Additive Feldspathic Chips: A Strong Choice

Indications, Study, and Application

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Introduction

Occasionally we are faced with a situation that calls for an ultra-conservative technique to satisfy what the patient sees as a fast and easy solution to a simple problem. The use of additive feldspathic chips has the potential to achieve many of the doctor and patient's goals. Both want the longest-lasting, most esthetically pleasing restoration while reducing minimal tooth structure. When indicated, these tiny chips can provide the perfect solution to a very common problem.

Figure 1: Our treatment should always be the most conservative in thought and application; the goal is to "protect" what is in our care.

Case Presentation

Indications

The patient was a young man with an exceptional dentition. His main concern was to preserve his smile in the most conservative way, just as we wish to protect nature (Fig 1) and "do no harm." His dental history revealed no restorative procedures and his oral hygiene could not have been better. Unfortunately, he had experienced a serious surfing accident. Figure 2 shows the damage to the distal incisal corner of tooth #9.

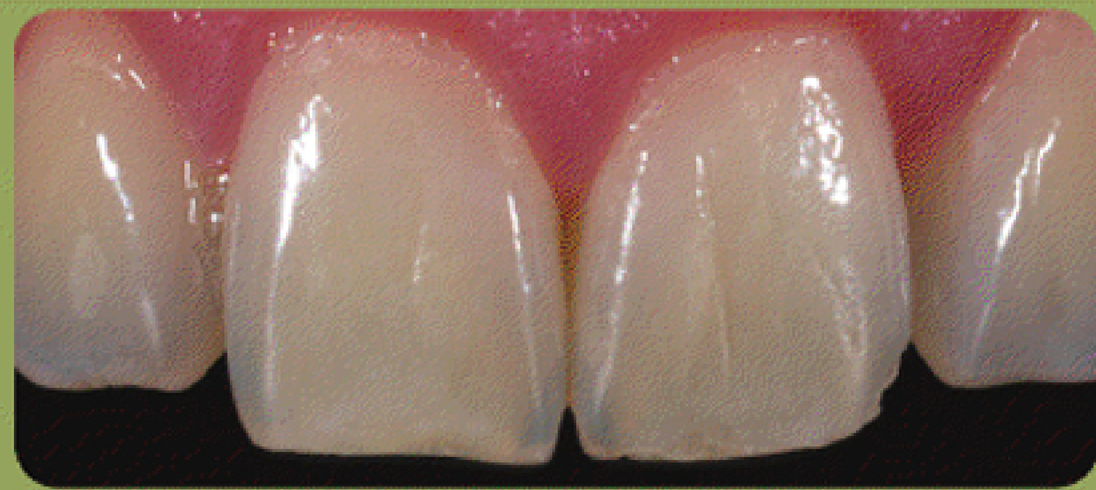

Figure 2: Initial situation. Patient lost natural tooth structure form surfing accident.

DIAGNOSIS AND TREATMENT PLANNING

STUDY

Restoring an incisal chip requires the dentist to ensure that the area will not be exposed to stresses that will cause the restoration to fail through fracture or debonding. This patient was examined for occlusal harmony and smooth crossover. This was achieved by guiding the patient through lateral and protrusive movements to ensure that the proposed restoration would not meet any interferences in everyday function. The area was not exposed to interferences, so the authors believed that the restoration would survive normal function. Ceramic is the most biomimetic material in terms of replacement of tooth structure because of its ability to simulate and restore crown rigidity.[1] Due to their high thermal expansion and elasticity, composite veneers cannot achieve this goal.[2]

