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Dr Andrew Chio completed his dental degree from the University of Melbourne in 1995 where he graduated at the top of his year and was awarded with several awards for clinical achievement. While practicing dentistry predominantly in a private setting, Dr Chio has also previously worked in the public system, participated in clinical programs with the Royal Flying Doctors and worked in a rural hospital in Nepal, giving him a wide perspective of the demands and challenges of general dentistry. Dr Chio maintains an active role in dental education through his involvement with university undergraduate programs (La Trobe University) and his involvement in various Continuing Education Programs. He has published articles in restorative dentistry in various dental publications as well as in peer-reviewed journals.

Class IV restoration with direct composite resin:

A case study utilising the layering-stratification technique with the G-ænial A'CHORD composite system

By Dr. Anthony Mak and Dr. Andrew Chio, Australia

The concept of layering or stratification of direct composite restorations utilises the combination of optical properties from the different resin layers with the aim of emulating the natural colour, characteristics and translucency of the natural dentition.

Progressive improvements in composite resin technologies have led to the simplification of this treatment procedure that is commonly perceived as complex. However, difficulties exist in mimicking the remaining tooth structure when restoring teeth in the anterior segment of the dentition because of the variety of shades, chroma, and translucency levels of many current composite resin systems.

The G-ænial A'CHORD represents the evolution of the highly successful G-ænial system that has been utilised in dental practices throughout the world for the past 10 years. Compared to its predecessor, the G-ænial A'CHORD system provides an upgrade from the original G-ænial system in the

following aspects:

- Beautiful and harmonious under any light with a natural fluorescence.
- Optimal handling properties allowing for the material to be easily sculpted with conventional composite manipulation instruments or brushed with restorative brushes.

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- The Full-Coverage Silane Coating (FSC) technology that covers the nano-fillers with silane coupling agent leads to high polish and gloss with only a few steps.
- The incorporation of additional opaque and enamel shades allows an infinite range of opacity and value possibilities.
- Simplification with 5 CORE shades which covers all 16 Vita shades.

VITA® Classic	A1	A2	A3	A3.5	A4	B1	B2	B3	B4	C1	C2	C3	C4	D2	D3	D4
Opaque	AO1	AO2	AO3	AO3	AO3	AO1	AO2	AO3	AO3	AO2	AO3	AO3	AO3	AO1	AO2	AO3
CORE	A1	A2	A3	A3.5	A4	A1	A2	A3	A3.5	A2	A3	A3	A3.5	A1	A2	A3
Enamel	JE	JE	AE	AE	AE	JE	JE	AE	AE	JE	AE	AE	AE	JE	JE	AE

Multi-layering technique correspondence

G-ænial A'CHORD

Enamel Opaque CORE Enamel CORE Enamel

CASE REPORT

The following case study demonstrates the use of the G-ænial A'CHORD (GC Europe) direct composite system in the restoration of a complex class IV in a 22-year old female patient. The patient presented to the practice relaying her dissatisfaction of an existing restoration on her upper left central incisor (FDI tooth 21). She requested its replacement with a new restoration that was conservative and “invisible” when she smiled or engaged in normal conversation. She also relayed that the existing class IV restoration had been done 4 times by her previous dentist without an outcome or result that was satisfactory to her.

Clinical examination revealed a high smile-line with a symmetrical and aesthetic gingival architecture. The existing composite restoration on the tooth 21, while clinically acceptable, did not integrate with the shade of the tooth and to the other teeth in her dentition. The discolouration and minor ledging on the disto-labial aspect of the existing restoration also indicated the likelihood of marginal leakage in the region.

The pre-operative colour assessment showed that the upper left central incisor (21) was slightly more chromatic than the adjacent upper right central incisor (11). The upper left central incisor (21) also exhibited a very slight labial displacement in its alignment compared to the adjacent right central incisor (11).

The patient's health history was unremarkable. Radiographic and periodontal examination showed that the tooth 21 demonstrated no pathology or issues requiring intervention prior to the commencement of the restoration. The 21 exhibited a normal response when the vitality was thermally tested.

The treatment options were discussed with the patient and the advantages and disadvantages of each of the options were carefully identified. The options presented were:

- 1) A single reductive ceramic veneer on tooth 21.
- 2) A full surface composite veneer on tooth 21. The patient was advised that due to the slight labial

displacement of tooth 21, a very small labial reduction would be required to allow the space to mask the chromatic dentine.

- 3) A conservative complex class IV on the tooth 21 to be completed additively to minimise any preparation and reduction of the natural tooth structure.

She preferred the conservative approach to her treatment involving an additive protocol (option 3). She relayed that she would be happy with a harmonious composite restoration on tooth 21 and did not feel that the slightly chromatic upper left central (21) would be an aesthetic concern for her.

From the clinician's perspective, final plan and goal of the treatment was to restore the tooth 21 with a durable and long-lasting conservative direct composite restoration with a final result that is biomimetic with optimal aesthetic and morphological integration with her existing natural dentition.

STEP BY STEP

Prior to the commencement of the restorative process, diagnostic images

and the selection of the estimated shade was completed. Diagnostic impressions were also taken to allow the fabrication of silicone palatal stent

or matrix that would facilitate the three-dimensional blueprint for the layering of the composite increments.



