Handling and Preparation Guidelines for Dentists and Labs

Lava™
Precision Solutions

Handling & Prep Made Easy

3M ESPE

3M ESPE AG
ESPE Platz
82229 Seefeld · Germany
E-Mail: info3mespe@mmm.com
Internet: www.3mespe.com

You + 3M ESPE =
A formula for success

02 (02.2009)

3M ESPE

It’s easy to offer 3M™ ESPE™ Lava™ Restorations

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The Lava™ Brand integrates digital technology and material science in an intuitive way to help dentists and labs improve productivity while offering excellent oral care.

The Lava system works together in harmony. From the digitization of the model with our Lava™ scanner to the virtual design with our software and the milling of our specially-formulated zirconia, the system has been designed to produce high-strength restorations with outstanding marginal fit and excellent esthetics.

Our preparation and handling guidelines have been designed for dentists and their dental labs. We are sharing the entire guideline with clinicians and labs so both groups understand the complete process. We hope you both enjoy working with Lava restorations.

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Handling Made Easy

Possible Indications with the Lava™ System

Due to its excellent mechanical and optical characteristics, 3M™ ESPE™ Lava™ zirconia can be used for a wide range of indications.

Figure 1: Single Crowns

Figure 2: Splinted Crowns[1]

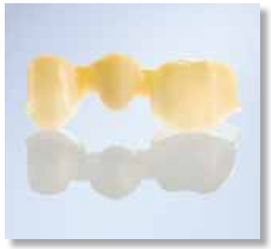


Figure 3: 3-unit Bridges

Figure 4: 4-unit Bridges

Figure 5: 5-unit Bridges[2]

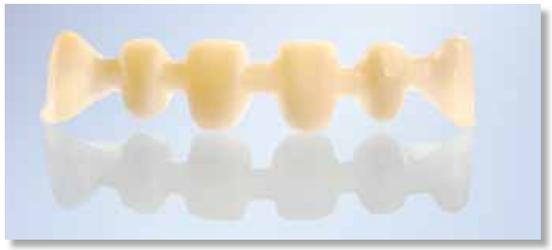


Figure 6: 6-unit Bridges[2]

Figure 7: Curved and Long-span Bridges[2] (up to 48 mm)

Figure 8: Cantilever Bridges[3] (excluded for patients with bruxism)

Figure 9: Inlay Bridges and Onlay Bridges[4] (excluded for patients with bruxism)

[1] Splinted crowns up to 4 units.

[2] 5+ unit bridges (up to 48 mm) with a maximum of two pontics next to one another in the posterior area and a maximum of four pontics next to one another in the anterior area.

[3] with a maximum of 1 pontics at the position of a premolar or incisor.

[4] Tests have proven: Lava™ Zirconia shows a sufficient strength for this indication. However, this type of indication overall can have a higher failure risk due to de-cementation and secondary caries regardless of manufacturer. Please refer to national and regional dental associations for more information.

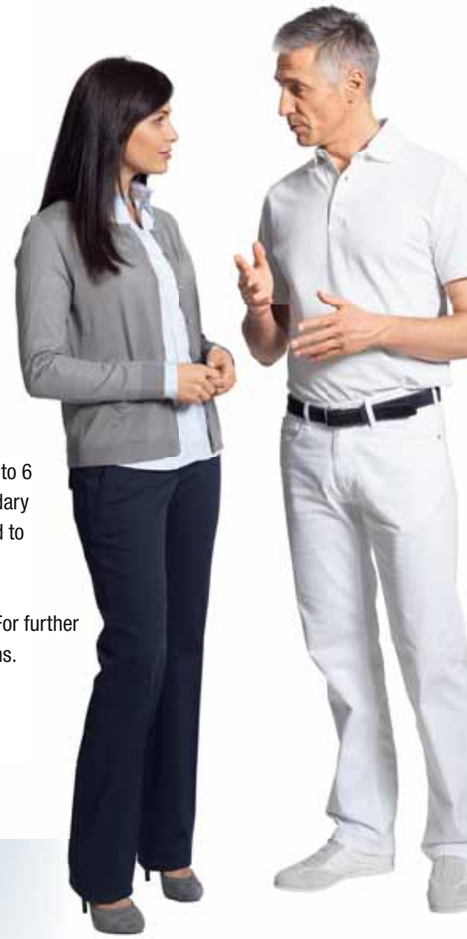
Figure 10: Anterior Adhesive Bridges[4] (excluded for patients with bruxism)

