



Case Report

Smile designing using a minimally invasive approach: A case report

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Abstract

The impact of a smile is incredible. A smile can provide a glimpse into a patient's emotions, health & age. Direct Composite resins allow clinicians to deliver an outstanding esthetic outcome with the benefits of minimal tooth preparation. This ability to be conservative is desirable for the patients & also reduces the risk of future case failure by maintaining adequate tooth structure. The successful completion of a smile design case with the direct composite restorations is extremely rewarding & humbling for the clinician while it provides the patient with the outstanding results. The present case report describes a systematic approach to rebuild the lost anatomy of a maxillary central incisors with direct composites under 10x magnification.

Keywords: Smile design, Direct composites, Lingual putty index, Layering technique, Magnification.

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1. Introduction

An aesthetic smile has always been an attractive element and it plays a significant role in overall psychology and confidence level of an individual. Teeth presenting with discoloration, diastema, fractures, malalignment are frequently seen in the upper central incisors and this fact can firmly affect the aesthetics of the smile.¹ To solve all these problems, the contemporary literature suggests several treatment options such as direct composite restorations, indirect ceramic veneers, orthodontic treatment or the combination of these.² The selection of the restorative material is based on the size of the defect and the success of the restorative procedures is dependent on the correct diagnosis, treatment planning, the correct technique and the type of restorative material to be used.

Among all these restorative techniques, direct composite restorations are most commonly employed in day to day practice. The direct composite restorations have several advantages over the indirect ceramic veneers such as conservation of the tooth structure, its repairability, adhesion to the tooth besides being more economic treatment option.³

The current case report describes a step by step technique to restore the lost tooth structure of upper central incisors with direct composite restorations. The entire procedure was done using dental operating microscope under 10x magnification.

2. Case Presentation

2.1. Diagnosis

A 12 year old young male patient visited the dental department of Subdivisional hospital, Kalka seeking an aesthetic solution for his smile. He had fractured his central incisors by accidentally falling on the playground. Both the central incisors were obliquely fractured involving the incisal edges hence classified as Class IV cavity as per G.V Black classification & Ellis Class II fracture since the pulp was not involved. (**Figure 1a**). There were no signs and symptoms of pain or swelling hence the key concern of the patient was his appearance.

We suggested a conservative approach with minimally invasive treatment, using composite restorations on teeth 11 and 21. An informed consent was taken from the parents before initiating the proposed treatment plan.

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Figure 1: a): Preoperative image; b): Diagnostic cast; c): The putty index

2.2. Clinical steps

During his first visit, impressions were taken using poly vinyl siloxane material for the wax-up and a diagnostic cast was fabricated using this impressions. Wax up was done on both the central incisors on the diagnostic cast using the composite restoration. (**Figure 1b**). A polyvinyl siloxane impression (**Figure 1c**) was taken from the lingual surface of the wax up as guide.

On his second visit, oral prophylaxis was done followed by the shade selection. For shade selection, button try-in technique was used in which small balls of different composite's shades were applied to the tooth without bonding or etching which were than cured.

The image was turned to a black & white image & the buttons were than compared to select the composite shade that best matches the tooth. Local anaesthesia was administered using 2% lignocaine & 1: 200000 adrenaline & Infiltrations were given on the buccal aspect from first premolar of left side to the first premolar of right side. The restorative treatment was initiated under rubber dam isolation (**Figure 2a**).

The putty index was tried to ensure proper fit & adaptation. A 40 micron tapered fissure diamond bur was used to smoothen out the jagged margins of the tooth and create a smooth bevel at least 2mm beyond the fracture line. This softens the edges and rounds off the fractured enamel prisms. The bevel was made in sun burst appearance so that the light reflection in the finished restoration is from a wavy line and not a straight line (**Figure 2b**). For improving the marginal adaptation, margins of the bevel was finished with TR13 EF bur (**Figure 2c**). Soflex discs were then used to create a smooth margin at an angle to maintain the bevel (**Figure 3a**). This creates an infinite bevel which helps in blending the restoration with the tooth surface & also minimizing the visibility of the restoration margin. (**Figure 3b**).

