Preparation guide

ZENO® Tec System

WIELAND Dental Division

The Material

- Zirconium oxide has a proven track record of over ten years as a framework material for dental restorations. This is the first material that can be used to make long-span bridgework for the molar region. Since zirconium oxide is white in colour and can be stained to resemble natural dentine, it offers significantly better aesthetics than PFM restorations.

Indications

- As a rule, the **ZENO®** Tec system can be used to fabricate crowns and long-span bridges.

Contraindications include a lack of space in the bridge connector area, since connectors must have a minimum cross-section of 9 mm^2, and root-canal pins. If the patient suffers from bruxism, the practitioner must decide on a case by case basis whether a full ceramic restoration is suitable or whether a metal occlusal surface is preferable.

ZENO® Tec System

Preparation

1. First steps

- Before starting treatment (and prior to administering an anaesthetic), use an ultra thin articulting film to record the bite whilst the patient is still seated upright. This enables the occlusion to be verified on articulated models at a later stage in order to achieve a more accurate fit for the restoration.

Indication

Fig. 1: White zirconium oxide blank with cut-out framework

2. Existing root canal pins

- Since it is a relatively opaque material, zirconium oxide can be used to completely cover existing pin restorations. This therefore also enables clinically intact pin superstructures, which can often be very difficult to remove, to remain in place when the tooth is prepared to receive a new zirconium oxide framework restoration.

  If a new pin needs to be inserted, then fibreglass composite pins have proven to be compatible, since they possess an elasticity similar to that of natural dentine.

3. Reconstruction material

- Since zirconium oxide can completely conceal existing substructures, as described in Section 2, the colour of the material used for reconstruction is of no great importance. At the Munich clinic the dual hardening composite Rebilda (voco, Cuxhaven) is used for the reconstruction. This composite is available in two different colours (dentine and blue). The blue material is especially suitable for reconstructive work in the molar region as the distinct colour contrast improves visibility and makes it easier to incorporate the reconstruction into the preparation.

  However, any other type of reconstructive material can also be used with the exception of compomers, which expand through swelling and can therefore exert undue pressure on the ceramic.

Fig. 2 **ZENO**® Preparation Set

4. Preparation instruments and restoration thickness

The preferred instruments for preparation are the burs from the widely used Zirconium Oxide Prep Set after Dr. Beuer (Fig. 2, Gebr. Brasseler, Order-No. TD 1727).

As a rule, a tooth prepared for a zirconium oxide restoration must always have a well-defined, clearly visible preparation margin. The preparation itself can either have a distinct chamfer or be a shoulder-type preparation with a rounded inner edge. Ideally, the preparation should be conical with a side angle of 4°. The thickness required for the subsequent restoration is similar to that needed for PFM restorations. There is therefore no truth in the rumour that full ceramic restorations always require a greater reduction of hard tooth substance.

The fact that zirconium oxide restorations can only be made by machining industrially produced blanks must be taken into consideration during preparation. For example, no sharp edges must remain after preparation, especially in the case of anteriors.

For anteriors, a thickness of 0.4 mm is adequate for a single zirconium oxide coping. For crowns in the molar region and for bridgework a thickness of 0.5 mm to 0.6 mm is needed. The ceramic build-up then requires another 1.0 – 2.0 mm at the incisal / occlusal surfaces (the same as for PFM restorations).

Fig. 3: Two lower molars prepared for zirconium oxide restorations

5. Impression taking

Impressions for zirconium oxide restorations must be taken using a precision impression material. One method of exposing the prepared margin and retracting the gingiva before the impression is taken is the use of non-impregnated retraction threads. For this, the so called "V" technique is a well proven method. First, a No. 1 retraction thread is placed around the entire sulcus of the prepared tooth and then a thicker thread is placed on top of this and both threads are left in the sulcus for 10 minutes. Then the thicker thread is removed. Provided that there is no bleeding and that the entire margin is visible, the impression can be taken. As an alternative or in addition to the use of threads, electrotomy or laser techniques can also be used to expose the prepared margin, whereby all forms of retraction must be as gentle as possible, especially in areas where the gingiva is visible. With the electrotomy method it is advisable to use the thinnest instrument available to open the sulcus and to avoid use entirely in the buccal region.