Figure 12: Primary Crowns/Telescopes

Figure 13: Implant Abutments

Wide range

Clinical Requirements for Adhesive and Inlay Bridges



Advantages.

Adhesive and inlay bridges have the advantage of being minimally invasive. Compared to traditional bridge preparation, only three percent to 30 percent of healthy tooth structure is lost instead of 63 percent to 72 percent. (D. Edelhoff et al. (2002)). This makes these restorations an attractive option for young people with healthy dentition. In addition, adhesive bridges (“Maryland” bridges) show a lower occurrence of post-operative sensitivity due to the enamel retention of the restoration. However, these restorations are associated with a higher risk of failure in comparison to conventional FPDs (Priest, 1996). Survival rates of these indications are 70 percent to 80 percent (4 to 6 years) and are lower than conventional FPDs. Debonding of the restorations and secondary caries are the most prominent failure rate. Undetected debonding of a retainer may lead to plaque accumulation and possibly to subsequent lesions and gingivitis.

Therefore, these indications have to be carefully considered for each clinical situation. For further information also see the recommendations of the national or regional dental associations.

Patient Selection*.

The literature recommends diligence in patient selection:

- Vital abutment teeth
- Only moderate sized carious lesions or restorations not exceeding the preparation depth of adhesive bridges
- Good oral hygiene
- Teeth in final occlusion
- No parafunction (e.g. bruxism)
- No periodontal hypermobility of abutment teeth or high difference in abutment teeth mobility
- No heavy occlusal load on the restoration

*References: please look on the inside back cover for more information.

(St George G. et al. 2002; St George G. et al. 2002; Ketabi 2004; Stokes A. 2002; C.J. Goodacre et al. 2003; Zalkind M. et al. 2003)

Preparation for Lava™ Crowns and Bridges

Many Procedures Remain the Same.

With 3M™ ESPE™ Lava™ Crowns and Bridges, you provide high-quality restorations to your customers. In addition to natural esthetics and durability, Lava crowns and bridges also stand out for their excellent fit. To achieve this, practice and laboratory have to meet just a few basic requirements.

Courtesy Dr. J. Manhart, University of Munich

Durability

Zirconium Oxide – the Framework Material of the Future Allows Minimal Reduction.

Unlike traditional all-ceramic restorations, Lava™ restorations have a substructure made of zirconium oxide. This strong material does not require an aggressive shoulder to support the framework or to enhance the esthetics. In addition, the margins can be thinly tapered. The zirconia used for Lava™ Framework is strong enough to allow for thin walls. Space for an opaque layer is not required. Therefore, a reduction of the tooth structure based on the dimensions indicated below is sufficient. This means the preparation for Lava restorations protects the tooth structure. A preparation matrix of the initial clinical situation can be helpful in order to check the progress of your tooth reduction during the preparation.

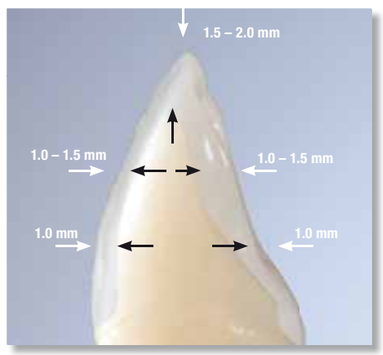
Strong Material

Ideal Preparation: Shoulder or Chamfer to Allow Precise Margin Detection.

