Zirconia in the practice

=cera\textregistered\textsubscript{mill} zi =cera\textregistered\textsubscript{mill} zolid

Maximum naturalness, aesthetics and compatibility
Zirconia material

The ceramic for maximum requirements of compatibility, durability and aesthetics.

Ceramill Zi blanks are pre-sintered zirconia blanks and are used for fabricating frameworks for fixed and removable prosthetic restorations. The material is processed as a pre-sintered blank and is then sintered in a special high-temperature sinter furnace.

Zirconia crowns and bridges are characterised by their high biocompatibility, stability and aesthetics.

A prerequisite for a durable zirconia restoration is a source material of permanently consistent quality, as this significantly affects the final result. The mechanical and optical properties in particular are largely determined by the manufacturing process of the blanks – for Amann Girrbach this was the decisive argument for in-house production of Ceramill blanks. With in-house production we ensure a guaranteed manufacturing quality and a consistently high material quality.

Maximum aesthetics due to natural light-optics
- Shape and shade can be customised to suit the individual patient
- High flexural strength
- Very good long-term stability
- Excellent biocompatibility

Indications:
Crowns and bridges in the anterior and posterior region
Conical/telescope crowns
Superstructures
Customised abutments on titanium bases

Contraindications:
Inadequate tooth structure availability
Inadequate preparation results
Inadequate oral hygiene
More than two connected pontics in the posterior region
Known incompatibility to the components

The higher the flexural strength of zirconia (ZrO₂), the better the long-term stability under masticatory loading.
Ceramill Zi is in the top group in a direct comparison with competitors with a flexural strength of approx. 1300 MPa.
Source: Internal tests
Zirconia material

Translucent, non-veneered and stable in the long term

Ceramill Zolid is a material-optimised translucent zirconia suitable for fully anatomical, monolithic and anatomically reduced restorations. Fully anatomical Ceramill Zolid restorations can be fitted as an alternative to full cast crowns or veneered crowns, preferably in the posterior region.

The translucent zirconia developed by Amann Girrbach also makes it possible to achieve translucent, highly stable and durable restorations without using an excessively high sinter temperature that damages the material properties.

- Highly stable and aesthetic due to optimal light dynamics
- Can be used for fully anatomical restorations; as a result there is no risk of veneering porcelain splitting off
- Biocompatible and durable
- Shape and shade can be customised to suit the individual patient
- Veneerable
- Minimally invasive preparation possible

Indications:
Monolithic (fully anatomical) crowns and bridges
Anatomically reduced crown and bridge frameworks in the anterior and posterior region
Monolithic (fully anatomical) and anatomically reduced bridges with a maximum of three connected pontics in the anterior region and a maximum of two connected pontics in the posterior region
Cantilever frameworks and bridges with a maximum of one bridge pontic

Contraindications:
Inadequate tooth structure availability
Inadequate preparation results
Inadequate oral hygiene
More than two connected pontics in the posterior region
Known incompatibility to the components
Highly discoloured tooth structures
Translucent zirconia with protective function

The ceramic for the highest requirements of compatibility, durability and aesthetics.

With Ceramill Zolid Amann Girrbach has been successful in imparting an aesthetically impressive translucency to a high-quality zirconia while guaranteeing maximum stability. The translucency is very close to that of a natural tooth. It can fulfil increased patient demands for a greater depth effect of the artificial restoration.

The material stability of Ceramill Zolid makes it suitable for non-veneered, fully anatomical restorations, which are functionally fabricated from one piece in combination with the Ceramill CAD/CAM system. It is important to avoid occlusal interference because of the high final hardness of translucent zirconia. Using the “Ceramill Artex” virtual articulator, which is integrated in the Ceramill CAD/CAM system, it is possible during the design process to produce a dynamic occlusal contour and so eliminate any occlusal interference beforehand.

The result is an interference-free, fully anatomical restoration without the risk of chipping and which takes into consideration the patient-specific dynamics. This reduces grinding adjustments of the monolithic restoration intraorally to a minimum - and all this WITHOUT additional expenditure for the dentist.

Design strategy and method for fabricating functional, interference-free restorations using the Ceramill CAD/CAM system.
From preparation to fitting the restoration

General preparation guidelines for Ceramill Zi and Ceramill Zolid with crowns

General:

- Ceramic-appropriate preparation, i.e. avoid sharp corners, edges (incisal and occlusal) and internal angles. The preparation margin area is the largest diameter of the prepared tooth.
- Circumferential shoulder or shoulder preparation with rounded internal angle
- Structure-conserving preparation taking into account the required minimum thickness of 0.5 mm for the material (zirconia thickness should not be below 0.5 mm)
- Prepared tooth height 3 mm minimum, the shorter the prepared tooth, the steeper the preparation must be
- Preparation margin should be clearly visible

Contraindications:

- Shoulderless preparation
- Re-rising deep chamfers (“gutter preparation”)
- Undercut areas
- Parallel axial walls
- Sharp junctions particularly occlusal/incisal
- Highly divergent abutments with bridges
ceramill\textsuperscript{®} zolid

From preparation to fitting the restoration

General preparation guidelines for Ceramill Zi and Ceramill Zolid with bridges

General:
- Ceramic-appropriate preparation, i.e. avoid sharp corners, edges (incisal and occlusal) and internal angles (the preparation margin area is the largest diameter of the prepared tooth)
- Circumferential shoulder or shoulder preparation with rounded internal angle
- Structure-conserving preparation taking into account the required minimum thickness of 0.5 mm for the material (zirconia thickness should not be below 0.5 mm)
- Prepared tooth height 3 mm minimum, the shorter the prepared tooth, the more steep preparation must be
- Preparation margin should be clearly visible
- Increased occlusal space should be taken into account when preparing abutments for bridges, depending on the length of the bridge