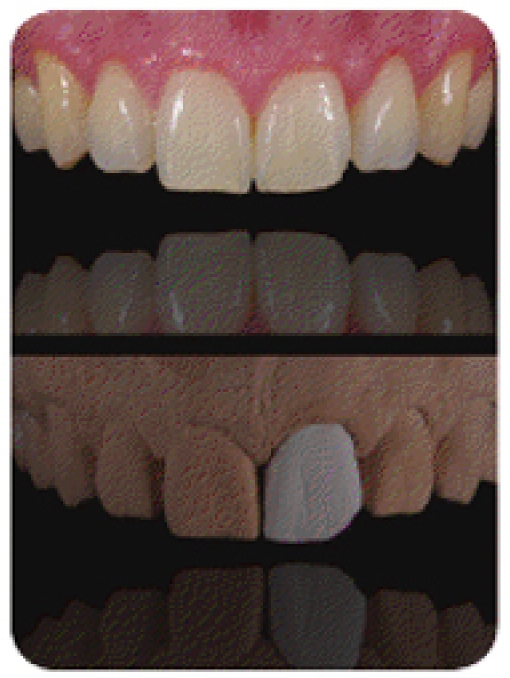

Figure 3: The first step is to transfer all information from an intraoral environment to a bench-top working environment.

Figure 4: An alveolar model is created to simulate exactly the given situation. The alveolar model should replicate to the detail mouth to model.

Treatment

Application

The first requirement, after the occlusal analysis, was to transfer the information from the mouth to the laboratory bench. Minimal preparation was done to smooth off sharp angles. The impression was taken and the die to be treated was duplicated, creating an alveolar model. The die was poured using refractory metal ceramic veneering material (Orbit Vest, Fuji Rock, GC America; Alsip, IL). The resulting alveolar model was an exact duplicate of the oral conditions (Figs 3 & 4). Digital photography helped to recreate a plan to match the shading of the untouched distal of #8 (Fig 5).

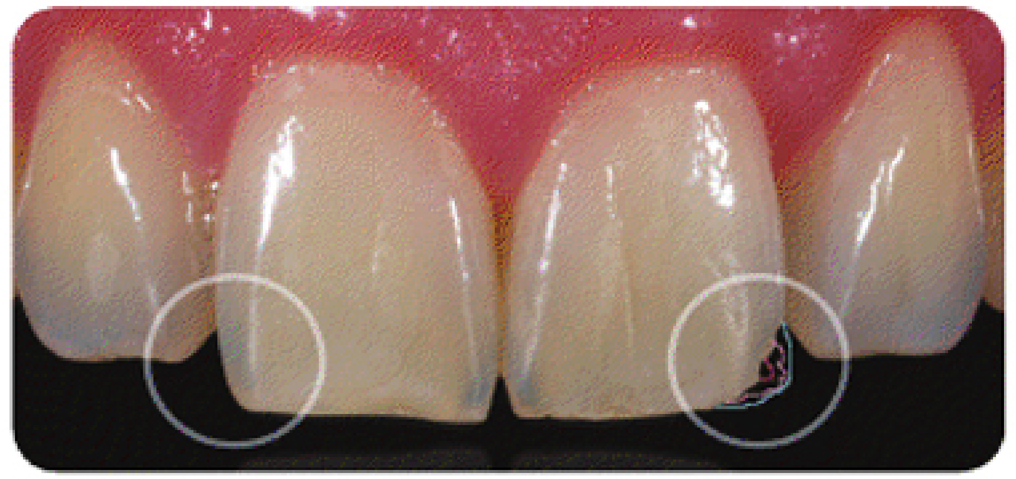

Figure 5: Once all information is transferred to a working environment, thought should begin on how to go about restoring utilizing a ceramic medium.

Observation of natural teeth reveals the complex nature of the dentin and the enamel, even in the smallest of chips. Note in Figures 6 and 7 the complexity of the dentin and enamel. With the aid of hydrochloric acid it is possible to study the underlying structure by de-enamelizing the natural tooth (Fig 8). Through this process of "reverse engineering" we can discover how the dentin should be restructured and how the enamel should be overlaid. The hydrochloric acid will strip the enamel from the tooth structure, leaving only the dentinal makeup.

