A single anterior crown

Accreditation Case Type 2

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Introduction

Making a single unit central incisor look natural and match the adjacent teeth is probably one of the most difficult procedures in dentistry. Masking a dark tooth adds a further degree of difficulty and requires a good understanding of how the various layers will affect the three dimensions of colour; value, hue and chroma as well as the opacity and translucency. It is also important to understand how the crown fits in with the surrounding teeth to achieve a harmonious smile design. Clear and precise communication with the laboratory is paramount.

In this case a Procera AllCeram crown shows how excellent aesthetics can be achieved using modern, high strength materials.[1]

History

The patient was a 25-year-old female in excellent health who worked as a reporter for a dental journal. Seven years earlier tooth 11 had been traumatised in an accident and had darkened over the following year. Root canal therapy was attempted by her general dentist who could not locate the canal but created a wide access cavity in the attempt. The patient was referred to an oral surgeon who performed an apicectomy with a retrograde amalgam. The patient still experienced symptoms and was finally referred to a specialist endodontist who performed a successful orthograde root canal treatment to the level of the amalgam retrograde. Since then the tooth has been symptom-free.

The patient had recently received treatment to mask this dark tooth that had failed. Her teeth had been bleached successfully except for the dark central incisor. But the feldspathic veneer that had been placed on tooth 11 had fractured vertically. Composite bonding that was carried out on teeth 21 and 22 was too high in value and opaque. The patient was unable to continue treatment with her dentist due to relocation. She was keen to achieve an excellent result especially as her job brought her in contact with so many dentists.

Clinical examination

Examination of all soft tissues showed them to be normal and free of pathology. Occlusion was Class 1, but with a reduced overbite. There were no signs or symptoms of TMJ disease. The patient's past dental treatment included composite fillings in teeth 17, 16, 27, 28, 37 and 48 that were all in good repair; oral hygiene was good, with no

Figure 1a: a-f – Smile: *Before (above) and after (below) images of the case*

periodontal pockets. Radiographs revealed good bone support, no periapical lesions or caries.

The patient was concerned that although tooth 11 was not as dark is at had been, it was still not symmetrical and of course the veneer was broken anyway.

Diagnosis

Tooth 12 had been root treated but no post was present and the access cavity was very wide and the lingual surface was under-contoured. It had a veneer that was fractured vertically, that was asymmetrical to the #11 and was not a good colour match. Composite bonding on teeth 21 and especially 22 were too high in value and opaque.

Tooth 11 would need a fibre post to strengthen the core and a full porcelain crown to allow sufficient thickness to create a lifelike depth of colour and to restore full contour on the lingual. Composite bonding on teeth 21 and 22 would also need to be replaced to improve aesthetics.

Vipersoft computer imaging was used to check symmetry of the centrals and harmony with the whole smile. Tooth 21 was almost ideal in width and shape to be copied in the new crown on tooth 11. Alginate impressions, an Artex facebow record and a stickbite registration were taken.[2]

The computer imaging was checked along with the radiographs, mounted diagnostic models, digital micrometer measurements and digital photographs by dentist and ceramist. Care was taken to develop symmetry of teeth 11, 21 and 22 in a diagnostic wax-up. The mounted diagnostic models and wax-up were used to check the occlusal scheme.

Procera AllCeram was selected for the crown because of the excellent strength and aesthetic properties that would be of great value in the long term successful treatment of this case.

Armamentarium

Composite bonding

- Dentagauge digital micrometer (Erskine dental; Sydney, Australia)
- Sof-Lex Pop-On discs (3M/Espe; St. Paul, MN)
- Teflon (PTFE) tape
- Fahl Anterior Composite Preparation Set (Axis; Irving, TX)
- Hygenic Dental Dam Kit (Coltene/Whaledent; Cuyahoga Falls, OH)
- Ultra-Etch 35% (Ultradent; South Jordan, UT)
- Consepsis (Ultradent)
- OptiBond Solo Plus (sds/Kerr; Orange, CA)
- Kerr Color Plus Opaquers (sds/Kerr)
- 4 Seasons hybrid shade super clear (Ivoclar/Vivadent; Amherst, NY)
- Renamel microfill body B Zero (Cosmedent; Chicago IL)

