# FujiCEM Evolve as innovative resin-modified glass-ionomer cement for zirconia restorations: a case report

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Due to the increasing patients' demand for aesthetics and its optimal biomechanical and optical properties, zirconia is widely used in prosthodontics as a material of choice for indirect ceramic restorations [1-4]. Recently, cubic translucent zirconia has been introduced in the market to improve the optical characteristics and reduce material ageing [3,5,6].

Due to the absence of any glassy matrix, zirconia is free from silica and, consequently, cannot be conditioned with conventional acid etching techniques [1,7,8]. Several surface treatments were suggested in the literature but to date data are still controversial [9,10]. On the basis of the physical-chemical properties of zirconia, in the presence of retentive preparation geometries and full coverage prostheses, conventional water-based luting agents (i.e. glass ionomer and zinc phosphate cements) and hybrid cements (i.e. resin-modified glass ionomer cements) should be considered the first choice materials for cementation [9,11,12].

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## Case history

A 43-year old male patient treated and stabilised for a previous severe chronic periodontitis asked for the aesthetic rehabilitation of both dental arches, complaining about aesthetic as well as functional problems (Figs. 1-2). After achieving good occlusal stability and proper vertical dimension of occlusion by means of implant-supported metal-ceramics single crowns in the posterior regions, a careful evaluation of the maxillary front teeth was performed, in order to formulate a proper biomechanical and aesthetic treatment plan. Particularly, the patient presented with the following problem list: diastema, tooth wear, high caries activity, moderate staining, unsatisfactory composite restorations, altered interdental proportions, gingival recessions and moderate bone resorption (Fig. 3).


**Fig. 1:** Extraoral pre-operative view.


**Fig. 2:** Intraoral pre-operative view.


**Fig. 3:** Pre-operative detail of the maxillary front teeth.

## Treatment

According to the patient's requests and taking the aesthetic needs and biomechanical drawbacks of the case (i.e. deep bite, long lever arms) into consideration, 6 cubic translucent zirconia single crowns were planned, in order to achieve a natural tooth-like appearance of the restorations and optimal mechanical resistance during function.

Minimally invasive vertical tooth preparations were performed on the maxillary front teeth, removing the previous composite restorations and secondary decays and keeping satisfactory total occlusal convergence. The prosthetic margins were iuxtagingivally placed and all the teeth were kept vital (Figs. 4-6). Temporary acrylic resin restorations were used for 3 weeks to allow the soft tissues to recover from preparation and impression procedures.


**Fig. 4:** Maxillary front teeth preparations for single crowns.


**Fig. 5:** Detail of the right side tooth preparations.


**Fig. 6:** Detail of the left side tooth preparations.

Subsequently, 6 cubic translucent zirconia single crowns were fabricated (Fig. 7). The buccal surfaces were layered with a dedicated veneering ceramics, so as to extol the aesthetic appearance, whereas the palatal functional aspects were left in the monolithic configuration and glazed, in order to avoid any risk of chipping. Because of the excellent biocompatibility of zirconia, the prosthetic iuxtagingival margins were manually polished and left unglazed to promote the formation of an epithelial attachment and optimise the biological integration of the restorations.

The inner zirconia surface of each crown was conditioned with mild sandblasting using 110 µm alumina particles at 0.2 MPa. An innovative paste-paste resin-modified glass ionomer luting agent (FujiCEM Evolve)


**Fig. 7:** Layered cubic zirconia anterior single crowns. A: internal view; B: buccal view.


**Fig. 8:** Maxillary central incisor zirconia crowns filled with resin-modified glass-ionomer cement.

was used to cement the restorations (Fig. 8). As this type of luting agent does not require complete field isolation and allows to perform a conventional cementation procedure, PTFE tapes were used to protect the adjacent teeth (Fig. 9). After seating the restorations, cement gelification was achieved by means of light-curing; this passage is not mandatory but allows for a faster setting of the luting agent. Then, cement excess was removed with a urethane dimethacrylate curette, in order not to damage the glazed surface of the ceramic crowns (Fig. 10), and dental floss was used to clean the interproximal spaces (Fig. 11). The same approach was used to cement the zirconia crowns onto lateral incisors (Fig. 12) and canines (Fig. 13). Finally, post-curing was performed after applying an oxygen barrier so as to achieve complete setting of the cement at marginal level (Fig. 14).


