Implant Retained Overdentures– The Advantages of Zirconia

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Abstract

The number of totally edentulous patients is steadily increasing, but so is the number of solutions to their problems. The percentage of patients wearing complete dentures who are dissatisfied with their comfort and functionality is high, and the solution is to combine these dentures with implant retention.

Removable implant-retained overdentures are a challenge both for the clinician and for the technician, but this may be a comfortable, aesthetic and functional option for a totally edentulous patient who cannot afford a large number of implants, or if inserting more implants positioned onto the whole surface of the dental arch is not possible.

Case presentation

A 55-year-old patient wearing maxillary dentures decided that he wanted to improve his level of comfort, the aesthetics and functionality of the work.

The concept of removable implant-retained overdentures using the Dolder bar is popular in Europe, but it has been improved with the emergence of new technologies and materials.

The solution is to use a zirconia bar, milled at 2° with 2 anchor systems (attachments) at the distal end of the bar, with a golden secondary structure obtained by Galvanoforming.

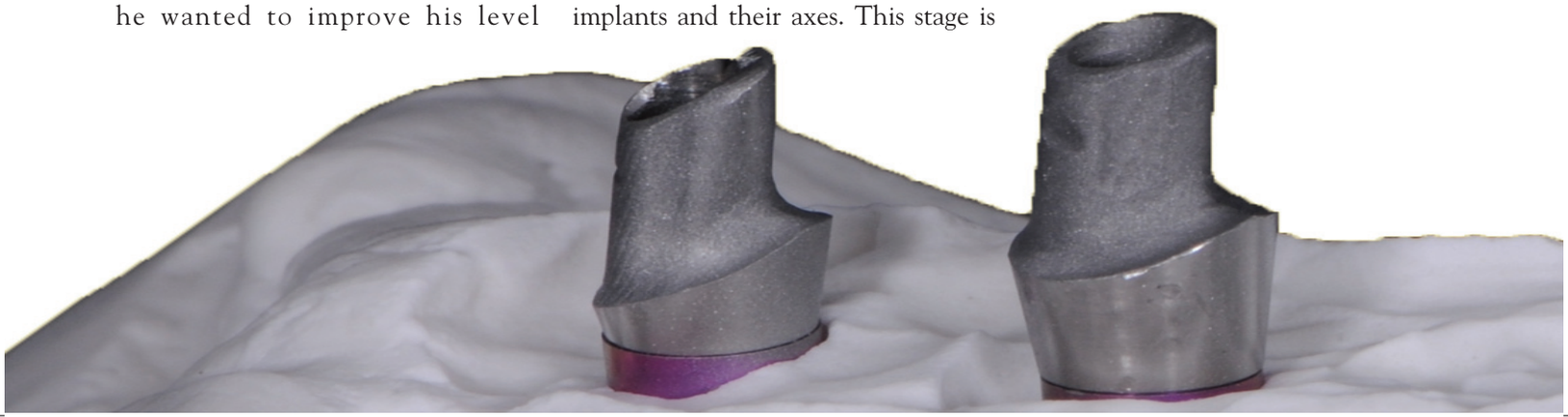
This approach gives us the advantage of a tension-free primary structure made of zirconia, a secondary structure that offers us the advantage of hydraulic retention and a tertiary structure that provides the endurance needed for a removable work.

In order to reach the next stage, we need a dental impression that will reflect the exact position of the implants and their axes. This stage is very important, because the accuracy of the primary structure depends, to a great extent, on the manner in which the position of the implants is transferred.

An open individual tray was produced on the first model, and the impression abutments were connected in the lab by means of a light cured universal modeling resin by primotec USA/Germany: Primopattern Gel. (Figs. 1 & 2)

In order to facilitate the insertion of the impression abutments and to ease the practitioner's job, the primopattern bar was sectioned, thus obtaining an individual impression guide. (Figs. 3)

The final impression was taken after positioning the abutments onto the implants and reconnecting the bar in the oral cavity by means of Primopattern Gel.



