

Hybrid ceramics for 'virtual patients'

Lukas Wichnalek and **Arbnor Saraci** explain how they treated an occlusally unstable patient purely virtually with hybrid ceramic

The 'virtual patient' has long been a utopian dream in dentistry. The goal was a precise, purely virtual working basis for the planning, design and fabrication of restorations, available at all times. Models were supposed to disappear from everyday work life.

Today, the first commercial laboratories are already working completely virtually, which is opening up entirely new treatment options. This is because digitalisation not only means the further development of hardware and software, but also the possibility of using new materials in CAD/CAM-supported production. These innovative materials offer a great opportunity to treat patients faster, more economically and appropriately for the indication.

What is the difference between Vita Enamic and other ceramics and composites?

Lukas Wichnalek (LW): It's important to first clarify the difference to understand how special Vita Enamic is.

All ceramic is brittle by itself. To counteract this, during the production of the hybrid ceramics, a tooth-coloured fine-structure ceramic is sintered to porosity in block form. This is then infiltrated with a transparent polymer under pressure and heat. As a result, the ceramic clearly dominates the material structure.

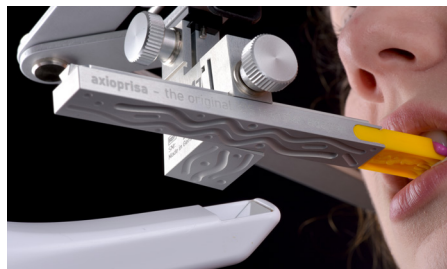


Figure 1: The Axiopriza bite fork carrier is scanned together with the maxillary dental arch

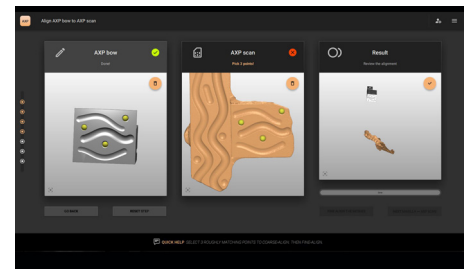


Figure 2: The Axiopriza software recognises the structures of the bite fork and spatially aligns the upper jaw

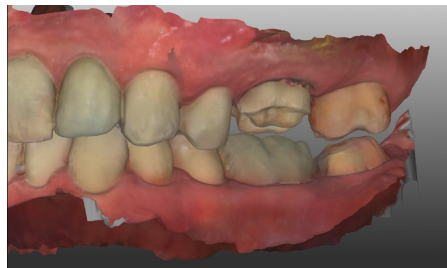


Figure 3: Partial crown preparation on UL6 and full crown preparation on LL7 in the virtual model

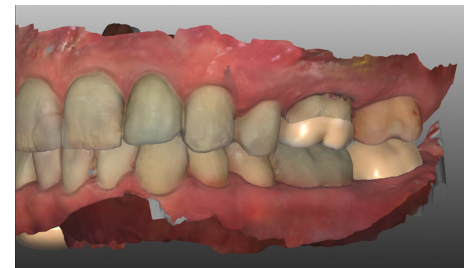


Figure 4: The construction of the partial and full crown from the hybrid ceramic Vita Enamic Multicolor

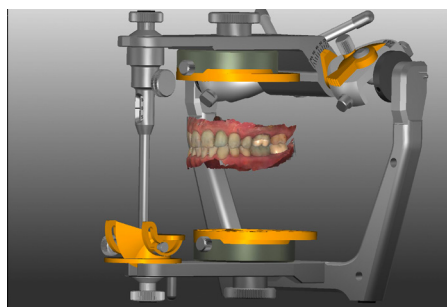


Figure 5: Both restorations on UL6 and LL7 in the virtual articulator

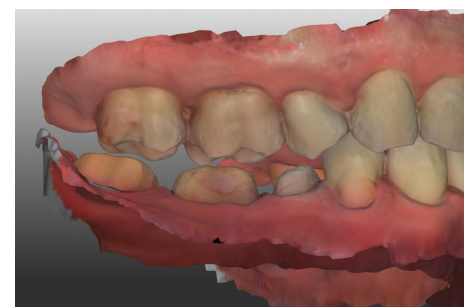


Figure 6: The full crown preparations on LR5, LR6 and LR7 in the virtual model



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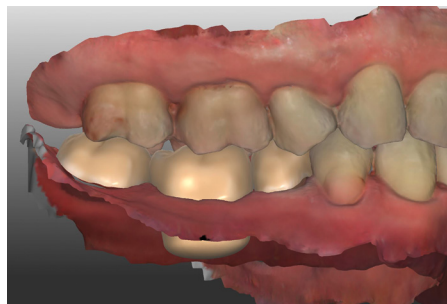


