

## Case Report

# Direct composite coronal reconstruction of two fractured incisors: an 8-year follow-up

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**Abstract** – Dental fractures of the anterior teeth are a relatively frequent accident during childhood. However until maxillary maturation is completed, the employment of porcelain crowns is not recommended, the treatment of choice, instead, would be direct composite restoration. The procedure for restoration of two extensive superior central incisor fractures is presented. Composite crowns were customized directly over the teeth. Root canal treatment was performed in one of the pieces and subsequently a post was cemented, around which a composite core was constructed. Acetate crowns were filled with composite, adapted to the dental contour and photo cured before removal to reproduce the anatomy. After follow-up of 8 years restorations remained esthetic and fully functional.

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Dental traumatic injuries are a frequent occurrence during childhood, affecting about 13% of the population under 12 years old. Of these fractures, 70% are superior incisor coronal fractures without compromising the root (1–4).

Several factors must be taken into consideration when choosing a treatment for this kind of fracture in a child. First, it is important to remember that maxillaries are not completely developed, and that the pulp chambers are occupying a greater volume. Second, the teeth are neither totally erupted nor in their final position, therefore rehabilitation with a ceramic crown should be ruled out as a therapeutic alternative. Third, dental grinding can compromise pulpar vitality, and dental eruption would expose the crown-dental junction. For all these reasons, the use of ceramic crowns should be considered only when dental and maxillary development are complete.

When fractures result in a large, if the fractured fragment were available, conservation of the dental sandwich technique would be a recommended

procedure (5), although the survival rate of repositioned fragments is low after 2 years (6). If the lost fragment is not recovered, or it is inadequate for repositioning, it would be advisable to use composite reconstruction. Although composite restorations tend to degrade with time, losing their esthetic properties, they are, however more resistant long-term (7).

In this article direct composite reconstruction of an uncomplicated crown fracture, with a loss of dental tissue, is presented.

## Case report

A 10-year-old patient attended our clinic because of a trauma that caused a fracture in the mesial angle of the maxillary left central incisor that affected enamel and dentine, and a horizontal fracture of maxillary right central with a pulp exposure (Figs 1 and 2). A periodontal and radiographic examination was performed and ruled out any root fractures. Because of the fact that lost fragments were not



Fig. 1. Superior central incisor, preoperation view in a 10-year-old male.



Fig. 2. Incisal view. Pulpal implication of fracture clear in superior right central incisor.

recovered, and bearing in mind the patient age, we considered composite reconstruction as the best therapeutic option.

Once anesthesia was administered the area was isolated using a mouth opener, cotton rolls and a dressing over the tongue to decrease humidity. Dental dam was ruled out in order to assure a better access to the gingival level.

Initially, color was determined, and for that, in the gingival, middle and incisal areas small quantities of different colors of composite were placed and cured as a color determination method. The colors chosen were A3 for the cervical third and A2 for the middle and incisal thirds (Herculite XRV, Kerr Corporation, Orange, CA, USA). Using a brush in counter-angle hand piece, the surface was cleaned with pumice stone powder. In addition, an extensive bevel was performed to increase adhesion surface and improve esthetics. A cellulose acetate crown (Frasaco, Franz Sachs & Co., Tettang, Germany) was selected to reproduce the original anatomy of the tooth, and was customized to remaining dental tissue.

Enamel and dentine were etched with orthophosphoric acid 35% for 20 s, then followed extensive washing with water spray, accompanied by high volume suction, in order to eliminate excess water and maintain a slightly humid surface. A mono-component adhesive (Prime & Bond 2.1, Dentsply, Konstanz, Germany) was applied strictly following the manufacturer instructions. Composite was introduced in the interior of the crown by means of a tip-gun, with care taken to avoid leaving bubbles, particularly around the incisal angles. Initially, incisal and middle zone of the crown were filled with the color previously selected for that area (A2), followed by (A3) for the cervical area so that when the crown was placed on the tooth composite would be mixed to create a soft transition from one color to the other. Once the crown was adapted to the teeth, orientation and position were verified and excess composite was eliminated, next, photo-curing was applied towards both surfaces of the teeth. The acetate crown was removed with a probe.