**Fig. 9:** PTFE- assisted cementation of the maxillary central incisors.


**Fig. 10:** Cervical cement excess removal from central incisors.


**Fig. 11:** Interproximal cement excess removal from central incisors.


**Fig. 12:** PTFE- assisted cementation of the maxillary lateral incisors.


**Fig. 13:** PTFE- assisted cementation of the maxillary canines.

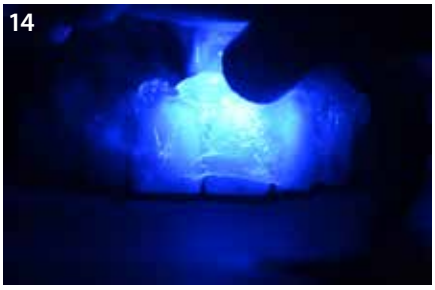


**Fig. 14:** Light-curing of the prosthetic margins of the zirconia crowns through the oxygen barrier.

Thanks to the excellent biocompatibility of zirconia, to the precision of the prosthetic margins and to the optimal performance of FujiCEM Evolve, 2 weeks after cementation the aesthetic and biological integration of the zirconia crowns was ideal, with good recovery of the gingival health and proper periodontal maturation (Figs. 15-17).
Due to economic reasons, the patient decided to have the severely worn and malpositioned mandibular front teeth (Fig. 18) restored with composite restorations. Consequently, the area was restored by means of direct restorations applied using the flowable composite (G-ænial Universal Flo) injection technique (Figs. 19-20).

Proper dynamic and occlusal functions were restored and carefully checked (Figs. 21-23). Moreover, the final outcome showed a good aesthetic


**Fig. 15:** 2-week soft tissues healing after cementation: front view of the cubic zirconia single crowns.


**Fig. 16:** Post-operative right side detail of the cubic zirconia single crowns.


**Fig. 17:** Post-operative left side detail of the cubic zirconia single crowns.


**Fig. 18:** Pre-operative view of the mandibular front teeth.


**Fig. 19:** Restoration of the mandibular front teeth by means of the composite injection technique with G-ænial Universal Flo.


**Fig. 20:** Post-operative view of the mandibular from teeth restored with injected direct composites.


**Fig. 21:** Post-operative view: layered cubic zirconia single crowns at the maxillary arch and injected direct composite restorations at the mandibular arch.


**Fig. 22:** Functional occlusal check at the maxillary arch.


**Fig. 23:** Functional occlusal check at the mandibular arch.


**Fig. 24:** Extraoral post-operative view.

restoration of the patient's smile line (Fig. 24).

## Outcome

Different advantages were noticed using FujiCEM Evolve, like ease of use (the possibility to use the automixing dispenser makes cement application very slightly dependent on the operator's skill), moisture tolerance (ideal in the presence of iuxta- or sub-gingival margins and requiring no isolation) and versatility (suitable for different restorative materials). Particularly, in the present case this luting agent was used to cement both zirconia crowns in anterior areas and metal-ceramics crowns onto posterior implants, showing the same flowability and easiness in cement excess removal, due to its user-friendly rubbery consistency, very useful to avoid the entanglement of any particle within the soft tissues.

Furthermore, no ceramic pre-treatment is mandatory before the application of the cement and the dual-curing technology allows for a faster setting using light-polymerisation.

Thanks to its innovative features, FujiCEM Evolve allowed to avoid any post-operative sensitivity and its radiopacity makes the identification of possible sub-gingival excess very easy.

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