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DIRECT COMPOSITE VENEERS - INJECTION TECHNIQUE

FACETAS DIRETAS DE RESINA COMPOSTA – TÉCNICA DE INJEÇÃO

CARILLAS DIRECTAS DE RESINA COMPUESTA – TÉCNICA DE INYECCIÓN

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ABSTRACT

The technique of composite resin injection to direct veneers has been grown in popularity among dentists. Compared to the conventional technique, in which the stratification of different shades and opacities of composite resin is necessary and requires experience and dexterity from the professional, the injection technique has reduced these requirements as well as the clinician's time. However, this technique is relatively new, and its details are poorly known among clinicians. Thus, the objective of the present work is to describe the technique of injection of flowable composite resin, illustrated by a case report, which resulted in an improvement of aesthetics and great patient satisfaction. Considering the clinical outcome, it can be concluded that the technique of composite resin injection for direct veneers facilitates clinical procedures and provides good aesthetic and functional clinical results.

KEYWORDS: Dental Veneers. Composite Resins. Dental Esthetics. Operative Dentistry. Tooth Preparation.

RESUMO

A técnica de injeção de resinas compostas para a confecção de facetas diretas tem ganhado popularidade entre os cirurgiões dentistas. Comparada a técnica convencional, em que é realizada a estratificação de diferentes cores e opacidades de resina composta e exige do profissional experiência e destreza, a técnica de injeção reduz essas exigências bem como o tempo de clínico. Contudo, essa técnica é relativamente nova e seus detalhes são pouco conhecidos entre os clínicos. Assim, o objetivo do presente trabalho é descrever a técnica de injeção de resina fluida, sendo essa ilustrada por um relato de caso, que proporcionou uma melhora na estética e grande satisfação do paciente. Considerando-se o acompanhamento clínico, pode-se concluir que a técnica de injeção de resina composta para facetas diretas, facilita os procedimentos clínicos e proporciona bons resultados clínicos estéticos e funcionais.

PALAVRAS-CHAVE*: Facetas Dentárias. Resinas Compostas. Estética Dentária. Dentística Operatória. Preparo do Dente.*

RESUMEN

La técnica de inyección de resina compuesta para carillas directas ha ganado popularidad entre los odontólogos. En comparación con la técnica convencional, en la que es necesaria la estratificación de diferentes tonos y opacidades de resina compuesta y que requiere experiencia y destreza por parte del profesional, la técnica de inyección ha reducido estos requisitos, así como el tiempo clínico del profesional. Sin embargo, esta técnica es relativamente nueva y sus detalles aún son poco conocidos entre los clínicos. Así, el objetivo del presente trabajo es describir la técnica de inyección de resina compuesta fluida, ilustrada mediante un reporte de caso, que resultó en una mejora estética y una gran satisfacción del paciente. Considerando el resultado clínico, se puede concluir que la técnica de inyección de resina compuesta para carillas directas facilita los procedimientos clínicos y proporciona buenos resultados clínicos estéticos y funcionales.

PALABRAS-CLAVE*: Carillas dentales. Resinas compuestas. Estética dental. Odontología operatoria. Preparación dental.*

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1- INTRODUCTION

An increasing number of patients are searching for minimally invasive composite resin procedures to improve smile esthetics. Direct veneers are indicated in the corrections in tooth color, volume, or shape, as well as when minor alignment adjustments are required. However, direct veneers are generally freehanded fabricated using a layering technique to reproduce the characteristics of the dental structures.[1]

To improve treatment predictability, clinicians may use diagnostic wax-ups, restorative mock-ups, and computer-based simulations. Silicone guides may also be fabricated to reproduce the treatment plan approved by the patient as accurately as possible.[1,2] In this context, applying the layering technique to multiple teeth can be challenging and largely dependent on the clinician's experience and technical skills.[1,2] In recent years, the composite resin injection technique has been refined to facilitate clinical procedures.[1-4]

The injection technique involves the use of a transparent silicone guide fabricated over a conventionally waxed model or a model printed after digital wax-up [1-5] The guide is positioned intraorally over the appropriately prepared teeth, followed by the injection of a flowable composite resin. The material should contain a filler content that provides suitable mechanical strength and esthetic properties. [1,6]

