Aesthetic and functional restorations with Panasil impression materials

A 70-year-old female patient presented to our practice complaining of pain in the region of the upper canine. Clinical examination detected a crown fracture of tooth 11 at the cemento-enamel junction with partial exposure of the pulp. The treatment plan submitted to the patient involved initial endodontic treatment, followed by aesthetic, functional restoration of the upper canine with an all-ceramic zirconia crown.

The patient was first referred to a specialist, who performed root canal treatment to eliminate the germs and their metabolites from the root canal. The tooth was restored using a quartz-fibre post and a composite core material. The subsequent restoration had to fulfill certain requirements in terms of functional and aesthetic design, as well as gingival adaptation in order to integrate successfully into the intra-oral situation of the patient.

Preparation of the tooth is very important for achieving this outcome. It is particularly important to determine the preparation margin, which must be clearly defined with a regular contour. These basic requirements must be fulfilled to ensure optimal application of the impression materials. The type of preparation margin depends on the restoration material selected; in this case, the margin was prepared as a modified deep chamfer. Geometrically, this type of margin design is between an extended deep chamfer and a rounded shoulder.

The tooth was also prepared to a depth of 1 mm, which is essential for attaining a good result. One of the most important requirements is the convergence angle between the two opposing axial walls. Some clinicians recommend an angle of 8°, which is difficult to achieve in clinical practice. Others recommend an angle of between 10 and 22°.

The interim or temporary stage is very important with aesthetic dental restorations, as apart from the restoration of function—temporary restorations have a positive psychological effect on the patient and are also useful in correctly simulating and planning the permanent restoration at an early stage. A temporary restoration is, therefore, not an insignificant aid; it has a key role in interdisciplinary dental treatment.

During this stage of treatment, we used a laboratory-fabricated temporary restoration, which was fabricated before preparation. The original shape was adjusted and corrected by waxing up the affected tooth on the dental stone model, which had been fabricated using an alginate preliminary impression. Following placement of an unsaturated retraction cord in the sulcus to ensure optimal marginal fit, the temporary restoration was relined. Once the contour of the cervical region had been established, the margins and all other areas of the temporary restoration were finished. Cementation was then completed using eugenol-free temporary cement. An ideal papilla contour can only be guaranteed by a precisely fabricated temporary restoration, with contact points placed at the correct height.

The papillae will remain fully intact, provided there is a distance of 5 mm between the contact point and the crest of the bone. This demonstrates the importance of the temporary restoration for preservation and regeneration of the gingiva following tooth preparation. A new impression of the preparation must be taken with all the details once gingival growth is complete, which normally requires an average of three weeks (Fig. 1) to ensure stable, compact tissue. The preparation margin must first be exposed using a retraction cord before taking the impression.

Gingival retraction is of crucial importance when taking an impression of the preparation margin as a fluid-free sulcus is essential for producing a good impression. Various gingival retraction techniques are used in clinical practice. The technique we used in this case consisted of mechanical-chemical retraction with a double cord. The retraction cords were placed with the aid of an applicator, whereby the first retraction cord (thickness 000), which was impregnated with an astrigent 25% aluminium chloride solution, was placed below the preparation margin. The second, unsaturated retraction cord (thickness 0) was then placed stress free on the first cord (Fig. 2).

The gingival retraction technique has a significant impact on the intra-oral situation of the patient. Pure cotton-wool retraction cords without a styptic agent are ineffective in preventing the influx of fluid into the sulcus. Successful isolation of the sulcus can only be achieved using chemical agents, while purely mechanical techniques using only cotton-wool retraction cord lead to increased formation of sulcus fluid.

The clinical success of a fixed restoration depends on a precise impression of all the details of the prepared tooth (Fig. 3). In summary, it can be stated that the accurate fit of crowns and fixed partial dentures depends on the impression. Inaccuracies during impression-taking can only be corrected with difficulty or not at all during the subsequent fabrication stages, which has an effect on the marginal adaptation of the restoration we fabricated.