Figure 7: The full crowns constructed out of hybrid ceramic on LR5, LR6 and LR7



Figure 8: The five restorations after grinding them out of the polychromatic blocks

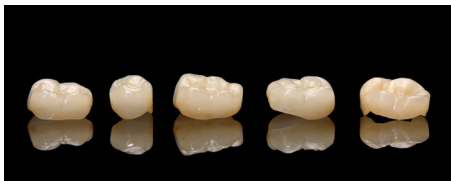


Figure 9: Result after surface finishing with the light-curing composite stains Vita Akzent LC



Figure 10: In the lumen-side view, the thin wall thickness is visible in reflected light

Arbnor Saraci (AS): And that is precisely the difference with composite blocks, which are also often incorrectly referred to as hybrid ceramics. Those consist of a polymer in which finely ground fillers made of glass, quartz or ceramic are embedded. The whole thing is then polymerised in the form of the blank.

In contrast to this, with the hybrid ceramic Vita Enamic, a dual interlocking ceramic-resin network is created, with clear material advantages.

What are the advantages for the occlusally unstable patient in the present case study?

LW: It was important to the practitioner to use a restoration material that could be ground easily and reliably at any time, but that could also be built up.

The hybrid ceramic Vita Enamic is very robust when grinding. If this causes microcracks in the ceramic, these are stopped by the time they reach the adjacent polymer. Cracks do not spread, preventing any major damage from occurring. Afterwards, polishing is fast and simple.

AS: Additions or corrections with composite are also possible at any time. The ceramic clearly dominates on the surface, which is why the hybrid ceramic can also be conditioned in the same way.

After final integration, such restorations can be roughened in the mouth at any time, silanized and then adhesively supplemented with filling composite. This flexibility gave the dentist more security with the occlusally unstable patient.

Did you work completely without a model in this case? How was this purely virtual way of working generated?

LW: There has really been some progress here. Even when working without models, everything can now continue as usual. First, of course, the dental arches are scanned and



Figure 11: The plasma-sterilised, welded restorations were ready for delivery



Figure 13: The crown on LL7, which was fabricated without a model, fits precisely, both marginally and occlusally

a vestibular scan is performed to record the habitual occlusion. Then the analogue SAM transferbow is applied as usual, but with a small, subtle difference.

AS: Yes, we now use the scannable Axiopriska bitefork carrier. Its special surface structure is recognised by the associated software after the scan, so that the virtual upper and lower jaw are arranged in a spatially correct manner relative to the base of the skull.

This virtual articulation can then be imported into the CAD software. The interaction of the Axiopriska and Vita Enamic Multicolor worked with absolute precision.

In what other cases is polychromatic hybrid ceramic used and what advantages does it offer?

LW: Our practitioners always like to use the hybrid ceramic Vita Enamic when it comes to single-tooth restorations in functionally difficult patients. As I mentioned, the material can be ground and polished or supplemented without any problems.

Another advantage is clearly the ability of the material to absorb chewing forces, which helps to relieve the masticatory apparatus.

AS: Not only that. The enamel-like abrasion is also a major advantage. If a material is more resistant to abrasion than enamel, the restorations will be too high in the long term and premature contacts will occur.

Vita Enamic wears down in harmony with the hard tooth substance. Of course, hybrid ceramic is the material of choice if the practitioner wants to proceed in a minimally invasive manner. In the case shown here, we see how very thinly and precisely the material can be ground.



Figure 12: The hybrid ceramic partial crown on UL6 appeared completely natural



Figure 14: The hybrid ceramic crowns on LR5, LR6 and LR7 hardly had to be ground



Figure 15: The restorations made of Vita Enamic Multicolor fit harmoniously into the mandibular arch

What advantages does the hybrid ceramic Vita Enamic offer for laboratory processes? How has your experience with the material been so far?

LW: The shade accuracy of the polychromatic hybrid ceramic Vita Enamic Multicolor was also the key to monolithic aesthetics in this case. Vita Zahnfabrik is, so to speak, the inventor of tooth shades. This means that the shade of the blank simply and reliably matches the specific tooth shade.

This is a huge advantage when working monolithically, of course. Because we buy the right tooth shade with the blank, the integrated shade gradient automatically ensures a natural appearance.

AS: It is amazing how quickly the restorations are ground out of the blocks. The material is processed without firing, and the restorations can be integrated immediately after finishing and polishing. All of this saves an incredible amount of time, which is why the five restorations could be manufactured with absolute efficiency.

We've had the hybrid ceramic in our portfolio for four years now and the feedback has been consistently positive. 