The teeth were sandblasted using 50um of aluminium oxide (**Figure 4a**).The adjacent teeth were covered with the Teflon tape so as to prevent their bonding. Selective etching was done using 37% phosphoric acid for 15 seconds on the enamel and 10 seconds on the dentine (**Figure 4b**). The acid etchant was then rinsed off for 30seconds and the excess

water was dried to check for the white frosted appearance (**Figure 4c**). Dentin was kept moist for the adequate bonding.

The bonding agent (Palfique, tokuyama) was applied with a fine applicator tip. After 30 seconds air was blown to evaporate the solvent and for thinning the bonding agent. It was applied on all the area that has been etched. The bonding agent was than cured for 20 seconds using a light curing unit. (3M Elipar Deep Cure) (**Figure 5**).

The lingual putty index was then seated (**Figure 6a**).The palatal shell was built with clear enamel shade (Tokuyama) with the aid of the putty index (**Figure 6b**).The palatal shell was light cured followed by the removal of the putty index. Next two posterior sectional matrices along with a wooden wedge was used to create mesial proximal walls of both the central incisors. For this the enamel shade was used (Figure 6c). A wedge secures the band in place and also causes separation of the teeth to ultimately ensure a good contact between the two adjacent teeth (**Figure 7**).

Stratification was done using a low translucent shade for the dentin (OA2 Tokuyama) (**Figure 8**)

White tints (Tokuyama) were used to replicate the natural anatomy including the incisal opaque halo & intra-mamellons (**Figure 9**). Effects to replicate the translucency was achieved using Clear enamel medium flowable composite (Tokuyama) (**Figure 10**). The facial enamel layer was then completed using highly translucent shade (A2, TOKUYAMA) (**Figure 11**) which was then cured with glycerine gelly to remove oxygen inhibited layer (**Figure 12**).

Finishing & polishing the composite restoration is extremely important for the long term success of the restoration. Surface texture was created using a diamond bur at low speed without water. For correcting the light reflecting line angles, Soflex discs (3M ESPE) followed by the silicone discs (shofu) were used following the contours of the adjacent teeth & the final polishing was done using the diamond polishing paste (Lucida, Style italiano) (**Figure 13**). The final smile of the patient after the treatment (**Figure 14**) The Patient was delighted & couldn't stop smiling. His 'Forced smile' which was seen preoperatively changed to a 'Spontaneous smile' seen postoperatively (**Figure 15**)



Figure 2: a): Rubber dam isolation; b): Creating the facial bevel; c): Finishing the bevel

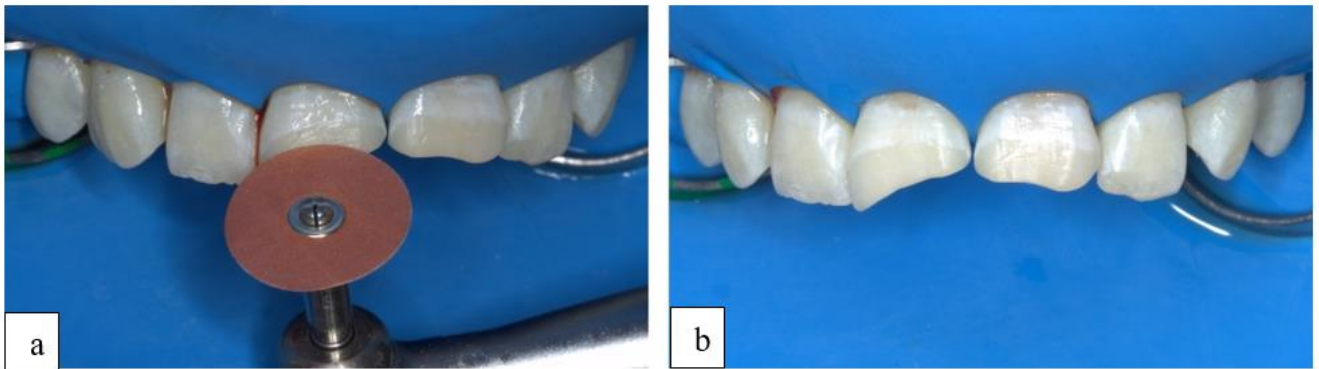


Figure 3: a): Polishing the bevel; b): The final infinite bevel



Figure 4: a): Sandblasting the tooth; b): Application of etchant; c): The white frosted appearance



Figure 5: Application of bonding agent



Figure 6: a): Approximating the lingual putty index; b): Layering the palatal shelves; c): Placing the sectional matrices & wedges



