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Direct anterior composite restoration – a predictable outcome: case report

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Abstract

In accidents, anterior teeth frequently get injured. In such cases composite restoration can be used as a minimally invasive approach. For a predictable result, it is recommended to use a wax-up and a silicon index as guides to create the correct shape of the incisal. The right matrix system helps reproduce the approximal surface. For an aesthetic outcome, an anatomic layering technique should be used to create the correct optical effects of a natural tooth. Finally, finishing and polishing is responsible for the surface texture and life-like reflection.

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INTRODUCTION

A twenty-five-year-old female patient contacted me after she had fallen and fractured her central incisors in a bicycle accident a few days before (Figure 1). Tooth 11 was fractured almost horizontally while on tooth 21 fracture of the mesial corner was observable (see Figure 2). A palatal view revealed exposure of the dentin of both teeth but the fracture line ran more incisal to the pulp horns (Figure 3). By conducting additional examinations, root fracture was ruled out. During the sensibility test the teeth gave a similar response to cold as the reference teeth.

The patient brought along a larger fragment (Figures 4 and 5) which could have provided a basis for a perfect incisal edge restoration. However, due to the absence of several smaller parts, the fragment could not be reattached to the remaining tooth structure.

Fig. 1. **The patient's smile with fractured teeth**

Fig. 2. **Front view of the fractured incisors**

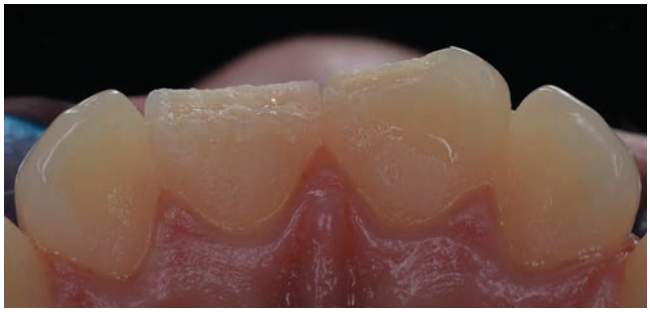

Fig. 3. **Palatal view of the fractured teeth**

Several methods are available for treating fractured anterior teeth, depending on the extent of missing tooth structure, involvement of the pulp, the requirements of the patient, and the manual dexterity and technical knowledge of the attending medical practitioner. Some of these circumstances are a given as the accident has already happened, however, some factors actually do depend on the practitioner administering the treatment. Despite the nil nocere principle, many use diamond burs to grind two teeth – even though only one may have been injured – for the sake of symmetry, passing on the aesthetic challenge to dental technicians. And yet, considering the features of modern materials, using the appropriate technique, lifelike direct restorations can be built up from composites. Such restorations do not only serve the aesthetic aim of substituting missing dental structure but are also fully functional due to the adhesive technique. Contrary to a common belief, there is therefore no need for parapulpal pins either.

PROTOCOL

After taking the patient's medical and dental history and examining her, possible treatment options were discussed. Freehand restoration would have been an immediate – even though a compromise – solution.

Fig. 4. **Buccal view of the fragment**

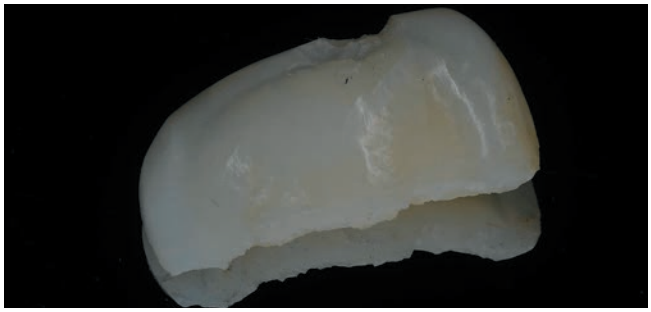

Fig. 5. **Palatal view of the fragment**

Restoration using an index would have required several appointments. Although most patients understandably want to eliminate such a major aesthetic issue affecting their anterior teeth as soon as practicable, the young lady in this case opted for the solution providing a more durable and aesthetic long-term result, even though this meant that she was going to receive final treatment only later.

