

NEW OPTIONS FOR NON VITAL TEETH: The Colibri concept

The use of glass fiber reinforced posts for root-anchored crown constructions is an established, excellent alternative to cast or prefabricated root posts. Their success is inherent with the advantages of adhesive dentistry: biologically compatible, substance-preserving and high esthetic quality.



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1. INTRODUCTION

The success of this type of restoration is based on a special and conclusive method and understanding the need for a new approach. This differs considerably from the fabrication of cast core build-ups. Radicular retention aids are declining due to increased knowledge about pulpless teeth and the advent of cemented partial restorations, which represent new treatment methods for endodontically treated teeth.

A crucial factor in plastic core build-up is the correct and careful application of composite in the root canals, with the objective of achieving perfect homogeneity.

If a rubber dam cannot be used or if the application of adhesive/bond is complicated, then the dentist should resort back to the indirect technique. In this case, making an accurate impression of the root anatomy and also of the cervical margin for the final

crown and the cementing of a post can prove to be a challenge.

1.1. Indications

Numerous core build-up techniques are presently available. For many years two standards have been applied: cast core build-ups or the combination of prefabricated posts with plastic material. (Fig.1)

In terms of establishing adhesive dentistry, it is up to the dentist to decide which technique is most suitable based on the clinical situation and his/her experience. Regardless of the reconstruction technique employed, it must meet a threefold objective:

- retention of coronary restoration
- reinforcement of corono-radicular cohesion
- ensuring tooth durability on the arch, in biological and structural terms

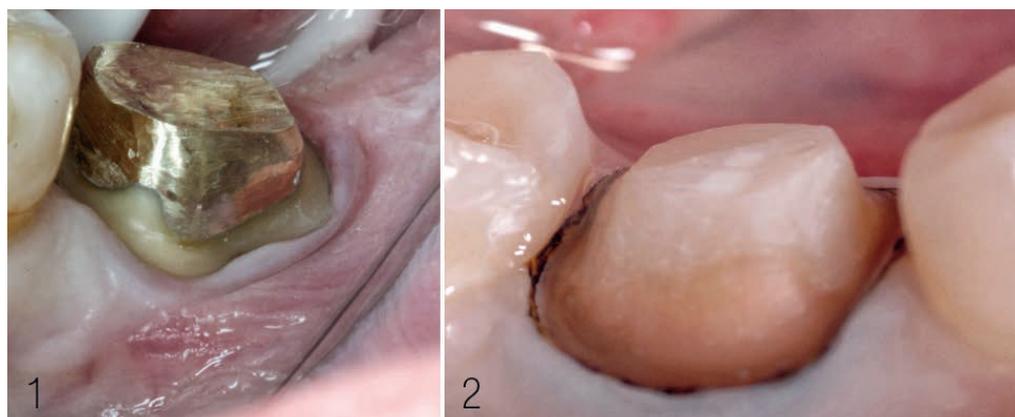


Fig. 1: Two techniques for the reconstruction of non-vital teeth: indirect technique with cast core (1) and direct technique with a glass fiber post (2).

2. COLIBRI FOR THE DIRECT TECHNIQUE: USED FOR CORE BUILD-UP

2.1. Principle of core build-up

The guiding principle behind this method is to substitute corrodible and above all, excessively rigid posts, with epoxy resin-coated quartz or carbon fiber root posts. This mechanically stable material partially exceeds the strength of alloys. At the same time, the lower modulus of elasticity reduces the burden on all structures.

The undisputable advantages of the adhesive technique are clearly demonstrated with this method: the connection between the root post and the tooth with a composite not only provides visco-elastic properties, but also seals the marginal areas and provides a perfect hold. The Colibri mixing tip proves to be a valuable instrument for this work step. Above all it helps to achieve a homogeneous reconstituted structure with high overall strength.

To achieve the best outcome, certain aspects should be observed which relate to the quality of the final restoration.

- Biomechanical considerations – the passive post principle is to be preferred to the adjusted post principle.
- Biological considerations – pronounced impact of cementing and the composite resin on the reconstructions.
- Esthetical considerations – taking into account the optical properties of the materials used.

2.2. Clinical method

APPLICATION AREA

To isolate the operating field, an elastic, thin, and above all robust rubber dam with suitable clamps is an essential prerequisite for any adhesive technique.

