Management of severe tooth wear with a predominantly additive, adhesive approach

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Advanced tooth wear is a multifactorial condition that may arise from mechanical processes (attrition and abrasion), chemical processes (erosion), or — most commonly — a combination of both. Before planning definitive care, it is essential to identify the dominant etiologies, assess their current activity, and determine whether they can be controlled. A careful medical and dental history is the starting point, but ancillary information often clarifies chronology and severity. Historical photographs (family snapshots, portraits, and casual headshots) can reveal progressive changes in incisal length, buccal corridor width, smile arc, and anterior guidance over time. These observations complement clinical indices for tooth wear and support risk assessment.

The case presented here illustrates a conservative, largely additive strategy in a patient with severe tooth surface loss and limited remaining structure — particularly on the palatal surfaces of the maxillary anterior teeth. The report emphasizes the diagnostic process, objective treatment goals, material selection, laboratory communication, and procedural steps, while also acknowledging limitations and alternative approaches.

PATIENT HISTORY AND INITIAL PRESENTATION

The patient reported adolescent orthodontic treatment that included extraction of four premolars with space closure. She recalled that her arches were narrowed to resolve crowding. Historical photographs were consistent with this memory and showed progressive inward tipping of the buccal segments and maxillary anterior teeth, with relatively constricted buccal corridors.

She reported no notable dental symptoms until her 30s, when she developed reflux symptoms that she associated with pregnancy. Medical management for gastroesophageal reflux disease (GERD) was initiated intermittently. During her 30s and 40s she and her dentist noted gradual "wear" of the dentition. A nocturnal occlusal splint was prescribed, but she could not tolerate it and was not compliant. In her early 50s she reported poorer sleep quality, intermittent temporomandibular symptoms, and a more rapid change in the appearance of her teeth. A physician addressed GERD medically. A new dentist recommended orthodontic expansion and uprighting to optimize arch form, tongue space, and occlusal and airway function. Following orthodontic treatment, the patient sought restorative solutions. Multiple consultations recommended near full-mouth rehabilitation with full-coverage crowns. Concerned about the limited remaining tooth structure, she pursued alternatives that would preserve tissues while addressing esthetics, sensitivity, and function.

EXAMINATION AND DIAGNOSTIC SUMMARY

Comprehensive examination revealed severe loss of tooth structure. The maxillary anterior teeth exhibited extensive palatal erosion; the remaining facial enamel resembled thin shells. Mandibular teeth showed occlusal erosive defects and cervical involvement on posterior facial surfaces. Periodontal evaluation showed health compatible with restorative treatment. Pulp testing was within normal limits.

Dental–facial analysis indicated that the vertical and horizontal positions of the anterior teeth relative to the lips were already near the limit of "fullness." In practical terms, any additional restorative thickness on the facial surfaces would need to be minimal (approximately 0.3–0.5 mm) to avoid excessive display beyond the wet–dry line or a bulky appearance at rest and in smile *(Figs. 1-12)*.

The pattern of wear suggested a strong erosive component (palatal maxillary surfaces, occlusal mandibular surfaces and buccal mandibular surfaces.

RISK ASSESSMENT AND CONTROL

Because adhesive, additive strategies have the greatest success when etiologies are controlled, the patient's medical provider was engaged to ensure continued GERD management. Dietary counseling addressed acidic exposures and intraoral pH challenges. The patient understood that successful restoration