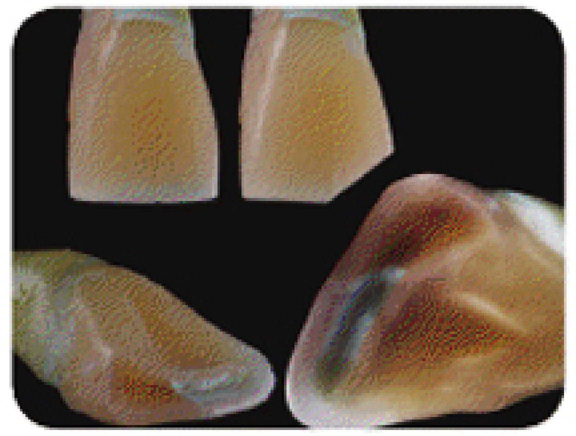

Figure 6: By observing a natural extracted tooth put into the same clinical environment at hand, one can clearly see the complexities of nature.

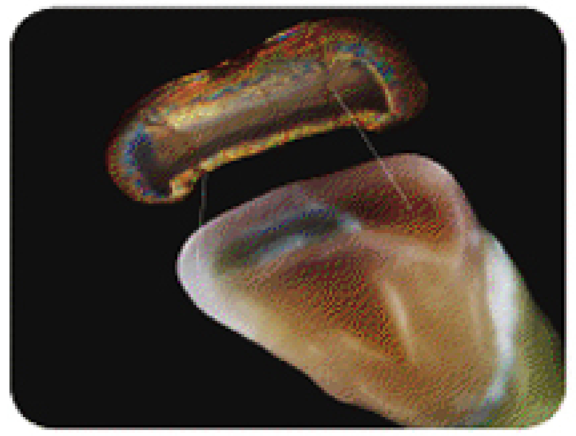

Figure 7: By observing nature one can understand that although it is only a small "chip" to be layered, the complexities of dentins and enamels are apparent.