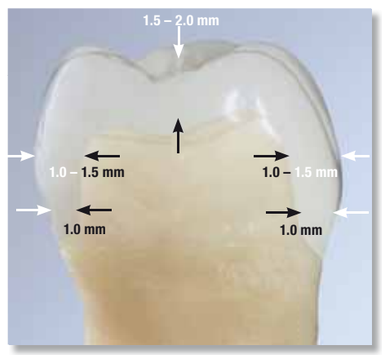
Ideally, the preparation includes a circumferential shoulder or chamfer with a horizontal angle of at least 5°. The vertical preparation angle should be at least 4°. The inside angle of the shoulder preparation must be given a rounded contour. All occlusal and incisal edges should also be rounded.

The marginal edge of the preparation needs to be continuous and clearly visible. A bevel should be avoided. Due to the tooth-colored framework, supragingivial margins in the anterior or posterior regions are acceptable to achieve esthetic results.

Ideal



Recommended preparation for anterior teeth.



Recommended preparation for posterior teeth.

Preparations

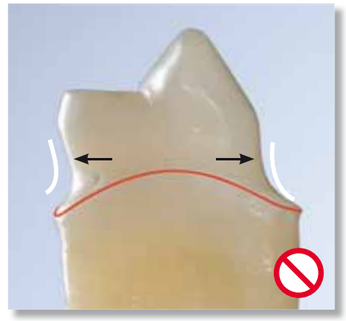
Special Preparations

Tangential preparation: Steep tangential preparations may result in extremely thin tapered margins. In principle, this type of preparation is possible, but caution is advised.

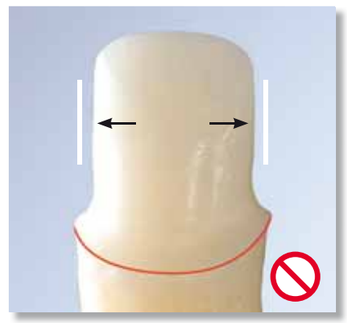
Unacceptable Preparations

Gutter Preparation: Margin cannot be detected clearly.

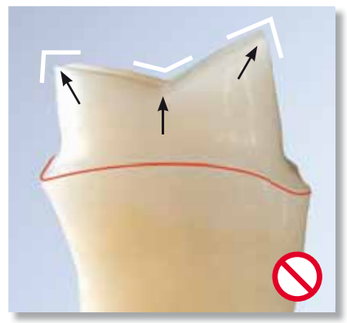
90° Shoulder: Margin cannot be detected clearly.



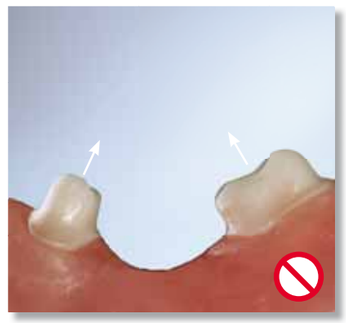
Undercuts must be avoided.



Parallel walls: In principle, parallel wall preparations are feasible. However, a cement gap cannot be milled in this case. This may significantly affect the fit.



Sharp incisal-occlusal edges must be avoided. The rounding radius should be > 0.4 mm.



Bridges with inclined teeth cannot be achieved due to the restricted path of insertion inclination of the two stumps.

Preparation samples and photography shown on pages 6–9 created by Dr. Carlos Eduardo Sabrosa, Rio de Janeiro, Brazil.

Preparation for Lava™ Adhesive and Inlay Bridges

Preparation of Anterior Adhesive Bridges.

Tooth preparation has an influence on the survival of the restoration. Especially in the case of adhesive bridges (“Maryland” bridges) retentive elements should be prepared (e.g. seating groove and pinhole (M. Behr and A. Leibrock, 1998, El Mowafy 2003, Kern (2005), see dental textbooks). The teeth to be restored by a 3M™ ESPE™ Lava™ Zirconia adhesive bridge should be prepared according to the following instructions. In general, rounded edges (minimum radius ≥ 0.4 mm) and clear margins are required for full ceramic restorations.

