Optical impressions with Zfx IntraScan: The accurate basis for various kinds of restorations Dr. Giovanni Pisoni

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Digital impressions which are taken with intraoral scanners and used as a basis for the fabrication of highly precise restorations are becoming increasingly popular in dentistry. As proven by clinical studies, the procedure is very accurate and usually more comfortable for the patient than conventional impressions. When the first oral scanners were launched in Europe in 2009, most of them belonged to closed CAD/CAM systems and were released for a restricted number of indications. Step by step, the range of applications was broadened and the architecture of the devices was opened to several other systems..

In September 2012, a new intraoral scanner will be launched by the company Zfx. Right from the start, Zfx IntraScan will be compatible with other systems, provided that they have open interfaces. It may be employed for impressions of natural teeth and implants. Within the Zfx CAD/CAM system, the generated three-dimensional model serves as a basis for the fabrication of implant abutments, crowns and bridges with up to five elements.

As a pilot user, I have tested the device for several months. My experience with the new device, different options regarding the restoration and the complete digital workflow offered by the company Zfx will be described in the following article on the basis of a patient case.

Two implants and a natural tooth
The patient presented with an insufficient metal-resin crown on the right mandibular first premolar and missing posterior teeth in this quadrant. In order to replace the teeth, two Tapered Screw-Vent® Implants (Zimmer Dental) were placed, one with a diameter of 4.1 mm and 11.5 mm length in the region of the second premolar and one with a 4.7 mm diameter and 10 mm length in the region of the first molar. Immediately after the surgery, healing abutments were placed on the implants (Figs. 1 and 2). Two months later, the old restoration on the first premolar was removed, the tooth prepared and a provisional placed (Fig. 3).
**CASE STUDY „Dr. Giovanni Pisoni“**

**Scanning preparations**
Once the soft tissues had healed and full osseointegration had occurred (Fig. 4), the temporary restoration was removed (Fig. 5). In order to achieve the conditions required for an accurate intraoral scan – a clean and dry working field and clearly visible preparation margins are necessary – retraction cords were placed around the abutment tooth and compatible match holders connected to the implants (Figs. 6 and 7). Connection of the match holders is easy, and the geometry of the connection makes sure that they remain in the desired position throughout the scanning procedure (Fig. 8).

During data acquisition, the dentist should always bear in mind that the scanner only captures what the eyes can see. With Zfx IntraScan, powdering of the surfaces with scan spray is not required however, the scanner works faster when a thin layer of powder is applied. In this way, a uniformly reflective surface is created and this makes modeling easier for the device.

**Three-dimensional model as a basis for design**
Subsequently, the intraoral scanner was guided over the surfaces of the teeth. While the device is moved inside the mouth, the dentist can follow the process of data acquisition on the monitor of the notebook which is connected to the handpiece via a cable. As a 3D model of the teeth is generated in real time, the dentist realizes directly e.g. when an area is covered by saliva and cannot be captured correctly.

In this case, it is possible to stop the scan, remove saliva and start the process again at the same point. For this purpose, the last point that has been captured is marked on the monitor. When the information about the mandible and the opposing dentition was complete, a bite registration was taken by scanning the teeth in occlusion (Fig. 9).

**Data transfer and virtual design**
The finished model was checked on the screen before a new project was opened in Zfx Manager for data upload onto the platform Zfx Dental-Net (Fig. 10). The data set was uploaded, information about the patient entered and a laboratory partner chosen. In the present case, the order was sent to Denttec, the partner laboratory of the milling centre Zfx Italia. It is located in the same building as Zfx Innovation, where new products of the company are being developed, and is co-owned by DT Andreas Geier, one of the directors of Zfx.
There, different restorations were designed with the Zfx Design Software: two implant abutments, three cores for zirconia crowns on the abutments and the tooth, one core for a bridge on the two implant abutments and three caps for the overpress technique (Figs. 11 to 13). For the abutments, connectors that are compatible with the Tapered Screw-Vent® Implants were selected in a library of the software which includes compatible titanium bases for various implant types.

**Production of the elements**

The resulting STL file with the digital designs was transmitted to the milling centre via Zfx Dental-Net. There, the abutments were fabricated in two versions: one set was made of titanium and one of zirconia (Fig. 14). Subsequently, three different sets of restorations were produced: Three zirconia cores for single crowns, a zirconia bridge framework plus a crown and a set of zirconia cores plus caps made of a burn-out plastic for the overpress-technique on zirconia copings (Figs. 15 to 17).

In order to check the interproximal contacts and the occlusion, the abutments and restorations were placed on a plastic model that was provided by Zfx in a partial articulator (Fig. 18).

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Fig. 11: Virtual design of the crown …

Fig. 12: … and bridge frameworks …

Fig. 13: … and the implant abutments.

Fig. 14: Two sets of abutments produced from different materials.

Fig. 15: Zirconia cores for single crowns on titanium abutments at try-in.

Fig. 16: Try-in of the zirconia core on the natural tooth abutment and a bridge framework on the titanium abutments.

Fig. 17: Plastic veneering layers on the zirconia copings.

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Fig. 18: Plastic veneering layers on the zirconia copings.
The model was also used for ceramic layering of the zirconia cores and finishing of the crowns made of lithium disilicate ceramic. Figure 19 shows the restorations after finishing and polishing.

**Intraoral comparison**
In order to compare the different restorations with respect to intraoral fit and aesthetics, they were all placed in the patient’s mouth. At first, the zirconia abutments were connected to the implants and the lithium disilicate crowns placed (Figs. 20 and 21). Subsequently, the titanium implant abutments were screwed in and the bridge as well as a zirconia crown placed (Figs. 22 and 23).
Finally, the zirconia crowns were cemented on the titanium abutments (Fig. 24). Thanks to the precision of the impression and the manufacturing process, all elements fitted perfectly (Figs. 25 to 27). The aesthetic result was highly pleasing as well. In the end, the single zirconia crowns on titanium abutments were the correct choice for the present case, because this combination turned out to be the most stable and secure solution recommended for implant-borne posterior restorations. Figure 28 shows the final restorations one year after their placement.

**Conclusion**

In the present patient case, different types of restorations were produced on the basis of a single digital impression. No matter whether tooth or implant-borne, single or multiple-unit restoration and irrespective of the selected material, all elements showed a perfect fit and the final restorations had a natural appearance.

To my mind, the Zfx IntraScan offers several benefits: on the one hand, it is part of a complete digital system with numerous options regarding indications and material selection, and compatibility with various implant systems. On the other hand, the data output in STL means that the user can also process the data in other CAD/CAM systems. Another aspect is the portability of the scanner. Since the required technology is incorporated in the handpiece, a large workstation is not required – the scanner can be connected to a usual notebook.

Furthermore, the data file containing the three-dimensional model has an appropriate size and can be exchanged between the practice, laboratory and milling center without difficulties. Finally, I would like to mention that it takes some time to acquire the skills needed for efficient intraoral scanning, however, once the dentist gets used to the floating movements and eye-hand coordination (looking at the screen and scanning in the mouth), highly accurate digital impressions are obtained so that the device has a positive impact on the work processes in the practice, the laboratory and the milling centre.