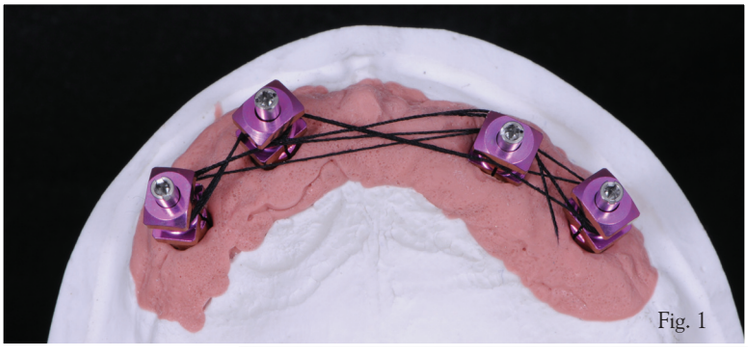


Fig. 1

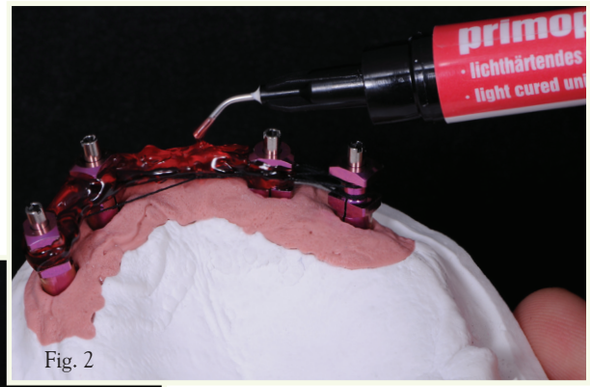


Fig. 2

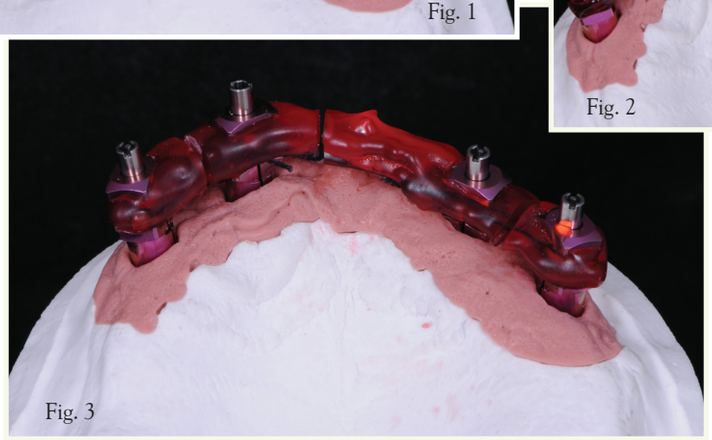


Fig. 3

This procedure is useful to the practitioner if he wishes to double-check his work, because the position of the bar on the model must be identical to its position inside the oral cavity.

The first step is to determine the shape and color of the teeth to be used. Although most reach this stage towards the end of the work, it is very important that, in the case of this type of protocol, this step is placed at the very beginning.

Why?

Because, after the occlusal relation determined and transferred it into the articulator, an aesthetic and functional set-up is produced. This set-up is tried in inside the oral cavity, and the rest of the steps are to be carried out after the patient gives his consent about the aesthetic aspect; all the other stages will be guided by the volume of the set-up.

Even though CAD is easy to use, i.e. automatically positioning the bar and giving us all the accessories needed to adjust or correct the structure, if we know the final position of the teeth from the set-up, we will be able to place the structures in the correct position and our work process will be streamlined.

The primary structure

The creation of a new work model was necessary: the master model, cast in type IV plaster into the impression taken with the individual tray. In the area of the implants, elastic silicone gum was used to facilitate the transition at implant level, thus easily controlling the check-up of the structures' adaptation to the implant platform.

Once the work models were obtained and the intermaxillary relations were recorded using occlusal patterns, all the information was transferred into an articulator.