Preparation depth: Minimum 0.6 mm, maximum 0.7 mm to assure optimal strength and esthetic. The preparation needs to be in enamel instead of dentin. The enamel depth of a tooth can vary from 0.4 to 1.0 mm (W. Kullmann 1990). All prepared radius have to be ≥ 0.4 mm, all prepared angles have to be ≥ 2 degrees.

Wall thickness of zirconia framework: 0.5 mm minimum to ensure sufficient strength.

Veneering: 0.1 mm — Glazing is necessary to prevent abrasion of antagonist; If the zirconia is not glazed, the restoration should not have any occlusal contact. If the preparation depth can not be realized with the minimum wing thickness of 0.6 mm (zirconia + glazing) due to insufficient enamel thickness, the dentist should re-evaluate this indication. We recommend the use of a preparation matrix to be able to check the preparation depth.

For the preparations of retentive elements see Figure 1 to 3 (e.g. pinholes, seating groove). In general a radius of ≥ 0.4 mm is required for the milling in the Lava system.

Adhesive

In comparison to a 3-unit adhesive bridge, fixed-pontic-fixed, cantilever 2-unit adhesive bridge, fixed-pontic, design is even more conservative, since only one abutment tooth needs to be prepared. The risk on unnoticed debonding and consecutive secondary caries is low. However, debonding of a single retainer adhesive bridge could directly lead to loss or swallowing/aspiration of the respiration. In general, clinical studies show a better survival rate of 2-unit cantilever bridges. When considering adhesive bridges, the recommendations of the national or regional dental association need to be followed where applicable.

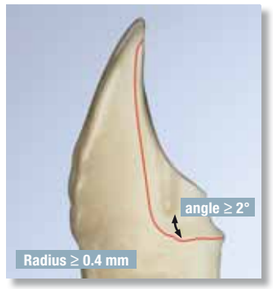


Figure 1: Rounded angles (Radius ≥ 0.4 mm, no sharp edges), clear margin and horizontal angle ≥ 2°.

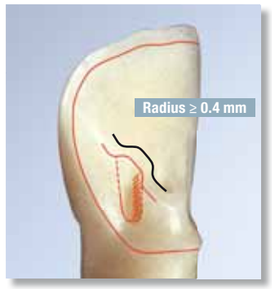


Figure 2: Retentive element: rounded ridge (Radius ≥ 0.4 mm).

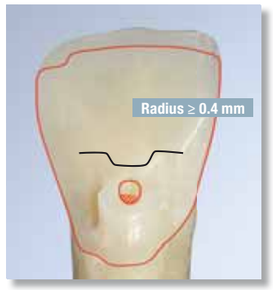


Figure 3: Retentive element: rounded pinhole (no sharp edges, radius ≥ 0.4 mm).

Figure 4: Not possible: circular preparation of the wings with no preparation in the middle. Only one preparation margin can be detected by the system.

Preparation for Lava™ Adhesive and Inlay Bridges

Preparation of Inlay Bridges.

Full ceramic preparation in general requires rounded angles (no sharp edges, minimum radius ≥ 0.4 mm). The margins must be clearly indicated. The maximum length of the pontic to replace a missing tooth is 10 mm.

Preparation depth: 2–4 mm; It is important to have sufficient space for a connector of 9 mm². The preparation should have a taper of ≥ 2° to 3° without any friction.

Wall thickness of zirconia framework: ≥ 0.5 mm

Veneering: Veneering or glazing is necessary to prevent abrasion of antagonist.

Remember:

Adhesive and inlay bridges are more complex to manufacture. With these restorations, it is even more important than ever to follow the preparation guidelines to avoid inferior marginal adaptation and lengthy manual fitting efforts after milling.

In the case of vestibular and oral wings in addition to the inlay cavity, the wings can be processed by the Lava system maximally to a 90° angle at the inlay preparation (see figure 7a + 7b).