PREPARATION OF ROOT CANAL FOR ROOT POST

First, residues of filling material and altered tissue are removed from the area of the crown. Using a series of Gates-Glidden and Largo drills with increasing diameters, most of the endodontic filling material is removed and the root canal is prepared roughly. The

length of the root canal must be adapted to the anatomy of the corresponding tooth. Here, the additional retention due to reconstructive cementing needs to be taken into account. The depth recommended for the metal posts should be significantly below two thirds of the root. The depth must be equal to the height of the future core build-up (8 to 10 mm). The root canal diameter must not exceed diameter 3, or in single cases, diameter 4 of the Largo drill. This makes the intervention less traumatic and is gentle on the tissue.

To optimize the quality of the surfaces before cementing, the walls of the root canal are cleaned using a long-necked round bur, supplemented by ultrasonic inserts. The number of posts used on teeth with multiple roots largely depends on the degree of lost substance and the size of the residual walls. Therefore the number of posts used increases (up to three) if walls no longer exist, and to improve the mechanical retention of the core build-up composite.

ADHESIVE PROCEDURES AND POST CEMENTING

To be able to create a high-quality hybrid layer, the adhesive system selected must be dual or chemically curing and be applied using a suitable micro-applicator. The composite resin (the second component of the system) must fill the spaces and coat the post in order to dampen and distribute the forces acting on it. To this purpose, a material with a modulus of elasticity similar to that of dentin is used. In addition, its ability to bond with the adhesive contributes to the cohesion of the assembly.

The Colibri mixing tip comes into use during the next step: the Colibri is inserted into the prepared root canal up to the gutta-percha. The composite material is applied from the root tip to the coronal region. The composite material is dispensed until the root canal is completely filled. This minimizes the risk of remaining cavities. (Fig. 2) In this context it is important that coronal reconstruction is performed with the same material to achieve homogenous build-up. (Fig. 3) This homogeneous build-up between the composite to the coronal reconstruction and the radicular com-

posite reduces the risk of material weakening through layer formation.

If the number of walls is not sufficient to enclose the material, then a core former is used whereby the ends have been trimmed beforehand with scissors. The objective is to achieve homogeneity of the material, i.e. without air bubbles, through the force exerted by the core former. (Figs. 4, 5, 6) If a post needs to be inserted, it is more efficient to perform glass fiber post reconstruction and preparation of the crown during the same appointment directly after the curing time of the composite (Fig. 7). Impression of the sulcular area is very important for the accuracy of the cast and for the final crown. (Fig.8)

The specific micro-instrumentation required to perform this restorations is also the very key to its success. The Colibri mixing tip has the advantage of being equally suitable for all types of canals. This improves the durability and quality of the application considerably.

Cemented corono-radicular reconstructions present numerous advantages:

- They ensure greater conformity with the root dentin as tissue is preserved. Furthermore, the failure rate is lower as the applied forces are distributed heterogeneously.
- The risks of fractures and the effects of corrosion are reduced.
- The natural tooth color of the core allows the use of translucent ceramic materials for prosthetic restoration.

2.3. Colibri in posterior area with core build-up

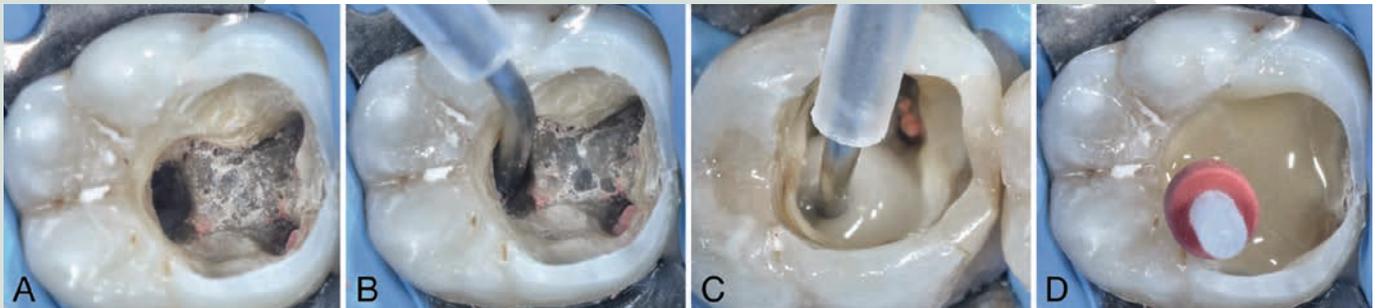


Fig. 2: Preparation of the root canal anatomy with Largo drill (a); Check fit of the Colibri mixing tip after preparation of the root canal (b); Dispensing of the composite into the root for cementing the root post (c); Insertion of the post (d).



