

BEHIND THE SMILE

Perseverance and Compassion

I met Aneth through her husband, my long-time patient Mark McCarthy. He had met Aneth during one of his trips to Tanzania, Africa. When they first met, Mark had noticed brown spots on Aneth's teeth and later asked if I could help her. I told Mark I would need to see Aneth to evaluate her case.

Initially, when Aneth arrived in the U.S., we experienced communication difficulties, but I soon realized that charm, kindness, warmth, and sincerity are expressed the same way in any language. Having experienced similar hurdles as an immigrant from Iran, I empathized and wanted to help restore Aneth's smile.

After a full examination and evaluation, it was determined that Aneth had enamel hypoplasia throughout all her dentition, likely due to a combination of the environment, genetics, and inadequate nutrition. It was further noted that her teeth were very small with excessive gingival display.

Aneth had a big smile despite her defective teeth but, after her new restorations, she seemed to smile unconsciously and I could only imagine how happy and grateful she was.

Aneth recently returned to Tanzania for the first time since arriving in the U.S. Her entire village had gathered to welcome her back. The villagers had seen a picture of Aneth with her new teeth and were anxious to know if they could have the same smile. Imagine being able to give a beautiful new smile—and renewed hope—to people who need it, whether in Africa, America, or anywhere else. How rewarding that would be!

For information on the clinical aspects of this case, please turn to page 28.



Restorative dentistry and clinical images by Sam S. Sadati, DDS, FAACD (Wellington, FL). Periodontal hard and soft recontouring by Stuart Feldman, DDS (West Palm Beach, FL). Ceramic artistry by master ceramist Ms. Hakjoo Savercool (Frontier Dental Laboratory, El Dorado Hills, CA). Cover photography by Gary D. James (Gary James Photography, Miami, FL). Cover photos shot with a Canon EOS-IDs Mark 11.



Preoperative

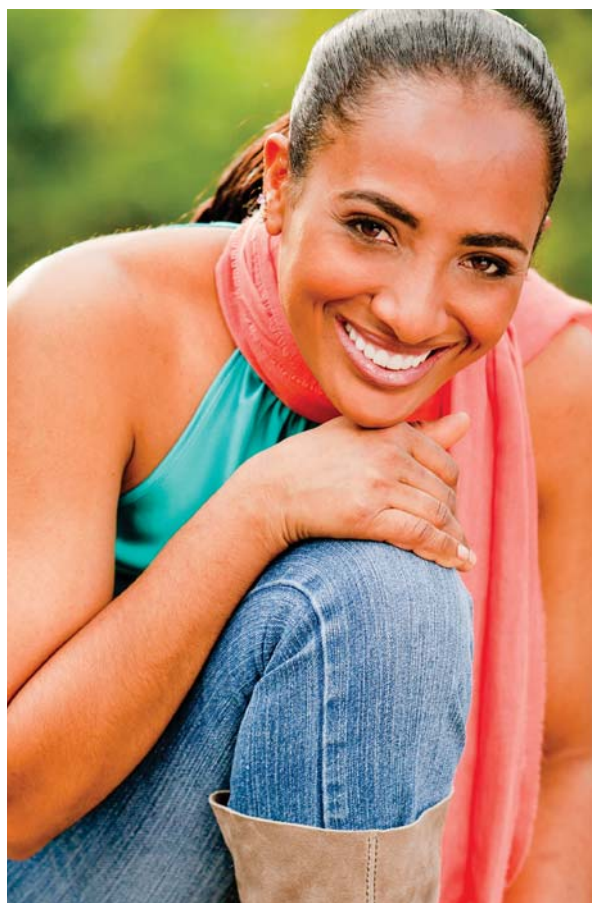


Postoperative

From Africa to America

Correcting Enamel Hypoplasia and Breaking Cultural Barriers

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Abstract

Amelogenesis imperfecta, a hereditary disorder causing developmental alterations of enamel, is considered a major cause of enamel hypoplasia. Although affecting only the enamel, enamel hypoplasia can lead to staining, discoloration, and secondary decay, as well as psychological issues, including lack of self-confidence, for patients. Although treatment is challenging, teeth can be restored to proper function and esthetics through focused evaluation, diagnosis, and a comprehensive multidisciplinary treatment plan. This article discusses the successful restoration of a patient's hypoplastic enamel and gingival display through the use of full- and partial-coverage lithium disilicate and leucite-reinforced all-ceramic restorations.

Aneth's husband, Mark, says:

When I met her, Aneth lived in the village of Esso in Arusha, Tanzania. Her home was a mud shack with a corrugated tin roof and dirt floor. There was one electric light bulb. There was no running water. She had never slept in a real bed, had three meals a day, a medical or dental checkup, or even taken a hot bath or shower. All the things we take for granted, she never had.