Contraindications:
- Shoulderless preparation
- Re-rising deep chamfers ("gutter preparation")
- Undercut areas
- Parallel axial walls
- Sharp junctions particularly occlusal/incisal
- Highly divergent abutments with bridges

Preparation with veneered zirconia frameworks

Minimum preparation with monolithic zirconia restorations

Shoulderless preparation

Gutter preparation
Checking the occlusion

Check the static and dynamic occlusion, using articulating paper. Remove rougher occlusal interference using a water-cooled turbine and suitable diamond rotary instruments (Recommendation: grit size ≤ 40 µm).

Polishing

It is very important, particularly with monolithic restorations, to polish the contact surfaces to a high lustre after grinding to avoid abrasion on the opposing dentition or adjacent teeth.

Zirconia is very abrasive if it is unpolished or inadequately polished. Correct polishing of the zirconia surface is proven to be the best protection against increased abrasion of the opposing dentition. This is demonstrated by the results of several studies showing that the mineral loss on opposing dentitions caused by polished zirconia is lower, for example than porcelain veneered restorations.

The Ceramill Polish-Dent Kit from Amann Girrbach is ideal for polishing zirconia. The polishing heads are available in different shapes and grit sizes and are interfused with diamonds, ensuring an optimal high-lustre polish and surface quality.

Avoid excessive heat build-up during polishing and use water cooling.

Fitting/Cementation

Ceramic materials with a flexural strength > 350 MPa can be luted conventionally or adhesively. This applies to all oxide ceramics.

One advantage of adhesive luting is the aesthetics, as these luting materials are more translucent than conventional cements. A disadvantage, however, is the required conditioning of the prepared tooth and inside of the restoration.

Conventional luting:

Requirement:
- Minimum prepared tooth height of 3 mm
- The shorter the prepared tooth, the smaller the conical angle must be

Advantage:
- No conditioning necessary

Cement groups:
- Zinc oxide phosphate cements
- Glass ionomer cements
- Resin reinforced glass ionomer cements

Adhesive luting:

Advantages:
- Better bond with small tooth preparations
- Translucent or coloured cements for supporting shade reproduction in the anterior region

Disadvantages:
- Framework conditioning is necessary with ceramic primer, which is applied to the oxide ceramic surface to be bonded
- Sandblasting is not recommended

Cement groups:
- Panavia F 2.0 (Kuraray)
- Panavia 21 (Kuraray)
- Relay X Unicem (3M Espe)
- Variolink 2 (Ivoclar Vivadent)

Follow-up at the dental practice

It is strongly recommended to check monolithic restorations intraorally once a year. The residual dentition, opposing dentition and the soft tissue should also be checked in the follow-up examination. Adjustments must be made, if necessary. Care should also be taken here to ensure that the restoration is then polished to a high lustre.
Case study: 3-unit Ceramill Z1 bridge

Preparation
  _ Recommended type of tooth preparation

Impression taking
  _ Taking the impression e.g. using polyether impression material

Temporary restoration
  _ Chairside composite temporary restoration
  _ Laboratory-fabricated long-term Ceramill TEMP temporary restoration fabricated in the Ceramill CAD/CAM system

Zirconia framework
  _ Cusp-supported framework design with the aid of the virtual articulator
  _ Fabrication of the zirconia framework using Ceramill CAD/CAM

Shade check
  _ Shade check of the veneered or stained framework

Proximal contacts
  _ Check of the proximal contacts on the model

Occlusion
  _ Check of the occlusal contacts
  _ Reduced grinding in times using the Giroform model system (proximal and occlusal)

Adhesive luting using Variolink II
  _ Fitting the finished restoration in the dental practice

Restoration in situ immediately after luting
Disadvantages of veneered zirconia restorations

The term "chipping" describes the splitting off of porcelain veneers from the respective framework. This can occur with veneered zirconia frameworks, particularly if the material has been processed incorrectly. As no oxide layer is created for the porcelain, in contrast to metal frameworks, the retention is produced solely by the shrinkage process of the porcelain. This makes the porcelain more prone to splitting off. For this reason care should already be taken beforehand to ensure correct planning, preparation, impression taking, anatomically reduced design, adequate porcelain thickness and fitting. During fitting, if required, grinding in of the restoration should be performed using the correct abrasive. The risk of chipping can be drastically reduced by using high motor speeds, adequate cooling, fine grit size and final polishing using diamond-coated polishers.

Trepanation
Trepanation through a crown always involves a compromise. Destruction of the porcelain structure creates the risk of chipping and a sufficient root canal treatment is only possible with great difficulty. Of course, in an emergency a zirconia framework can also be trepanned using a diamond at a high motor speed, though the restoration must be remade after treatment. Monolithic zirconia restorations can also be trepanned using the above procedure.

Removal
The first step in removing a veneered zirconia crown should be to prepare a slit in the porcelain, which is then generally easily split using a crown lever (deliberate chipping). In the next step the zirconia framework should also be slit using a new diamond at a high speed, applying light pressure and good cooling with a clear view. A 1/3 slit is normally sufficient and the framework can then be split open using a crown lever. This also applies for monolithic zirconia restorations.