Fig. 3: X-ray confirms the precision and homogeneity of application with the Colibri mixing tip.

2.4. Colibri in anterior area with cementation and core build-up

The use of micro-instrumentation adapted individually to the anatomical shape of the root is another key to success.

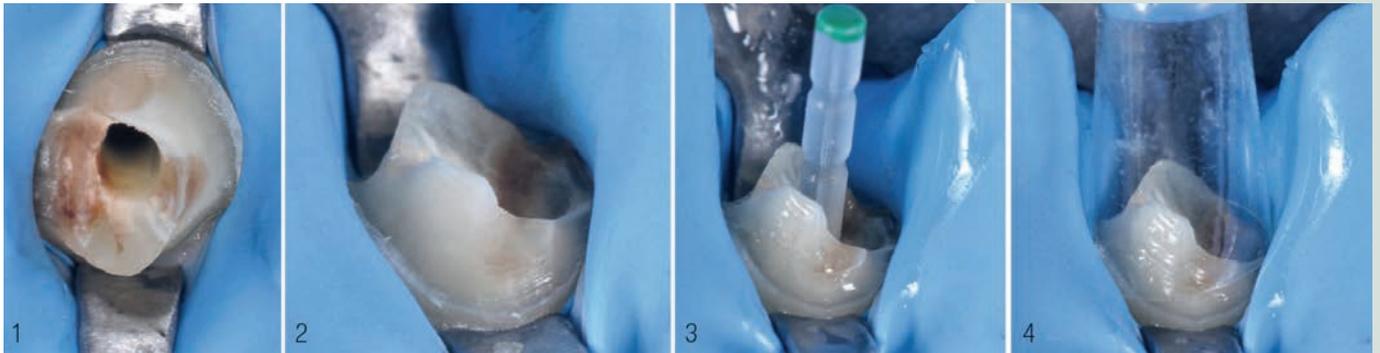


Fig 4: Check of perfect isolation before the bonding procedure (1,2); Check of the freedom of the glass fiber post (3); Check of the transparent plastic matrix which will guide the core build-up (4).

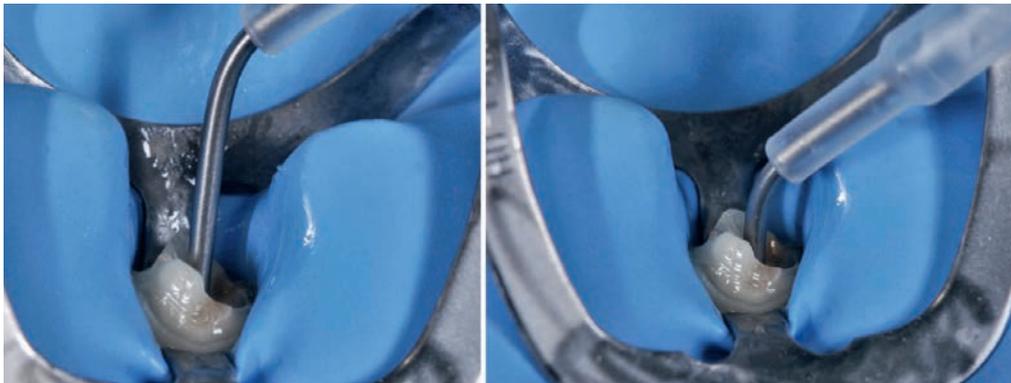


Fig. 5: Fitting of the Colibri mixing tip in the root canal.

