KATANA Bridge Block Is Here!

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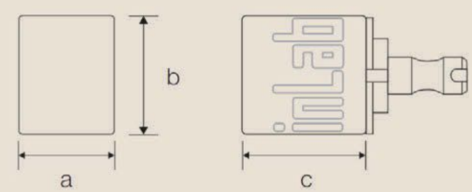
Chairside zirconia has been an important evolution in the CEREC® workflow. The ability to manufacture same-day zirconia, first introduced in 2016, has allowed clinicians to manufacture extremely high-strength restorations with success in high-stress clinical situations. One drawback of the original partially stabilized tetragonal zirconia (Y-TZP) has been esthetics. High-strength zirconia (3Y-TZP) is extremely strong but lacks translucency. Over the past few years, manufacturers have developed more translucent zirconia (4Y-TZP) and (5Y-TZP), which contain tetragonal and cubic grains; this has opened up workflows to use zirconia in more esthetic clinical situations.

One of the leaders in the development of translucent zirconia is Kuraray Noritake. Because of their unique pigment technology and special manufacturing, they have the ability to create smooth gradation and control layer shrinkage. More importantly, their proprietary powder has the ability to be fired extremely fast with the use of the CEREC SpeedFire, while maintaining strength and translucency.

Over the last two years, CEREC dentists have enjoyed the benefits of the Kuraray Noritake STML Block for the creation of esthetic chairside zirconia restorations for single units. In fall 2019, Kuraray Noritake will add to their portfolio with the release of the next evolution of esthetic zirconia options: the 14Z L Bridge Block (Fig. 1). This block is 40 mm, which will allow the fabrications of three-unit or cantilever bridges (less than 32-mm distance sintered) and comes in 14 shades (Fig. 2). The most exciting feature of this new bridge workflow is the KATANA 14Z L Bridge Block can be sintered in 18:39, which truly makes this workflow a single-visit experience for patients (Fig. 3).

Literature reports that the most common clinical failure of ceramic- and metal-based fixed partial dentures (FPDs) is chipping of the veneering structure. Monolithic zirconia and lithium disilicate restorations have been proposed to improve strength and survival rate. Since

Fig. 1: KATANA Blocks



		a (height)	b (width)	c (length)
12Z	Before sintering	15.3 mm	19.2 mm	20.2 mm
	After sintering	12.2 mm	15.4 mm	16.2 mm
14Z	Before sintering	17.8 mm	19.2 mm	20.2 mm
	After sintering	14.2 mm	15.4 mm	16.2 mm
14Z L	Before sintering	17.8 mm	19.2 mm	40.0 mm
	After sintering	14.2 mm	15.4 mm	32.0 mm

Fig. 2: Sintering effects

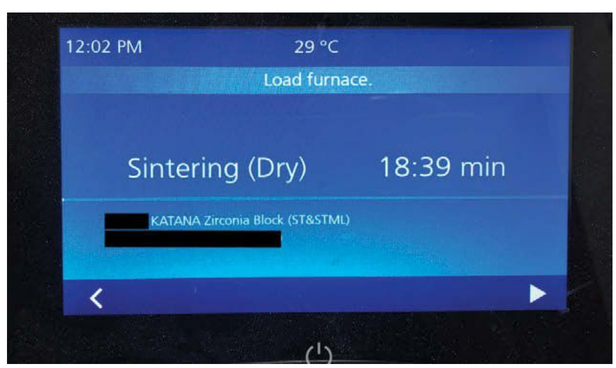
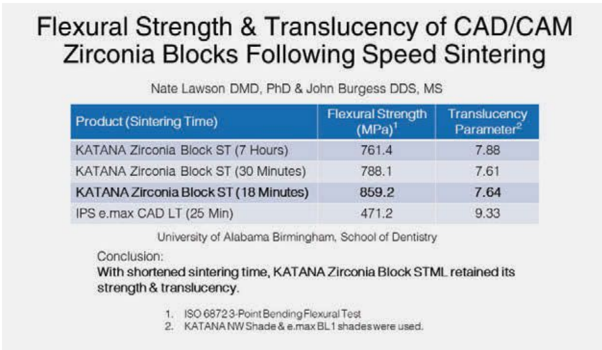


