Introduction and chief complaint
A 16-year-old male patient was referred for cosmetic dental bonding. The upper central incisors (tooth #s 11 and 21) have been subjected to major trauma when he slipped and fell off a cliff at age seven. He reported multiple root canal attempts in the past with functional failure attributed to coronal leakage and recontamination, and aesthetic failure associated with dark dental staining secondary to haemosiderin retention and bacterial mass ingress. The involved teeth both had old composite restorations that were discoloured (Figure 1), uneven and unacceptable, which has caused the patient anxiety. Adding to this complexity, a repaired subgingival perforation was present in the immediate subgingival mid-buccal region, causing gingival irregularity with a recently resolved periodontal pocket. The distal aspect of tooth #21 had also been undercontoured, leaving a subgingival shelf or underhang with a deficient emergence profile. The patient desired longer, even and more attractive central incisors but had financial and residual dento-structural limitations.

Examination
1. Extraoral
The patient’s lymph nodes, salivary glands, muscles of mastication and temporomandibular joints were examined. His range of motion was 50mm, which was considered within normal limits.

2. Intraoral
A specific review of his upper anterior dental sextant revealed the deepest peritooth probing depths of this region (4mm) particularly in the distobuccal (DB) region of tooth #21. A maximum depth of 3mm was observed in all other regions measured with bleeding on probing. Compared to tooth #11, #21 had a shorter clinical crown and was in buccoversion (proclined). Hard tissue deficiency was observed subgingivally at the distal aspect of tooth #21 where the “underhang” existed, which affected the emergence profile (from DB to DL). Tooth #s 13 to 23 were not tender to percussion or palpation and exhibited no significant clinical mobility.

3. Radiographic
A periapical radiograph of the region revealed large obturation spaces and the absence of a post. A conservative preparation was suggested, which will retain the maximum amount of existing tooth structure without the need for a post. This was discussed and confirmed with the referring endodontist before proceeding.

To address the patient’s aesthetic concerns, discussions revolved around the placement of two direct, layered composite veneer restorations, which involve minimal tooth structure reduction. Width:height ratios would be improved to better approximate an 0.8:1.0 width:height ratio as per ideal proportions. Bonded porcelain restorations were also suggested, as this would have a positive effect on coronal strengthening. Although the patient and his mother were interested in this option, the patient’s desire for reparability with potential...
future accidents and financial constraints were the limiting factors. The patient decided on the placement of direct, layered composite veneers on both upper centrals.

**Procedure**

Both upper centrals were obturated using gutta percha and Roth’s sealer. The core had been restored using a Cavit liner (3M Espe) in the deeper layer and non-descript B1 flowable and B2 composites.

Following examination, diagnosis, treatment plan and informed consent, the patient was recalled for preparation and completion of direct, layered complex composite resin veneers on tooth # s 11 and 21. The patient was anaesthetised (1.5 carpsules of 4 percent Articaine (amide anaesthetic) with 1:105 epinephrine).

Prior to split dam isolation (Figure 2), the colour map was immediately charted.

A diode laser gingivectomy (Ezelase 940nm, Biolase, 1.5W continuous) was completed to remove overgrown tissue in the underhang shelf region subgingivally on the distoaxial surface as previously described (Figure 3). The laser facilitated simultaneous tissue removal and haemostasis, producing ideal conditions for bonding. This was selected because the 940nm wavelength is optimally absorbed by haemoglobin and oxyhaemoglobin. The subgingival perforation and repair can be visualised in Figure 3, along with the translucent composite used by the dentist for the previous core.

Since complete removal of the existing composite would likely result in more damage to the residual tooth structure, the preparation was stopped. Caries detector dye (Caries Detector, Kuraray) was utilised to visualise and remove residual bacterial mass, ensuring a hard, clean dentin base.

Following dry # 0 (Ultrapak, Ultradent) retraction cord placement via the continuous buccal sulcus packing technique, micro air abrasion was completed using 50 micron aluminium oxide for increased micromechanical retention (Figure 4).

Etching with 33 per cent orthophosphoric acid was completed, followed by the application of a fourth generation, three-step total etch adhesive system (Optibond FL, Kerr).

**Colour assessment** is a snapshot of the varying optical properties of the affected tooth, which is influenced by dehydration and time/ageing, and depends on five variables: hue, chroma, translucency, fluorescence and opalescence. Irfan Ahmad describes the colour match at any given time is more ephemeral rather than eternal.

Amaris TN (translucent neutral) was the shade used for this scaffold due to its milky-white translucent enamel shade.

**Secondary layer**

The goal of the next layer was to start to mask out the translucent background as best as possible with opaque dentin shades. The opacity would be positioned in a way to block out the visibility of the join lines. Failure to do this would lead to a less attractive final outcome. The limitation was the thickness and translucency of the residual core due to the past materials used.

Amaris O3 (Opaque #3) was used in the distoaxial region in the deeper layers to visualise whether this shade was adequate to match the stump shade of the tooth (Figure 6). After curing, a slightly lighter opaque shade (Opaque #2) was utilised in the superficial layers to best match the target value of the tooth (Figure 7).

The mathematical modifiability of Amaris makes direct aesthetic dentistry a breeze and a pleasure to do. This layer is important because dentin creates the basic hue of the tooth and complements the fluorescence and chromatic interpretation of the final restoration.