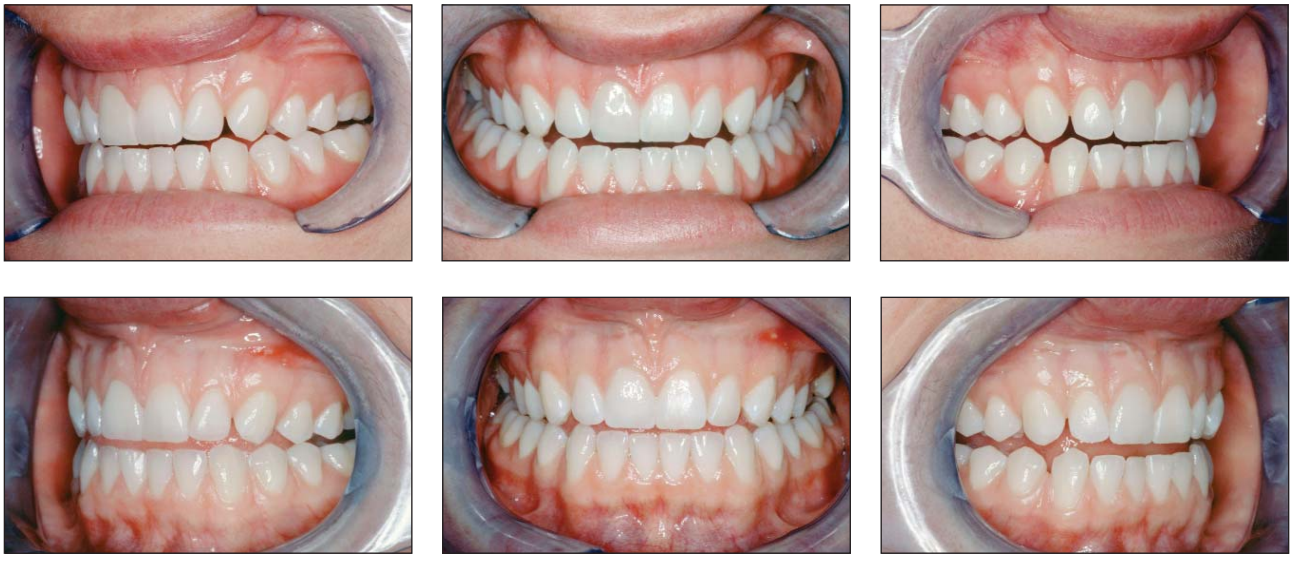


Figure 1b: a-f – Retracted: *Before (above) and after (below) images of the case*

- Optilux 501 Curing light (Demetron Research corporation; Danbury, CT)
- Gold microfill composite instrument (Almore; Portland, OR)
- Gold composite instruments IPCT and 8A (Cosmedent)
- Artist brush #3 (Cosmedent)
- Scalpel Bard Parker #12 blade (Becton Dickinson; Franklin lake, NJ)
- Epitex Mylar and finishing strips (GC; Alsip, IL)
- Fahl Anterior/Posterior Composite Finishing Set (Axis)
- FlexiCups and FlexiPoints (Cosmedent)
- FlexiBuff discs (Cosmedent)
- Enamelize (Cosmedent)

Preparation and temporisation

- Artex articulator and facebow (Girrbach; Germany)
- Sil-Tech (Ivoclar/Vivadent; Amherst, NY)
- Dentagauge digital micrometer (Erskine dental; Sydney, Australia)
- Vitapan 3D master shade guide (Vita Zahnfabrik; Bad Sackingen, Germany)
- LSU- Chiche PFM / All Ceramic preparation kit (Brasseler)
- All-Bond 2 (Bisco; Schaumburg, IL)
- Luscent Anchors (Dentatus; New York, NY)
- Luxacore Automix Dual (DMG/Zenith)
- Optibond FL (sds/Kerr)
- Kerr Color Plus Opaquers (sds/Kerr)
- Point 4 Microhybrid (sds/Kerr)
- Aquasil LV (Regular set) and Rigid (Regular set) (Dentsply/Caulk; Milford,DE)
- Blu-Mousse Superfast bite registration (Parkell; Farmingdale, NY)
- Luxatemp Plus B1 (DMG/Zenith; Englewood NJ)
- Super-Snap discs (Shofu; San Marcos, CA)
- Temp-Bond NE (sds/Kerr)
- Optilux 501 Curing light (Demetron Research corporation; Danbury, CT)
- Temp-Bond NE (sds/Kerr)
- Ultra-Etch 35% (Ultradent)
- Ultrapak #00 retraction cord (Ultradent)
- AccuFilm II (Parkell; Farmingdale, NY)

Cementation and finishing

- Hygenic Dental Dam Kit (Coltene/Whaledent; Cuyahoga Falls, OH)
- Consepsis (Ultradent)
- Ultra-Etch 35% (Ultradent)
- All-Bond 2 Resin(Bisco)
- Variolink II Transparent, White Opaque and Catalyst (Ivoclar/Vivadent)
- Brush #3 (Cosmedent)
- Optilux 501 Curing light (Demetron Research Corporation)
- Scalpel Bard Parker #12 blade (Becton Dickinson)
- Esthetic Trimming (ET) Carbides (Brasseler; Savannah, GA)
- Dialite Porcelain polishing kit (Brasseler)

Figure 1c: a-f – *Before (above) and after (below) images of the case*

Figure 1d: a-f – Full face. upper occulsal and lower occulsal: *Before (above) and after (below) images of the case*

Clinical procedures

Composite bonding on the mesial of tooth 21 was first carried out using Renamel Microfil B Zero (and other materials as listed above). It was built slightly over-contoured and then contoured and polished to the correct dimensions by checking the width with a micrometer to achieve symmetry of the two centrals.