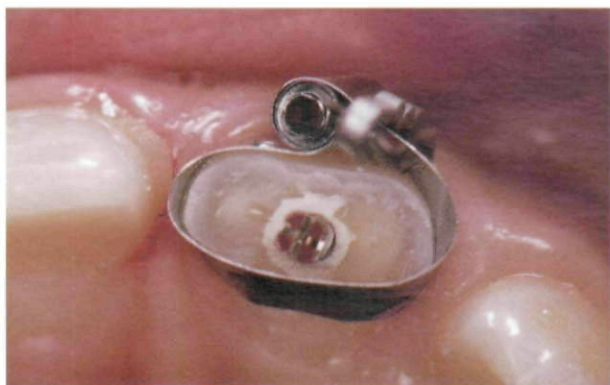
With the excess removal and proper polish, a uniform and continuous surface in the tooth-restoration junction is obtained, without any irregularities that would contribute to the accumulation of plaque. For that task a carbide multiblade bur is ideal, preferably with a worn edge that would allow a gradual wear out of the composite avoiding irregularities in the cement or the restoration. A probe was run over the cervical area to assure uniformity of the surface. For the labial surface polish discs were used, along with polish strips for the interproximal surface (Sof-Lex, 3M ESPE Dental Products, St Paul, MN, USA) (Fig. 3).

For the upper right central a root canal treatment was performed and in the following visit a titanium-prefabricated post (Unimetric, Dentsply, Ballaigues, Switzerland) was cemented using glass ionomer (Fuji I, GC Corporation, Tokyo, Japan). The post must



Fig. 3. Reconstruction of left central incisor. Transparent acetate crown used as a matrix.





*Fig. 4.* Unimetric® post (Dentsply) cemented in right central incisor using glass ionomer. Automatrix® (Dentsply) surrounding tooth used to construct composite core.

take up two thirds of the root, leaving 3–5 mm of gutta-percha in the apical zone.

Because of gingival proximity of the fracture the restoration was practiced in two steps. First an Automatrix® (Dentsply Detrey, Konstanz, Germany) was adapted to perform a core of opaque composite (Fig. 4). Subsequently and after removal of the matrix, the composite core was prepared ensuring a wide bevel that entailed the composite core and the remaining enamel (Fig. 5).

Etching was applied once more and followed by adhesive. The remaining procedure was similar to that practiced on the left incisor. An acetate crown was trimmed in the same manner as that used for the upper left central. An intimate adaptation to the gingival contour of the tooth, as well as, an adequate height of the incisal board, is crucial. It is recommended that the resulting composite crown be slightly bigger than the definitive crown so that by means of polish, shape can be adjusted and possible pores eliminated from the incisal board. A bur is used to customize a hole to allow the excess composite to flow out. The crown is filled with



*Fig. 5.* Opaque composite core on top of which direct reconstruction will be realized.

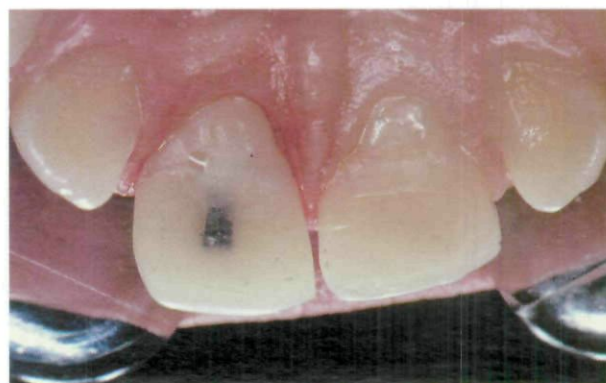


*Fig. 6.* Cellulose acetate crown filled with composite and situated in its position, the over flow of composite is eliminated before final curing.

composite and immediately after, an instrument is introduced to allow some space for the remaining tissue, whilst avoiding the excessive outflow of composite in the cervical region (Fig. 6). Once the crown is placed with the adequate orientation excess composite is removed through the aperture in palatine and gingival surface of the acetate crown. After withdrawal of the acetate crown a



*Fig. 7.* Finished restoration of both superior central incisors.