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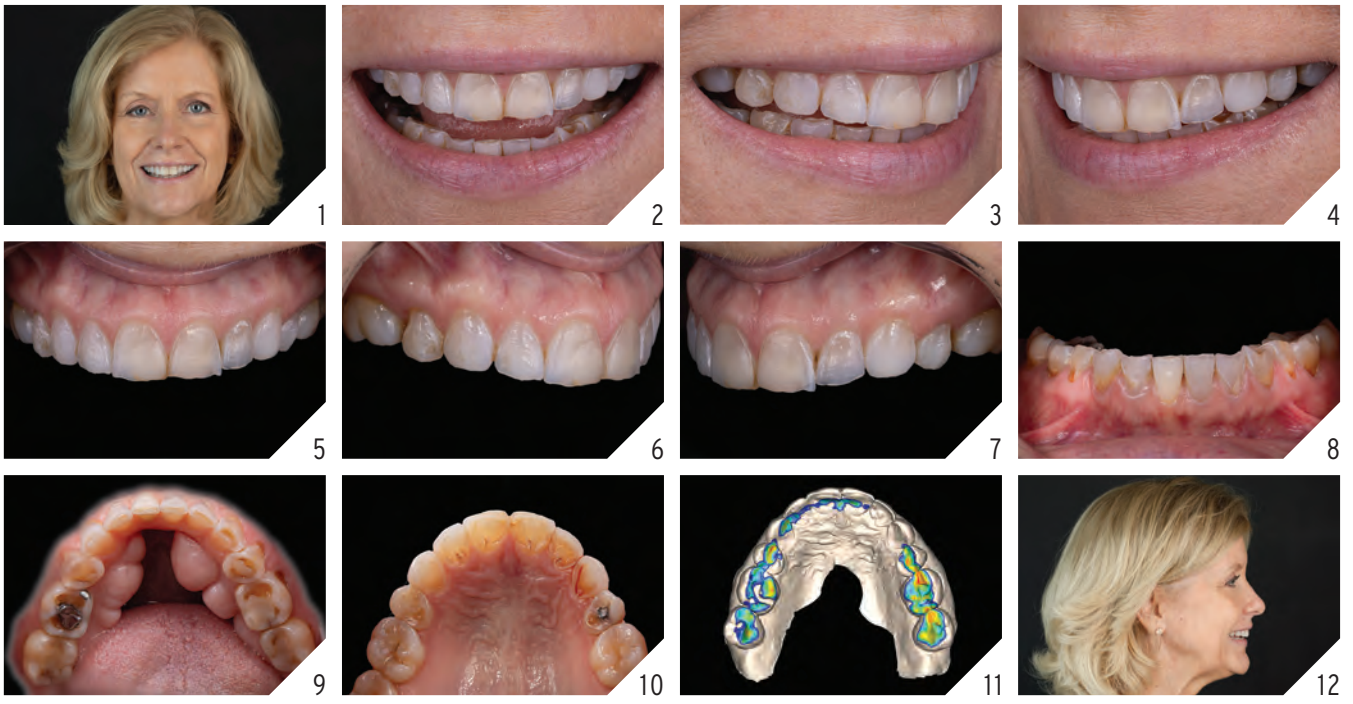

1. Dento-facial analysis revealed that the existing vertical and horizontal tooth positions were already within aesthetic fullness and harmony, serving as the reference for an additive approach. **2–7.** The maxillary dentition demonstrated generalized erosive wear affecting all surfaces. Previous composite restorations were present on the facial surfaces to compensate for enamel loss. **8–9.** The mandibular arch exhibited a distinct erosive pattern, with the most significant structural loss observed on the occlusal surfaces. **10–11.** The maxillary lingual surfaces, particularly in the anterior region, displayed the most severe erosion and represented the greatest area of structural compromise. **12.** Sagittal analysis confirmed that the facial position of the anterior teeth was already ideal, indicating that additive veneers would require <0.5 mm thickness to prevent excessive volume.

required ongoing control of contributing risk factors and that maintenance would be essential.

TREATMENT OBJECTIVES

1. Restore structure and protect exposed dentin to reduce sensitivity and improve function.

2. Conserve remaining tissues by favoring bonded, additive procedures whenever feasible.

3. Maintain dental–facial harmony by respecting existing anterior tooth position and fullness.

4. Re-establish a stable occlusal scheme with appropriate posterior disclusion.

5. Provide a phased approach that allowed functional testing and patient adaptation prior to finalization.

TREATMENT PLAN OVERVIEW

Planned treatment included maxillary teeth #5–12 and mandibular teeth #19–30. The strategy combined:

Maxillary anteriors: additive palatal shells created with a direct composite injection-mold technique to re-establish lingual contours and encapsulate exposed dentin.

Maxillary facial surfaces and mandibular anteriors: minimal- or no-preparation porcelain veneers to refine esthetics with minimal added thickness.

Mandibular posteriors: thin porcelain veneer-onlays where indicated to manage occlusal erosive lesions and preserve cuspal integrity.

This approach prioritized conservation of tooth structure, recognizing that traditional full-coverage crowns remain an appropriate option but would require more aggressive tooth preparation to achieve that goal while allowing proper path of insertion of restoration.

RECORDS, REFERENCE POSITION, AND DIGITAL DESIGN

A Kois deprogrammer was used to establish a repeatable reference position from which to open the vertical dimension within a digital design. After less than one week, the patient demonstrated a stable, reproducible bite position and was asymptomatic. A centric relation bite record was captured with the device in place using intraoral scanning.

Comprehensive records included upper and lower digital scans, standardized intraoral and extraoral photographs, and a brief video to capture lip dynamics. These data informed the smile design by relating tooth form, proportion, and incisal display to the patient's facial features and expressive lip dynamics.