Fig. 3: Sintering time



Product (Sintering Time)	Flexural Strength (MPa)[1]	Translucency Parameter[2]
KATANA Zirconia Block ST (7 Hours)	761.4	7.88
KATANA Zirconia Block ST (30 Minutes)	788.1	7.61
KATANA Zirconia Block ST (18 Minutes)	859.2	7.64
IPS e.max CAD LT (25 Min)	471.2	9.33

Fig. 4: Speed sintering results

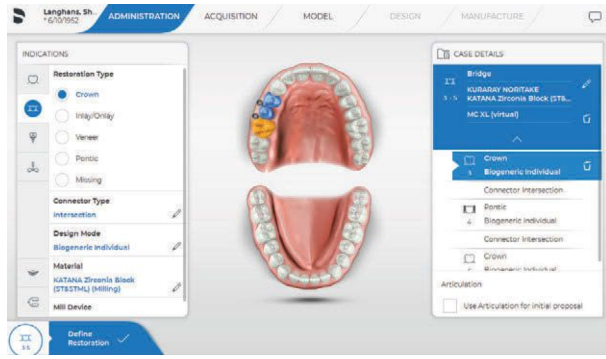


Fig. 7: Designation in Administration

Fig. 5: Preop condition

Fig. 8: Bridge preparations

Fig. 6: Radiograph of preop condition

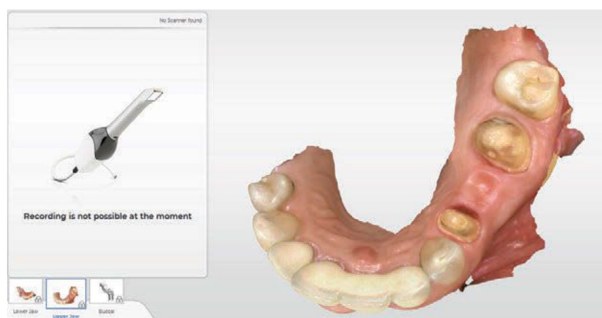


Fig. 9: Primescan imaging

lithium disilicate bridges are ideally indicated for anterior situations, monolithic zirconia has been a popular option for posterior bridge indications. Although high strength (3Y-TZP) zirconia has been successful for these situations, one glaring weakness, as previously mentioned, is esthetics. Creating a monolithic high-strength esthetic bridge in the posterior has been a significant challenge. The KATANA 14Z L Bridge Block is a significant step in the right direction to maximize both strength and esthetics in many of these clinical scenarios.

Nate Lawson, D.M.D., Ph.D., and John Burgess, D.D.S., M.S., have looked at the flexural strength and translucency of CAD/CAM zirconia blocks following speed sintering and have found very encouraging and interesting results (Fig. 4). Their research has shown that speed firing KATANA STML at 18 minutes not only maintained a clinically acceptable level of translucency, but also resulted in a flexural strength that was higher than sintering at 7 hours or 30 minutes. With this conclusion, we as clinicians can feel comfortable introducing KATANA Zirconia Blocks manufactured at shortened sintering times into our clinical arsenal. In the following case study, we will examine a three-unit posterior bridge manufactured with the new KATANA 14Z L STML Zirconia Block.

Case Study

A 67-year-old female presented with an existing bridge from #3–#5 that was fractured. The bridge was done in our clinic in 2015 and was fabricated out of lithium disilicate. The original replacement was of a porcelain fused to metal (PFM) bridge that was loose on the mesial abutment with decay. IPS e.max CAD is not indicated by the manufacturer for posterior bridges but was chosen due to the esthetic needs of the patient and Ivoclar research stating that posterior bridges can be successful if the connector dimension was at least 16 mm^2.