Figure 1: Pre-Operative unretracted view illustrating the unaesthetic and failing direct composite restoration on the upper left central incisor (tooth 21).



Figure 2: Pre-Operative Retracted a) with regular flash b) with Polarized filter.



Figure 3: The working field was isolated with the use of the rubber dam. The existing restoration and caries was removed and a 2 mm bevel prepared on the labial margin of the preparation to facilitate the aesthetic and functional integration of the restoration to the remaining natural tooth structure.



Figure 4: The bevel was prepared and finished with a tapered diamond bur (Komet 6862.314.012 and 8862.314.012). All the transition angles of the cavity were rounded with an oval or egg-shaped polishing diamond bur (Komet 8379.314.023). The burs form part of the "Dr Anthony Mak Custom C&B Selection" Kit from Komet Dental.



Figure 5: The palatal stent was trimmed and tried-in to verify the fit of the silicone matrix and to ensure the absence of any interferences to its seating from the rubber dam and clamps.



Figure 6: The cavity was lightly air abraded with a 29-micron aluminium oxide powder AquaCare (Velopex) prior to the adhesive procedure and Teflon (PTFE) tape was utilised to prevent the inadvertent bonding to the adjacent teeth.



Figure 7: The adhesive procedure commenced with the cavity selectively etched with 37% phosphoric acid gel Ultra-Etch (Ultradent). The etching gel was rinsed away and the adhesive protocol was completed by the application of a universal bonding agent, G-Premio BOND (GC Europe). The universal bonding agent was then air dried for 5 seconds with maximum air pressure and light-cured for 10 seconds according to the manufacturer's instructions.



Figure 8: Following the adhesive protocol, a thin layer of semi-translucent enamel, G-aenial A'CHORD shade JE (GC Europe), was used to create the palatal shell.

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Figure 9: The interproximal wall was then completed utilising the same semi-translucent enamel shade, G-ænial A'CHORD shade JE (GC Europe). The interproximal wall was formed with the use of a plastic myeloid strip and pull through technique to help developing an anatomical contour.



Figure 10: The dentine layer was then completed by the application of an opaque shade, G-ænial A'CHORD shade AO2 (GC Europe). This increment was shaped to emulate the extensions of natural dentine core morphology and was extended just slightly short the prepared bevel. The dentine or opaque shade provides the correct opacity to the final restoration.



Figure 11: A chromatic body shade, G-ænial A'CHORD shade A2 (GC Europe) was then applied and extended beyond the bevel to mask the transition line. Internal anatomy (i.e. mamelons) in the incisal third was also sculpted and formed in this increment of composite resin.



Figure 12: White tints, Essentia White Modifier (WM) (GC Europe) was utilised to accentuate the mamelons and to replicate the similar characteristics and features present in the adjacent right central incisor (tooth 11). Comparisons to the polarised diagnostic images taken prior to commencement of the restoration provided a reference for the incorporation of these internal features.



Figure 13: A final translucent shade of G-ænial A'CHORD shade JE (GC Europe) was then layered to bring the anatomy to full contour and to achieve a natural optical blending effect.



Figure 14 a, b: Glycerine gel was then applied over the buccal surface of the restoration and light-cured to maximise the polymerisation of the layered direct composite restoration due to the absence of the oxygen-inhibition layer.

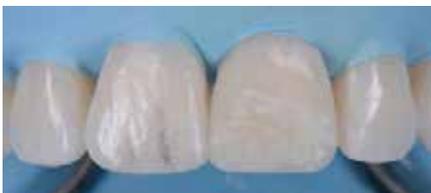


Figure 15: The restoration was then polished and finished to incorporate the primary, secondary and tertiary anatomy with the aim to produce a life-like restoration that mirrored the adjacent right central incisor (tooth 11).



Figure 16: The polishing and finishing protocol employed the use of abrasive discs (Soflex; 3M-ESPE), polishing diamond burs (Komet), followed a graded sequence of silicone polishers and finishers (Astropol; Ivoclar-Vivadent). The restoration was then completed using a Diapolisher paste (GC Europe) on a felt-buff (Flexi-Buff; Cosmedent Inc) to recreate the gloss of natural enamel.



Figure 17: Immediate post-operative (Unretracted). The finished and polished G-ænial A'CHORD (GC Europe) restoration demonstrates the morphological and optical aesthetic integration of the completed restoration to the existing natural dentition.



Figure 18: Immediate post-operative (Retracted)
a) regular flash
b) polarised filter



Figure 19: 2-week review demonstrating the complete optical and functional G-ænial A'CHORD restoration on the tooth 21.



Figure 20: 2-week review demonstrating the complete optical and functional G-ænial A'CHORD on the tooth 21.

CONCLUSION

While developments in single shaded universal composite systems for the anterior dentition continue to improve and advance layering techniques for the placement of a truly aesthetic anterior direct composite restoration will always be necessary in the contemporary aesthetic dental practice. This is due to the intrinsic anatomy of the natural tooth where the emulation of the optical and morphological properties cannot be achieved by a single mass of restorative material. The G-ænial A'CHORD (GC Europe) composite system has a simplified approach to the shading/layering process while providing a final result that is truly biomimetic, aesthetic and long-lasting.