13–15. Palatal injection molding was initiated with an alternating-tooth protocol using Teflon tape to isolate untouched surfaces. A second injection pass completed the lingual composite scaffold. **16.** A black light was utilized to identify any excess composite that had flowed onto the facial veneer preparation surfaces, allowing for precise refinement prior to final preparation. **17.** Final veneer preparations required only minimal refinement, focusing on removing excess composite and smoothing line angles without significant tooth reduction. **18–19.** Maxillary provisional restorations were completed. Mandibular provisionals were bonded directly over the unprepared teeth on the same day to stabilize the newly established vertical dimension. **20.** Digital laboratory design demonstrated the proposed restorations superimposed over the existing tooth structure, confirming a strictly additive protocol with minimal thickness.

LABORATORY COMMUNICATION

Because the facial position of the anterior teeth was near ideal, the laboratory was instructed to maintain facial volume and fabricate the thinnest restorations possible *(Fig. 20)*. To execute the palatal reconstructions precisely, the laboratory was instructed to design the linguals of the anterior teeth only, which meant the facials would be of the existing dentition. They prepared two clear matrices:

1. Alternating-tooth matrix: to injection-mold every other tooth first, improving visibility and control.

2. Full-arch matrix: to complete the remaining teeth in a second pass and harmonize contours.

A conventional full-smile wax-up, including facial, lingual, and incisal morphology, was also provided along with injection mold templates. The wax-up respected the design requirement of minimal facial addition and focused on rebuilding palatal volume for functional guidance.

CLINICAL PROCEDURES

Surface preparation and isolation

After anesthesia, existing defective restorations on the maxillary arch were removed. Enamel and dentin were air-abraded with approximately 27 µm aluminum oxide at ~40 psi to clean the surfaces. Isolation utilized an OptraGate and dry-angle/cotton-roll adjuncts *(Fig. 13)*.

Palatal injection-mold technique (Maxillary anteriors)

First pass (alternating teeth). PTFE (Teflon) tape isolated every other tooth to prevent unintended bonding. Exposed teeth were etched with ~35% phosphoric acid (selective enamel etch on enamel-only areas; controlled etch on dentin guided by manufacturer instructions), followed by a fourth-generation adhesive protocol. A highly filled flowable injectable composite was delivered through the matrix ports, with the cannula tip maintained within the material and starting at the cervical margin to reduce voids. Each tooth was light-cured individually immediately after injection to limit polymerization stress and allow meticulous flash control. Interproximal finishing and polishing followed removal of the matrix *(Fig. 14)*.

Second pass (remaining teeth). Previously injected teeth were protected with PTFE tape, the full-arch matrix was seated, and the sequence was repeated for the remaining teeth. After curing, excess was removed, and palatal surfaces were polished to a high luster. The resulting palatal shells restored lingual contours, re-established anterior guidance, and protected exposed dentin with an adhesive envelope *(Fig. 15)*.

Provisional occlusion and phasing

Because the case was phased, a shrink-wrap bis-acryl provisional was placed on the mandibular arch to test the new occlusal scheme against the completed maxillary palatal surfaces. This step enabled evaluation of phonetics, envelope of function, and patient comfort prior to final restorative steps.

Minimal-preparation veneers (Facial maxillary and mandibular anteriors)

With the palatal anatomy established, a bis-acryl mock-up derived from the wax-up guided conservative facial depth cuts. A black light inspection highlighted






21–22. Restorations were milled and subsequently refined with cutback techniques to introduce secondary anatomy and internal detail. **23–26.** Characterization was achieved through staining and glazing to enhance translucency and introduce maverick coloration while maintaining minimal thickness.

any composite overhangs from palatal injection that may need to be removed before final veneer preparation *(figure 16–17)*. Sharp line angles were rounded to reduce stress concentration. A #00 retraction cord was placed to improve margin capture. Final impressions were obtained using a monophase PVS with a light-body wash. Provisionalization employed spot-etch on enamel and the adhesive part of a fourth-generation, without the primer, under bis-acryl to protect prepared areas and aid in retention *(Figs. 18–19)*.

Posterior veneer-onlays (Mandible)

Posterior teeth with occlusal erosive defects were planned for thin bonded ceramic overlays (veneer-onlays) to restore cusp form and occlusal stops while minimizing preparation. Reduction was limited to defective or undermined areas, guided by the wax-up and provisional trial.

Definitive cementation

For the maxillary arch, absolute rubber dam isolation was used. Ceramic restorations were treated per manufacturer recommendations (e.g., hydrofluoric acid etch on glass-ceramics, silane application, and internal resin coating where indicated). Tooth surfaces were cleaned, selectively etched, and treated with an adhesive system compatible with the resin cement. Veneers were bonded in pairs using a light-cured resin cement to maximize working time and color stability *(Fig. 27)*. After seating, excess cement was removed, flossed interproximally, and margins were light-cured. Occlusion was verified against the mandibular provisional and adjusted as needed. The mandibular definitive phase followed the same protocol after maxillary completion.