Composite bonding on tooth 22 was then carried out. Although only a relatively small chip on the mesioincisal corner, a layered technique was required because of the polychroma of the natural tooth in this area. A stent made from the wax-up was used to create the initial halo[3] with Point 4 XL2. Kerr color plus A1 and Clear were used to mask the fracture line. Point 4 B1 was used for the dentine mamelons; 4 Seasons super clear for translucency between the mamelons. Renamel B Zero was used as the final enamel layer. Optibond Solo Plus was used as the adhesive along with other materials as listed above.

Tooth 11 was then prepared for the post and crown. The post hole was prepared using burs from the dentatus luscent anchor kit.[3] A large size luscent anchor was selected and trimmed to length. Under rubber dam, the cavity was etched for 15 seconds using 35% phosphoric acid, rinsed and dried using high volume suction and paper points only to avoid over-drying. All bond 2 primer (A+B) was applied in several coats and lightly dried then All bond 2 dual cure resin was mixed and applied to both post cavity and post, and air thinned. Luxacore automix dual was syringed into the post cavity and the post was seated and cured in place for 30 seconds. The facial surface was then etched, rinsed and dried till moist. Optibond FL primer and resin were applied as above then cured. Kerr Color Plus A1 opaquer and red tint were mixed to create a pink opaquer tha was used to block out the darkest and greyest areas. The rest of the core was built up using Point4 B1 Opaque shade microhybrid curing each increment for 20 seconds.[4]

The core was then prepared for a crown using the round ended tapered diamond Brasseler 5850-016 allowing 1.0–1.5mm on the facial, lingual and proximal surfaces and 2mm on the incisal. Facial margins were finished with a very heavy chamfer at the gingival level and all internal line angles rounded.

Gingival retraction was accomplished with Ultrapak #00 retraction cord. As the gingival health was good and there was no bleeding only a single cord technique was required. The final impression was made with Aquasil LV and Rigid. The temporary was made using Luxatemp B1 from a putty stent made from the wax-up. It was cemented with TempBond NE.

A stickbite registration was taken with Blu-Mousse Superfast to

confirm the earlier one. A stump shade was also recorded and photographed. No facebow record was taken as the upper model would be mounted against the existing mounted lower model.

Laboratory instructions

The patient returned for a separate shade appointment when the teeth had rehydrated. Digital photos were taken with shade tabs in the frame for reference. The ceramist also attended in order to take his own shade and a consensus opinion was reached after some discussion. The ceramist agreed we could achieve an excellent result with a Procera AllCeram crown.

A detailed laboratory instruction was written for the crown concerning shape, contour and surface opacities. The basic shade for the tooth was 1M1 but a lot of characterisations were required to match it to tooth 21. All the records were sent along with diagnostic models, wax-up, colour map and photos with shade tabs to confirm the colour map, stump shade and horizontal plane.

The crown was returned from the lab and a try-in was done using a clear try-in gel. Again the ceramist was present and photos of the crown were taken and returned to the lab for final surface characterisation.

Cementation

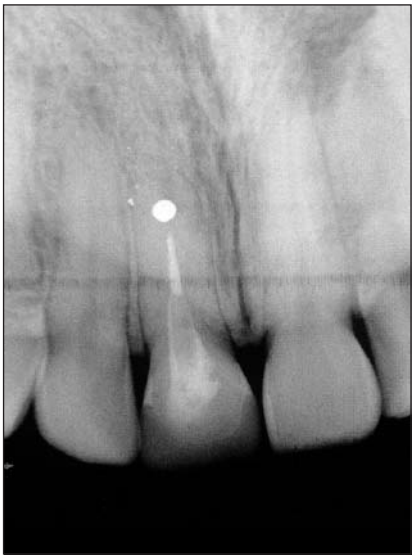
The temporary crown on tooth 11 was removed and the tooth cleaned with pumice mixed with consepsis. The Procera crown was tried in dry to check fit. It was then loaded with water to evaluate the shade. Both fit and shade were satisfactory. The crown was rinsed off, dried and silane applied to the internal surfaces. The anterior teeth were then isolated using a split dam technique. The tooth was etched for 15 seconds using 35% phosphoric acid, rinsed and dried using high volume suction to avoid over-drying. All-Bond 2 dual cure was used. The primer (A+B) was placed repeatedly until there was a shiny layer. Then the dual cure resin was mixed and one coat was applied to the teeth and fitting surfaces of the crown and air-thinned. Simultaneously the Variolink II translucent was mixed with catalyst. This was loaded into the crown and seated under pressure, tacked on with the light and cleaned up with brushes and floss. The crown was then light cured using Glycerin as an oxygen inhibitor. Excess was then trimmed with a #12 scalpel blade, a fine 'mosquito' carbide ET3 and football shaped carbide OS1 from the Brasseler ET carbide kit. The occlusion was rechecked and the crown was polished with Dialite cups and points carefully progressing through the three grades to achieve a good polish.

Conclusion

The aesthetic results in this case were considered excellent by dentist and patient alike. It has brought a happy close to a very long period of unresolved problems with a front tooth that affected the confidence of an attractive young lady.

Excellent communication is essential for success in this type of case.

Figure 2a: Associated radiograph



Whilst all the records and shade photos are crucial, there is no better way of communicating all the details than having the ceramist present.

References

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