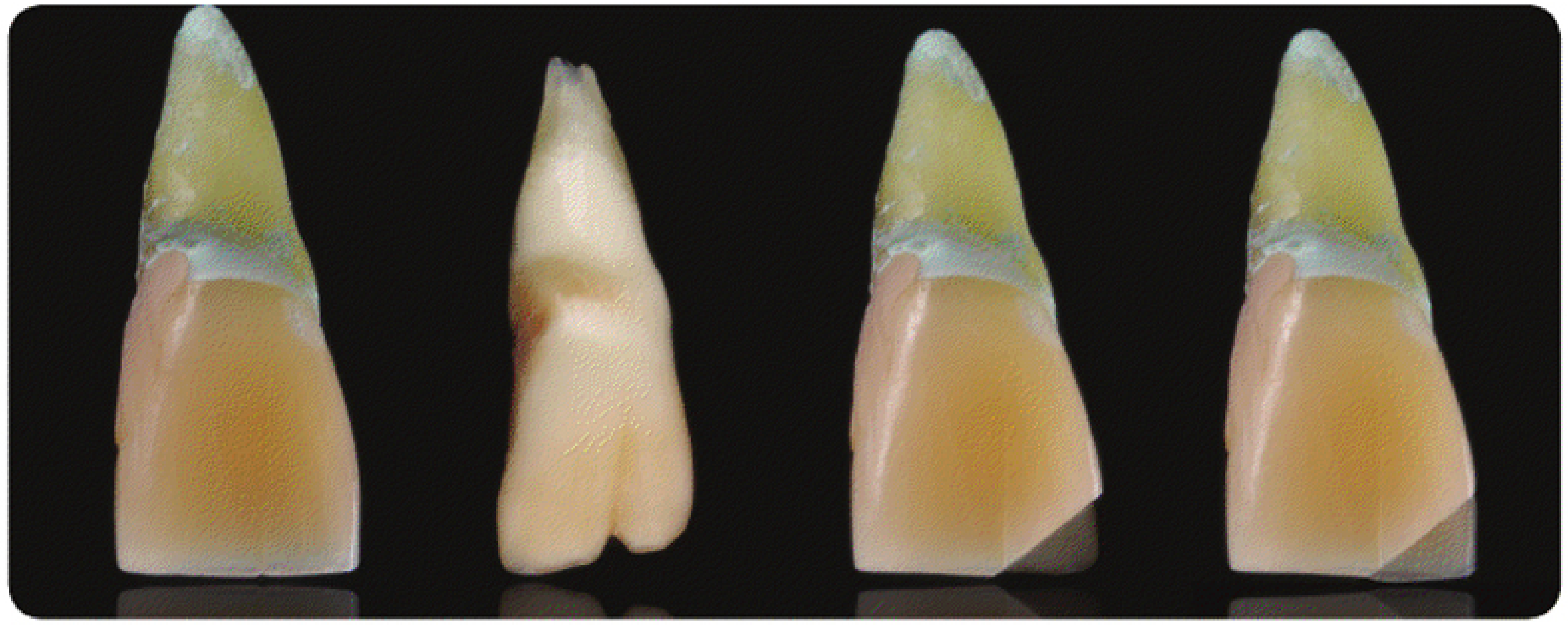

Figure 8: With the aid of hydrochloric acid one can also study nature by "de-enamelizing" a natural tooth.

Figure 9 reveals the layering process (GC Initial MC ceramic system). As in nature, every detail must be replicated in the layering process. The layering started with a combination of dentins A1 and A2 (GC Initial MC), and a mixture of opacious a1 dentin with a translucent dentin in a1, and a fluorescent dentin 91 (GC Initial MC) to recreate the internal distal mamelon structure. Translucent opal and opal effect blue (GC Initial MC) were then overlaid, covering the wet mamelon structure created. Finally, light enamel and clear (E58 and CL, both GC Initial MC) were overlaid before firing.

Figure 9: With all the information gathered from nature, it is possible to apply this knowledge directly to layering techniques.