As a first step, impressions were taken of the mandible and the maxilla. This ensures an aesthetically successful and functionally correct wax-up on the properly articulated models (Figure 6 and 7). A silicone index is made based on the wax-up and cut along the incisal edge. Owing to this step, the functional (palatal and incisal) surfaces of the incisors can be easily transferred into the mouth instead of having to design them directly based on a mirror image. Accordingly, a dental technician can provide valuable help in designing these surfaces in the form of an appropriate wax-up and silicone index (Figures 8 and 9). The wax-up made in this case was the work of dental technician Tímea Toboz (Interdental Studio).

Selection of the materials to be used is another significant part of treatment planning. It is a common fact that the dehydration of isolated teeth starts already after a few minutes, resulting in a change of colour. Therefore, tooth colour should be defined at the very beginning of treatment. It is best to place sample amounts of the composite materials to be used on the appropriate parts of the tooth to be treated. As the incisal edge consists mainly of enamel the coloured enamel materials found matching should be applied in this area, while dentin composites should be placed in the mid-cervical area which is more decisive in the shade of the dentin. Considering that upon polymerisation the optical features of most composite filling materials change to a certain degree, it is recommended to decide for the optimal combination of materials only after exposure to light (Figure 10). For analytical purposes, photos may be taken using a polarising filter as well (Figure 11). Special lamps designed for colour definition may provide additional help. An optimal source of light and a polarising filter facilitate the selection of composite materials of the right shade. In our case, Rite Lite 2 was used (Figure 12). It requires great self-discipline to closely follow the recipe developed this way in the face of dehydration during restoration.

As an adhesive technique is used, proper isolation is indispensable. In order to provide easy accessibility, the rubber dam is applied in this case from premolar to premolar. Floss ligatures may be used for extra retraction at the teeth treated (Figure 13). After isolation of the teeth, irregularly fractured and unsupported enamel rods were smoothed and a so called mini-chamfer finish line was prepared (Figure 14). As a result, a greater surface is available for adhesive bonding to the enamel with high bond strength. In addition, the line between the natural tooth structure and the restoration is less visible.

After appropriate pre-treatment for adhesion, the previously mentioned silicone index (Figure 9) was used to

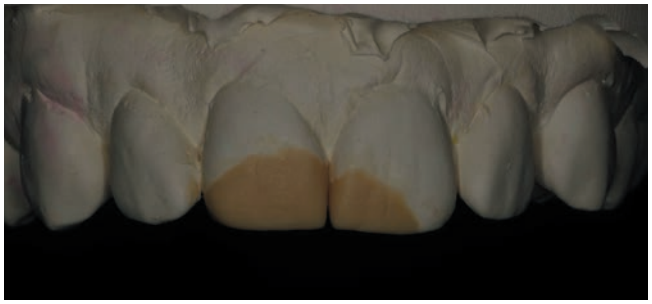

Fig. 6. **Labial view of the wax-up (made by Tнmea Toboz, dental technician of Interdental Studio)**