Aneth's teeth had suffered from the lack of care and nutrition. Her diet consisted mainly of soft foods. I asked her why and she explained that her teeth were too weak for her to eat many solid foods.

Upon returning with Aneth to the U.S., we visited Dr. Sadati's office for an evaluation and learned she was in need of many dental treatments. The first to be done was a root canal. Later that day when Dr. Sadati called to see how she was feeling, she told him that it was the first time in five years she was able to chew food on the right side of her mouth. Imagine going five years with a toothache because you had no means of paying for treatment. We are very grateful to Dr. Sadati for his help.



Photo credit: Randy Hribko (Studio Palm Beach, Palm Beach, FL);

CLINICAL COVER STORY



Figure 1: Preoperative full-face image.

Introduction

Dentition are considered specialized structural components of the craniofacial skeleton and can be susceptible to genetic defects.¹ Whether alone or in combination with the oral environment or nutrition, genetic defects can detrimentally affect the development, function, and esthetics of oral structures.¹

Amelogenesis imperfecta is a hereditary disorder causing developmental alterations or defects in the enamel structure.

Amelogenesis imperfecta is a hereditary disorder causing developmental alterations or defects in the enamel structure. It affects primary and permanent dentition.^{2,3} One of the most prevalent of these disorders, enamel hypoplasia, is characterized by brown spotting or overall browning of tooth surfaces.² Unlike conditions affecting the entire tooth structure, enamel hypoplasia is contained within enamel.²

Enamel Hypoplasia

Patients with this disorder often have normal roots, normal pulp chambers, and the root canals are typically present.² Although damage is limited to the enamel, it is significantly affected, developing as amorphous and granular, instead of smooth.² It is rare with this condition for enamel prisms to follow the usual course, and teeth often dem-

onstrate pseudo-isotropic regions and lamellae.² The enamel also tends to be softer, demonstrating a dentin-like density.³

The primary clinical problems of amelogenesis imperfecta include sensitivity issues, loss of occlusal vertical dimension, and dysfunction, in addition to the patient's esthetic concerns.³ Patients with enamel hypoplasia also demonstrate increased susceptibility to

secondary decay, a direct result of malformed enamel.³

Restoring the dentition solves functional problems associated with this developmental defect and has a positive impact on the patient's psychological status, which is significantly important.³ To develop the best treatment plan, dentists and technicians must consider the patient's age, socio-economic status, type and severity of the disorder, and intraoral condition.³ A multidisciplinary approach that includes evaluation; diagnosis; and a combination of periodontal, prosthodontic, and restorative treatment often is required.³

Case Study

The patient, a 23-year-old woman born in Tanzania, South Africa, had recently arrived in the U.S. to begin her new life. Although her English was limited, her husband knew some Swahili and served as the main interpreter throughout the case. The patient was concerned with the brown spots on her teeth and desired to improve her smile (**Fig 1**).

Since everything she was seeing and experiencing was new, unfamiliar, and strange, the dental team ensured that her office visit was very comfortable and welcoming. During the consultation, where patient and doctor typically sit alone to discuss concerns and goals, two female team members also were present. After the initial conversation, the patient was informed that more data were needed before beginning the smile makeover process.

Diagnostic Information

During the first appointment, diagnostic information, including full-mouth, panoramic, and temporomandibular joint radiographs to evaluate the joints for disorders and disease, was gathered, and gingival tissues were checked.⁴ To increase predictability, study models of the maxillary and mandibular arches were created from the impressions ob-



Figure 2: Preoperative retracted front view showing enamel defects on the dentition.



Figure 3: Preoperative maxillary occlusal view showing the extent of the defects on most surfaces of the teeth.



Figure 4: Image of the mandibular occlusal demonstrating the unusual shape and size of the canines.

tained and helped determine the anatomic alterations required during treatment.^{5,6}

A facebow transfer (Protar 5, KaVo Dental; Charlotte, NC) recorded and transferred the spatial relationship of the maxillary arch to the selected anterior reference point and the articulator.^{7,8} A centric relation (CR) record then was taken to determine the relationship of the maxilla to the mandible, with the mandible in CR.⁹ Full intraoral and extraoral digital photographs (Canon 10D, Canon USA; Lake Success, NY) were taken to communicate proper shading and characteristics to the technician for use when fabricating the definitive restorations.¹⁰ Periodontal charting enabled recording of furcation involvement, mobility, pocket depths, bleeding sites, and other gingival abnormalities.¹¹

Following an oral cancer screening, a comprehensive esthetic evaluation of the patient's gingival and dental condition was performed.¹² The patient had light to moderate (mostly supragingival) calculus, with isolated areas of inflammation. She was in good overall health, but complained of pain in the area of tooth #3. To resolve the pain radiating from #3 and provide a temporary restoration until a definitive treatment plan was developed, endodontic therapy and a buildup were completed during the initial appointment.