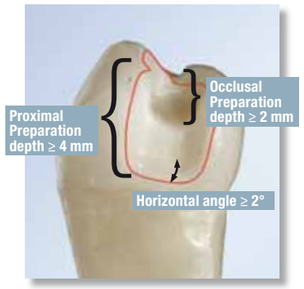


Figure 5: Proximal view inlay preparation.

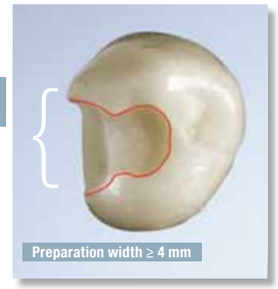


Figure 6: Occlusal view inlay preparation.

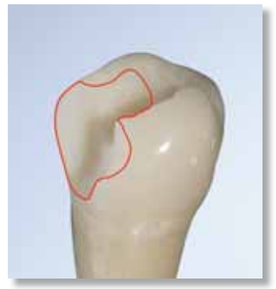


Figure 7a: Additional lingual or vestibular wings: extension on the level of the tooth equator or above.

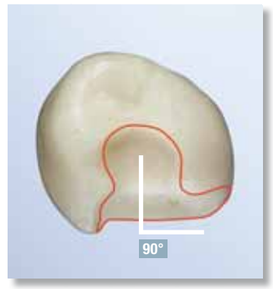


Figure 7b

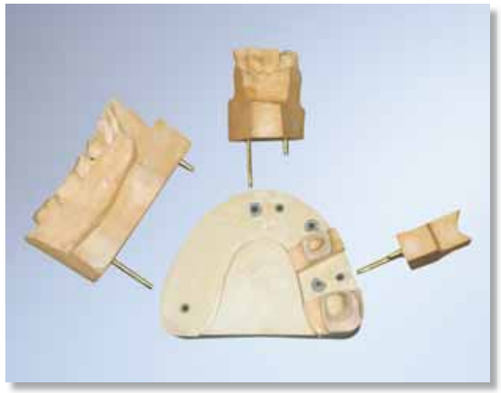
Inlay

Model and Die Preparation at the Lab

Model Preparation.

A precise model preparation is vital for quality and fit of the restoration. To ensure that all data can be collected, the saw cut model for the scanning process is made of a light-colored, unvarnished gypsum laboratory stone (Class IV) with a dull surface.

All stumps, the alveolar ridge and all other segments need to be removable and need to have a defined seat in the base. For optimal analysis of the situation in the scanned area the maximum height of the model, measured from the bottom of the base to the incisal edge, should not exceed approx. 40 mm. A magnet split cast system available from SAM (Order 526) is recommended. However, in principle, all systems are feasible, provided that they meet the general requirements. A bite registration in the form of a simple silicon or polyether key serves as an aid in placing the bridge elements.



Segmented model: The scanner digitizes the dies, alveolar ridge, bite registration, and adjacent teeth (optional). They can be visualized on the screen according to the individual needs.

Precise

Ditching.

The prepared margin can be precisely ditched using a rotary instrument under magnification. Margin marking with e.g. a pencil is not recommended as the system automatically detects the precisely identified margin. Inadequate ditching may effect the quality of the scan.

Ditching.

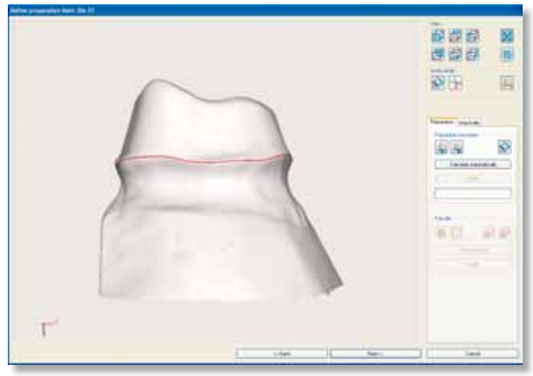
Scanning and Design of Lava™ Restorations

Design

Preparation Margin Detection.

