

## Clinical

# Monolithic all-ceramic restorations

Complications associated with monolithic all-ceramic restorations are much lower than with ceramic veneers, while suitable instruments make it possible to use a uniform technique, says **Sven Rink**



**Figure 1:** Fractures in the ceramic material of all-ceramic veneered restorations have led to an increased popularity of monolithic restorations in the lateral area

**Figure 2:** Grenade shaped diamond instruments with special bond for work on high-performance ceramics (ZR cutters: normal grain (blue/white ring) and fine grain (red/white ring), Komet Dental)



Monolithic restorations made of high-strength glass ceramics or zirconium oxides are a lot less prone to technical complications than veneer ceramics. Chipping, for example, can be excluded. With the correct choice of suitable instruments, a consistent work protocol for processing and polishing can be drawn up and followed – irrespective of the material.

A lot of complications can be avoided with monolithic restorations without veneers. These restorations can be made of either high-strength glass ceramics (average bending resistance: >350 MPa) or of translucent types of zirconium oxide.

The successful clinical use of tooth and implant-supported single-tooth restorations (crowns and partial crowns) made of lithium silicate ceramics in the lateral area has been documented by various studies with an observation period of more than seven years (Pieger et al, 2014; Reich and Schierz, 2013; Spies et al, 2015; Pozzi et al, 2015).

Ten-year data exists for three-unit monolithic bridges made of lithium disilicate ceramic. These show a survival rate of 87.9% provided that the recommendations provided by the manufacturer with regard to the minimum layer thickness (1.5 mm) and the connecting cross cuts (16mm<sup>2</sup>) are observed (Kern et al, 2012). The well-established lithium disilicate ceramics have recently been joined by so-called zirconium oxide reinforced lithium silicate ceramics (ZLS) (Celtra Duo, Dentsply Sirona; Suprinity, Vita Zahnfabrik).

According to in vitro studies, the resistance of these materials is similar (370-420 MPa) (Rinke et al, 2015). The findings of these studies have been confirmed by the initial results of clinical studies that showed a success rate of >98%.

Up until recently, the production of fully anatomical restorations made of zirconium oxide ceramic was held back by the lack of translucency of the material, compared to lithium disilicate ceramic. One of the advantages associated with the newly developed monolithic restorations made of translucent varieties of zirconium oxide is that there is no risk of chipping.

From a clinical aspect, the reduced space required by these restorations – compared to veneer crowns – and the consequential reduction of the preparation depth are of decisive importance.

Like this, traditionally cemented all-ceramic crowns and bridges can now be produced for the first time by removing as little substance as previously for cast metal restorations only (Rinke and Fisher, 2013).

For a while, it was feared that the great hardness of the material might abrade and cause undue damage to the antagonist. This was considered a potential risk associated with the clinical use of monolithic zirconium oxide restorations. However, various in vitro studies have shown that polished zirconium oxide surfaces cause less harm to the antagonist than traditional veneer ceramics (Preis et al, 2011; Rosentritt et al, 2012). This has now been confirmed by clinical studies (Stober et al, 2014; Mundhe et al, 2015).

In summary, the scientific data available has shown that monolithic restorations made of both high-strength glass ceramics and translucent types of zirconium oxide can be used in the lateral region as required by the indication.

## Abrasion? Problem solved

To reduce the risk of excessive abrasion of the antagonist, the surface of all ceramic restorations should be well polished. Due to their great final hardness, lithium silicate ceramics and translucent types of zirconium oxide require different tools for surface treatments than those used for traditional veneering ceramics.

Bearing in mind the different properties of the two materials (translucency, wall thickness, range of indication), it makes sense to combine high-strength glass ceramics and zirconium oxide in a comprehensive, all-ceramic treatment concept.

## Polishers for both materials

In view of the above, it is very helpful that nowadays polishers are available for work on both material groups. Diamond-coated rotary instruments with a special bond (ZR cutters, Komet Dental) are particularly suitable for work on high-performance ceramics (high-strength glass ceramics and zirconium oxide). Their durability and cutting performance is clearly superior to that of traditional diamond instruments.

Diamond interspersed polishers made of polyurethane are available for further polishing (94020C/F.204.040, Komet Dental). Both groups of material can be polished effectively with these polishers.

ZR abrasives are not only distinguished by their vast choice of shapes, but also by the fact that they are available in various grit sizes.

The ZR range comprises for example instruments covered in medium grain (blue/white ring), which are recommended for adjusting dentures to ensure a perfect fit, as well as fine-grain instruments that are perfectly suited for final corrections after cementing. Grenade shaped diamond instruments (ZR972, 319.020/ZR8972.314.020) are also part of the range. These instruments are intended for work on occlusal surfaces and interproximal contacts (Figure 1).

