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MAXILLARY TOOTH SPLINTING IN PERIODONTALLY COMPROMISED PATIENTS USING FIBER-REINFORCED COMPOSITE: THE TARGIS-VECTRIS METHOD

(AU: Please provide abstract)

Various factors are to be considered in splinting maxillary incisors in periodontally compromised patients who have undergone orthodontic treatment.[1–3] Several methods are currently used to splint both maxillary and mandibular teeth, after finishing orthodontic treatment, especially in adult patients.[4–9] With all of the undesirable side effects due to the use of conventional lingually bonded retainers in periodontally compromised patients (bond failures, plaque accumulation, periodontal reaction, abrasion of opposing teeth), splinting maxillary teeth by means of reinforced composites is often the elective way for long-term esthetic retention.[10,11] Different types of fiber-reinforced composite, which have optimal properties of biocompatibility, adhesion, and esthetics, are available. Their wide use in clinical orthodontics and the subsequent advantages have been well documented.[12–14] The aim of this article is to show a new retention system with Targis-Vectris, illustrating its features and clinical application in periodontally compromised patients.

TARGIS-VECTRIS SYSTEM

The Targis-Vectris system was introduced by Ivoclar Vivadent (Schaan, Liechtenstein) as an alternative to traditional treatment concepts, as a result of the increased number of patients unable to wear metal and in response to the esthetic awareness of the population. The system is made of an esthetic external layer (Targis) combined with and, at the same time, supported by a metal-free structure (Vectris), both well-harmonized due to the thermal expansion coefficient (TEC) and an elastic modulus similar to that of dentin (Fig 1).

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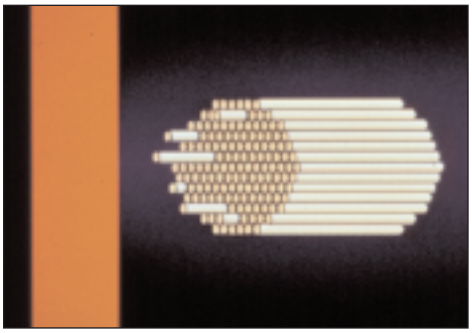

Fig 1 Schematic representation of the glass fibers (FRC), unidirectionally oriented (pontic) to resist flexural strength.

The Targis material is a member of the ceromers family (CERamic Optimized polyMERS). It is a combination of an inorganic filler (80%), made of silanized ceramic microparticles with variable dimensions between 30 nm and 1 µm, and an organic matrix (20%), based on Bis-GMA, that fills the intermediate spaces and is compatible with the Vectris fiber-reinforced composite (FRC). The Vectris FRC was introduced as a substitute for the metal framework in prosthetic restorations. It is made of many glass layers organized in crossed bands, variably oriented, according to their use (Vectris single, pontic, and frame). This system, used to solve prosthetic restorative problems involving a single tooth, such as crowns, inlays, and onlays, works alongside the conventional metal-free ceramics, already well accepted and on the market. Moreover, the system, thanks to features that include biocompatibility, light weight, resistance to flexural strengths and fractures, and abrasion similar to that of a natural tooth,[15–17] can extend its clinical applications to certain treatment techniques, such as the Maryland and Californian bridges and the orthodontic splint.[18,19]

In making an orthodontic splint, the Targis-Vectris system represents a new retentive method. It has to be used with the intracoronal indirect technique and it needs to be constructed in the laboratory. Its clinical indications are similar to those for metal wire splints. The system, as an intracoronal indirect technique, needs adhesive cementation and is strongly suggested for dental disorganization cases [Au: Do you mean complex restorative cases?], where periodontal problems can be found. In addition, long-term splinting is needed, after the proper surgical and orthodontic therapy, to attain esthetic results.

Step-by-step procedure

The procedure starts when orthodontic treatment has been completed (Figs 2 to 4). The first step is to prepare the groove on the lingual face of the teeth (Fig 5), where the splint will be placed, using specific burs (Komet; Gebr. Brasseler, Lemgo, Germany) (Fig 6). A customized tray is placed in the mouth with a fit-checker paste, and a precision impression is taken using a polyether material (Figs 7 and 8). The technician prepares the cast to be used in the procedure, then the fiber-reinforced splint is manipulated using the dedicated system previously described (Figs 9 to 11). The fit of the splint is checked in the mouth prior to cementation (Fig 12). The teeth to be splinted are first cleaned and etched (Fig 13) to allow adhesive cementation. Two days after placing the FRC, the debonding is complete and the teeth, together with the splint, can be polished (Figs 14 to 16).