The complete surface of the die is scanned with a non-contact white light fringe pattern. Approx. 120,000 data points are measured and digitised for each die. Detection is carried out from incisal/occlusal to the die.

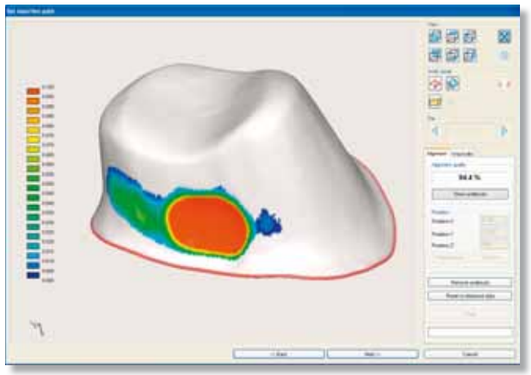
The complete surface must be easily visible under the scanner light. The system automatically defines the overall preparation margin.



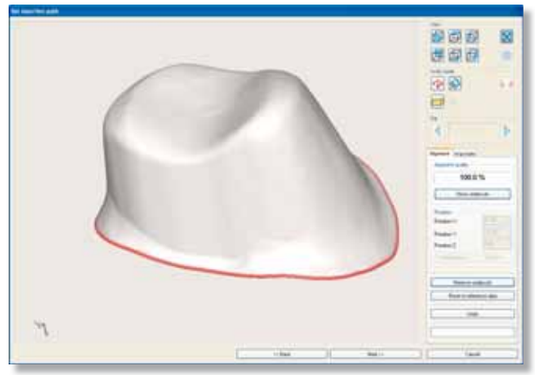
Precise preparation margin.

Blocking Out.

Dips, cavities and pores can be blocked out in a conventional way with light colored wax or by use of the digital wax knife. Undercuts are automatically blocked out by the software.



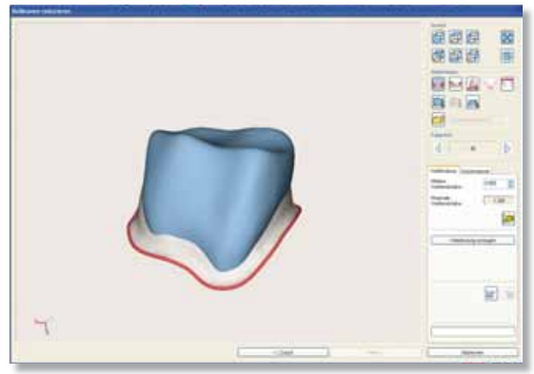
Undercut before being blocked out.



Undercut blocked out with Lava™ Design Software.

Full-contour and Automatic Reduction.

The full-contour features allows to choose a digital single crown from an integrated tooth library. Individualization of not only fissures and cusps but also from the tooth equator and proximal contacts is possible. With the digital wax knife function, further individualization is possible to design the optimal anatomically formed coping. This will deliver optimal support for the veneering.



Full-contour and automatic reduction.

Design Choices for Labs and Dentists

Framework Coloring.

3M™ ESPE™ Lava™ Restorations offer the option of coloring the framework with seven different shades based on the Vita®* Classic shade guide (plus one shade, if uncolored).

Wall Thickness and Connector Design.

You can determine the thickness of the framework wall to fit your needs. The minimum wall thickness is 0.5 mm for bridges and posterior crowns and 0.3 mm for anterior crowns. The minimum connector cross section highly depends on the bridge position and the amount of pontics. For special indication, please contact your laboratory or milling center or check the instructions for use.