The mounting of the teeth was made according to the established rules, but also taking into account the antagonistic works, the

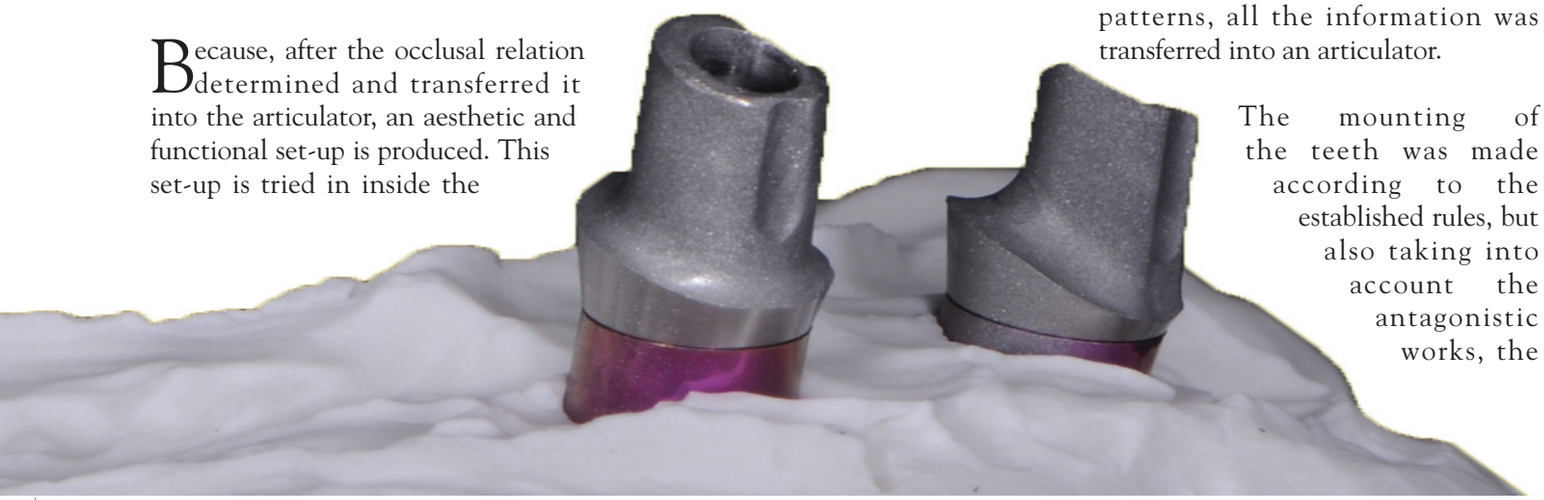



Fig. 4


Fig. 5

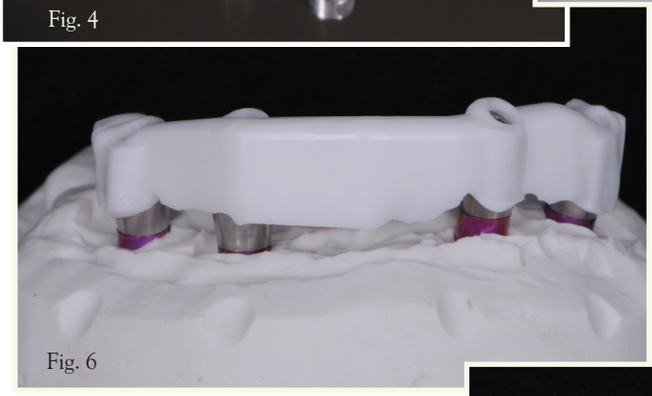


Fig. 6

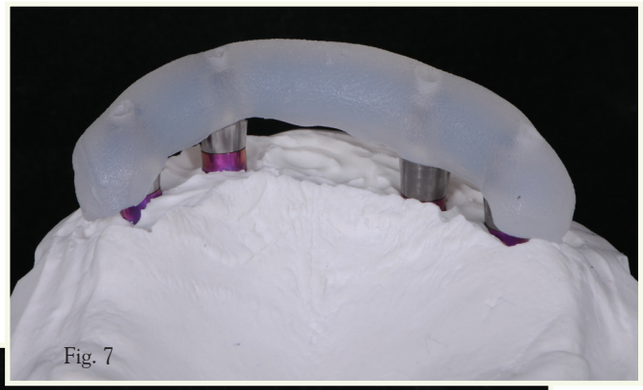


Fig. 7


Fig. 8

patient's requests and the dentist's instructions. A silicone key was made over the set-up, on both the vestibular and palatal sides, to guide us when producing the structures.