Thus, the composite resin injection technique for direct veneers enables accurate transfer of the shape, contours, and volume established in the diagnostic wax-up, resulting in a more predictable procedure with a shorter clinical execution time.[1,3,4-8]

Initially, conventional flowable composites were used, and the indications for this technique were therefore limited to emergency repair of fractured teeth; fabrication of long-term provisional veneers and crowns in the permanent and primary dentitions; extensive Class III and IV restorations; and provisional increases in the vertical dimension of occlusion in posterior teeth.[8] With advances in nanotechnology, the mechanical properties and strength of flowable composites have improved. Consequently, the indications for the injection technique have expanded to include increases in the vertical dimension of occlusion and the fabrication of definitive direct veneers.

Although this technique offers several advantages that may outweigh its limitations, the available scientific evidence remains limited to a small number of case reports, generally without clinical follow-up. Given the lack of clinical evidence and the limited familiarity of dentists with this approach, this article aims to describe the composite resin injection technique for the fabrication of direct veneers. Its advantages and limitations are discussed through the presentation of a clinical case.

2- CASE REPORT

The publication of this clinical case report was approved by the Research Ethics Committee of Univeritas UnG (CAAE: 95430826.2.0000.5506). A 47-year-old male patient sought esthetic treatment because he was dissatisfied with his smile due to tooth wear and yellowing of the existing restorations. After discussing the available treatment options, alternatives, advantages, and disadvantages with the patient, direct veneers fabricated using the composite resin injection technique were selected for the maxillary anterior teeth (Figures 1 and 2). At the beginning of treatment, clinical photographs should be

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obtained, including a facial photograph to assess the relationship between the teeth and the face (Figure 1), as well as a photograph of the smile.[7] Impressions of the dental arches are then taken.[5]



Figure 1. Facial photograph of the patient, who reported concerns regarding “yellowing” of the teeth.



Figure 2. Patient’s smile showing stained restorations in the anterior teeth, discoloration, insufficient tooth volume, and cracks on the facial surfaces.

Dental impressions may be obtained using either condensation- or addition-cured silicone. The aim was to reproduce the cervical and proximal margins accurately, allowing the laboratory technician to wax these areas properly and thereby reduce excess of material after composite resin injection and reduce the need for its removal during finishing. If the rehabilitation involves changes in the occlusal function of the teeth, the casts should be mounted in an articulator, preferably in maximum intercuspation.[7]

The casts should be sent to the dental laboratory for fabrication of the diagnostic wax-up. The laboratory technician must be informed that the composite resin injection technique will be used, with particular emphasis on obtaining well-defined proximal areas and cervical margins. Photographs of the patient’s smile and lips at rest should also be provided so that the technician can assess the occlusal plane and the relationship between the smile and the face. Specifications regarding the desired shape, volume, and surface texture should also be included.

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Upon receiving the waxed cast, the clinician should verify whether all requested features have been incorporated and then schedule the patient for the restorative trial. The restorative trial, or mock-up (Figure 3), allows the patient to preview the expected outcome and approve the proposed changes in tooth size, shape, volume, and color. For this purpose, a condensation-cured silicone guide (Optosil Comfort Putty; Kulzer GmbH, Hanau, Germany) was filled with a bis-acryl resin (Primma Art A2; FGM, Joinville, SC, Brazil). The proposed outcome was approved by the patient. If modifications are required, the clinician may request changes from the laboratory or make the adjustments directly on the wax-up.



Figure 3. Following the diagnostic wax-up, the restorative mock-up showed a slight increase in tooth volume, indicating the need for tooth reduction before composite resin injection.

If no modifications are required, tooth preparation and fabrication of the transparent silicone guide for flowable composite resin injection can begin.[5] A conventional smooth impression tray or a prefabricated acetate matrix may be used to fabricate the silicone index. In the present case, Transil F silicone (Ivoclar Vivadent AG, Schaan, Liechtenstein) was dispensed into a prefabricated matrix using an automixing tip. The silicone should extend over at least two teeth distal to the teeth being restored to provide guide stability and ensure proper seating.[9] A fine diamond bur is used to create holes in an inciso-cervical direction through the outer aspect of the incisal edge of the index. These holes serve as injection ports for insertion of the flowable composite resin tip.