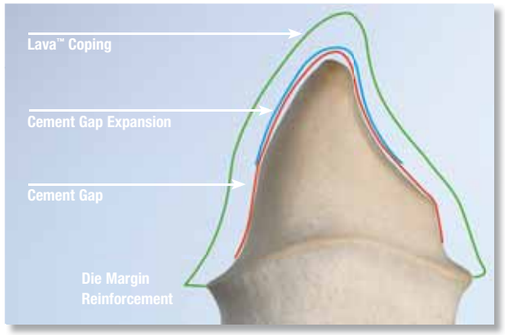
Minimum Connector Cross Section

	Anterior	Posterior
3-unit bridges	7 mm²	9 mm²
4-unit bridges	7 mm²	9/12/9 mm²

	Wall thickness	Connector
Adhesive bridges	0.5 mm	7 mm²
In-/Onlay bridges	0.5 mm	9 mm²

Cement Gap.

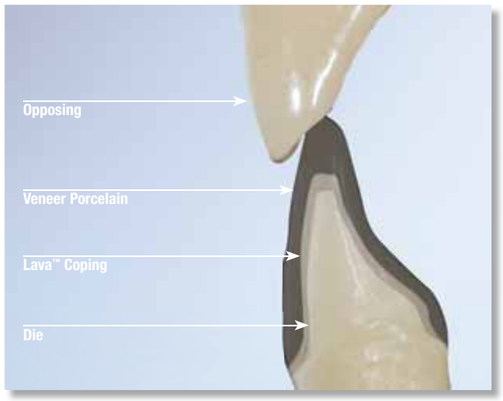
The size of the cement gap can be adjusted using standard values or individually. For certain parts of the framework, for example the upper half of a coping, the cement gap may be increased.
The cement gap is adjusted by the CAD specialist at the milling center in accordance with the dentist's needs, based on each individual clinical situation.



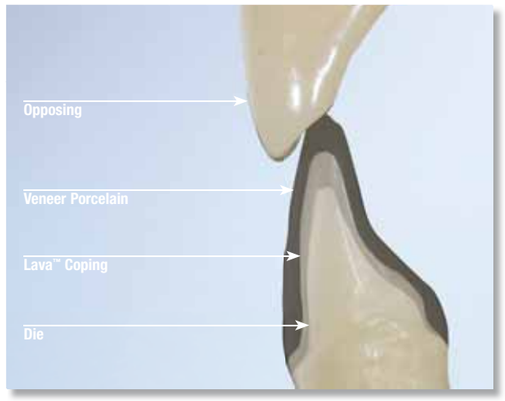
Recommendations for Cement Gap Dimensions

Optimal Framework Design.

It is important to optimally support the veneering porcelain by an anatomical correctly designed zirconia framework. It should be designed to leave an even thickness of no more than two millimeters. This can be accomplished by using the digital wax knife or the automatic reduction feature. In addition, it is also possible to directly scan your manually designed wax up, also for bridges. You may discuss other design ideas with your milling/design center beside the mentioned parameters above.



Inadequate porcelain support.



Optimal framework design with the digital wax knife.

*Registered trademark of Vita Zahnfabrik H. Rauter GmbH & Co. KG, Bad Säckingen, Germany.

Finishing of Lava™ Restorations

Esthetic Advantages of Colored Framework.

Lava™ Frameworks can be shaded in seven different colors (FS1 – FS7) which eliminate the need for a fired porcelain shoulder (butt margin). A perfectly aesthetic appearance can be achieved by using effect and glaze materials on a narrow collar with no additional layers.

Treatment of the Sintered Lava™ Zirconia.

When working on the surface of sintered Zirconia framework, some recommendations should be respected. Intense grinding may introduce defects into the zirconia. In order to remove marginal reinforcement or undesired contacts, it is important to use a turbine with a fine diamond bur (red ring; particle size ≤ 30µm) and copious amounts of water.

If sandblasting of the zirconia framework is applicable, aluminium oxide ≤ 30µm and 2 bar pressure should be used. This is only necessary if Lava Zirconia is veneered with Lava™ Digital Veneering System. If handlayered or pressed technique is used, sandblasting is not necessary.


Trimming of the coping.

Interdental Separation of a Veneered Bridge.

