Improved longevity and aesthetics in Class IV restorations

A clinical case involving Tetric N-Ceram and FRC Postec Plus from Ivoclar Vivadent

Truamas and injuries in anterior teeth are common in young people and those active in sports and other physical activities. Treating such injuries with predictable, conservative and natural looking restorations is of primary concern for aesthetically conscious dentists. A new generation of nanocomposite restorative materials and adhesives is helping clinicians to place composite restorations in Class IV fractures conservatively. These materials provide restorations that closely resemble the form, function and aesthetic properties of natural teeth.

Many factors contribute to the appropriate design and material choice for the restoration of an anterior tooth, such as the patient’s age, occlusion, habits and aesthetic preferences. Laborator-fabricated restorations and chairside direct restorations offer unique advantages, which should be considered by both the patient and dentist.

This article presents a clinical case in which Tetric N-Ceram (Ivoclar Vivadent), a modern nanocomposite resin restorative, was used in conjunction with FRC Postec Plus (Ivoclar Vivadent). A glass-fibre-reinforced composite post, to achieve enhanced longevity, composite retention and superb aesthetics in an extensive Class IV restoration on a 15-year-old male patient. The young man presented with a large fracture of the right and left maxillary central incisors after a sports injury (Fig. 1). Intra-oral, peri-implant radiographic findings revealed pulp exposure. Immediate endodonic treatment was planned and completed in the same visit to relieve the patient of pain. In addition, impressions of both arches were taken to restore the patient’s smile line.

As the patient was young, the practitioner considered the patient’s aesthetic appearance to be of particular concern. Consequently, different treatment options such as direct and indirect restorations were discussed.

After the models had been prepared, a diagnostic wax-up was created (Fig. 2) and a high viscosity, silicone putty matrix was prepared. The putty matrix, once placed in the patient’s mouth, was used for spatial reference as a volumetric, 3-D guide for the placement of the composite restorative and to preserve the facial/lingual line angles.

Fig. 1: Initial situation after endodontic treatment completed on teeth #1 and 2.

Fig. 2: Wax mock-up done on a stone plaster model.

Fig. 3: Tooth preparation with a long wave bevel and a short bevel.

Fig. 4: FRC Postec Plus post cemented with Multilink Automix resin cement.

Fig. 5: Silicone putty matrix prepared from the wax-up on the stone model placed and Tetric N-Flow in shade A1 placed on the palatal surface.

Fig. 6: FRC Postec Plus post cemented with Multilink Automix after following a proper adhesive protocol, also a chamfer prepared on the palatal surface.

Fig. 7: Enamel and dentine surfaces with N-Etch.

Fig. 8: Adhesive bonding application with Tetric N-Bond using the VivaPEN for 20 seconds.

Fig. 9: Silicone putty matrix prepared from the wax-up on the stone model placed and Tetric N-Flow in shade A1 placed on the palatal surface.

Fig. 10: The first layer of Tetric N-Ceram in shade T1 placed on putty matrix and the completed scaffold.

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Treatment procedure

The patient opted for a restoration involving a direct composite layering technique and glass-fibre post placement for better composite retention. The composite shade was selected and a shade map for the layering technique was designed. In addition, the length and size of the glass-fibre post FRC Postec Plus were determined using post-operative, intra-oral radiographs.

The putty matrix was tried in the patient’s mouth for lingual and incisal fit. A bevel was prepared along the fracture line in the dentine using high-speed diamond burs and extended as a chamfer preparation on the palatal surface. A short bevel was prepared along the fracture line in the enamel on the labial surface (“wave bevel”, Fig. 1). In order to achieve an additional blending of margins and increase the micromechanical bonding, the bevel was extended further to roughen the enamel. Under local anaesthesia, a size 2 FRC Postec Plus post was placed after completing the drill protocol to remove the gutta-percha material and widen the root canal to allow proper fit of the post. An intra-oral radiograph was taken to ensure optimum fit of the determined post length. After using 58% phosphoric acid (N-Etch, Ivoclar Vivadent) for better retention of the post, placing it with Monosound-S (Ivoclar Vivadent) and applying Multilink Primer A and B (Ivoclar Vivadent) to the root, the post was cemented in place using Multi-link Automix resin cement (Ivoclar Vivadent; Fig. 4).