Tooth preparation is subsequently performed. During both the preparation and restorative stages, modified rubber dam isolation should be used whenever possible. If this is not feasible, relative isolation combined with gingival retraction cords may be employed. Tooth preparation should be as conservative as possible. For this purpose, a selective reduction technique is performed through the initial mock-up (Figure 3).

Considering the intended final tooth shape and volume represented by the mock-up, preparation is carried out through the bis-acryl resin according to conventional guidelines. Depth-orientation grooves ranging from 0.5 to 0.7 mm are prepared when tooth discoloration is present. For teeth without color alteration, an FG 4141 depth-cutting diamond bur may be used under water cooling at high speed. For discolored teeth, an FG 4142 bur is indicated. These burs have depth-orientation rings, with the shaft between the rings serving as a depth reference (Figures 4 and 5).

The grooves are marked with a graphite pencil (Figure 4), and the bis-acryl resin is removed (Figure 5). The areas requiring tooth reduction remain identified by the graphite markings (Figure 6). The depth grooves are subsequently connected using a cylindrical diamond bur at high speed. Adequate space for the composite resin is achieved when all graphite markings have been removed.

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Figure 4. To ensure uniform reduction of the facial surface, depth-orientation grooves were prepared through the restorative mock-up and marked with a graphite pencil.

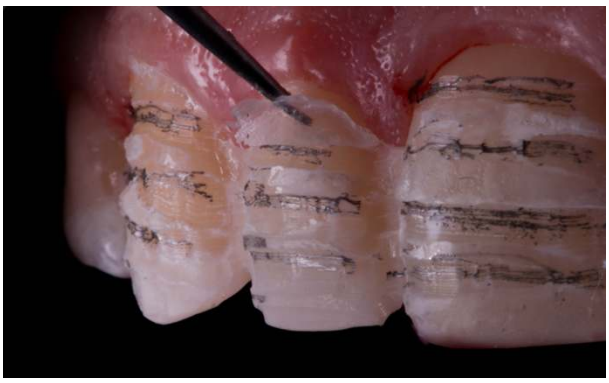


Figure 5. Removal of the remaining bis-acryl resin reveals the areas requiring enamel reduction, which should be continued until all graphite markings have been removed.



Figure 6. Areas requiring tooth reduction are identified by the graphite markings in all preparations, whereas unmarked areas do not require reduction.

After tooth reduction, the preparations are completed with final adjustments. These include removing existing restorations to improve adhesion of the new composite to the tooth structure; rounding sharp internal angles; further reducing darkened or discolored areas when the available space would not allow adequate masking by the composite; and defining the preparation margins. The margins may have a bevel or a light chamfer and should be positioned outside the dynamic zone of visibility. The cervical margin should be located at the gingival level or slightly subgingivally (Figure 7).

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Figure 7. Completed tooth preparations showing the space created for the composite resin and a light chamfer defining the cervical margin, which is visible due to the retraction provided by the cord placed in the gingival sulcus.

For the restorative procedure, it is recommended to begin with the maxillary central incisors, followed by the lateral incisors and canines. To shorten the clinical procedure, some authors recommend simultaneously injecting alternate teeth—for example, teeth 13, 11, and 22, followed by teeth 12, 21, and 23. However, individual injection of the flowable composite resin is preferable, with each tooth adjusted and polished separately.

The flowable composite resin is injected using a transparent silicone guide.[5,10] Because the guide is relatively bulky and must be seated over the teeth (Figure 8), relative isolation is generally performed using cotton rolls, a photographic lip retractor, and continuous suction

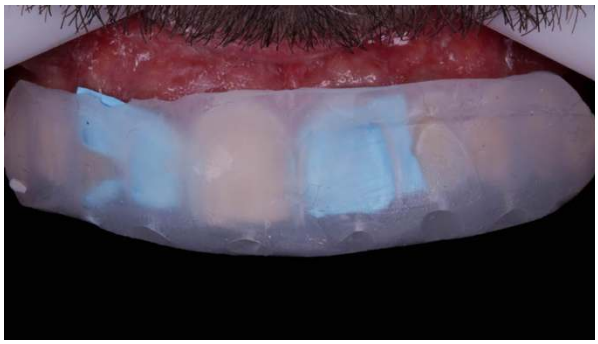


Figure 8. Silicone guide in position, showing an injection port in the incisal region of each tooth through which the composite resin tip is inserted.