In addition to the advantages of productivity and precision, CAD/CAM also makes it easy for us to create a Dolder structure. At the first step the standard Titanium non-hex abutments (Fig. 4) were prepared to obtain custom abutments and after that scans of the Titanium base non-hex abutments (Fig. 5), of the model and a double scan of the set-up were made. This scan of the set-up is the equivalent of silicone keys made at the beginning in order to guide ourselves on the model, thus obtaining the volume of the final work in 3D format, a volume that, as previously mentioned, guides us in correctly positioning the bar. The CAD library includes various types of bars, shapes, positioning and modelling instruments, but at the same time it has certain restrictions; if one wishes to change certain portions of the bar that may jeopardize the correct result, the software will block these operations.

These restrictions represent an advantage for those who are inexperienced with this type of structures.

At the distal end of the structure, we positioned 2 Swift ART sliding anchor attachments from the CAD library. The 3D information of the anchor systems may be found in the library of the software, depending on the system we choose.

The attachments are positioned in the insertion axis of the bar or, if one wishes, the axes may be modified. The relation to the prosthetic field may be adjusted as needed.

The structure was milled in zirconia, with the help of CAD/CAM, and then sintered (Fig. 6).

In order to secure the exact and repetitive position of the Titanium non-hex abutments, we created a key made of primotec's Primosplint light cured splint material, using it each time the abutments needed to be detached from the model (Fig. 7).

Using dual cements, the titanium abutments (Fig. 8) were sandblasted and cemented onto the zirconia structure; thus, we obtained a passive-

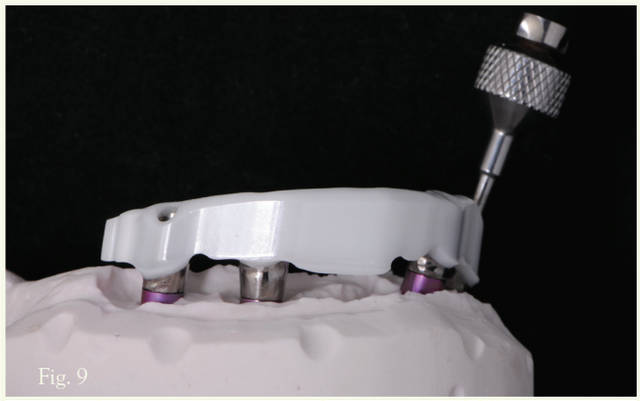


Fig. 9


Fig. 10

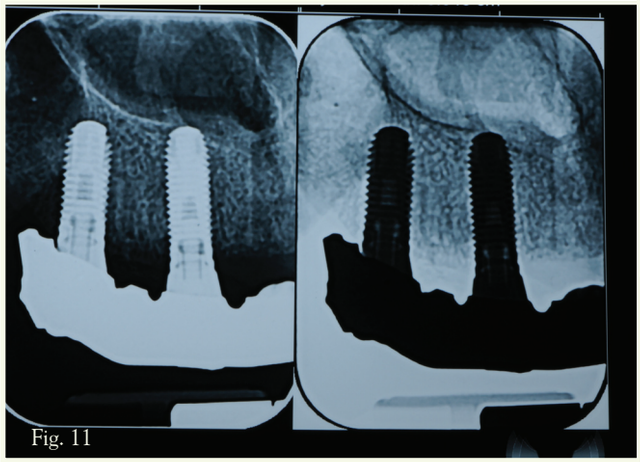


Fig. 11

fit structure (Figs. 9, 10 & 11, Periapical x-ray obtained after 1 year. Bone adaptation is excellent)

Next, special attention was given to the final finishing of the zirconia structure, in order to obtain a bar milled at 2°. The finishing was carried out by means of the lab turbine and parallelometer. The walls of the structure were given their finishing using diamond milling tools and the sufficient amount of water spray. (Figs. 12 & 13)

