to accept incisal and cervical characterization. A wash firing sealed the colors. A further small cutback and EO2 layering porcelain (IPS e.max Ceram [Ivoclar Vivadent]) was used to build up the body, giving an opal effect to subdue the internal staining. Then the crowns were fired again for the final finish and glaze.

When the lithium disilicate crowns were delivered from the lab team, they were inspected and assessed to be certain that they satisfied the parameters of our lab photos and provisional model (Figures 13a to 13d).

**Figure 14.** Aesthetic dentistry can give teeth a second chance, yielding spectacular results.

The patient was then called for appointment. The patient was anesthetized, the teeth cleaned with a slurry of plain flour, water, and the crowns placed for inspection. The crowns mirrored the provisional and exceeded the patient’s expectations. A resin-modified glass ionomer cement (Fuji Plus [GC America]) was placed into the restorations and then seated. Next, the excess cement was removed, and then a radiograph taken to ascertain that no excess cement remained.

The results of this case speak for themselves (Figures 14 to 15b). Our patient was absolutely delighted and could not differentiate the all-ceramic crowns from her natural teeth. She felt reborn! All the time, effort, discomfort, and expense was more than worth it to her. She would do it again in a heartbeat and would unhesitatingly encourage others to follow the same or a similar treatment path. By allowing the final restorative vision to dictate our course of treatment, and using technology and the skill of our specialist and lab teams, our patient came out as the winner. It is most important to know our limitations and not to push our luck. Predictability in dentistry is everything!

**Closing Comments**

Combining detailed treatment planning together with excellent collaboration and communication among the patient, dental team, and laboratory ceramist is key to the success of our cases. It is this team effort that allows us to solve and successfully execute most of the difficult aesthetic challenges that come our way.

**References**


Dr. Mechanic received his bachelor of science (1975) and doctor of dental surgery (1979) degrees from McGill University. Dr. Mechanic maintains membership in numerous professional organizations, including the American Academy of Cosmetic Dentistry, the Academy for Dental Facial Esthetics, the American Society for Dental Aesthetics, and the European Society of Cosmetic Dentistry. He practices aesthetic dentistry in Montreal, Canada. He also is the cofounder of the Canadian Academy for Esthetic Dentistry, program coordinator of the University of Toronto Advanced Restorative Continuum, and is recognized as a Leader in Continuing Education by Dentistry Today. He is the aesthetic editor of Canada’s Oral Health dental journal and is on the advisory board of Dentistry Today. His work has been profiled in magazines, television, and radio. He can be reached at info@dmechanic.com.

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