In the present case, treatment began with tooth 11. Before the bonding procedure, the adjacent teeth (12 and 21) were protected with polytetrafluoroethylene (PTFE) tape so that any flowable composite resin extending onto these teeth could be easily removed. The adhesive system should be applied according to the manufacturer's instructions. However, prior phosphoric acid etching is recommended, even when a self-etch or universal adhesive is used, because preparations for direct veneers are generally limited to enamel.

Tooth 11 was etched with phosphoric acid for 20 seconds, rinsed, and air-dried. The self-etch adhesive BeautiBond (Shofu, Kyoto, Japan) was then applied twice for 5 seconds per application. Each application was followed by solvent evaporation for 10 seconds, and the adhesive was light-cured for 20 seconds.

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Immediately after the bonding procedure, the silicone index was seated over the teeth. The tip of the flowable composite resin syringe was inserted through the injection port corresponding to tooth 11 and advanced toward its cervical region. During this step, the tip should not contact the prepared surface because this could disrupt the adhesive layer.

A highly filled flowable composite resin is then injected directly intraorally.[9,10] Beautifil Flow in shade A2 was selected because of its nanometric filler particles and bioactive properties.[8] The transparency of the silicone guide allows the clinician to monitor the filling of the cervical region. As the composite is injected, the syringe tip should be slowly withdrawn from the guide using gentle pendular movements in the mesial, distal, and incisal directions. This directs the material toward the proximal surfaces and helps prevent air bubbles. If an air bubble is detected, the tip should be repositioned toward it and the material injected until the bubble is displaced.

After the tip has been completely withdrawn, light pressure should be applied to the silicone guide to ensure close adaptation to the preparation and cervical region. This pressure displaces excess flowable composite resin beyond the preparation margins, reducing the need for proximal and cervical adjustments. The injected composite is initially light-cured for 40 seconds through the transparent silicone guide. The residual composite within the guide's injection channel is removed with a hand instrument, after which the silicone guide is removed.

Once the guide has been removed, the surface texture established in the diagnostic wax-up can be observed on the veneer, providing the tooth with a natural appearance (Figure 9). Because the initial light-curing procedure is performed through the silicone, with some loss of irradiance, an additional light-curing cycle should be performed for the time recommended by the manufacturer. This allows the composite resin to achieve the required properties and supports its clinical longevity.

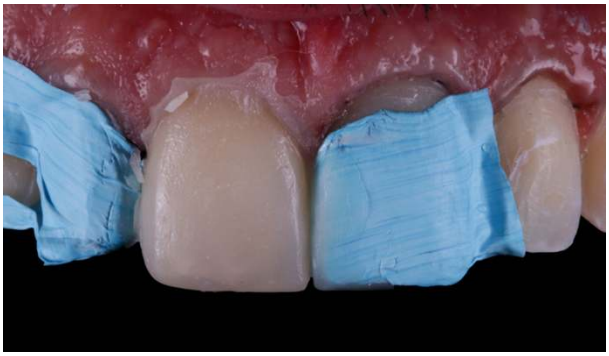


Figure 9. Following composite resin injection, the veneer exhibits a natural appearance and reproduces the contours established in the diagnostic wax-up previously approved by the patient.

Finishing and polishing of the proximal surfaces are then performed under direct access using diamond burs, abrasive discs, and finishing strips, followed by initial finishing of the cervical region. Because of the adaptation and compression of the silicone guide, only a thin layer of excess resin generally remains, which can be easily removed using a No. 12 scalpel blade. Coarse abrasive discs should be avoided at this stage because they may result in excessive removal of composite from the proximal surfaces, leading to loss of the contact point and formation of diastemas.