At the extremities the attachments have been checked and the matrixes have been added. (Figs. 14 & 15)

The secondary structure

The zirconia structure was prepared in order to produce the secondary structure by the Galvanoforming process. The screws were positioned onto the bar and the retentive areas were covered in Primopattern Gel, thus also obtaining a base for the Galvanoforming. (Fig. 16)

The zirconia bar was covered with a conductive silver coating by the airbrush method. (Fig. 17)

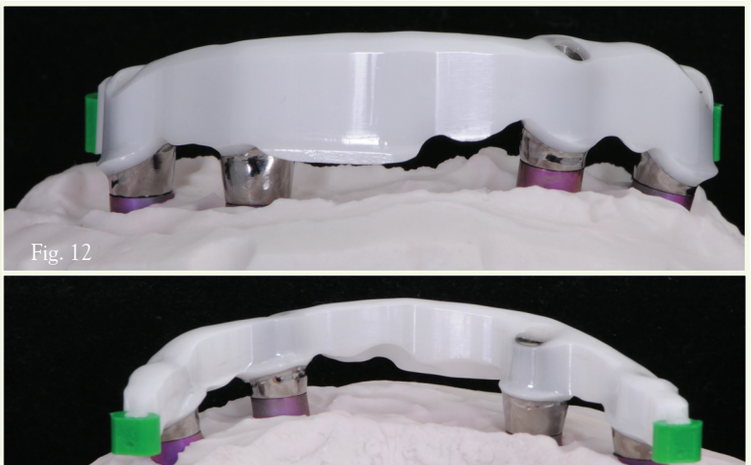


Fig. 12

Fig. 13


Fig. 14


Fig. 15

Fig. 16

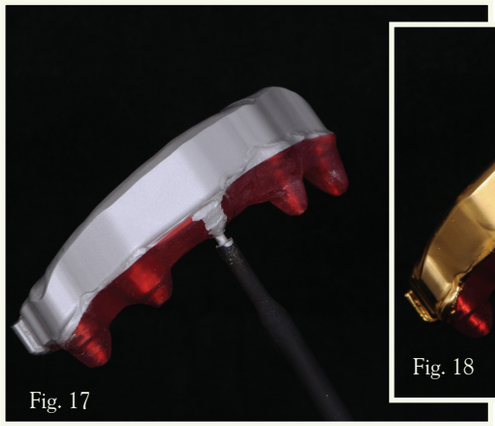


Fig. 17

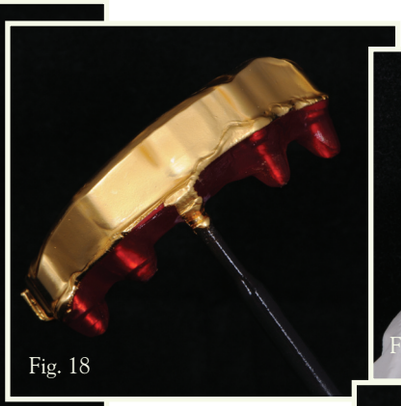


Fig. 18

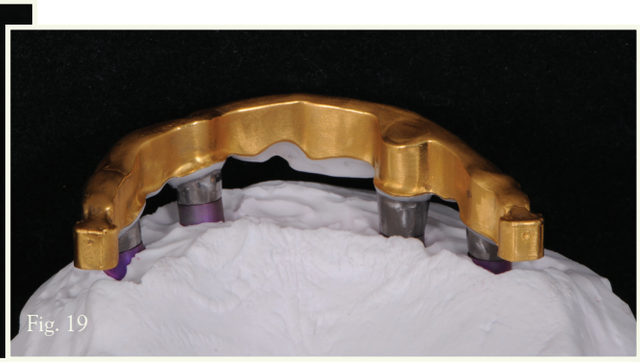
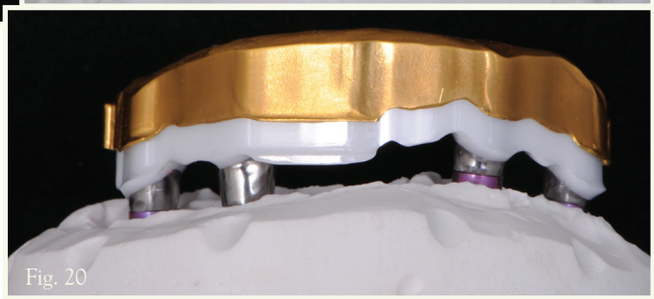