CLINICAL REPORT

An adult female patient was referred by her general dentist for a consultation concerning the progress of her orthodontic treatment (Fig 17). She had undergone 12 months of orthodontic treatment, with first premolar extraction to resolve the crowding of maxillary teeth. The patient had a bilateral full Class II malocclusion. Both the mandibular first molars were extracted, due to caries, 10 years earlier. The patient had just received complete periodontal treatment. At the time of the authors' observation, the conditions were compromised, particularly in the anterior teeth, with significant bone loss and pathologic extrusion

Fig 2 Due to the minor collapse of the dentition, there are dramatically increasing diastemas and "long" teeth. The goal is to have healthy gingiva and patient satisfaction with esthetics of the teeth.

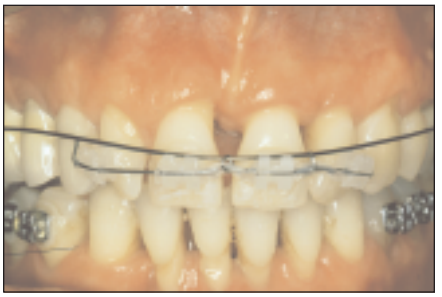

Fig 3 The aim of the orthodontic treatment is to reduce the clinical crown length through combined intrusion and retraction.

Fig 4 Close-up view of the final result.

Fig 5 The prepared groove on the lingual surface, where the splint will be placed before debonding.

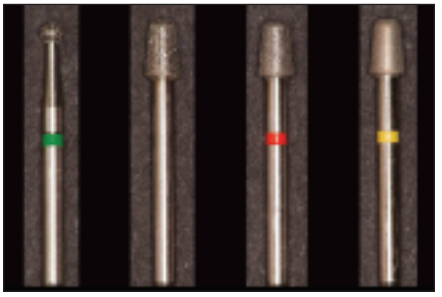

Fig 6 The burs generally used by the authors are (from left): round Komet 6801-016 *(coarse, green ring)*; round end-taper Komet 845 KR-025 *(medium, no ring)*; round end-taper Komet 8845 KR-025 *(fine, red ring)*; round end-taper Komet 845 KREF-025 *(extra-fine, yellow ring)*.

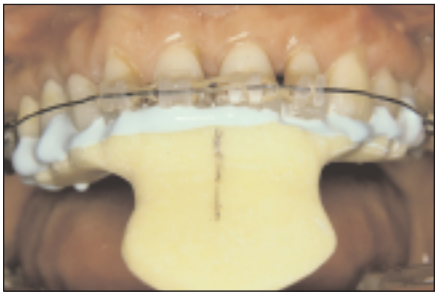

Fig 7 Customized tray is evaluated through a fit-checker paste-

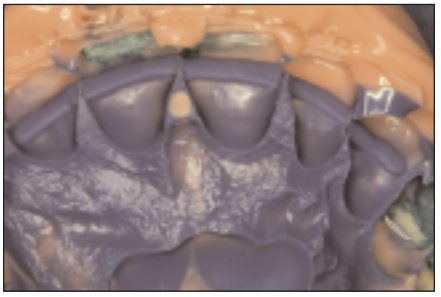

Fig 8 A precision impression is taken, using a polyether material.

Fig 9 When the master cast is ready, the procedure can start. Preparation depth is 0.8 to 1 mm and preparation width is about 2 mm.

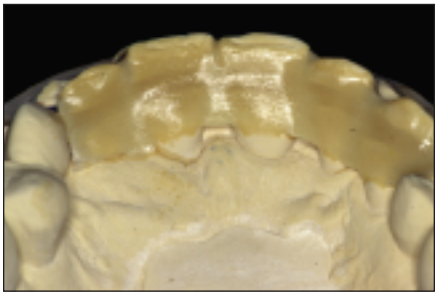

Fig 10 After the splint is waxed into the prepared groove, the splint (unidirectionally oriented fibers to resist compressive occlusal load) is vacuum-pressed onto the cast and light- activated in the Vectris framework former by using a transparent silicone mask.