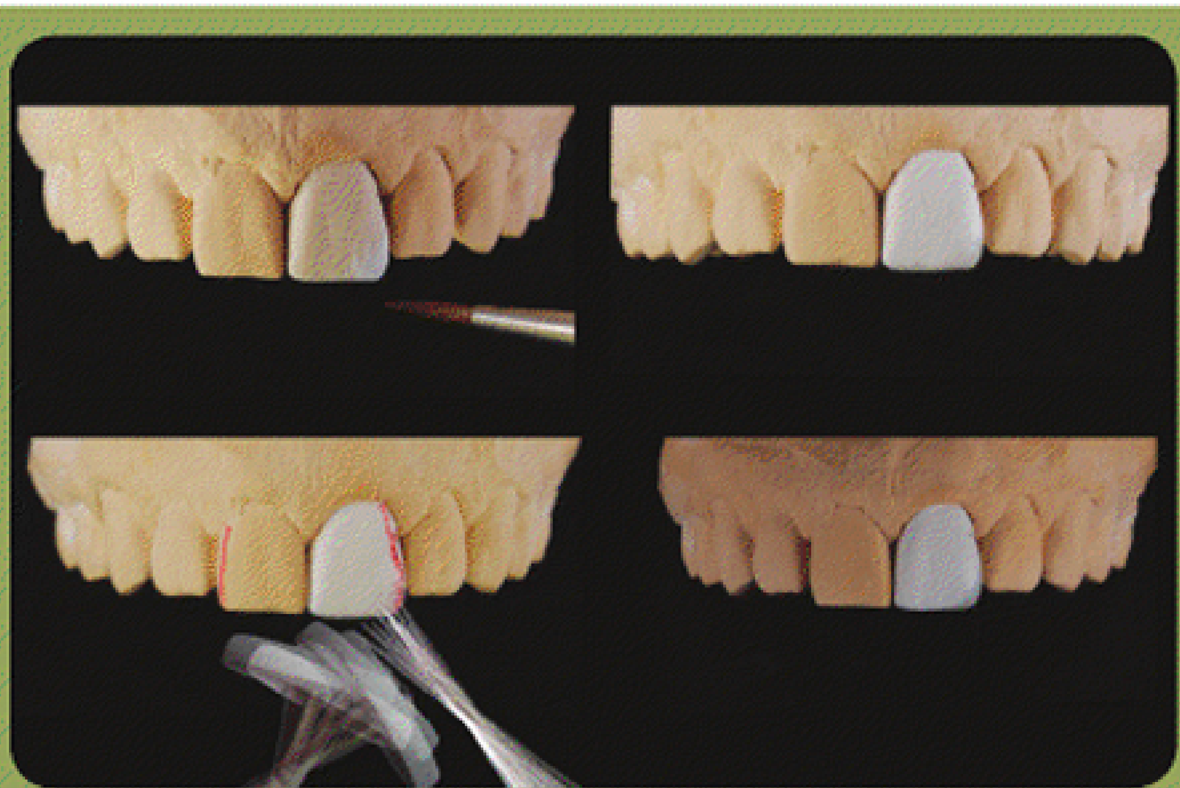

Figure 10: With the refractory die technique the "chip" is fixed onto the die. This allows for the "chip" to be treated like any other restoration.

The ceramist should not attempt to create an exact margin or fit of the chip; rather, a thin contact lens effect should be feathered over the junction to lay over the tooth structure that is present. The margin will be finished once the chip is fitted and bonded to the natural tooth. With the refractory die technique the chip is fixed onto the die, allowing the chip to be treated like any other restoration. Rotary instruments, markings, and additions are all easily used/applied before the chip is to be devested (Fig 10).

The devestment phase can be somewhat tricky. The die is split from the rest of the cast and submerged in a thin patty of laboratory putty (GC America). This allows for the chip to be sandblasted (at less than 2 bars of pressure from a sandblasting unit [Renfert USA; St. Charles, IL]) with support. With the chip fixed in putty it also allows for control of the ceramic, as they can easily blow away. Once devested, the chip can be placed directly on the solid cast (Fig 11).

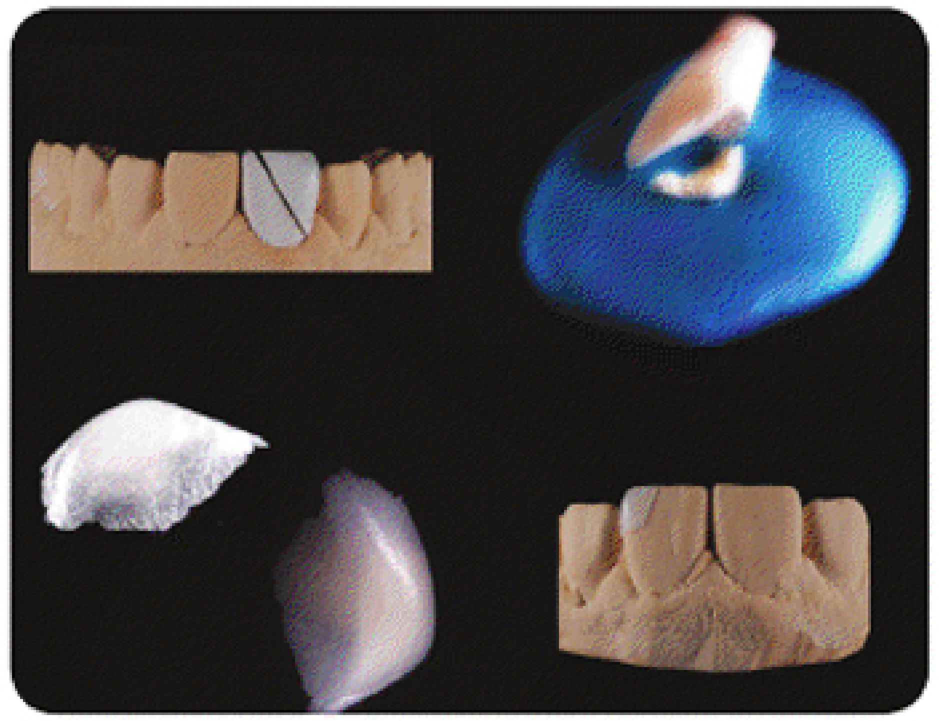

Figure 11: The skill and delicacy of this technique really comes into play during the divesting phase of fabrication.

