

Anterior case with dual-layering composite

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Case Background

A healthy systemically ASA I classified 30-year-old male presented to my service for esthetic options relative to tooth 2.1. This tooth had been impacted in a bike accident at 16 years of age in South Africa, where the individual high-sided and traumatized the tooth. Since then, it has progressed through specialist endodontist intervention 7 years prior.

Soft tissue clinical examination revealed a band of localized moderate marginal erythema affecting his upper anterior sextant, with no periodontal pockets of significance, with the likely etiology mouth breathing, for which nasal breathing was reinforced. Clinical dental examination revealed tooth 2.1 with significantly lower value than the contralateral teeth with visible margins of the old acid-etched bonded composite restoration on the MIDBP surfaces. There was an oblique crack affecting the distal marginal ridge extending centro-obliquely. A small enamel fracture was noted on the 11MI angle also. Radiographic examination revealed no apical rarefying osteitis and no caries affecting the teeth in view, however the distal marginal ridge incomplete fracture was visible and extended to a cervical level possibly violating the biologic width.

Restorative Procedure

Internal bleaching was discussed with the patient as a structure-conservative first option for lifting the chroma and value especially in the cervical aspect where the enamel volume is the thinnest and can range from less than 0.3-0.5mm².

The risks inherent to this procedure involve a 15.1% lifetime risk of External Cervical Resorption (ECR) and with internal bleaching an increased risk to 10.6% of teeth involved.¹

The patient was anesthetized with 1.5 carpules of 2% Lignocaine with 1:100,000 epinephrine via buccal and lingual infiltration as possible biologic width violation was possible as dissecting out the fracture line to recreate a well-bonded periphery for hermetic enclosure of the walking bleach. Rubber dam isolation was achieved initially but abandoned as the fracture line descended to a significant subgingival level distogingivally and thus required surgical access to be dissected out in its entirety. Following the construction of the distal marginal ridge, the rubber dam was dropped to a crestal level and a small plug of temporary filling placed superficial to this to seal off the obturation.

A slurry of sodium perborate and 16% carbamide peroxide was applied to the access opening and a bonded approach using a contrast shade flowable composite applied to the palatal aspect.

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Figure 1.

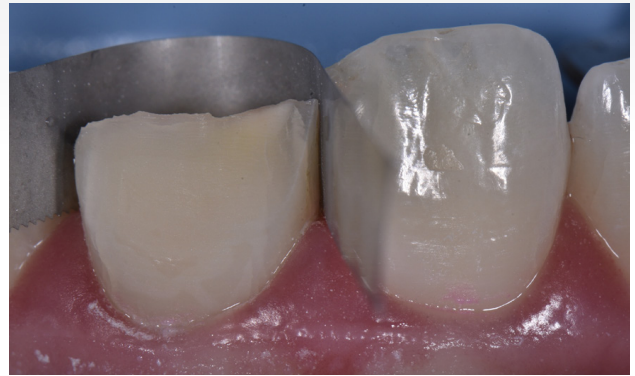


Figure 2.

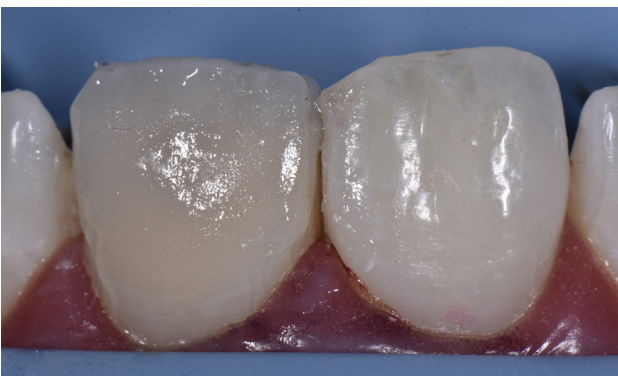


Figure 3.



Figure 4.

This was removed on a weekly basis for 2 iterations before restoration of the access cavity with a glass ionomer restoration for a 10-day minimum standdown period before any bonded restorative procedures.

In actuality a 5-week standdown period eventuated due to scheduling congestion. This period is to allow oxygen leaching from the tooth that can interfere negatively with composite polymerization reactions.⁵

Shade selection was completed as the first step of the restorative process especially as dehydration sets in quickly and changes the opacity and value of the tooth if the tooth is not maintained in a hydrated state due to topical and local anesthetic application lag. Composite shade tabs of both CLEARFIL MAJESTY™ ES-2 Premium (Kuraray Noritake Dental Inc.) A1D and A1E were applied, along with the Blue and Clear shades.