Even though the minimal connector dimension was achieved, and the bridge was bonded into place, a tension fracture occurred in the connector between #3 and #4 and also the ML of #3 (Fig. 5). There are many potential causes for this failure and one may blame this strictly on the flexural strength and using lithium disilicate for a posterior bridge, but another potential cause could have been incorrect design and contouring of the cervical portion of the embrasure. The original postoperative radiograph of the seated bridge revealed a narrow/sharp radius of this embrasure. This design is often prone to crack initiation and tensile failure (Fig. 6). No matter the cause of the failure, the bridge needed to be remade and the decision was made to use KATANA STML as the new material.

In the Administration Phase of the CEREC 5 software, the bridge was designated, intersecting connectors were chosen, and the material (KATANA Zirconia Block) was selected (Fig. 7). The existing bridge was removed carefully with diamond burs and copious irrigation and the abutment teeth were reprepared for the new bridge (Fig. 8). KATANA Zirconia requires a minimum of 1.0-mm circumferential and occlusal reduction, and the preparation easily met those standards.

After preparation and isolation were complete, the preparations, opposing, and buccal bite were taken with the CEREC Primescan (Fig. 9). When restoring multiple teeth in a quadrant, it is advisable to image at least to the contralateral canine if the articulation function of the CEREC software is to be used.