The subsequent impression should be taken using customised or individual impression trays. The preferred impression material is polyether using the single-phase technique. First fill a syringe with the impression material and inject it all around the prepared teeth. Then direct a jet of compressed air at the material using moderate pressure and place the full impression tray over the teeth, holding it in place until the material has completely set. The use of a stopwatch is recommended.

After removing the tray from the mouth, examine the impression under a stereo microscope or through magnifying glasses. Repeat the procedure if necessary.

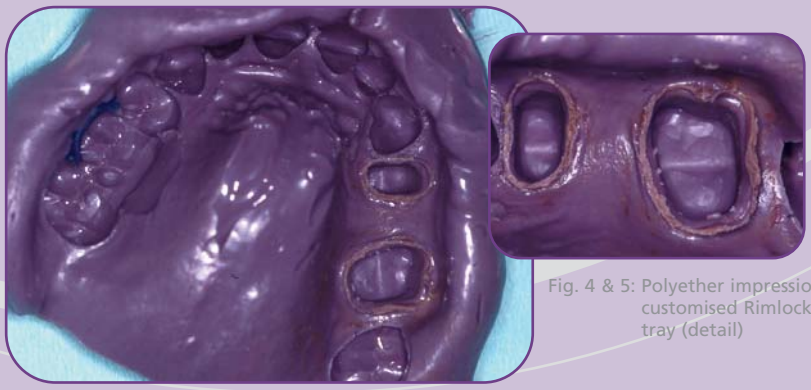

Fig. 4 & 5: Polyether impression in a customised Rimlock Impression tray (detail)

Fig. 6: Trimmed and polished temporary crowns

6. Recording the hinge axis and the maximum intercuspidation

An arbitrary face bow (e.g. SAM / Gauting) is a proven method of articulating the upper model. It is advisable to take a bite registration to ensure that the models are accurately positioned in the articulator.

Suitable materials are silicones or autopolymers for temporary crowns. The material Imprint™ Bite from 3M ESPE is also suitable for scanning. Apply the material to the abutment teeth and ask the patient to close their mouth and keep it closed. Once the material has set, remove the bite registration from the mouth and trim it so that only the deepest tooth impressions are visible. Then reinsert it into the mouth and check the bite against the articulating film record described in Section 1 in order to ensure that the correct articulation is passed on to the dental technician.

7. Temporary restorations

The best way to make a matrix for a temporary restoration in the dental laboratory is by vacuum forming a polyethylene laminate over a separately made model of the original dentition. The thickness of the layers allowed for by the preparation can be checked before the impression is taken by placing the clear matrix in the mouth and observing the amount of tooth substance that has been removed. With bridgework, an artificial tooth can be inserted into the model and then integrated into the temporary restoration to achieve perfect results.

The temporary bridge also acts as a splint and prevents the abutment teeth from straying. First, dispense a pea-sized reference sample onto the treatment tray, then fill the matrix with auto polymer (e.g. Protemp 3 Garant, 3M ESPE) and position it in the mouth over the abutment teeth and pontics and ask the patient to close their mouth.

The reference sample on the treatment tray helps you to determine when the acrylic material passes from the soft plastic stage to the heat-emitting polymerization phase. Shortly after this transformation stage, remove the matrix and place it in a water bath heated to 50 °C in order to accelerate the curing process. Now remove the temporary restoration from the polyethylene matrix and trim the acrylic. The restoration should be finished on a polishing lathe in the dental laboratory. After buffing with pumice, insert the temporary restoration in the patient's mouth once more, check the static and dynamic occlusions, correct as necessary and double-check the edge margins and the approximal contact points.

Tip: For anteriors, shorten the temporary restoration at the labial surface by approx. 0.5 mm to avoid irritation of the gingiva and prevent recession.

Finally the temporary restoration is lathe polished to a high lustre and fixed onto the prepared teeth with eugenol free cement (e.g. RelyX® Temp NE, 3M ESPE).

8. Framework try-in

- Especially when making long-span bridges, it may be advisable to try in the zirconium oxide framework before finishing off the restoration.

  When doing so, check the marginal fit by applying a thin-flowing impression material (e.g. Xantopren blue, Heraeus Kulzer) to the gap between the prepared tooth and the restoration. Then clean the framework with alcohol to ensure that no traces of silicone are left inside the restoration.

After the impression material has set, remove the restoration from the mouth. If the marginal fit is a good one, the material will tear off cleanly at the crown margin.

If there is still some uncertainty about the accuracy of the occlusion, the maximum intercuspidation can now be double checked by using the framework to support the bite registration material (following the method described in Section 6).