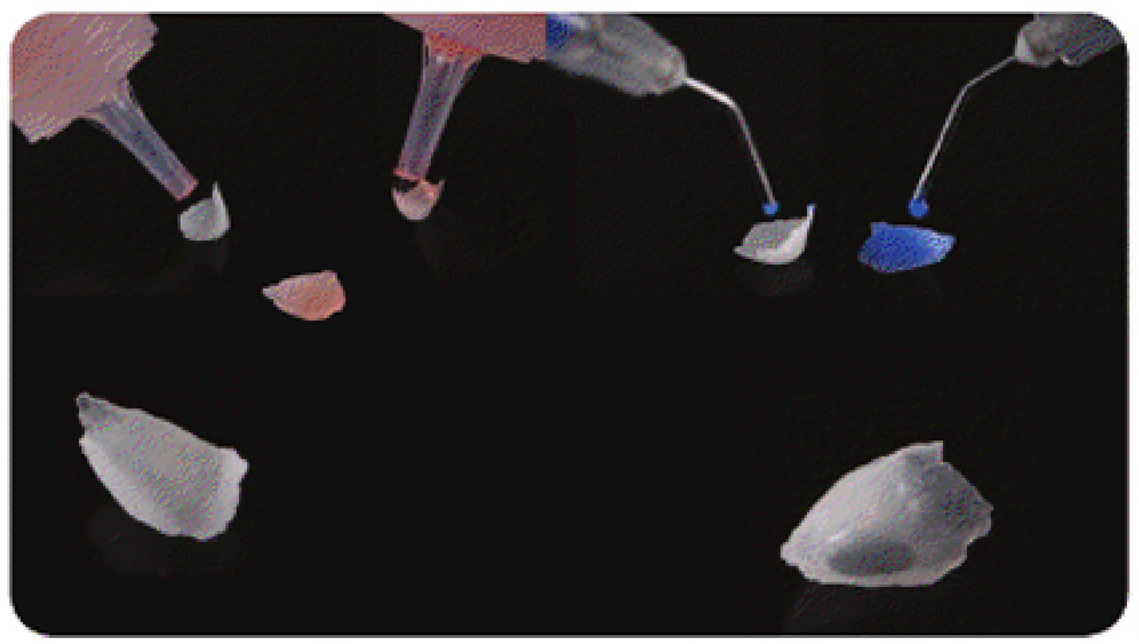

Figure 12: Because of the sensitive nature and size of these chips a steamer is not recommended as the chip can easily be blown away. Phosphoric acid is used instead to clean the chip to give the nice clear appearance.

Care must be taken during the etching phase. Because these chips are quite fragile, steaming is not recommended. Once devested; the chip was treated with etchant (Tri-Dynamics; Cherry Hill, NJ) for 90 seconds, after which a white chalky film became evident. Phosphoric acid was then applied to clean the chip and give it a clear appearance (Fig 12).

The chip was delivered to the dentist for placement. Extra care should be exercised due to the delicate nature of the chip. Pick-up sticks were used to transfer the chip to the tooth. Once the chip is on the site, a finger can be used to adjust it into place. Water can be sprayed to hydrate the chip. This is the time to see if any adjustments should be made (Fig 13).