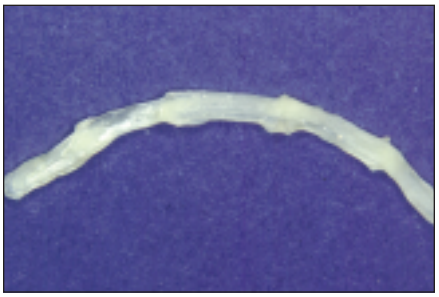

Fig 11 The splint is finished by the technician and is ready for bonding.

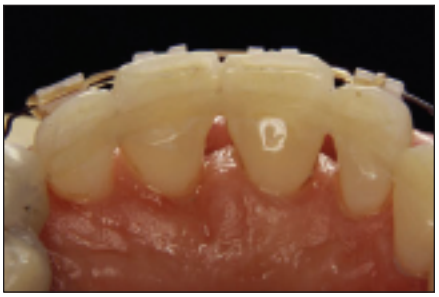

Fig 12 The fit of the fiber-reinforced splint is tested in the mouth.

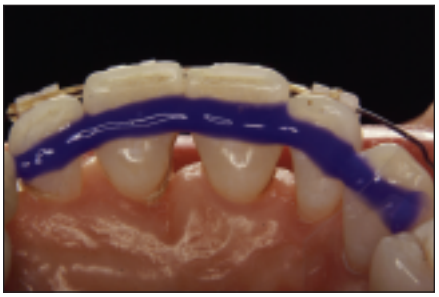

Fig 13 Before bonding, the teeth are cleaned and etched.

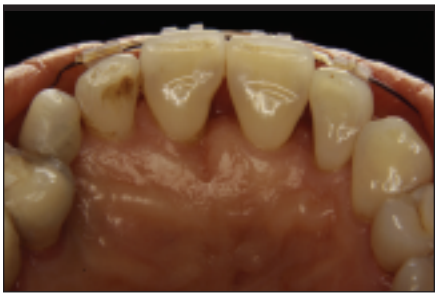

Fig 14 Palatal view, following gross and fine finishing and polishing.

Fig 15 Frontal view showing the inconspicuous restoration.

Fig 16 Final esthetic result.

of the maxillary left central incisor. However, the teeth were in a stable condition, with Class I mobility of the anterior teeth, and the patient was highly motivated for oral hygiene, having a periodontal recall with dental prophylaxis every 2 months.

Treatment plan

Treatment objectives were to:

- Align and level the dental arches
- Correct the overbite and overjet
- Close the spaces in the maxillary arch
- Open spaces in the mandibular arch prosthetic needs (replacing both mandibular first molars)
- Improve the dentogingival relationship

Treatment progress

A bidimensional fixed appliance was placed in both the arches. Brackets were preferred to bands on the molars to minimize soft-tissue irritation. The first phase involved overbite correction by standard Burstone mechanics (Figs 18 and 19); the second phase [AU: edit okay? Second phase?] involved canine retraction and space closure using sliding mechanics (Fig 20). The patient was seen at 3-week intervals, and the periodontal condition was monitored throughout treatment.

Treatment results

A functional occlusion with a Class I canine and Class II molar relationship was achieved (Fig 21). The patient's smile was significantly improved. The radiographs showed no further bone loss. At the end of treatment, and before debonding, a fiber-reinforced splint was placed using the Targis-Vectris system, following the step-by-step procedure described above. Permanent retention was necessary, and bonded 3.3-4.3 lingual retainers were placed. The final result remained stable, as shown by the 5-year posttreatment records (Fig 22).

Fig 17 Pretreatment records and radiographs.

