Minimally invasive prosthetic treatment with various ceramic materials

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In cases where a full mouth reconstruction is required, it is essential to follow a systematic procedure and use carefully coordinated materials.

The following case study describes the treatment of a patient with tooth agenesis.

New materials and innovative techniques for modern esthetic and minimally invasive dentistry are coming to the market every day. As a result, patient-focused treatment protocols are continuously improving. If complex treatment is indicated, however, personal aspects in addition to the functional and aesthetic requirements of the patient need to be addressed – for example, psychological stress or financial constraints.

In this article, we will explore the possibilities of providing minimally invasive treatment, taking these factors into consideration.

Case study

The twenty-three-year-old patient showed severe hypodontia (tooth agenesis) with a total of fourteen missing teeth (Fig. 1). Seven teeth were missing in both the upper and the lower jaw. Severe hypodontia of this kind usually results in a very low vertical dimension of occlusion. In some cases, it disturbs the chewing function. At the beginning of this type of treatment, psychosocial aspects have to be taken into consideration. In the present case, the patient did not smile during the first appointment, and he covered his mouth with his hand when he spoke. Due to the financial constraints of the young candidate and his fear of an operative intervention (treatment with implants), it was decided to pursue a conventional prosthetic treatment approach. According to the treatment plan, the upper anterior teeth would be restored by means of an all-ceramic bridge and the lower anterior teeth with lithium disilicate veneers. The decision was taken to treat the posterior teeth with metal-ceramic restorations.
Clinical examination and treatment planning

The first part of the oral rehabilitation process involves a clinical examination in which the facial and dental conditions are analyzed. This investigation showed a substantially reduced vertical dimension of occlusion. The patient was missing 14 permanent teeth. Furthermore, several deciduous teeth were still in place. Tooth 36 had been destroyed by caries, making its extraction inevitable.

In order to provide the dental technician with the information required for waxing up a restoration, details related to the vertical dimension of occlusion and facebow records must be supplied in addition to the impression. If the vertical dimension of occlusion needs to be increased, the correct centric position has to be evaluated first. In this case, an anterior Lucia (a made of a thermoplastic material was used as a registration aid (Fig. 2). A facebow was used to establish the relationship of the maxillary jaw to the horizontal reference plane or bispinum line. In the fabrication of extensive restorations, the prosthodontic and the laboratory positions have to be recorded in order to make any necessary adjustments to the articulator. An additional silicone, for instance, Virtual CAD-bit can be used for this purpose. In most cases, this type of material produces faster and more accurate results than wax. When wax is used for bite-taking, the patient has to be shown how to move into the protrusive or lateral functional position. Experience has shown that it is easier to let the patients produce these movements of their own accord and store them when they arrive at the “right” position (Fig. 3). Virtual CAD-bit is injected while the teeth are in this closed position.

Wax-up and mock-up

The following minimum documentation was required for the fabrication of the wax-up: precision impressions of the upper and lower jaw, a facebow transfer record, a centric bite record in wax with the patient smiling, facebow transfer record, a centric bite record in wax with the patient smiling, facebow transfer record, a centric bite record in wax with the patient smiling, facebow transfer record, and a facebow transfer record. This method entails the following minimum information in order to fabricate the restoration: precision impressions of the upper and lower jaw, precision impressions of the provisionals, a facebow transfer record and three bite records (cross-mounting), and the centric jaw relationship of the patient smiling. A “cross-mounting” technique is suitable for this purpose. This method entails first making a bite record of the prepared teeth in the upper and lower jaw. Subsequently, a second record is taken of the provisional restoration in the upper jaw and the prepared teeth in the lower jaw. A third record is captured of the prepared teeth in the upper jaw and the provisional restoration in the lower jaw.

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The aim at this stage was to “copy” the shape and occlusal plane of the provisionals and to accurately transfer this information to the final restoration. For this purpose, the cast was fabricated in the laboratory after the “cross-mounting” process. Since the final situation had been successfully attained by means of the provisionals, the frameworks could be fabricated relatively easily.

As a result of using the CAD/CAM approach, the final restoration could be visualized, modified and/or duplicated with the assurance that all the design guidelines would be observed. The Wearland Precision Technology (WPT, Naturns, Italy) milling centre was responsible for fabricating the frameworks for the metal-ceramic restorations in the posterior region as well as the zirconium oxide framework for the upper anterior teeth (Fig. 9). The framework was tried-in to confirm the correct fit of the restoration. Most of the inaccuracies that usually occur are due to errors made during impression taking, casting or model fabrication. The framework was finished and veneered with an additional adhesive technology (IPS e.max®). The metal frameworks were veneered with the new PFM system IPS Style®. It allowed us to achieve the desired natural-looking, translucent shade without having to sacrifice on brightness. The IPS Style® offers a major advantage in that it can be optimally adapted to the IPS e.max Ceram. As a result, the veneers on the metal frameworks could be optimally adjusted to the IPS e.max Ceram. Furthermore, the IPS Style® is well accepted by the patient.