*Fig. 8.* Palatine view of both restorations. Integrated post can be appreciated.





Fig. 9. General aspect of reconstruction immediately after rehabilitation.

gingival contour polish is performed using multi-blade carbide burs. In addition, fine grain polish discs were used to obtain the ultimate shape of incisal edges and angles (Sof-Lex, 3M ESPE Dental) (Figs 7–9). A few days later the restoration is revised to verify gingival health and correct possible esthetic and polishing defects that might have occurred.

A year later the patient returned for a review examination. The restorations were found to be in excellent condition, although a slight gingival inflammation was noticed in the papilla, between the central incisors, caused by a composite irregularity detected in the area (Fig. 10). Fine polish strips were used to reduce the surface and promote healing of the papilla. The maxillary and dental maturation had closed the incisor diastem and slightly inclined the upper right central.

In the following annual check-up no significant alterations were detected, although, a slight polish of the labial surface was necessary to eliminate small irregularities that had developed in the surface. Seven years after the first visit the patient developed pulpitis in the maxillary central left incisor that



Fig. 10. One-year control examination. Slight gingivitis in papilla between central incisors is obvious. Found to be because of polish defect and subsequently eliminated using polish strips.

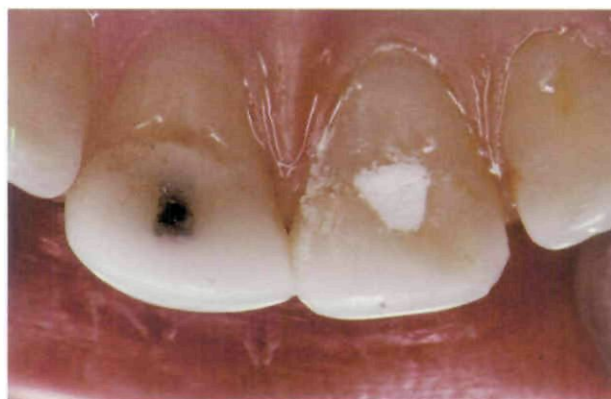


Fig. 11. Composite clearing out, along with, a staining of the interface (composite-teeth junction) is observed. In teeth 12, opening for the root-canal treatment.

required root canal treatment and the cementation of a titanium post (Fig. 11). The possible causes of this rather late pulpal inflammation were not clear, but marginal filtration in the restoration might be a possible cause.

## Discussion

Despite the fact that the restoration was projected as a temporary treatment whilst awaiting an adequate maxillary growth of the patient, the durability of the treatment confirms that with proper case selection, this kind of treatment may be feasible in the long-term (Fig. 12) (7).

The attachment of the fractured fragment of the teeth following the sandwich technique, described by Simonsen (5), represents a very successful fragment repositioning system with excellent esthetic properties. However, carrying out this technique presents crucial difficulties, including a very demanding dentin casting process, and a complex fragment alignment task, particularly at the interproximal level. Recent studies have proved that it



Fig. 12. Eight years, most recent follow-up photograph with a fully normal and functional aspect of restoration.

presents inferior longevity compared with composite restorations (6).

The functional behavior of a porcelain crown, from an esthetic and mechanical point of view, is superior to a composite (8), but it is contra-indicated in a child at the age of 11, with an immature dental and periodontal system. In addition, composite crowns can be easily repaired, reconditioned or even replaced. Composite crown cost is minor and never rules out the use of porcelain crowns in the future. It is important to note that this clinical procedure could be enhanced if we can rely on broader variety of sizes and forms of preformed acetate crowns.

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