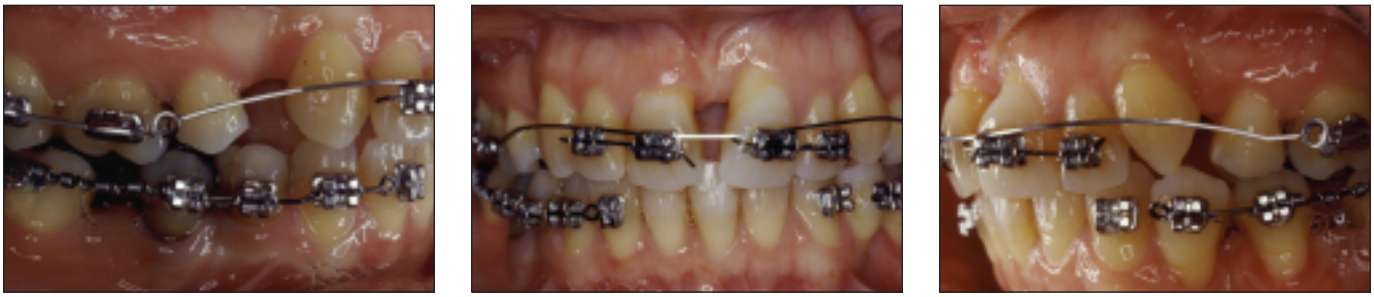

Fig 18 Intrusion of the incisors with segmented mechanics.

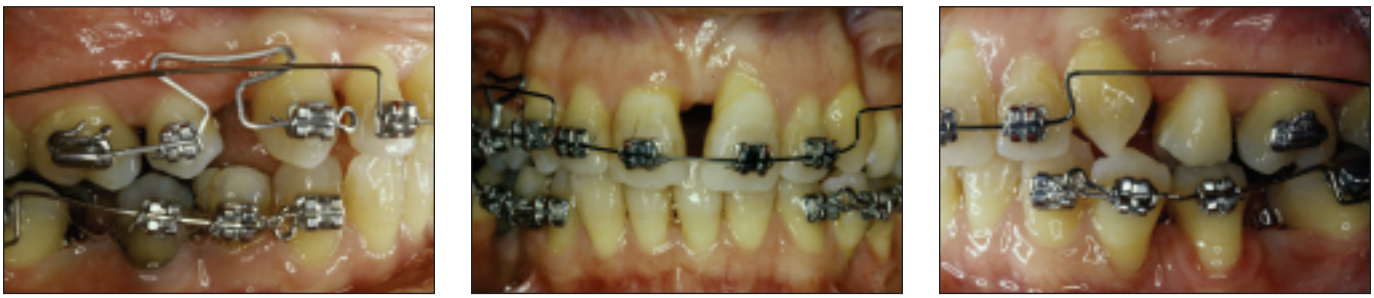

Fig 19 Retraction of the right canine with T-loop (TMA 0.17 × 0.25).

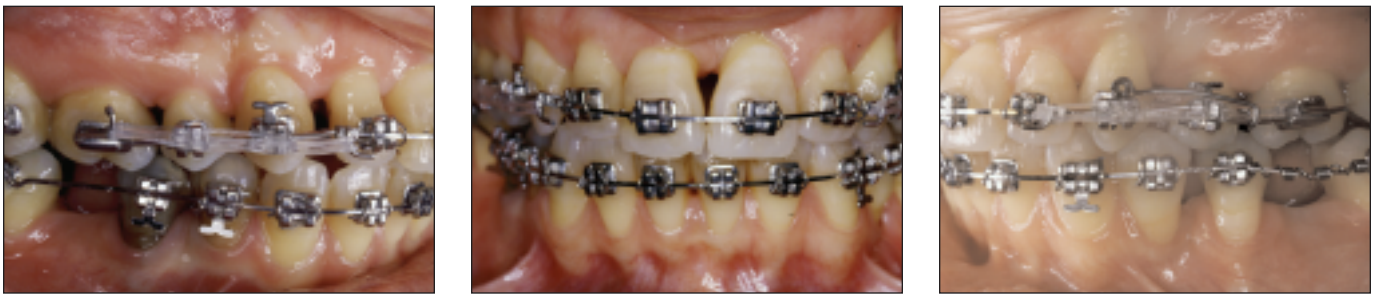

Fig 20 Space closure with sliding mechanics (Bidimensional technique).

CONCLUSION

The Targis-Vectris method, as discussed in this article, can be a useful solution for splinting maxillary teeth in selected periodontally compromised adult patients. In such patients, the most critical factor is the thickness of the composite material placed on the lingual surface of the teeth; if care is not taken, this composite material can cause undesirable occlusal interferences on the anterior teeth and increase the risk of splint breakage. Periodic monitoring of the periodontal condition is strongly recommended when a Targis-Vectris fiber-reinforced splint is placed in orthodontic adult patients.