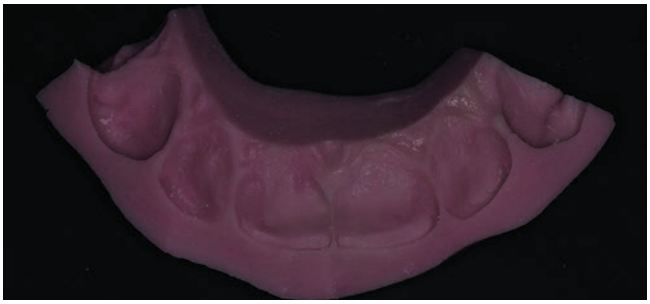

Fig. 9. **Prepared silicone index**

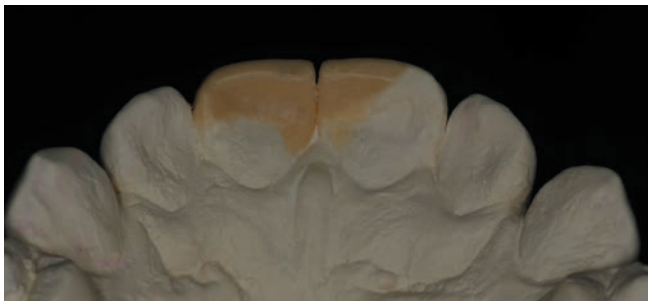

Fig. 7. **Palatal view of the wax-up**

Fig. 10. **Composite samples on the fractured teeth**

Fig. 8. **Silicone index on the wax-up**

Fig. 11. **Image recorded using a polarising filter for tooth colour analysis**

create the palatal section of the enamel, the incisal contour and the distal margin of tooth 11 (Figure 15). Building of the mesio-approximal surfaces was aided by matrices selected according to the specificities of the treatment sites (Figure 16). In our case, 'Incisor Mesial' matrices of the Bioclear system were used. These steps allow for a predictable reproduction of palatal, approximal and incisal tooth surfaces. The resulting 'shell' is made of the enamel composite selected beforehand (Micerium - Enamel Plus HRi - UE 2) (Figure 18). It is advised to perform any corrections that may be necessary to arrive at a perfect shape at this stage (Figure 17).

Having done so, application of the dentin with an appropriate layering technique may follow, shaping also the mamelons of the tooth in the process (Figure 19). To mimic the translucency characteristic to incisors along the edge a material providing an opalescent effect (Micerium - Enamel Plus HRi - OBN) was applied in between the mamelons (Figure 20).

Proper replication of surface morphology must be observed already in the stage of building up the labial enamel of the restoration (Micerium - Enamel Plus HRi - UE 2).

Removal of the rubber dam is followed by finishing and polishing in order to achieve a texture matching natural patient characteristics (Figure 22). It is recommended to advise the patient of dehydration and the potential colour deviations it may temporarily cause right at the beginning of the treatment.

Fig. 12. **The Rite Lite 2 instrument**

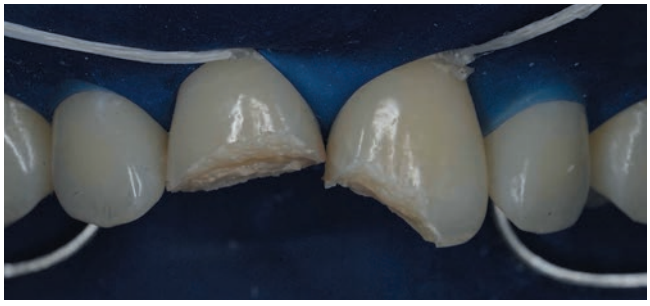

Fig. 13. **Rubber dam isolation with additional floss ligatures**

Fig. 14. **The teeth after preparation**

Fig. 15. **The completed palatal wall**

Fig. 16. **Sectional matrix and wedge in situ**

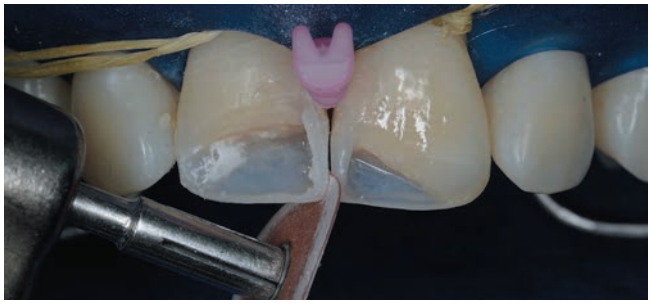

Fig. 17. **Finishing of overhangs using a Sof-Lex disc**

Fig. 18. **Palatal-incisal-approximal enamel shell**

Fig. 19. **Dentinal body with mamelons**

Fig. 20. **Application of an opalescent layer**

Fig. 21. **Stratification of labial enamel**

Fig. 22. **Finished restorations with the rubber dam removed**

Fig. 23. **The teeth after rehydration from a palatal view**

Fig. 24. **Complete and rehydrated restorations**

It is only after full rehydration two weeks later that the restoration may be assessed for colour and then finalisation of the surface and high-gloss polishing may take place (Figures 23 and 24). Corrections due to contrasts in colour or shape may also be carried out at this stage.

The patient was completely pleased with the finished restoration.

CONCLUSIONS

Adhesive techniques involving modern composite materials allow for the functional and aesthetic restoration of anterior teeth. Artistic gift and manual dexterity are not the only success factors: familiarity and strict adherence to an appropriate protocol are just as important. Thorough planning and meticulous care in implementation facilitate the work of the dentist and guarantee patient satisfaction. This way, the required aesthetic result and functionally stable and durable restorations can be produced using a minimally invasive method.

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Conflict of interests:
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