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After finishing tooth 11, the same procedures were performed on the remaining teeth treated with composite resin injection, followed by final finishing and polishing (Figures 10 and 11). At the 12-month follow-up, the veneers remained intact, with no evidence of wear or staining, and periodontal health was maintained. The restorations also retained their surface gloss and color, with no need for adjustment or repolishing (Figure 11).



Figure 10. Following injection, finishing, and polishing of the veneers, an improvement in the color and anatomy of the anterior teeth can be observed.



Figure 11. Comparison of the initial clinical condition, the immediate outcome after composite resin injection, and the 12-month follow-up, showing the harmonious relationship between the teeth, smile, and face.

3- DISCUSSION

The freehand fabrication of direct veneers requires considerable chair time, clinical skill, and attention to detail, making the procedure demanding for both the clinician and the patient.[2] In contrast, the composite resin injection technique can simplify the fabrication of direct veneers, improve procedural predictability, and reduce both clinical time and the use of finishing and polishing materials.

In addition, the preparation approach described in this report, when combined with the injection technique, allows a more conservative procedure because tooth reduction is limited to the amount

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required to accommodate the injected composite resin while preserving periodontal health. In some cases involving teeth with insufficient volume, composite resin may be injected without tooth preparation, resulting in an additive and reversible procedure.[7]

Although the composite resin injection technique offers several advantages, no medium- or long-term clinical studies were identified in the literature. Only a limited number of reports have described its use in the fabrication of long-term provisional restorations,[11] definitive veneers and crowns in permanent teeth,[3,9,10] and the rehabilitation of primary teeth,[4] generally without clinical follow-up.

The present article describes the technique and reports that, after 12 months of follow-up, the veneers remained intact, with no color alteration, marginal staining, or detectable wear. This finding is consistent with the limited evidence available from other case reports. Hosaka et al. (2020)[1] used the technique to transform two lateral incisors into central incisors and reported no changes in the veneers after five months. Geštakovski (2021)[5] also reported favorable outcomes for injected veneers after 10 months. Ypei et al. (2020)[6] observed stability after 12 months in injected veneers placed on the maxillary anterior teeth and first premolars (teeth 14–24). Cortés-Bretón Brinkmann et al. (2020)[7] fabricated injected veneers for tetracycline-stained teeth 14–24 and reported acceptable clinical conditions after 24 months. In 2019, Geštakovski[8] reported no bleeding or detectable wear of the injected composite resin after 24 months of follow-up in short teeth treated with injected veneers for diastema closure. These cases suggest favorable outcomes; however, careful execution of the technique and appropriate selection of the flowable composite resin remain necessary.

In 2014, Terry and Powers recommended the injectable composite resin technique only for the fabrication of long-term provisional restorations that more closely resembled definitive restorations. Its indication as a provisional material reflected the characteristics of the flowable composite resins available at the time, which did not provide adequate mechanical properties. The authors suggested that advances in biomaterials could expand the potential applications of the technique.[3,4] Subsequent material development has resulted in flowable composite resins with high concentrations of nanoscale filler particles. The improved mechanical strength of these materials has allowed a technique previously used primarily for provisional restorations to be applied to definitive restorations.[6,7,9]

The development of these flowable composite resins has therefore expanded their clinical indications. They may be used for small Black Class I and Class V restorations because their wear resistance is comparable to that of microhybrid and nanohybrid composite resins.[2,12] This finding is consistent with the report by Ammannato et al. (2015), [13] who used the injection technique to restore the vertical dimension of occlusion in a patient with tooth wear. After two years, the vertical dimension remained stable, and the composite restorations exhibited minimal wear.