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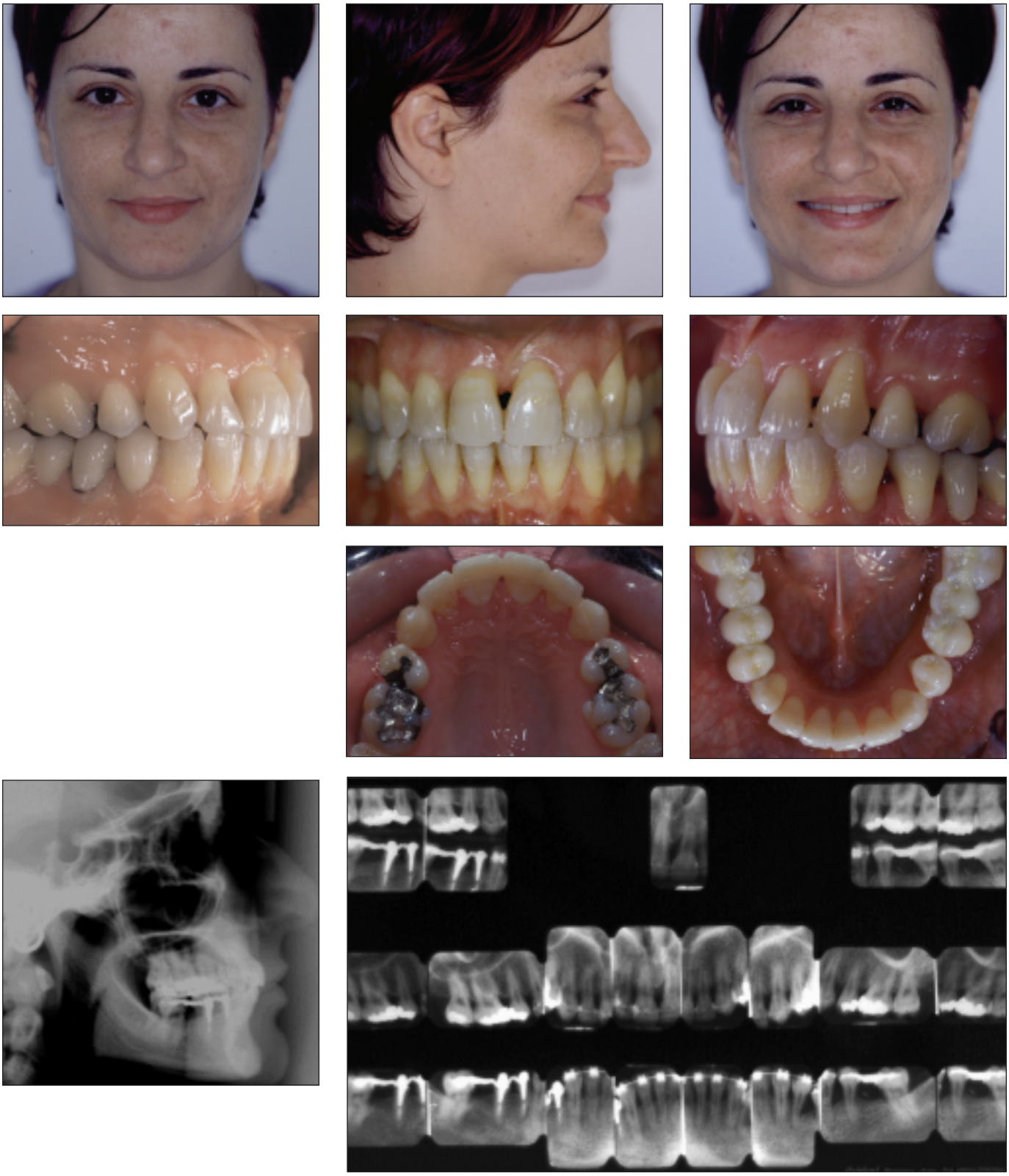

Fig 21 Posttreatment records and radiographs.

Fig 22 Long-term records at 5 years posttreatment.

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