Following this procedure, N-Etch was applied to the enamel for 20 seconds and to the dentine for 5 to 10 seconds (Fig. 1). The acid etchant was then removed with copious amounts of water and the moisture with a slow stream of air. The adhesive Tetric N-Bond (Ivoclar Vivadent) was applied using the VivaPEN (Ivoclar Vivadent) and brushed in for at least 10 seconds (Fig. 6). The solvent of the bonding agent was removed with a gentle stream of air and light-cured with a bluephase C8 curing light (Ivoclar Vivadent) using the low start programme.

The silicone putty matrix was placed on the teeth and a first increment of a flowable composite resin, Tetric N-Flow in shade A1, was applied to the palatal chamfer area in order to achieve a tight seal (Fig. 7). Then, the material was polymerised. A thin layer of Tetric N-Ceram composite resin in shade T1 was placed on the putty matrix and polymerised using the Soft Start Mode of the bluephase C8 light in order to reconstruct the missing palatal and incisal shelf. A further thick layer, 1 to 1.5 mm of the same shade T1 was placed on the entire incisal edge to create a halo effect in the incisal area of the final restoration.

The silicon putty matrix was removed, as the scaffolding had been prepared on the palatal and incisal morphology (Fig. 3). Tetric N-Ceram in dentine shade A 5.5 was placed on the entire fracture line. This opaque dentine layer helped to hide the demarcation line between the tooth surface and artificial composite resin restoration. After light-curing this layer, another substantial layer of dentine shade A 3.5 was applied in the shape of the natural dentine mamelons using OptraSculpt instruments (Ivoclar Vivadent) to replace the lost dentine structure in this area and light-cured (Fig. 9). Tetric N-Ceram in shade T1 was placed in a thin layer between the mamelons and spread evenly with the OptraSculpt tips and a single-use brush. After polymerising this layer, a sublayer amount of Tetric Color in shade blue (Ivoclar Vivadent) was placed between the mamelons with a thin 0.8 mm endodontic file and spread evenly with a fine single-use brush.
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This material was polymerised for 20 seconds using the SOF mode of the bluephase to achieve incisal edge characterisation and natural translucency in the enamel area (Fig. 10). Tetric N-Ceram in enamel shade A1 was prepared in the shape of a ball and placed over the middle third area, spread evenly with OptitraSculpt and blended smoothly again using a single-use brush (Fig. 11). After light-curing the last layer, Tetric N-Ceram in shade T was prepared, placed at the centre of the labial surface and evenly and smoothed with the single-use brush (Fig. 12).

While contouring the last two layers, the mesial and distal line angles, as well as incisal margin were reconstructed. Furthermore, the practitioner took care of the contact points and embrasures. Final light-curing was performed on both the labial and palatal surfaces using the intensity programme of the bluephase C8 light for 20 seconds each time. Excess composite was removed with a #12 scalpel blade. The labial and palatal surfaces were contoured with medium-grit discs, diamond finishing burs and interproximal finishing strips. At this stage, special care was taken to preserve the contours and surface characteristics. Proper occlusion was verified in centric occlusion and excursive movements. Final finishing and polishing were achieved with the Astrotop three-step finishing system (Ivoclar Vivadent). Astrotop grey cups were used at slow speed with water-cooling to ensure an improved natural texture (Fig. 11). In the next step, Astrotop green finishing points were used at slow speed with water-cooling for initial polishing (Fig. 14). Finally, the pink Astrotop finishing cup was used at slow speed without water-cooling to impart a shiny lustre to the final restoration (Fig. 15). The final ultimate gloss on the restoration was achieved using Astrobrush (Ivoclar Vivadent) at slow speed (Fig. 16).

Conclusion

Traumatically damaged teeth can be restored effectively with beautiful and natural-looking restorations. In this case, good results were achieved by combining the excellent physical and aesthetic properties of the latest-generation nano-composite, Tetric N-Ceram, with an FRC Postec Plus glass-fibre post (Fig. 17). Proper planning by the clinician in selecting compatible materials and meticulous execution of the treatment plan yielded highly aesthetic results. The patient was amazed to see his beautiful smile restored in just a few hours.

A list of references is available from the publisher.

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