Beautifil Flow was used in the present case. In addition to its mechanical strength, associated with an approximately 70% filler content by volume, its nanoparticles provide suitable esthetic properties, facilitate polishing, and contribute to gloss retention. The material is also available in a range of shades and opacities. Furthermore, it incorporates Giomer technology, in which surface pre-reacted glass-ionomer (S-PRG) filler particles provide bioactive properties.[8,14,15]

Bioactivity refers to the capacity of a material—in this case, a restorative composite—to elicit a biological effect. One of its main characteristics is the release of fluoride ions (F^-), which may inhibit

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demineralization and promote remineralization, including through interactions with silicate ions (SiO_3^{2-}). Aluminum (Al^{3+}), borate (BO_3), sodium (Na^+), and strontium (Sr^{2+}) ions are also released and may contribute to chemical remineralization and antibacterial activity.[16-18] Lima et al. (2025)[14] demonstrated that bioactive composite resins can reduce biofilm formation and affect the species *Streptococcus mutans, Streptococcus gordonii, Streptococcus mitis, Streptococcus sanguinis, Campylobacter rectus, Campylobacter showae, Fusobacterium periodonticum, Tannerella forsythia, Neisseria mucosa,* and *Selenomonas noxia*.

In this case, the clinical practicality of the injection technique was combined with the mechanical, esthetic, and bioactive properties of the restorative material to support the longevity of the veneers.

Because restoration longevity also depends on the relationship between the veneers and periodontal health, appropriate treatment planning, study-cast fabrication, and diagnostic wax-up are important. In addition to making the expected outcome more predictable for the patient, these procedures help determine the required amount of tooth reduction and assess the relationship between the restorative material and periodontal tissues, particularly the emergence profile and embrasures.[3,4,19]

Similarly, fabrication of a restorative mock-up supports treatment planning, helps resolve uncertainties between the dental team and the patient, and allows assessment of the relationship between the veneer design and the periodontal soft tissues. Once positioned, the mock-up facilitates functional and movement assessments, three-dimensional evaluation of the proposed tooth volume, and determination of preparation depth.[3] Any required modifications can be made directly on the wax-up before fabrication of the transparent silicone index used for flowable composite resin injection.

A carefully performed adhesive protocol is essential for any composite resin restoration. When fabricating veneers, the entire enamel surface should be etched with 35% phosphoric acid, even when a self-etch or universal adhesive system is used, as described in the case reports. In cases involving more than two adjacent teeth, the bonding procedure and subsequent flowable composite resin injection should be performed separately for each tooth. Adjacent teeth should be isolated with PVC tape so that any excess flowable composite resin can be easily removed, even after light curing.[2]

Adequate light curing of the injected composite resin is another important step. Because the initial light-curing cycle is performed through the silicone guide, the irradiance reaching the flowable composite resin is attenuated and may be insufficient for the resulting polymer to achieve suitable mechanical properties. Additional light curing after removal of the guide is therefore essential and should follow the exposure time recommended by the manufacturer. It should also be performed in two stages because the diameter of the light-curing unit tip is generally smaller than the veneer surface.

One limitation of the composite resin injection technique is the use of a single shade during injection. Compared with the conventional layering technique, this approach provides less reproduction of the optical details of natural teeth, which can be created more precisely by combining composite resins with different shades and opacities. However, some patients may not consider detailed reproduction of translucent areas and other anatomical features necessary. In such cases, the composite resin injection technique may be an appropriate option.

A combined approach is also possible. The prepared tooth can first be layered using the conventional technique, followed by injection of a flowable composite resin with enamel opacity to form

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the final layer. This approach allows the optical effects to be created manually while the injection procedure reproduces the facial surface anatomy.[9] This hybrid technique is particularly indicated for discolored teeth that require an opaque layer before flowable composite resin injection.

Overall, the injectable composite resin technique offers several advantages, although it does not reproduce the full range of esthetic effects achievable with the conventional layering technique. Nevertheless, it represents a clinically feasible alternative that requires less operator skill and chairside manipulation and may be suitable for routine clinical practice.[6] Because the technique is relatively recent and supported by limited clinical evidence, periodic follow-up is advisable to assess veneer integrity.[6,7]

4- CONCLUSIONS

Within a structured treatment plan for veneer fabrication, the composite resin injection technique using highly filled flowable composites can facilitate clinical procedures, reduce chair time, provide favorable esthetic outcomes, and help maintain oral health. This technique allows the functional and esthetic characteristics of direct veneers to be established efficiently, while simplifying the clinical workflow and reducing treatment costs for patients.

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