Fig. 8: Basal view of the framework in the interior of the impression

9. Fitting

- When the occlusion, shade and approximal contacts have been checked, the restoration can be fitted into the mouth. In theory, the zirconium oxide is strong enough to be fixed with temporary cement, but this is not recommended. Temporarily fixed restorations are often forgotten and never fixed permanently. The temporary cement tends to wash out, leaving the underlying teeth susceptible to secondary caries. Moreover, the removal of temporary restorations can be a difficult process which can result in damage to the ceramic veneer. Before fixing the restoration permanently, sandblast the framework with aluminium oxide (100 µm) at a pressure of 2.0 bar.

  The question of whether to use adhesive or cement continues to be a controversial issue. Subgingival preparations, insufficient enamel margin and the difficulty of verifying an adhesive bond all favour conventional cementation. One of the main arguments in favour of zirconium oxide restorations is the fact that they are very strong and can be fixed with cement. From a clinical point of view it does not matter whether the cement used is phosphate cement mixed by hand (e.g. Harvard Cement, Richter and Hoffmann / Berlin), or a glass ionomer cement supplied in a pre-mixed capsule (Ketac Cem, 3M ESPE).

  Adhesives can also be used (e.g. RelyX® Unicem, 3M ESPE). The prepared teeth must not be cleaned with H_2O_2 as any residues could be detrimental to the strength of the bond or the setting properties of the adhesive.

Fig. 7: Try-in of the zirconium oxide framework prior to veneering

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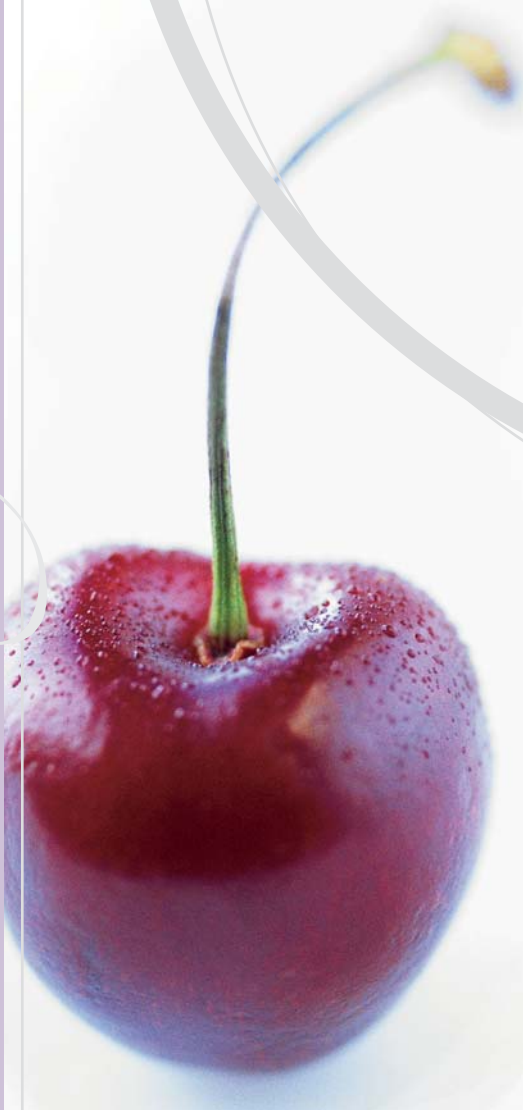
Fig. 10: Permanently fitted molar crowns with a zirconium oxide framework

10. Trephination and removal

Although the low thermal conductivity of a zirconium oxide restoration provides excellent insulation for the dental pulp, it may be necessary to carry out endodontic treatment on the restored teeth. In this case, the following procedure must be observed: First use a coarse diamond bur to completely remove the ceramic veneer from the point at which entry is to be made. Only then can the framework of the restoration be penetrated, again using a coarse diamond bur. Hold the bur at an angle of approx. 45° to the zirconium oxide framework, in other words at a tangent to the tooth. This ensures that the diamond bur is always adequately cooled and prevents it from overheating. A similar procedure should be followed when removing a restoration completely. It may be necessary to remove the ceramic veneer from the approximal regions in order to break up the framework.

On the whole it can be said that the trephination or removal of a zirconium oxide restoration is just as straightforward as that of a framework made from a non-precious metal.



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