

# The Reference Guide: A Step-by-Step Technique for Restoration of Fractured Anterior Permanent Teeth

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*“Clinical Showcase” is a series of pictorial essays that focus on the technical art of clinical dentistry. The section features step-by-step case demonstrations of clinical problems encountered in dental practice. If you would like to propose a case or recommend a clinician who could contribute to this section, contact editor-in-chief Dr. John O’Keefe at [jokeefe@cda-adc.ca](mailto:jokeefe@cda-adc.ca).*

Dental trauma in children, caused mainly by falls during recreational and sporting activities, as well as car crashes and acts of violence,<sup>1</sup> can be regarded as a public health issue.<sup>2</sup> Greater-than-normal dental overjet and inadequate lip coverage are predisposing factors.<sup>3</sup> The most common consequence of hard-tissue trauma is uncomplicated crown fracture,<sup>4</sup> and among children 6 to 15 years of age the incidence of this type of trauma ranges from 15% to 79.6%.<sup>2,3,5,6</sup> The central superior incisors are the most vulnerable teeth,<sup>2,3,5-7</sup> especially among boys.<sup>8,9</sup>

The main techniques for reconstructing fractured teeth include the use of direct adhesive restorative materials. However, this type of treatment is time consuming and requires a skilled operator who has complete mastery of the restorative mate-

rials. An alternative to the direct restorative technique is the use of a reference guide.

This paper offers a step-by-step description, based on a specific case study, of a reference guide technique for restoration of permanent superior incisors fractured through trauma.

## Case Study

A 9-year-old girl, accompanied by her guardian, attended the odonto-pediatrics clinic with esthetic concerns related to dental fractures caused by a fall from a bicycle.

Other aspects of the patient’s medical history did not reveal anything of relevance.

An oral examination showed that oral hygiene was good and caries were absent. The patient had Class II molar relation, an anterior open bite and overjet of 4 mm,



**Figure 1:** Frontal view of uncomplicated crown fractures of teeth 11 and 21 (horizontal and oblique fractures of the enamel and dentin).



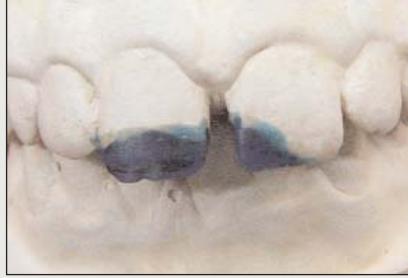
**Figure 2:** Occlusal view of the crown fractures.



**Figure 3:** Initial periapical radiograph shows no pathological conditions in the pulpal or periodontal tissues of the fractured teeth.



**Figure 4:** A model was constructed with an alginate mould during the first consultation.



**Figure 5:** The model was waxed to rebuild the size and shape of the fractured teeth.



**Figure 6:** The model was moulded with a heavy silicon base to obtain the reference guide.



**Figure 7:** Occlusal view of the reference guide.



**Figure 8:** Selection of restorative material (l. to r.: A3 TPH Spectrum, Dentsply; A2 Durafill and Charisma, Kulzer).



**Figure 9:** Selection of colour by means of a mockup selection system.



**Figure 10:** The reference guide was divided into 2 halves, vestibular and palatal.



**Figure 11:** The palatal portion of the reference guide was fitted to the palatal surface of the teeth, to serve as the matrix.



**Figure 12:** Pumice stone and water were used to remove dental plaque.

and uncomplicated horizontal and oblique crown fractures in teeth 11 and 21 (Figs. 1 and 2). A periapical radiograph (Fig. 3) revealed no pulpal and radicular involvement. Therefore, the clinician chose to use a reference guide restorative technique.

A model was constructed (Fig. 4) in which the fractured teeth would be reconstructed by means of progressive waxing (Fig. 5). After that, another mould with a heavy silicon base was made (Fig. 6), reproducing the shape and contour of the needed restorations (Fig. 7). The

restorative material and colour were selected (using a mockup colour selection system) (Figs. 8 and 9) and noted in the patient's record.

During the next session, the mould of the reconstructed teeth was cut into 2 halves (Fig. 10). The palatal portion of the mould fit perfectly the palatal aspect of the teeth to be reconstructed, thus serving as a reference guide (Fig. 11).

Total isolation of the teeth was followed by treatment with pumice stone and water to remove plaque (Fig. 12). The area was then



**Figure 13:** After etching conditioning with 35% phosphoric acid, the bonding system was applied according to the manufacturer's instructions.



**Figure 14:** Restorative material was applied on the palatal portion of the reference guide.



**Figure 15:** The guide and the restorative material were adapted on the palatal face of the teeth.



**Figure 16:** The initial palatal portion of the restoration was easily created after the photopolymerization.



**Figure 17:** The crown was reconstructed in 2 incremental layers using a restorative technique.



**Figure 18:** Final view of the restoration after 3 months.

washed with a physiological solution; there was no cavity preparation. The adhesive protocol was performed according to the manufacturer's specifications (Fig. 13). A3 TPH Spectrum restorative material (Caulk Dentsply, Konstanz, Germany) was applied to the palatal portion of the reference guide (Fig. 14), and incisal Charisma restorative material (Kulzer, Hanau, Germany) was applied to the incisal portion. The reference guide was then fitted to the palatal surface of the teeth (Fig. 15), and photopolymerization was applied for 40 seconds (Fig. 16). A2 Durafill VS restorative material (Kulzer) was used for restoring the vestibular surface (Fig. 17). Finishing, polishing and adjustments were performed with a scalpel blade, multilaminated drills, abrasive straps and polishing paper disks.

The patient and guardian received instruction on postoperative care and were alerted to the importance of using a mouthguard and the need for orthodontic treatment. The first follow-up appointment took place 3 months later

(Fig. 18), and subsequent follow-up will occur at yearly intervals.

### Discussion

Direct adhesive restorations are commonly used for the reconstruction of uncomplicated crown fractures, as in the case of fracture of the enamel and dentin without pulpal involvement.<sup>2,3,5</sup> However, the ideal for this type of reconstruction is to reattach the dental fragment by bonding. In the case presented here, the patient no longer had the dental fragments, and the dentist had to reconstruct the fractured area with composite resin. The patient had 2 teeth that needed restoration, so a reference guide technique was used to ensure optimal outcome.

The restorative technique used in this study facilitates the reconstruction of fractured anterior teeth. A reference guide is created from the teeth (as reconstructed in a model), which makes it possible for the clinician to increase the chance of success by planning the procedure in detail. The size, shape, inclination and colour of

the teeth are determined in advance, which reduces the need for eventual adjustments. Another advantage is that the restorative procedure can be carried out in 2 short clinical sessions, with a drastic reduction in chair time; this factor is important to ensure the child's cooperation. In addition, use of a reference guide makes it possible for 2 or more teeth to be restored simultaneously; in contrast, with the conventional technique, the second restorative procedure can begin only when the first one is complete (to guarantee total recovery of the contact point). Besides functioning as a matrix for reconstructing the anatomy of the teeth, the reference guide functions as a baffle plate to hold the restorative material, facilitating its insertion into the area to be reconstructed. The method does have limitations, however: moulds are needed, and progressive waxing of the fractured teeth must be performed, which demands additional materials and steps not directly related to the creation of the direct adhesive restorations. ✦

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