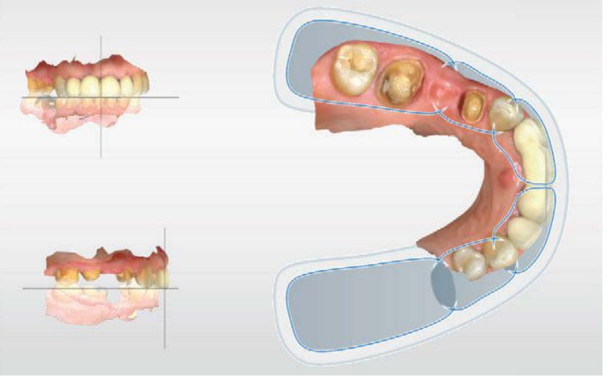


Fig. 10: Model Axis setup

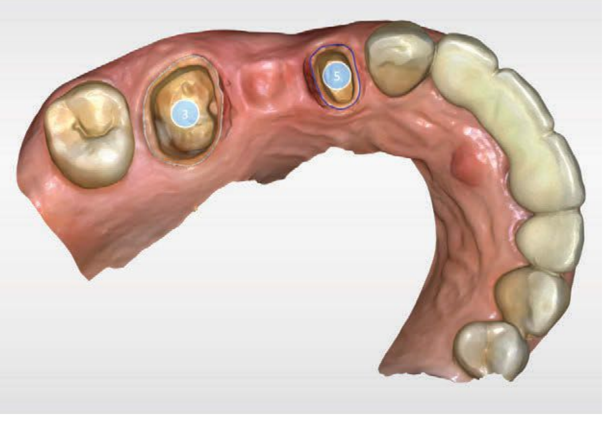


Fig. 11: Margins drawn

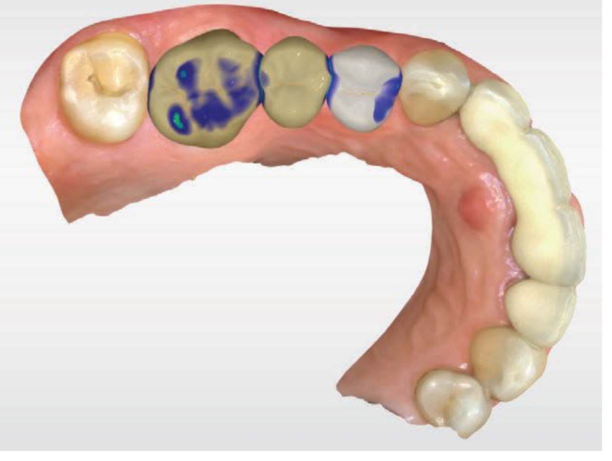


Fig. 12: Occlusal view initial proposal

The CEREC software uses advanced artificial

Fig. 13: Facial view initial proposal

Fig. 15: Facial view final proposal

Fig. 14: Occlusal view final proposal

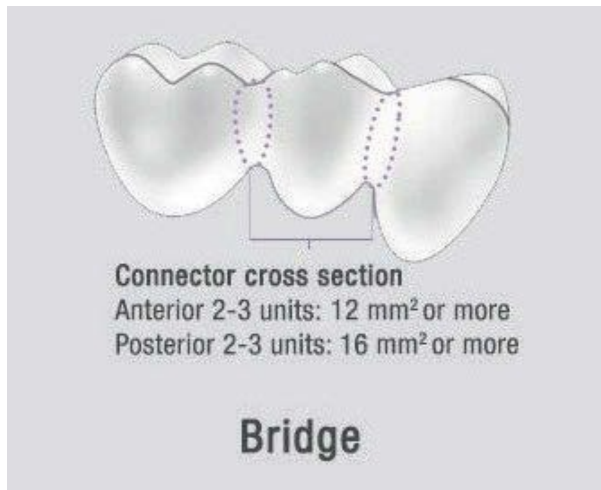


Fig. 16: Recommended connector size

intelligence (AI) to automatically set the Model Axis and draw the margins on the preparation. In some instances, it needs to be modified slightly; therefore, it is recommended that you verify both before continuing to the design. In this case, the software did an excellent job aligning the occlusal plane in the Model Axis (Fig. 10) and got extremely close with the margins (Fig. 11). The margins needed to be altered slightly, but the overall benefits of the AI in the CEREC software are clear and it greatly increases the efficiencies of the workflow.

The next step in the workflow is the Design Phase. When doing posterior bridges, proper design is critical to success. Not only do you need great contours, but also proper connector dimension for the material chosen. The CEREC software did a good job with the initial proposals (Figs. 12–13) and the final design could be achieved by using only two tools: Circular 2-Directional Shape and the Form Smooth tool. When designing bridges, the majority of work needs to be focused on three areas: occlusion, embrasure form, and connector dimension. After modifying those areas, the final bridge design was complete (Figs. 14–15).

The recommended connector dimension for bridges is manufacture-specific and depends on the material. For KATANA STML bridges, the recommended connector dimension for a posterior 2–3 unit bridge is 16 mm^2 or more (Fig. 16). This large connector dimension needs to be taken into consideration when considering using monolithic materials for posterior bridges. For example, if the interocclusal distance is small and you don't have the biology to form an ovate pontic site, getting a connector dimension of 16 mm^2 may be impossible or may create a hygiene issue around the bridge and another material should be selected. In this case, the proper connector dimension was achieved