MATERIALS AND ADHESIVE CONSIDERATIONS

Selection of materials for this case prioritized bondability, polishability, and minimal thickness performance:

Palatal shells: Direct composite resin provided intraoral control, immediate reinforcement, and a repairable surface. Modern composites with optimized filler load can achieve favorable wear resistance, particularly on protected palatal surfaces that primarily guide function rather than bear heavy centric stops.

Facial veneers: Thin bonded ceramics, in this case lithium disilicate milled and stained, offer color stability, translucency, and durability when bonded to enamel or well-prepared substrate. Because facial volume could not be increased appreciably, ceramics were designed at minimal thickness within manufacturer guidelines *(Figs. 20–26)*.

Posterior veneer-onlays: Bonded ceramics allow cusp coverage with conservative reduction; they distribute occlusal loads efficiently when bonded to sound enamel/dentin with a reliable protocol.

Adhesive protocols emphasized selective enamel etch, careful dentin management, and strict isolation.

OCCLUSION, FUNCTION, AND ESTHETICS

Reconstruction aimed to restore acceptable occlusal function with smooth palatal contours, harmonize posterior contacts to reduce interferences, and maintain the patient's established dental–facial relationships. The wax-up and digital design aligned incisal edge position with the patient's phonetics and lip dynamics. Because facial fullness was already near the upper limit, veneer thickness was constrained (~0.3–0.5 mm facially), and contouring focused on micro- and macrotexture rather than bulk to achieve natural esthetics.

DISCUSSION

Why an additive, adhesive strategy?

When remaining tooth structure is scarce — particularly in the presence of widespread dentin exposure — further circumferential reduction for full-coverage crowns may compromise biomechanics and pulpal health. An additive approach "envelops" the tooth: palatal composite shells protect dentin and re-establish functional guidance; thin facial ceramics refine esthetics without significantly increasing

27. Final porcelain restorations were delivered under absolute rubber dam isolation, placed two units at a time to ensure optimal control and bonding integrity. **28–35.** All erosive damage was fully covered using a combination of porcelain and composite materials, achieving restoration of form and function with virtually no tooth preparation. **36–37.** Occlusal views show seamless integration between composite and porcelain interfaces, with full coverage of eroded surfaces and undetectable material junctions. **38.** Final dento-facial analysis confirms that minimal-thickness restorations preserved the original vertical and horizontal parameters while restoring surface integrity and aesthetics.

volume. This envelope can reduce crack propagation risk by distributing functional loads across bonded layers, while preserving the option for future retreatment. The approach is not universally applicable, but when facial position is already ideal and sufficient enamel remains for bonding, it can be advantageous.

Evidence and expectations

Bonded veneers — ceramic or composite — have demonstrated favorable survival when properly indicated and bonded to enamel. In erosive dentitions, outcomes improve when etiologies are controlled, margins are primarily on enamel, and patients adhere to maintenance. Direct composite surfaces may require periodic repolishing or localized repair; patients should be informed of this expected maintenance. Ceramic veneers bonded under ideal conditions can provide long-term esthetics and color stability, though they are not immune to chipping or debonding if functional risk remains high.

Limitations of the case

This is a single-patient report with short-term functional testing prior to finalization. It cannot be generalized to all wear cases. Objective outcome measures (e.g., quantified wear indices, patient-reported outcomes, and long-term follow-up) would strengthen conclusions. Additionally, while the reflux history correlates with the erosive pattern, multifactorial contributions (dietary acids, salivary factors, and airway function) cannot be fully separated.

OUTCOME

Following completion of the maxillary palatal composites, facial veneers, and mandibular restorations, the patient demonstrated improved function and esthetics with preservation of remaining tooth structure. Occlusal function was re-established without excessive facial bulk, and the occlusal scheme was balanced against the provisional, then finalized. The patient was enrolled in a structured maintenance program with emphasis on GERD control, dietary counseling, and periodic evaluation of restorations *(Figs. 28–38)*.

CONCLUSION

Severe tooth wear demands a diagnostic approach that integrates medical factors, functional analysis, and dental–facial esthetics. In appropriately selected patients — particularly when facial position is ideal and enamel bonding is feasible — a predominantly additive, adhesive rehabilitation can protect remaining structures, restore function, and achieve esthetic goals while minimizing additional removal of tissue. Success depends on controlling etiologies, rigorous laboratory and clinical execution, and a commitment to maintenance. This case demonstrates one such pathway, while acknowledging that full-coverage restorations and other indirect options remain valid when risk, structure, or functional demands dictate.

Oral Health welcomes this original article.

References can be viewed on our website: www.oralhealthgroup.com