Figure 7: Creating the proximal walls

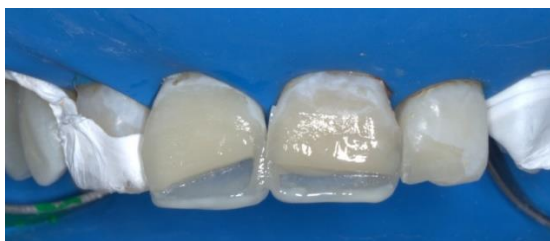


Figure 8: Layering the more chromatic dentin shade



Figure 9: White tints at incisal edge



Figure 10: The incisal halo



Figure 11: The enamel layer



Figure 12: Final cure under glycerine gelly



Figure 13: Post finishing & polishing



Figure 14: The final smile



Figure 15: The forced smile & the spontaneous smile

3. Discussion

Sustaining injury in the anterior tooth is a frequent finding in clinical dental practice. Such injuries are frequently seen to be associated with maxillary incisors due to their susceptible position in the upper jaw that makes them prone to fractures. Various etiology of such fractures include road traffic accidents, sports mishaps, trauma from malocclusion due to anterior tooth crowding, etc. Such injuries are very common especially in young age.⁴

Composites are often considered as the material of choice when restoring any defect in esthetic areas. Composites are mercury free, thermally non-conductive, matches the shade of natural teeth & bond readily to the tooth surface using adhesive systems besides being an economical treatment option.⁵

Shade selection in direct composites is done using button try-in technique. This technique is considered more precise than the conventional approach of using shade guide. The VITA shade guides are meant to match the shade for the indirect ceramics and not for the composites since composites are polymerized unlike ceramics which are processed. Further shade guides are prone to contamination with saliva which can lead to cross-infection in dental clinics.⁶

The current approach in direct restorations in anterior teeth consists of three main steps (1) Framing the palatal wall and incisal margin; (2) Building interproximal walls with matrices; (3) Layering free-hand buccal surface.⁷

Once the outer frame with palatal, interproximal & incisal wall is ready, it is possible to add dentinal shades according to the shade selected.⁸ The internal anatomy have an effect on the esthetic outcomes of the final restoration.⁹

For substituting enamel, high value shades were used whereas for substituting dentin more chromatic shades were used in the middle and the cervical thirds of the crown, where greater chromaticity was required.¹⁰

Anatomical layering technique was used which involves using successive layer of dentin, enamel & incisal composite so that more lifelike color depth could be obtained. At the same time, surface & optical characteristics that mimics the natural tooth are aimed with this technique.

Lastly, the finishing and polishing of the composites is one of the most important step for the composite restorations. Often, the form and function is achieved but the surface of the restorations is rough. This might invite microbial flora over the period of time leading to an inevitable failure of the restoration. To avoid such failures and to satisfy this patient-driven demand for aesthetic restorations, finishing & polishing of the restorations is very important. These techniques of finishing and polishing helps to achieve the proper form and function of the restoration along with aesthetics and the maintenance of proper gingival & periodontal health.

Aesthetic dentistry has expanded dramatically in the recent decades & restoring the exact natural appearance of the tooth is extremely challenging. It is necessary that the undergraduate dental curriculum be integrated with the digital dentistry¹¹ & the curriculum of paediatric dentistry be reorganized in relation to modern need of population & esthetics demand of community.¹²

Nowadays, there are many treatment options available based on the extent & type of tooth fracture & it is possible to restore the esthetics & function of the teeth using minimally invasive techniques. In our case, the use of composites was well suited for restoring the fractured incisors in our young patient since it is a conservative technique where even if the failure happens, it is repairable without much loss of tooth structure.¹³

4. Conclusion

The impact of a smile is incredible. A smile can provide a glimpse into a patient's emotions, health & age. Direct Composite resins allow clinicians to deliver an outstanding esthetic outcome with the benefits of minimal tooth preparation. This ability to be conservative is desirable for the

patients & also reduces the risk of future case failure by maintaining adequate tooth structure. Smile designing not only results in esthetic enhancements but also results in the enhancements in functional design. The successful completion of a smile design case with the direct composite restorations is extremely rewarding & humbling for the clinician while it provides the patient with the outstanding results.

5. Source of Funding

None.

6. Conflict of Interest

None.

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