The one-step putty-wash technique was used in this case for fabricating the restoration. It has been proven in in vitro studies that impressions fabricated using this technique exhibit a higher detail definition than two-step putty-wash impressions. As the initial contact of the impression material with the oral mucosa is the critical moment clinically, we focused on a material that becomes hydrophilic with increased relative humidity and maintains its hydrophilicity throughout the entire working time. We therefore selected the impression materials Panasil tray soft and Panasil initial contact light (Kettenbach). Panasil initial contact light was applied to the sulcus using a dispensing gun fitted with an application tip (Figs. 4 & 5), while a non-perforated metal impression tray with a reinforced edge was coated thinly with Panasil adhesive beforehand using a brush (Fig. 6), prior to being loaded with Panasil tray soft (Fig. 7).

The flowability of the light material, viscosity of the tray soft and the pressure produced by the dispenser ensure that the impression material flows uniformly onto the tooth surface, including intra-gingivally. Another characteristic of this material is that it is easily removed from the mouth, which may be a problem when using polyether materials. The thixotropic properties (positionality stability) of Panasil initial contact light prevent the material flowing into the oral cavity when the impression tray is inserted into the oral cavity. The intra-oral working time of 1 minute and intra-oral setting time of 2 minutes and 30 seconds are very practice friendly. The combination of Panasil tray soft and Panasil initial contact light is impressive: the products ensure perfect reproduction of all details of the tooth in the
impression (Figs. 8, 9 & 10).

**Technical procedure**

The most commonly used material for fabricating models is dental stone, owing to its compatibility with all types of impression materials, low expansion and high compressive strength. The use of Class IV dental stones that have a volumetric expansion of approx. 0.08% is preferred, e.g., Tewrock and Tewestone (Kettenbach; Figs. 11 & 12). Careful pouring of the impression using vacuum-mixed dental stone ensures precise reproduction of all the details (Fig. 15). A precise, stable working model should be fabricated that can reproduce the anatomical features (occlusal surfaces, proximal contact points). The gingival section was removed under a stereomicroscope to expose the preparation margin (Figs. 14 & 15).

It is difficult to recreate the natural aesthetics with metal-bonded restorations, particularly when there is little space available. Apart from the search for materials with improved aesthetic characteristics, development concentrates on new technologies, e.g., fabrication with semi-finished products using the CAD/CAM technique, which eliminates certain working stages that are normally completed manually. In this case, the patient was treated with a zirconia crown, which was veneered using low-fusing porcelain. Zirconia, with a flexural strength of 900 MPa and a fracture resistance of 9 MPa, has better mechanical properties than conventional porcelains without a metal core; zirconia is partly stabilised with yttrium, which further enhances its mechanical properties.

In addition to aesthetics and fracture resistance, an important requirement for the long-term success of a restoration is also a high degree of marginal adaptation (Fig. 16). The majority of researchers agree that marginal gaps of 100 µm are clinically acceptable with regard to the service life of a restoration. In our opinion, however, the overall goal should be to attain a marginal adaptation in the region of 20 to 50 µm.

**Clinical finishing**

Cementation is the final stage of prosthetic treatment. It should be noted that while the luting cement does not provide the dentist with the possibility of correcting inaccuracies in the restoration, it does contribute to clinical success. The luting cement influences the functional performance of a prostodontic restoration; should the wrong cement be selected or used incorrectly, it can have an adverse effect on the service life of the crown. A high mechanical compressive strength is one of the most important properties.

As luting material is distributed in very thin layers, it must be capable of withstanding compressive loading in order to prevent fractures. We used glass ionomer cement that has not only a high compressive strength, but also the advantage of fluoride release. A comparative study of various cements established that the glass ionomer cement we used in this case produced the lowest film thickness of 20 µm. A follow-up examination was completed one week after permanent cementation to check the integration of the prostodontic restoration into the tissue. The clinical procedure was completed with a further follow-up examination to check the occlusal relationship, which in most cases cannot be completed satisfactorily when fitting the restoration, owing to stress to the patient. The correct use of a temporary restoration & an adequate morphological design of the permanent restoration contributed to good adaptation of the incisor tooth papilla, as was established at intervals of 30, 60 and 90 days (Fig. 17).

**About the author**

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