In order to achieve a natural look and a periodontal healthy proximal design, the use of diamond separation cutters is possible. It is strongly recommended not to cut into the framework at the interdental area as this may effect the durability of the final restoration. If the framework is inadvertently damaged during separation, this area has to be polished. Rubber polishing discs with diamonds (polishing system for ceramics from Komet No. 4330, series grey) are suitable for this purpose.

Finishing


Interdental separation with a separation disk. Beware of cutting into the framework.

Trimming and Interdental separation photos created by Dr. Carlos Eduardo Sabrosa, Rio de Janeiro, Brazil.

Cementation of Lava™ Restorations

Due to the strength of Lava™ Zirconia frameworks, adhesive cementation is not necessary. For Adhesive and Inlay bridges, see "Cementation of Adhesive ("Maryland") and Inlay bridges". Restorations can be placed in the mouth in a conventional way by using a glass ionomer cement or by using an adhesive or self-adhesive cement. Before cementation, thoroughly clean the restoration and sandblast the interior surfaces of the crowns with aluminum oxide ≤ 50 µm. For detailed cementation please see the appropriate Instructions for Use of the respective cements for detailed information.

1. Conventional Cementation

- Use a conventional glass ionomer cement or resin modified glass ionomer cement, e.g., Ketac™ Cem or RelyX™ Luting Plus. The use of phosphate cements will not provide the desired esthetic results.

2. Cementation with RelyX™ Unicem Self-Adhesive Universal Resin Cement

- Thoroughly clean the Lava restoration, sandblast the interior surfaces of the crown with aluminum oxide ≤ 50 µm. For most indications, it is not necessary to pre-treat with 3M™ ESPE™ Rocatec™ or to silanate it, if 3M™ ESPE™ RelyX™ Unicem Cement is used, however if increased adhesion is required, the internal surface of the zirconia restoration should be silicatized and then silanized.
- Please refer to the product's instructions for use when using RelyX Unicem Cement.

3. Adhesive Cementation

- Lava zirconia frameworks cannot be etched or silanized with a silane coupling agent. For adhesive cementation with resin cements, the inside surfaces of the restoration must be treated for 15 seconds with Rocatec™ Soft or 3M™ ESPE™ CoJet™ Sand and silanized with ESPE™ Sil.
- If the restoration is to be tried in, it must be done before the treatment described above.
- See the Instructions for use for Rocatec™ System or CoJet Sand for detailed information.
- Place the restoration in the mouth with a resin cement (e. g., RelyX™ ARC) as soon as possible after silanization.
- Please follow the Instructions for use of the respective resin cement.

Cementation of Adhesive ("Maryland") and Inlay Bridges*:

- Adhesive bridges must be cemented adhesively.
- Cementation is only allowed with a cement clearly indicated for the cementation of these indications made of zirconia. The recommendations of the cement manufacturer need to be followed to ensure optimum bonding. Please consider that the zirconia part of the restoration needs to be pre-treated differently than the veneering part.
- Before cementation Lava restorations should be sandblasted (≤ 50 µm grain size) in order to increase the surface roughness.
- Especially for Adhesive bridges the bonding should be mainly to enamel surfaces.
- Sufficient enamel surface is required for optimal bonding. Some textbooks recommend to have a 1.5 to 2 times larger surface for bonding compared to the palatinal or lingual surface of the pontic (W. Kullmann, 1990). Therefore, the abutment teeth should be characterized by low enamel abrasion.
- The working area needs to be free of contamination. The adhesive cementation has to be performed using a rubber dam isolation.
- Debonding of the Adhesive/Inlay bridges and secondary caries are the most prominent failure reason for these indications. Unnoticed decementation of one of two retainers leads to plaque accumulation and possibly subsequent carious lesions and gingivitis.
- To prevent decementation additional retentive elements should be prepared (see preparation guidelines for Adhesive and Inlay bridges).
- Please see also the recommendations of the national and regional dental associations.

*References: please look at the right page.

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