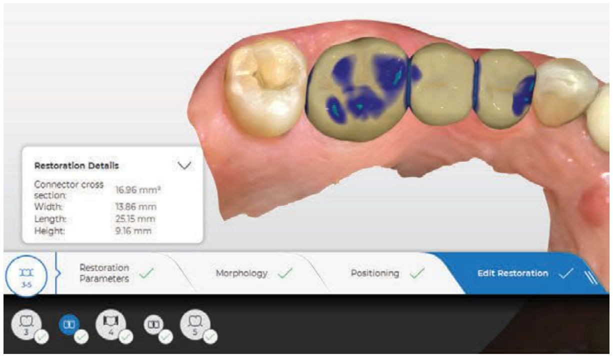


Fig. 17: Distal connector size

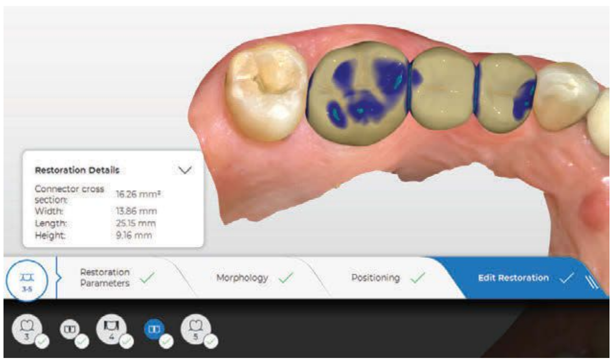


Fig. 18: Mesial connector size

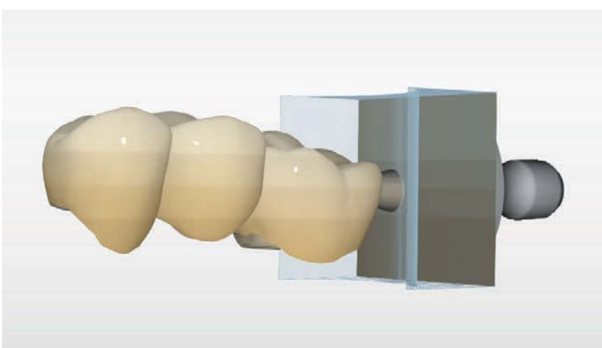


Fig. 19: Design in multicolor block

Fig. 20: PANAVIA SA Cement Universal

Fig. 21: Occlusal view final restoration

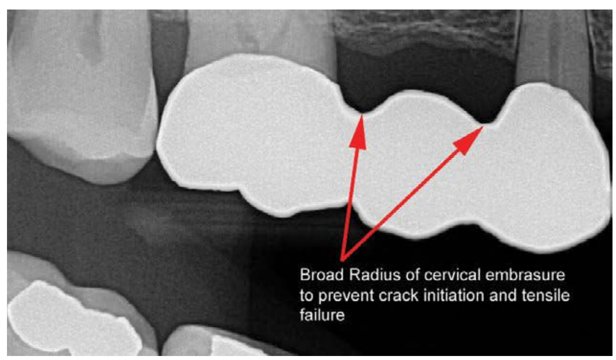


Fig. 22: Radiograph of cervical embrasures

at both connectors while also maintaining proper cervical embrasure form and pontic emergence (Figs. 17–18).

When design was complete, the restoration is brought to the Manufacture Phase. Here the restoration can be manipulated in the multicolored block to determine how much chroma or enamel-like translucency is needed (Fig. 19). The KATANA STML Blocks are chromatic multilayered with an enamel layer, two transitions layers, and a body layer.

The bridge was milled in a little more than 20 minutes, sprues removed, and sintered in just over 18 minutes. It is not necessary to glaze a zirconia restoration, but it can be done if desired. However, it is a good idea to polish the areas that will be in function as this has been shown to be less abrasive than raw zirconia or glazed zirconia. This restoration was first polished with Brasseler Dialite wheels and then stained and glazed for additional esthetics.

After sandblasting with 50-µm aluminum oxide, ultrasonic cleaning, and drying, the final bridge restoration was bonded in place with PANAVIA SA Cement Universal (Fig. 20). This new resin cement is special because there is no need for a separate primer, and silane coupling is included in the self-adhesive cement. It has two novel features: long carbon-chain silane coupling, which can create a chemical bond to all glass ceramics and resins, and also the original MDP monomer for chemical reactiveness with zirconia, enamel, and dentin. The most clinical advantageous feature of PANAVIA SA Cement Universal is the cleanup. A simple 2–5 second tack cure will allow it to be cleaned up just as easily as any traditional cement and result in an over 30-MPa shear bond strength to virtually every restorative material.

After cleanup, minimal adjustment, and polish, the final KATANA STML bridge is complete (Fig. 21). Compared to the original bridge, the shade value is higher. However, the multichromatic buccal surface creates a nice blending advantage compared to other monolithic bridge options. After further experience with other KATANA STML cases, this author has determined that you should choose 1–2 shades darker to compensate for the brighter value of the material in the enamel layer. When looking at the postop radiograph, it can be seen that the cervical embrasures have a much broader radius to help minimize crack formation (Fig. 22).

The new KATANA 14Z L STML Bridge Block is a significant step forward in same-day treatment of 2–3 unit bridges. The combination of excellent scanning with the CEREC Primescan, efficient design with the CEREC 5 software, and being able to sinter in 18 minutes (while maintaining both strength and esthetics) is a tremendous advantage clinically. The case outlined here was completed in a single visit of 1 hour and 45 minutes.

For questions and additional information, Dr. Skramstad can be reached at mike@cerecdoctors.com.