The patient was scheduled to return the following week to allow sufficient time for development of a proper treatment plan.

The primary clinical problems of amelogenesis imperfecta include sensitivity issues, loss of occlusal vertical dimension, and dysfunction.

Diagnosis

After review of the radiographs and an in-depth visual examination, the patient was diagnosed with hypoplasia throughout her dentition. The causes, although not definitively known, were most likely environment, genetics, nutrition, or any combination of these (Figs 2-4). Aside from being unesthetic, the spotted enamel decalcification made the teeth prone to staining and secondary decay.

A portion of the dentin in #3 had been lost due to lack of treatment, which ultimately led to irreversible pulpitis and chronic pain over the previous five years. The patient's teeth were very small, in part because of an excessive gingival display. The anatomy, size, and morphology of the lower canines, crowns, and roots deviated from normal anatomical form. Teeth #1, 5, 12, 17, and 32 were congenitally missing.

Treatment Plan

The patient's face was studied carefully during planning to ensure that her final smile design would match her radiant and positive personality. It was decided that the patient would need a wider, brighter, yet still feminine smile.

After studying the mounted casts, radiographs, periodontal chart, and digital photographs, it was obvious that the patient required soft and hard tissue lengthening in order for her teeth to demon-

CLINICAL COVER STORY



Figure 5: Excessive gingival display.



Figure 6: The right lateral smile view showing the patient's shortened dentition.



Figure 7: Preoperative left lateral smile view displaying stained teeth that were detrimental to the smile.

strate the correct size, fit the frame of her lips to complement her smile, and be harmonious with her facial anatomy (Figs 5-7).¹³

Discussions about whether the proposed treatment was periodontally responsible were held with Dr. Stuart Feldman, chairman of the Department of Periodontics at the Atlantic Coast Dental Research Clinic. After examining the patient, Dr. Feldman determined she was a good candidate for the procedure and offered to donate his services. Surgical guides were requested to demonstrate how much tissue should be removed.

Additionally, full- and partial-coverage leucite-glass ceramic restorations were planned for the anterior teeth and full-coverage lithium disilicate restorations for the posterior dentition. Due to the condition of the patient's enamel and the fact that all her teeth were prone to severe decay, any treatment other than full-coverage restorations for most of the teeth would have been irresponsible esthetic treatment.

Prior to the patient's next appointment, a computer-generated image of the proposed smile makeover was created to demonstrate how her smile would appear after treatment. This step was crucial, as the patient was from a different part of the world, and what looks good to the dentist may not always look good to the patient, especially if they have different perceptions of what is esthetically pleasing. The digital image also helped to overcome verbal communication barriers.

During the treatment plan presentation, the findings and ideal treatment, and advantages and disadvantages, were discussed with the patient and her husband. Both were very excited and grateful. The patient was shown the computer-generated image of the final restorations, at which point she became extremely emotional and began to cry. This was enough confirmation that the restorations would satisfy her desires and that she was ready to undergo treatment.

Treatment

Composite Mock-up

The patient underwent a complete oral hygiene regimen to stabilize her gingival health, with home care instructions provided. Although it was obvious that her teeth needed to be longer, further examination was required to determine whether length would be added toward the gingival margin only; or, as in reversed smile cases, to the incisal edge, or both.¹⁴ For this determination, a quick and temporary composite mock-up was done on her six anterior teeth. After considering lip position and testing all phonetic sounds, the patient was asked to speak. While she counted numbers, she was observed and photographs (frontal, lateral) were taken at different magnifications (1:1, 1:2), which helped the technician determine the required tooth length and create the wax-up to visualize the patient's lip and incisal edge position.

Prior to removing the composite mock-up, alginate impressions of the maxillary arch were taken, making it possible to determine and mark with a red pencil on the preoperative casts how far api-



Figure 8: Four months postoperative, the patient exhibited longer and more proportional teeth, in comparison to the original amount of gingival display.

dental office to determine if any areas needed further reduction or modification. The surgical guides were placed intraorally by the restorative dentist, and the gingival margins were compared to the surgical guide margins, which observation found to have been followed precisely. The zenith and curvature of the arch of the gingival margin on each individual tooth, the symmetry of the gingival height between the right and left sides, and the overall appearance were evaluated and determined to be precise and exactly as originally planned.

Laboratory Communication

A full series of digital photographs, study casts, and a facebow transfer were completed again to properly communicate the case to the laboratory.⁸ These new records, cast of the composite

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cally the gingival margins needed to be on each individual tooth. The zenith on each tooth was marked facially and buccally on the casts.