Fig. 19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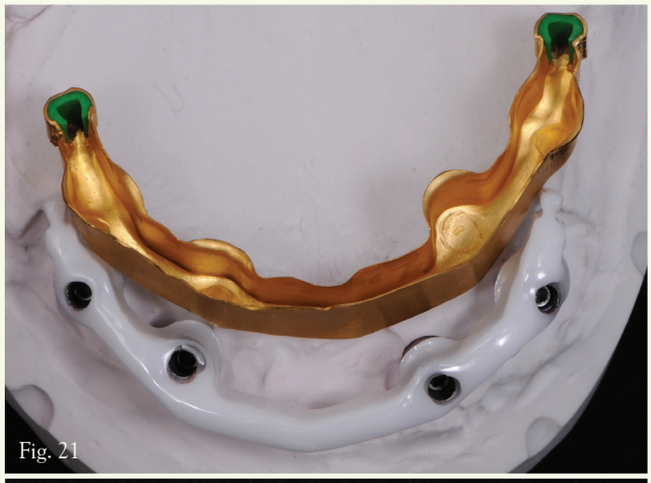
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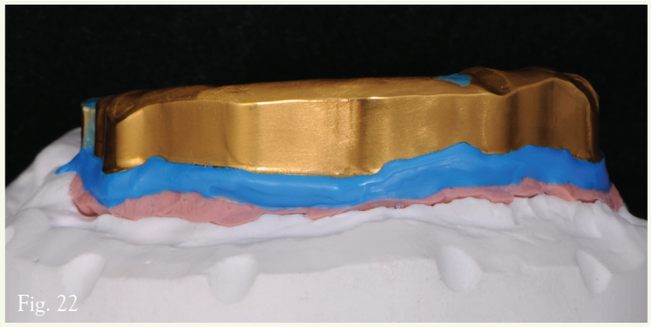


Fig. 22

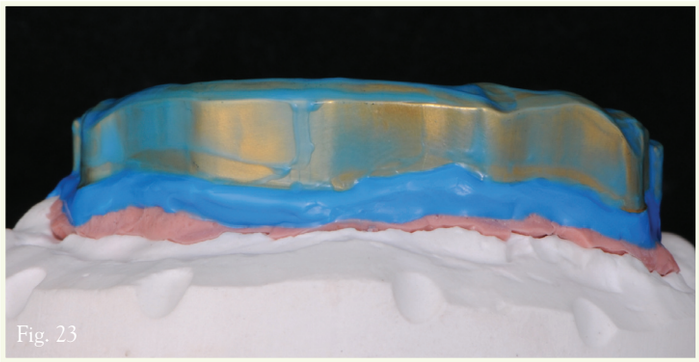
After the Galvanoforming process, (Fig. 18) the galvanized gold structure was detached from the zirconia bar and the conductive silver coating was removed by means of a nitric acid based solution. (Figs. 19-21)

The tertiary structure

All components were repositioned onto the work model, and the retentive areas were blocked out with wax. (Fig. 22) The entire surface of the golden secondary structure was covered with a thin layer of wax, which is meant to create the space necessary for the cement film that would be used to cement the two structures. (Fig. 23)

In order to save time, the method of using a duplicate model was avoided. Instead, the tertiary structure was built directly on the work model over the existing structures (Fig. 24) very efficiently using Primopattern Gel. Next, the casting sprues were positioned and the tertiary structure was invested for casting. The silicone key was used at this stage as well, in order to check that enough space would be left at the end for the aesthetic component and to make sure that the structure could be modeled so that the result would be durable.