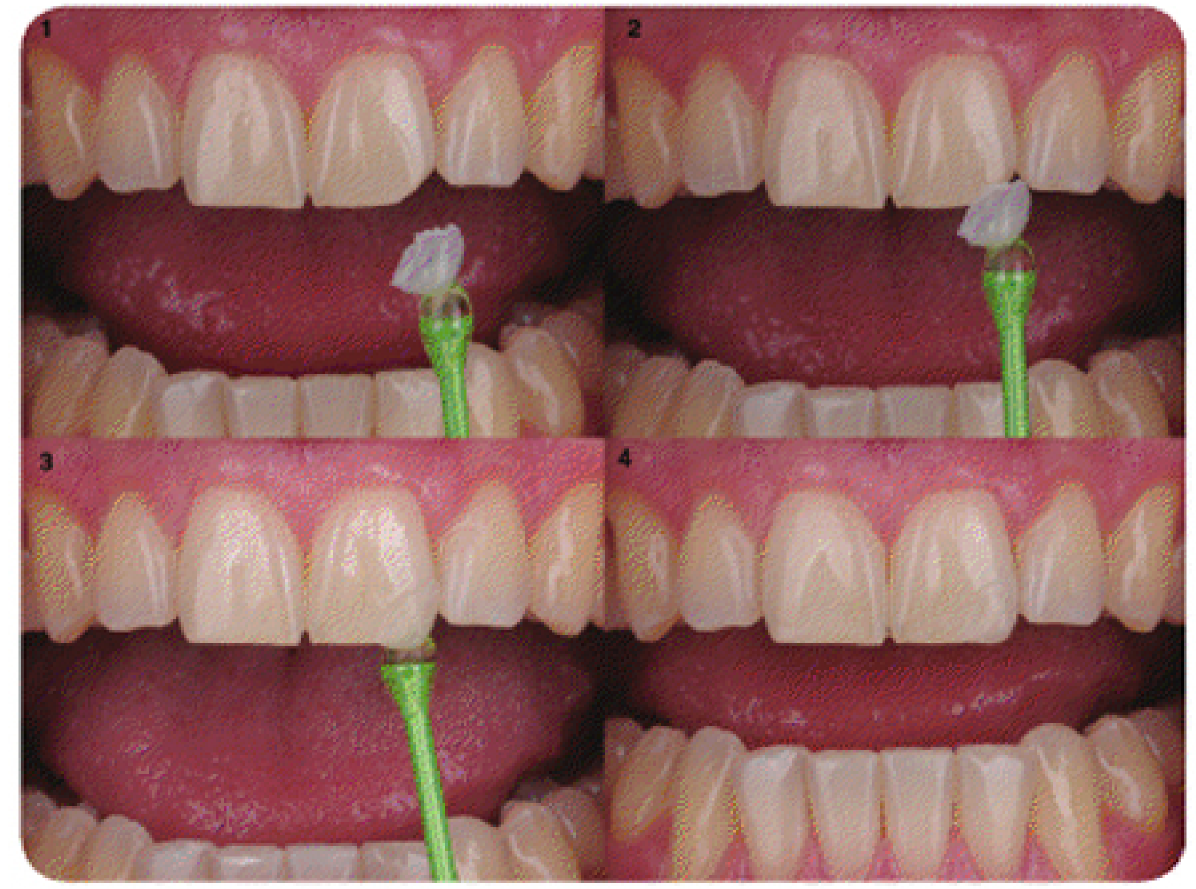

Figure 13: The chip should be handled with care during insertion and fitting. A stick with a sticky side can be used to insert onto the tooth.

A flowable cement should be used to bond the chip to the tooth. Stiff cements are contraindicated due to the resistance they may impart. The chip was passively placed over the preparation so it was possible to visualize the extended contact lens. The dentist cured the restoration in place and proceeded to finishing. Finishing was accomplished with Dialite wheels (Brasseler USA; Savannah, GA), in a descending order from strong grit for abrading to a fine grit for smoothing and polishing (Fig 14). Once the chip was bonded and finished intraorally, a diamond paste (GC America) was applied to achieve a finish similar to the adjacent natural dentition (Fig 15). The final chip should mimic the surrounding dentition so as to be imperceptible (Fig 16).