The final prosthetic phase started after the long-term temporary had been worn for an adequate period of time. Before impression-taking, the teeth were prepared again and polished. It is very important to transfer the vertical dimension of occlusion and the information about the tooth-to-tooth relationship from the provisional to the final restoration with great care. The “cross-mounting” technique is suitable for this purpose. This method entails first making a bite record of the prepared teeth in the upper and lower jaw. Subsequently, a second record is taken of the provisional restoration in the upper jaw and the prepared teeth in the lower jaw. A third record is captured of the prepared teeth in the upper jaw and the provisional restoration in the lower jaw.

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In extensive cases, it is particularly important to develop a well thought-out plan including all the treatment steps, which needs to be carefully followed at all times. In the described case, various ceramic materials were cleverly combined to produce a harmonious result. Excellent communication between the dentist and the dental technician together with well-coordinated state-of-the-art materials provided the basis for this highly satisfactory outcome.
3Shape CAD/CAM in a major Dental Lab

It was the technicians’ choice

By 3Shape

The versatility and solution coverage offered by 3Shape systems has enabled Glidewell to grow and develop well ahead of its competition by continuously expanding the range of its products and services. Now all types of restorations and large orders are handled digitally each day, with over 50 of 3Shape’s installations covering every Glidewell department need.

The Challenge

Glidewell’s proclaimed ambition is to be a pioneer in the Digital Dentistry Revolution, and, to achieve this, they knew they must work with the best systems. Investing in a single CAD/CAM brand was not the important issue for them; Glidewell simply wanted to use best-of-breed systems for each service they provided.

With a dampened mood in the economy, more and more small and mid-sized laboratories were looking for sources of digital technology services in order to remain competitive, and this opened new business opportunities for full-service labs like Glidewell. More than ever, it became imperative to have fast and productive systems that could provide attractive digital services and products of high quality.

Glidewell develops their own systems and methods for many applications, including abutments, implants, milling and special materials, and they required flexible and highly versatile software systems to support these.

They needed a system that was not limited—a system that could grow with them, ensuring that they could continue bringing their in-house developed products to the market while broadening their range of services.

The Solution

Glidewell initiated a technology solution business plan whose goal was to become familiar with the market’s flexible CAD/CAM systems. 3Shape was one of the first to present itself, but other brands were installed later, and Glidewell technicians soon became familiar with operating a wide range of systems.

Despite Glidewell’s readiness to employ best systems for different purposes, 3Shape accuracy, ease of use and efficiency continued to win preference in every department. Alternative 3D scanners and software systems were simply being pushed aside to make room for 3Shape. Glidewell’s technicians at the bench slowly but surely gravitated to 3Shape’s solutions for most of their tasks.

Today, Glidewell Laboratories has over 50 3Shape DentalSystem™ and D4oo series scanner installations spread throughout the full areas of Glidewell’s many departments. In step with the ever-increasing integration of 3Shape into their workflows, Glidewell has instituted convenient on-line services for other Dental labs using 3Shape, enabling them to upload their 3Shape scans or design files direct to Glidewell for special processing and production with Glidewell’s own materials.

The Results

It has become clear to Glidewell that their 3Shape solutions are a major factor in enhancing their business, and they credit this to the system’s accuracy, consistency, predictability and reproducibility of output. Many incoming orders explicitly express the condition that they are to be executed using Glidewell’s 3Shape systems.

The accuracy of the 3Shape system enabled Glidewell to introduce 2 highly successful products that are enjoying explosive market growth. BruxZir® full Zirconia restorations and Inclusive® Implant Abutment applications. No other CAD/CAM solution contained the powerful design capabilities necessary to morph the explicit full contour required. Designs made with 3Shape could be milled directly without flaws – thus opening windows to new productivity and profitability with Zirconia material.

BruxZir® Zirconia soon became the fastest growing product in the history of the laboratory, and today Glidewell is making 8,000 BruxZir® restorations per week using 3Shape’s technology.

The flexibility of 3Shape as a system and a company fit perfectly with Glidewell’s goal to help pioneer the growth of digital dentistry. Glidewell’s technicians continuously communicate with 3Shape, giving feedback regarding their daily challenges, and often seeing direct solutions answers in later 3Shape software releases.

Source: Greg Minzenmayer, Robin Bartolo, Rudy Ramirez