The tertiary structure was cast in CoCr alloy by the induction method. After checking and polishing the tertiary structure (Fig. 25), the golden structure was cemented into the CoCr tertiary structure, and the entire resulting structure was coated with light-curing opaque material. (Fig. 26)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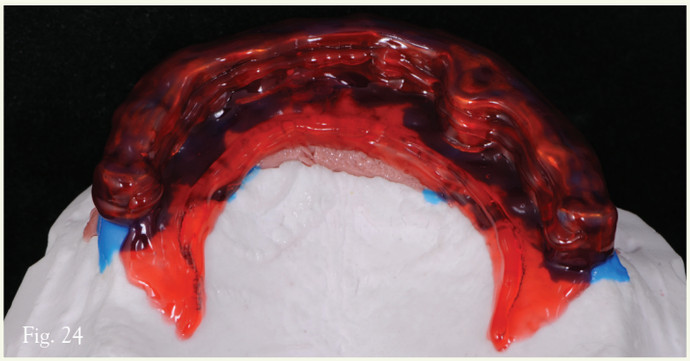
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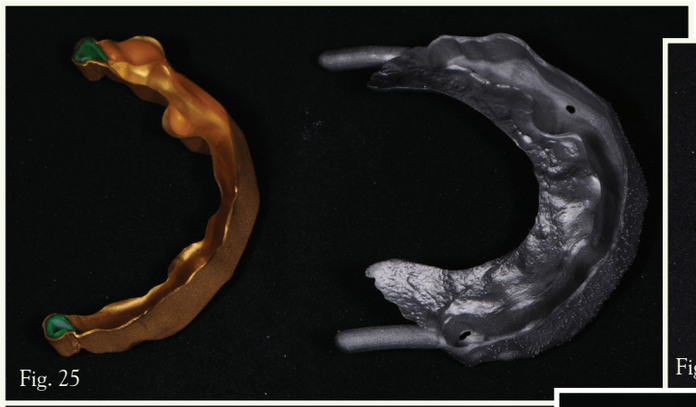
Fig. 25


Fig. 26


Fig. 27


Fig. 28


Fig. 29

The silicone guide was used again, in order to reposition the denture teeth in wax on top of the tertiary structure. The occlusal relation was checked once more; then, we went on to transform the physiognomic component. In order to obtain improved aesthetics for the artificial gum as well, several gingival masses were used after injection. The colors were placed directly into the silicone key, in order to obtain as natural an aspect as possible for the artificial gum. The extra amount of gum needed was injected manually and polymerized at 45°C, under a 2-bar pressure.

After the final polymerization, the dentures were divested, the surpluses were removed and the work was carefully processed by means of various types of grinding tools, brushes and threads. The final polishing was carried out by means of biaxial brushes and pads. (Fig. 27, 28 & 29)

• Special thanks to Dr. Alina Picos for the collaboration on this work.

Conclusion

In the attempts to restore oral implants in the edentulous mandible, Dolder bars appear to offer a high rate of implant survival, good stability of the peri-implant tissue, and a low rate of prosthetic complications.

Additionally, the evolution of technology and materials makes it possible for us to find varied solutions and increase our productivity, while also improving precision. The comfort of totally edentulous patients who choose this way of treatment is also improved. In the end, it is up to each technician to offer the patient a customized smile. SD

About the Author

Cristian Petri successfully completed his 2-year dental technician college in Cluj-Napoca, Romania in 1999. Subsequently, he worked as a dental technician until 2001. He then decided to work in the USA and Germany as a dental technician for almost 2 years. (May – Oct. 2001: New Jersey and Dec. 2001-Nov. 2002: Althausen-MDT Alexander Konig).

In November 2002, he opened his own laboratory, Artchrys, in Cluj-Napoca. He has continued to further specialize as he has partaken in courses conducted by Prof. Rudolf Slavicek, MTD Massimiliano Trombin, MTD Achim Ludvig, MTD Jan Langner and MTD Haristos Girinis. Since 2011, he has lectured and published information regarding the fabrication of complex implant restorations with a focus on function and aesthetics.

Since 2013, he has been the pilot lab for Primotec/Germany and also the opinion leader in Romania for Artiglio-Italy.