The shade tabs were polymerized to express any inherent color shift before taking a photograph, although there is virtually no color shift post-curing with CLEARFIL MAJESTY™ ES-2.

Procedurally, the patient was isolated using a split dam

rubber dam approach to ensure adequate cervical access on the day of preparation.

No local anesthetic was required, and the old restoration was excavated from the tooth.

A serrated metal strip was placed surrounding the tooth to protect the adjacent teeth from the effects of the micro air abrasion using 27-micron aluminum oxide.

A total etch procedure was staged with a 15 second etch on enamel before a 5-10 second dwell on dentin and the preparation thoroughly rinsed and puff air dried. A 2% chlorhexidine solution was scrubbed into the dentin for 30 seconds before again blot dried to a moist dentin state before application of a single step 10-MDP-based self-etching adhesive, CLEARFIL™ UNIVERSAL BOND Quick.

Without waiting time after the application, the bond layer was air thinned and carrier evaporated before curing using a 2000mW/cm² polywave curing light unit (Pencure 2000, J.Morita Corporation).

A pre-crimped Mylar matrix strip was placed to guide the freehand placement of the lingual shelf, a 0.3mm thick layer composed purely of A1E Enamel (CLEARFIL MAJESTY™

ES-2 Premium). Following this, the join line was occluded using two successive layers of shade of A1D Dentin (CLEARFIL MAJESTY™ ES-2 Premium) and the dentin mamelon incisal details characterized using a dental instrument.

Next, Blue Translucent effects were placed (CLEARFIL MAJESTY™ ES-2 Premium) on the proximoincisor corners to accentuate the opalescence of the enamel and a Trans shade was applied to the mid-incisal area. White tint was used to characterize the tips of the dentin mamelons before a final layer of A1E Enamel was sculpted to final form in preparation for finishing and polishing procedures.

Primary anatomy was completed focusing on incisal embrasures, cervical embrasures and line angles. Secondary anatomy characterized facial anatomy and lobe detail.

Final reassessment of the case shows excellent optical and functional integration of an esthetically complex case that would have been an equal challenge for an indirect approach however with greater reduction of tooth structure.

Rationale for Material Choice

An indirect approach using laminate porcelain restorations would have necessitated the removal of a minimal of 0.3mm of enamel cervically, which often is the maximal volume of the rigid enamel shell in the cervical third of upper anterior teeth¹.

This acts to compound negatively with the reduced flexural strength of a tooth that not only has previously been endodontically-treated but features existing palato-oblique fractures. Preservation of a maximal volume of tooth structure is key to preserving a maximal long-term prognosis.

Part of the preservation effort is not only macroscopic, but importantly on a microscopic level. By limiting the phosphoric acid etch's effect on dentin and especially deep dentin, there is a maximal volume

of hydroxyapatite crystal volume remaining, which not only bolsters residual flexural strength but allows both super dentin and super enamel development through use of a 10-MDP-based acidic monomer, which has the ability to nanolayer calcium in pattern creating phenotypically a very acid-base-resistant layer, measuring 1000-1200nm in thickness.^{3,4} The adhesive selected contains a novel amide monomer, which also increases both hydrophilicity and penetration potential relative to HEMA but is more resistant to hydrolytic degradation.²

CLEARFIL MAJESTY™ ES-2 Premium is the only VITA approved shade (VITA Zahnfabrik, Bad Sackingen, Germany) composite system in the world. It features a buttery, no-slump, non-sticky consistency which is a

remarkable benefit for universal applications but especially sculpted direct anterior cases. It features an excellent optical refraction index very similar to tooth structure.

Often, the filler to resin matrix in anterior composites leaves the composite sticky, with the subsequent need to use wetting resin (bis-GMA, TEGDMA) to handle the material, which can often dilute the intended chemistry and affect ultimate performance if not used sparingly.

CLEARFIL MAJESTY™ ES-2 Premium features a very unique Light Diffusion Technology (LDT) which allows applications in thinner layers to achieve the same degree of optical refraction as in other composite systems.

This translates to need for less tooth preparation, which is ideal from a responsible esthetics standpoint. With 15 shades in total, it is a slick and tech-smart armamentarium that will be able to tackle any challenge head on in your minimally-invasive daily practice.

References

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