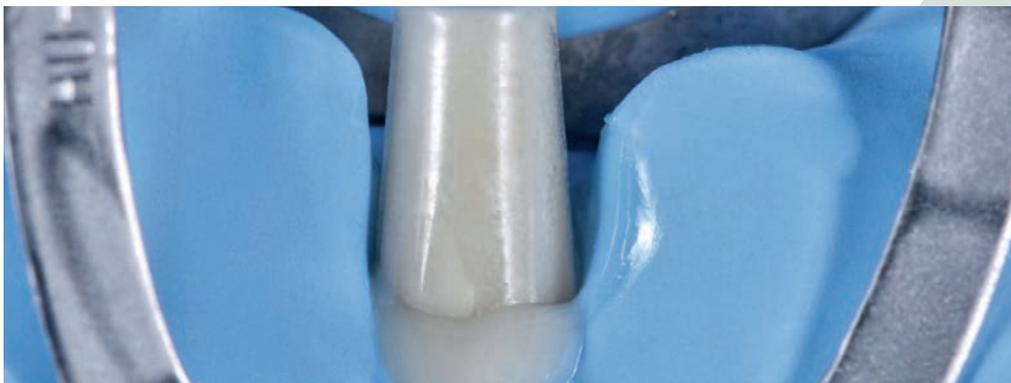


Fig 6: The entire process is an all in one step; the composite material is injected into the root canal and then the glass fiber post is placed. Simultaneously, the plastic matrix is filled with the same material to create perfect homogeneity.

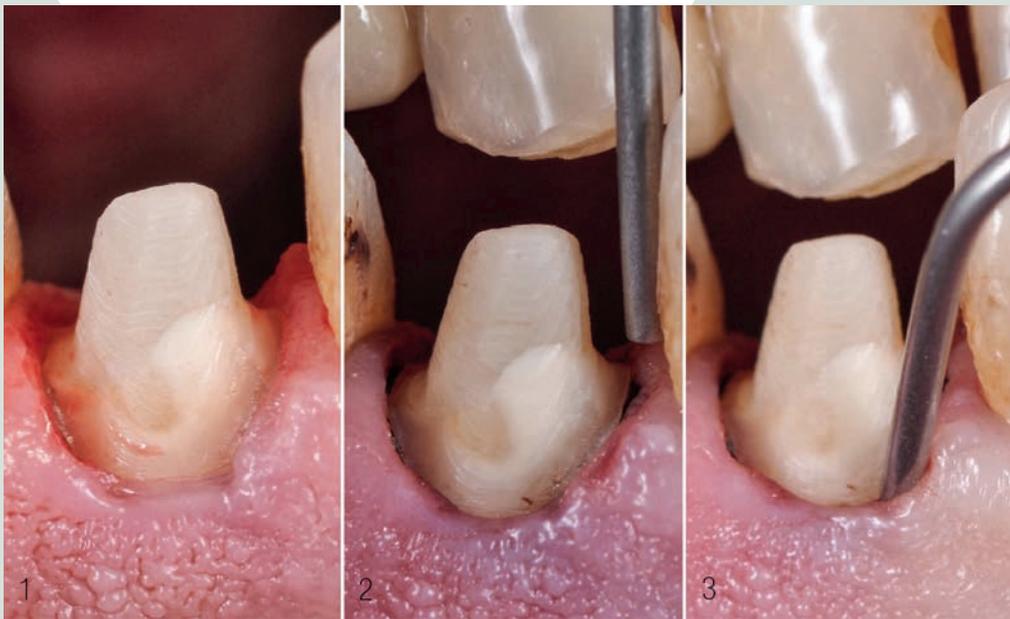


Fig. 7: After curing of the composite material, preparation of the crown was performed (1); a retraction cord is placed in the sulcular area (2); The metal cannula of the Colibri can be adapted individually. (Alignment), The end of the tip can be placed in the sulcular region to enable accurate impression taking (3).

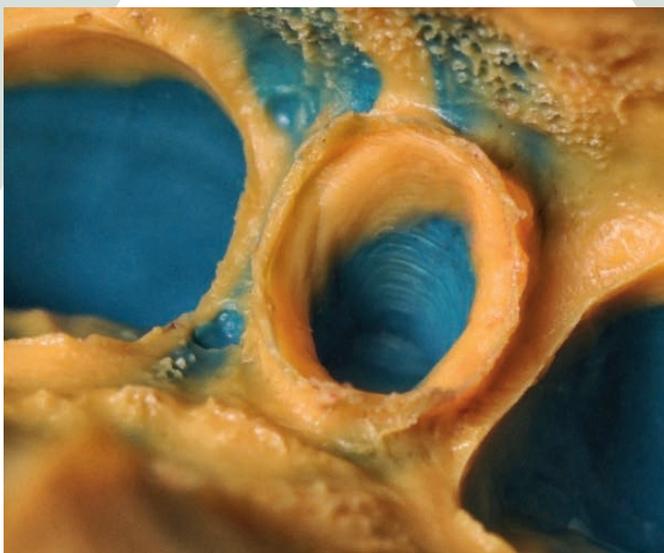


Fig. 8: Accurate impression taking with the aid of the Colibri mixing tip.