**Superficial dentin layer**

This layer was sculpted and burnished cervically in the marginal areas to occlude the buccal subgingival region. The incisal half was created from a second increment of Amaris O2 and burnished incisally. This layer is characterised by irregular fingers of dentin, which will form the basis of the incisal effects seen in the final product.

Lobe formation of the dentin layer is also built into this superficial dentinal layer before final curing. The next layer involves a highly-translucent shade used in the incisal fingerling and dentinal lobe areas as a space filler. The use of a clear translucent shade increases light penetration, transmission, reflection and refraction of this area in the finished result (Figure 8).
The shade is now assessed with the dehydrated shade of the adjacent teeth. Very little or no intraoperative modification is imperative once the colour map has been decided on.

The patient had requested slightly whiter teeth as he had wanted to complete vital tooth bleaching on the adjacent teeth sometime in the future.

As central incisors are often lighter than the lateral incisors by nature, we decided on placing a lighter enamel shade (TL: translucent light) instead of our initially planned shade (TN: translucent neutral). Again, Amaris’ modifiability allows value control of the fi nal product at different stages in the build-up.

Two balls of cured Amaris composite were placed on tooth 11 as an intraoperative shade guide:
- Incisal: TN (translucent neutral)
- Cervical: TL (translucent light)

TL applied by itself in a thick layer would increase the value of the tooth beyond our target shade (Figure 9). Therefore, it is important to always judge the thickness and morphology of the dentin layers from the incisal aspect. In this situation, a very thin layer of fi nal enamel-shaded composite was all that was required to build the tooth emergence profile and line angles to full profile. We decided on using TL to slightly lift the value of the dentin layer (Figure 10).

Following fi nal curing, contacts were opened using light interdental separating force (the “Mopper Pop”) and fi nished using moderate and fi ne abrasive metal strips (GC), as well as Epitex abrasive polymer strips (GC). Pencil markings were placed on the labial surface, guiding preservation of line angles and emergence profile.

Primary and secondary anatomy fi nishing was completed using coarse abrasive discs (Soflex, 3M ESPE) and fi ne needle-shaped diamond grit burs (Mani Dia-Burs). Polishing was completed using the Double Diamond two-step (Clinician’s Choice) System at 5000rpm to high shine, followed by fi nal buffing using an aluminium oxide paste (Enamelize, Cosmedent) on a felt disc (Flexibuff, Cosmedent, Figure 11).

The patient was discharged for gingival healing and fi nal composite set before recall and fi nal polishing (Figure 12 to 14).

Rationale for choice of restorative material
For the patient – a 16-year-old young man with multiple structural coronal compromises in his upper central incisors, it was important to select a composite system with both superior physical properties and an advanced shading system that would be critical in recreating the optical nuances of nature. The goal in this case is biomimicry through restoration of original tooth volume, maverick effects and anatomy.

Pascal Magne advocates bonded porcelain restorations in cases where structural coronal compromise is greater than 60 per cent of the original tooth volume. This figure represents the critical threshold of minimal crown stiffness needed for long-term performance where increased loss will require a material with heightened physical properties. A composite material is more flexible than porcelain and when used to regain stiffness in a critically weakened tooth renders it still highly susceptible to fracture.
Tooth reduction required was minimal, perhaps 15 to 20 per cent of total tooth volume. Residual tooth volume was comprised of a tight intermingling between core material and irregular tooth structure. It was thought best not to disturb this matrix as there was no evidence of deeper caries and the high risk of reducing yet even more precious dentin structure. Tooth #21 exhibited less than 40 per cent residual tooth structure, and would have been a good candidate for a bonded porcelain restoration, if financial constraints were a non-issue. Aesthetic symmetry would have been most predictable by placing a bonded porcelain restoration on tooth #11, but again was not possible. It was realised before we started that the residual stump shade would be different if the teeth exhibited intact dentin, thus rendering the flexibility of being able to modify shading intraoperatively invaluable. The solution then was to use a modern supercomposite that not only ranked highly in physical properties but also exhibited an intelligent shading concept that would allow value modification on the go.

The achromatic enamel technique according to Newton Fahl2 was utilised. A non-Vita-shade enamel layer (Amaris TN) was used, with the chroma being composed of two dentin shades (Amaris O3 and O2). The value of O3 was judged to be too low relative to our target value, hence utilising the Intelligent Shade Concept by VOCO which, in turn, was able to be modified using a dentin shade of brighter value, O2. The value was modified further by the use of a higher-value enamel layer than initially proposed (Amaris TL).

Precision of incremental layer thickness is crucial to the development of the shade match. Too thick an enamel layer will create a result with a value that was lower than intended. Too thick a dentin layer will affect value, hue and chroma. This was judged frequently and systematically from the incisal edge as volume was rebuilt.

Conclusion
The preservation of residual intact dentin volume was key in our decision to leave the bulk of the core structure intact. The use of an intelligent composite system that allows mathematical modifiability as core shade changes intraoperatively was crucial to the success of this case.

The ability to recreate lost tooth volume, contours and optical nuances using a single system with the brains to help you through unexpected aesthetic intraoperative hurdles really does make Amaris a modern supercomposite and a key instrument in the modern, conservative aesthetic dentist’s arsenal. Featuring one of the most highly polishable surfaces in combination with minimal surface roughness and three-body abrasion features, this will provide the patient with a functional and ultra-aesthetic result that lasts.

Amaris is a formula for predictability in difficult anterior aesthetics, as well as the simple equation that will keep our patients smiling long into the future.

References