All marks were connected according to the ideal gingival margin pattern. Using a sharp #3(1/2) Hollenback carver (GC America; Alsip, IL), the red lines were followed and indented while trays were created with a vacuumed thermoforming machine using 1.0-mm thick plastic sheets. By trimming the edges of the trays at the indented lines, the surgical guides required by the periodontist for the maxillary and mandibular arches were formed.¹³

Gingival and Osseous Tissue Surgery

The patient then underwent the full-mouth osseous and gingival crown-lengthening procedures with Dr. Feldman. The surgical guides facilitated determination of the desired final position of the gingival margin once the healing period was completed. The

procedure did not extend to the lingual side of any teeth. The guides were periodically placed on the patient's surgical site during the surgical procedure to evaluate the correct amount of reduction and, as importantly, the correct gingival margin shape.

It is imperative that patients who undergo this type of surgical procedure allow ample time for complete healing and stabilization of the gingival margins prior to any restorative procedure. Otherwise, irritation from the restorations could cause hypertrophy, inflammation, poor gingival health, and restoration failure. It was initially believed that the patient could wait three months to begin the restorative phase. However, four months were allowed for proper healing before beginning the restorative phase (Figs 8 & 9). The patient was seen by Dr. Feldman on a routine basis during this time.

Six weeks after crown lengthening, the patient returned to the restorative

mock-up, photographs of the desired mold and anatomy of the six maxillary anterior restorations, and detailed prescription were sent to the technician, along with a request for further discussions between the technician and clinician. Following a telephone discussion, the wax-up was completed and returned to the clinician's office within 10 days.^{15,16}

Preparation

Since the patient's appointment required between three and five hours, no other appointments were scheduled that day to limit interruptions. The patient was administered Carbocaine 3% (Cook-Waite, Novocal Pharmacy; Ontario, Canada) and Marcaine 0.3% (Cook-Waite) to fully anesthetize her left side and her right side slightly. All left teeth were prepared to match the guides provided by the laboratory, taking into consideration the amount of

tions when sleeping.¹³ For the most part, breakages occur while eating. Many times restoration failure also is directly related to parafunction.¹³ This issue could be solved by simply questioning the cause, studying why it occurs, and quantifying it. Once this problem is assessed systematically and understood, a solution can be developed.

However, presentation of the patient's condition and possible treatment options also must be approached systematically and appropriately.¹⁴ Once patients are advised of the problems, focus should shift to what is clinically relevant to enhance understanding and comprehension.¹⁴

For example, consider that teeth should not wear more than 11 μ per year, which means it would take 100 years to lose 1 mm of tooth structure. A patient who has lost 4 mm of tooth structure needs to be told that the amount of wear they present is equivalent to 400 years of use. Based on this explanation, any occlusal restoration or treatment can be viewed as an anti-aging strategy and more likely to be accepted by the patient, since the problem can be more clearly understood.¹⁴

Unfortunately, many times a lack of clear and objective data allows one dentist to determine a treatment that another dentist may deem inappropriate.^{14,15} The result of this emotionally-driven decision making creates much of the stress experienced in the dental practice and that Six Sigma dentistry and systematic approaches aims to eliminate.^{14,15} As a result, things may happen in the practice and treatment process that should not. When risks are known and ignored due to emotions, the final outcome often is compromised.¹⁵

By utilizing a better technologically-based metric, much of the dentist's clinical decision making can be removed from an emotionally-driven state. With better metrics and a systemic approach to risk assessment and evaluation, patients can be offered significantly improved treatments.^{14,15}

Conclusion

The paradigm of systematically approaching patient examinations, risk assessment, diagnosis, and treatment planning emphasizes the need to prevent oral health problems from progressing in the future.¹⁶ Because the burden of responsibility rests with the dentist, problems should not be corrected with solutions that will not be permanent.²

All health records will eventually be in digital format, and there may come a day when public kiosks can provide individuals with diagnostic data indicating whether a physician visit is necessary.

Although it is generally accepted that most choices are never perfect, they should be, at the least, well calculated.² In dentistry, calculating risk and predicting the outcome many times may involve the lesser of two evils. The critical objective is to utilize systems that eliminate subjectivity so patients receive the best in care at the lowest functional, periodontal, biomechanical, dentofacial, medical, and financial cost while simultaneously increasing reward.² After all, part of what patients pay for is guidance from their dentists toward the best treatment options for their case, whether for longevity or esthetics.^{2,14}

Risk assessment is beneficial not only for patients, but also for dentists.¹⁷ The struggle, however, is not in understanding the risk. The problem most dentists face is in implementing risk-reducing protocols. Although implementing science into practice remains a challenge, using evidence enables dentists to better predict and control the outcome.²

Part 2 of this article will elaborate on the process of risk assessment and the categories to be addressed therein.

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