3. COLIBRI FOR INDIRECT TECHNIQUE: IMPRESSION TAKING OF THE ROOT CANAL ANATOMY AND CEMENTATION OF THE POST.

If coronal destruction is too advanced (fewer than two walls, deep cavity, margin in subgingival region), the use of a glass fiber post is not recommended due to the problems of the adhesive technique and the placement of the rubber dam. In this case the use of the indirect technique using a core build-up is far more efficient. For the dentist this means taking a perfect impression of the root canal anatomy. An accurate model can be prepared based on this impression, which in turn is used for the core build-up. Instead of dual-curing composite materials, impression silicones are now used. A special Colibri mixing tip was also used for this application. In a first step, the root canal was prepared for placement of the core build-up. Here, the canal is prepared with size 3 or 4 Largo drills and the existing root canal filling is removed. Then the metal cannula of the Colibri mix-

ing tip is inserted into the prepared root canal until it has contact with the gutta-percha. The silicone is dispensed from the depth to the coronal region to achieve good homogeneity. When using the Colibri mixing tip, there is no need to use a lentulo, which is normally used to apply the root filling with silicone. At the same time, this reduces the time required for this clinical step as well as the application time during the impression process. If the post is fabricated in the laboratory, the clinician is faced with the challenge of inserting the self-adhesive cement in the root before placing the post. (Figs. 9, 10)

Two important clinical steps can be simplified with Colibri mixing tip:

- impression of the root anatomy
- cementation of the core build-up



Fig. 9: The silicone impression of the root canal anatomy is performed with a Colibri mixing tip (1) and cementation of the core build-up with self-adhesive cement (2, 3).

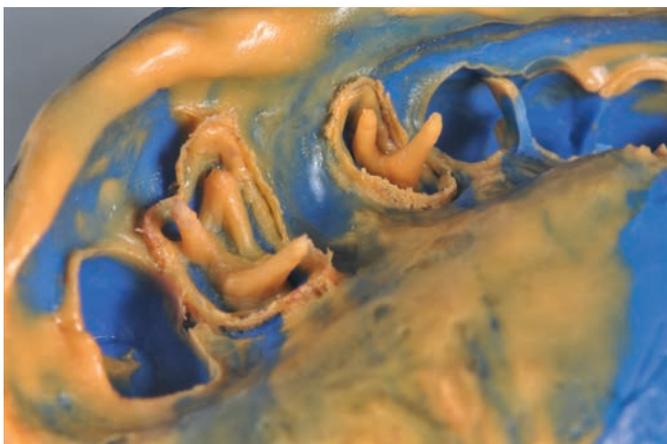


Fig. 10: The accuracy of the root canal anatomy can be seen clearly: bubble-free, perfect homogeneity.

4. THE ADVANTAGES OF COLIBRI AT A GLANCE

Under the brand name MIXPAC™ Colibri, a product has been launched on the market which has proven to be a most useful helper in all the above mentioned applications. It can be used both for the indirect and direct techniques for core build-up as well as for impression taking of the root canal anatomy and for cementation of the post.

This product is a combination of the established MIXPAC™ mixing tip with an integrated medical stainless steel cannula. This integrated cylindrical metal cannula is bendable and can be rotated through 360°. It can therefore be adapted easily to the clinical situation - i.e. adapted to the anatomy of the root canal.

This is of particular advantage in the posterior region or areas with difficult access. The cannula is simply bent by hand. The consistent inner diameter allows an even flow of material. The metal cannula is available in different diameters from 0.9 mm to 1.4 mm. This allows processing various material viscosities. The outlet of the mixing tip is rounded and thus allows easy and gentle guidance during application and reduces the risk of injury to the patient. Due to the integrated stainless steel cannula, the time for the procedure is shortened as no additional dispensing tips need to be attached to the mixing tip. (Figs. 11, 12)

This versatility meets the expectations of dental clinicians and simplifies their daily routine – regardless of which technique is employed.