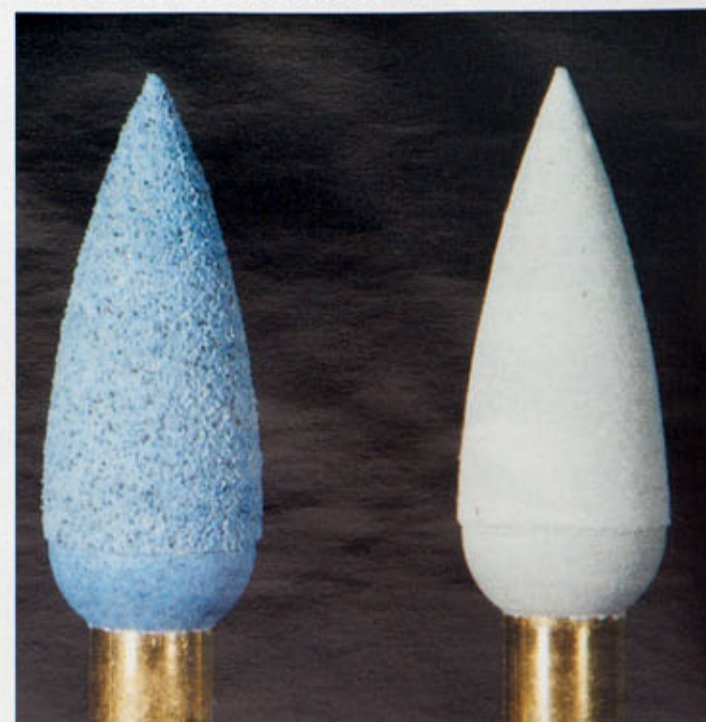
The final polishing can be done very effectively with two-step polishing systems consisting of two diamond interspersed polyurethane polishers (94020C/F.204.040, Komet Dental) (Figure 3). This means that monolithic restorations can be processed efficiently with a significantly reduced number of instruments, irrespective of the material.

The author proceeds according to the following sequence, which has proved successful in his own dental practice:

- Adjusting the occlusal and interproximal contacts during the fitting of the denture with a grenade shaped diamond instrument (blue/white ring = medium grain, ZR972.314.020, Komet Dental)
- Extraoral polishing of the adjusted areas with a two-step polishing system comprising diamond interspersed polyurethane polishers (94020C/F.204.040, Komet Dental)
- Fine corrections after cementation in the mouth with fine-grain (grenade shaped) ZR abrasives (ZR8972.314.020, Komet Dental) (Figure 4)
- Final intraoral polishing, again with diamond interspersed polyurethane polishers (94020C/F.204.040, Komet Dental) (Figures 5a and 5b).

Make sure that the site is cooled with water spray at all times both during occlusal adjustments with diamond ▶

**Figure 3:** Two-step polishing system for effective polishing of high-performance ceramics (94020C/F.204.040, Komet Dental)





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**Figure 4:** Fine adjustments with a grenade shaped ZR abrasive (ZR8972.314.020, Komet Dental)



Figure 5a

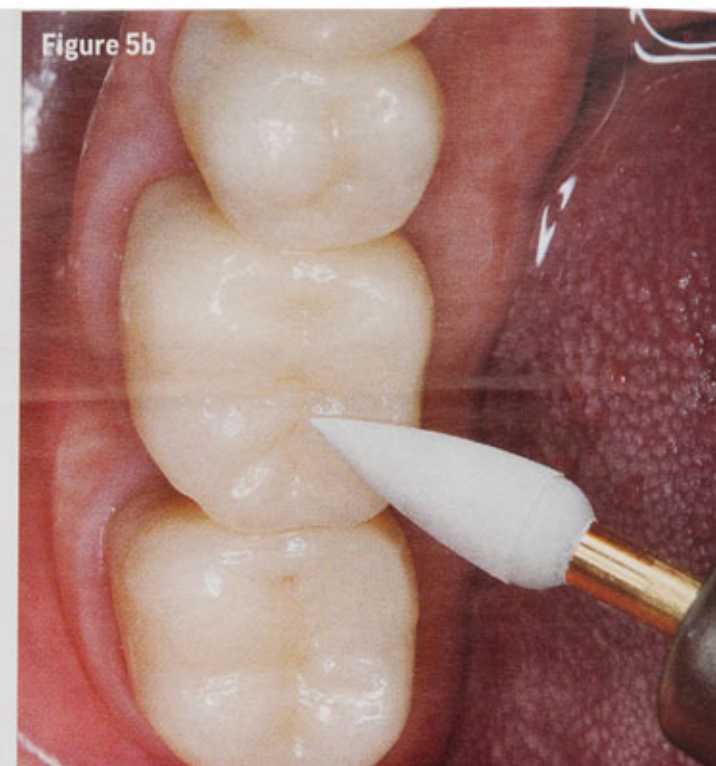


Figure 5b

**Figures 5a and 5b:** Pre-polishing and high-shine polishing of monolithic restorations with a two-step polishing system containing diamond interspersed polyurethane polishes

instruments and polishing with polyurethane polishes. The polyurethane polishes should be used at an optimum speed of 6,000rpm.

A diamond-based polishing paste is available to achieve a perfect polishing result even in hard-to-reach areas. The paste is authorised for intraoral polishing. It is first applied to a small nylon brush and then spread onto the area to be polished.

This is followed by polishing at a speed of 1,500rpm, without water spray.

## Conclusion

The clinical data available show that monolithic restorations made of high-strength glass ceramics or zirconium oxide ceramics have a lower clinical complication rate than restorations with veneers and that they constitute a useful treatment option in an all-ceramic concept. Thanks to the vast choice of suitable instruments for adjusting and polishing, the dentist can follow a consistent treatment sequence in his practice, irrespective of the material used. **D**

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