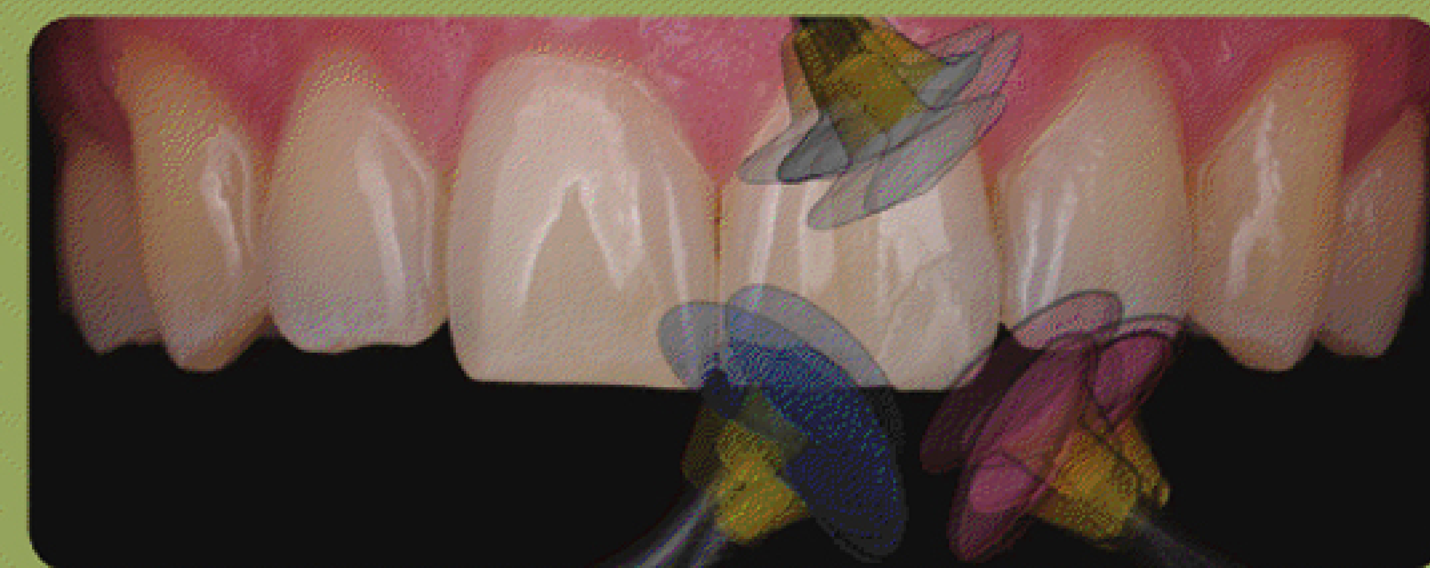

Figure 14: Once the chip has adhered the over-extended marginal contact lens can clearly be seen.

Figure 15: Once the chip has adhered and been finished intraorally, a diamond paste can be applied to get a finish similar to the adjacent natural dentition.

Figure 16: The final additive feldspathic chip in situ.

Conclusion

The final restoration should demonstrate an overall balance of form, value, and harmony with the opposing and adjacent dentition. Additive feldspathic chips can serve as an excellent alternative to more aggressive techniques and direct bonding techniques. The advantages include strength and color stability. Occlusal forces should be considered prior to using this technique. Using minimally invasive dentistry builds trust with patients (Figs 17 & 18). With the ability to restore as conservatively as possible, we take away many variables that could disrupt an overall harmonious smile. The only way to achieve this result is through a deep understanding of materials and clinical/laboratory applications, and overall trust and appreciation between the dentist, technician, and patient.

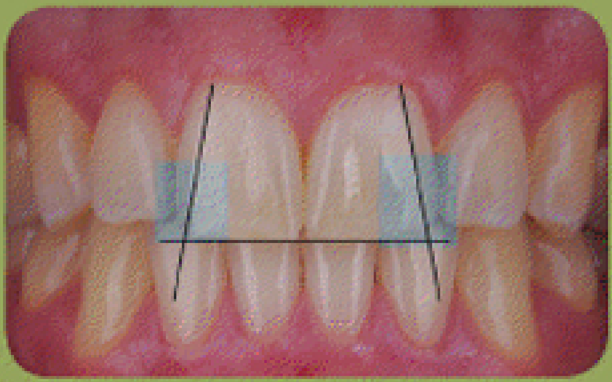

Figure 17: The overall analysis of the restoration in situ should demonstrate an overall balance of form, value, and harmony with the opposing dentition.

Figure 18: With the ability to restore as conservatively as possible we take away many variables that could disrupt an overall harmonious smile.

References

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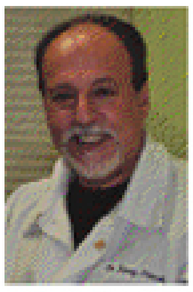

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