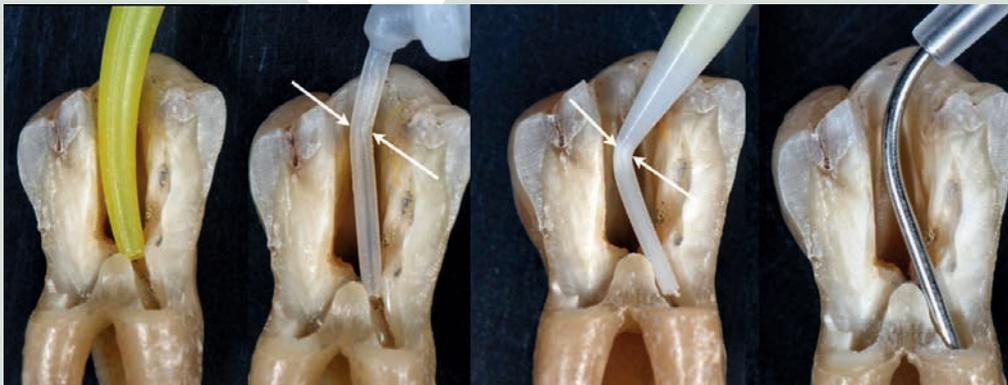


Fig. 11: Differences between a classical endo plastic tip and the Colibri metal cannula in bent condition. The internal diameter of the plastic tip is reduced and the flow of the dispensing decreases. This disadvantage is avoided with the Colibri mixing tip.

The product is manufactured in Switzerland according to GMP (good manufacturing practice). The raw materials used comply with FDA regulations. As a result, the Colibri mixing tip fulfils the high standards in terms of cleanliness and hygiene.

The MIXPAC™ Colibri is a product of Sulzer MIXPAC AG which holds a leading position in the manufacturing of for single and multi-component materials to the dental industry. The products are compatible within the different systems for impression and restorative materials.

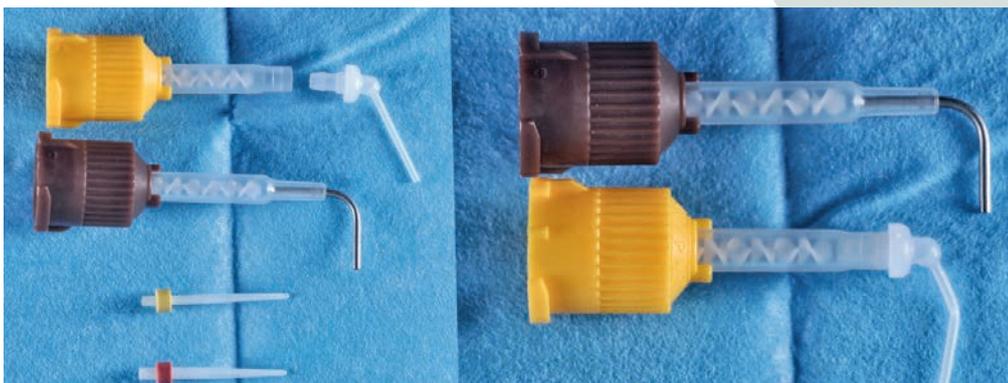


Fig. 12: Comparison of available plastic tips (integrated or attachable) and their bending capacities. The Colibri mixing tip even allows bending through 90°-without changing flowability.

5. CONCLUSION

The Colibri mixing tip is a new option to simplify reconstruction of non-vital teeth, regardless of which technique is used:

- Direct technique – can be used for restorations with core build-up.
- Indirect technique – can be used for impression taking of the post core (preparation) and for cementation.

Other clinical applications are also possible. For example, the cementation of the post with self-adhesive cement or the traditional impression of the cervical margin, as the bendable metal cannula affords the required accuracy. The MIXPAC™ Colibri combines outstanding mixing quality with previously unattained flexibility, making it useful for numerous applications in daily dental routine.

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Education and Experience

- 1998 – graduated from the Marseille University School of Dentistry, France
- 1998 to 2001 – He worked as a clinical assistant at the Hôpital Louis Mourier (Hôpitaux de Paris) in the Department of Stomatology headed by Prof. Poidatz. In addition, he was research assistant at the University of Paris V, School of Dentistry in Montouge.
- 2008 – He became Associate Professor and earned his PhD in 2011. Moreover, he was awarded the Gold Molar by the students of Marseille University.
- 2013 – Foundation of “L’institut de la facette”, a private training centre which mainly focuses on laminate veneer restorations and the minimally invasive rehabilitation of worn teeth.

