Short Communication

A Laboratory Comparison of Individual Targis/Vectris Posts with Standard Fiberglass Posts

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This article presents an in vitro analysis of a specific occlusal loading test on endodontically treated teeth restored with 2 different composite post materials. Individual, customized posts (IFPs) were compared to standard fiberglass posts (SFPs). The selected IFPs (standard cylindric Targis/Vectris posts) were compared to SFPs (Conic 6% Post, Ghimas). The posts were first subjected to a 3-point bending test to compare their flexural elastic properties. They were then used to restore 22 endodontically treated artificial maxillary central incisors and subjected to a specific occlusal loading simulation test. The loading test showed that IFP restorations performed better than SFP restorations. A clinical evaluation of this laboratory observation is suggested. *Int J Prosthodont 2007;20:190–192.*

The restoration of an endodontically treated tooth usually involves the use of prefabricated composite posts to provide a superior mechanical and esthetic restoration.[1,2] However, the presence of gaps between posts and cavity walls requires the use of a luting agent. Consequently, any large mismatch between the physical properties of posts, cements, and residual tooth tissues may cause adverse stress concentrations at the different interfaces involved.[3] This pilot investigation compared the laboratory response of an occlusal loading protocol in 2 different endodontic post systems.

The authors investigated the mechanical behavior of individual fiberglass posts (IFPs) made from the Targis/Vectris (TV) system (Ivoclar Vivadent), with standard fiberglass posts (SFPs) tested for comparison.

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Materials and Methods

The design protocol for this study consisted of 2 experiments. In the first experiment, a 3-point bending test was used to compare the flexural behavior of 30 posts: 15 IFPs (TV system) and 15 SFPs (Conc 6%, Ghimas). The posts were tronco-conical and approximately 16 mm long, with a 7-mm-long conical portion and minor and major diameters of 0.98 and 1.4 mm, respectively. A standard ISO 10477 test was followed.

The second experiment was a simulated clinical test. Twenty-two identical, artificial maxillary central incisors were randomly divided into 2 groups. The coronal portions of the teeth were removed to the level of the cementoenamel junction. To simulate the presence of alveolar bone, the teeth were embedded in epoxy resin cylinders so that 3 mm of the root structure extended beyond the resin block. For IFP-restored teeth (Group 1), the canal morphology was definitive. Conical morphology was obtained using manual tools up to ISO size 35 (K-file, Dentsply) and Pro-Taper (F1 to F3, Dentsply-Maillefer) mechanical tools, and ISO 35 was employed in the apical portion and ISO 110 in the coronal portion. Gates-Glidden burs (nos. 2, 3, and 4) were then used to remove the gutta-percha. For SFP-restored teeth (Group 2), the drill provided with the post system was used to prepare the canal.

Polyvinyl siloxane molds made using an autopolymerizing acrylic resin from a master cast of the root cavity were used to build the TV post-core framework for the IFPs. A resin composite cement (Variolink,

Table 1 Material Properties Used in the Numeric Analysis

Material	Young's modulus (GPa)	Poisson's ratio	Shear modulus (GPa)	Stress limit (MPa)
Vectris (IFP)	19.82*	0.30		883*
Conic 6% (SFP)	30.08*	0.22 (0.29)	4.2 (4.1)	1,133*
Restored crown (porcelain)	120	0.28		
Targis/Vectris (custom post-core)	12.3	0.30		170
Tetric Ceram HB (standard post-core)	12	0.35		150
Variolink II (cement)	7	0.30		110
Gutta-percha	0.00069	0.45		
Epoxy resin for in vitro tests	4.5	0.40		
Dentin	18.3	0.27		245–268

*Mean values determined by tests conducted in this study.

Table 2 Results of 3-Point Bending Tests

Post	Young's modulus (GPa)		Strength (Gpa)	
	Mean	SD	Mean	SD
SFP	30.082	–	1.133	–
IFP	19.819	2.395	0.883	0.8783

Table 3 Results of Occlusal Load Tests

Post	Ultimate load (kN)	
	Mean	SD
SFP	0.859	0.329
IFP	1.008	0.227

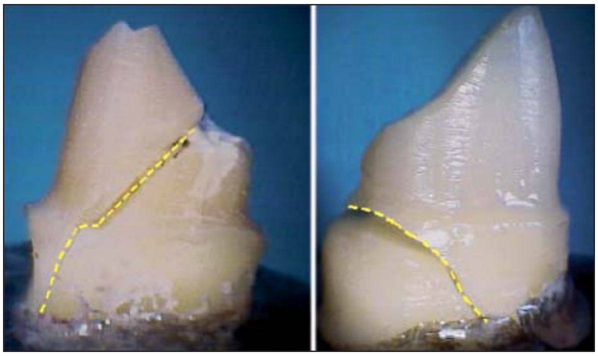

Fig 1 Predominant failure modes observed for the IFP *(left)* and SFP *(right)* restorations.

Ivoclar Vivadent) and bonding agent (Excite, Ivoclar Vivadent) were used.

The materials and procedures used for Group 1 were used to cement the SFPs into the root cavity for Group 2. Tetric Ceram HB (Ivoclar Vivadent) was shaped to form the core using the same molds as used for Group 1.

A Class I occlusal relationship was simulated. A stainless steel fixture that loaded the tooth specimen at an angle of 130 degrees with respect to its longitudinal axis was used. A metallic tip coated with a ceramic material contacted the experimental restoration. Table 1 shows the physical properties of the materials used.

Results

Three-Point Bending Test

The flexural strength of the IFP specimens was about 20% lower than that of the SFP specimens (Table 2). The elastic modulus of the IFPs was approximately 20 GPa, as opposed to 30 GPa for the SFPs. The difference in the flexural stiffness of TV and dentin (18 GPa) was less than 10%.

Occlusal Load Test

The mean strength and dispersion were better for IFPs (Table 3) than SFPs. IFPs were more resistant and more consistent in terms of global performance (Fig 1). A fracture of an IFP appeared to initiate in the loaded area and then propagate toward the post-core/dentin interface (PDI) in the direction of the applied load. Conversely, in the case of SFP posts, decohesion occurred at the PDI. The fracture also appeared to propagate up the post, and its relatively high stiffness forced the failure pattern to progress through the weaker dentin, parallel to the loading direction. Favorable fracture patterns occurred in 70% of the IFPs versus 30% of the SFPs.

Discussion

All experimental teeth restored with the IFP system offered a greater resistance under loading than the standard restorations. This probably resulted from the larger diameter of the IFPs, particularly at the cervical portion. The IFPs do not require additional preparation of the middle third of the tooth. Consequently, the post contains more glass fibers, offers increased resistance, and requires less cement. A smaller thickness of cement results in a more regular distribution of the occlusal loads and limits contraction of the resin cement during polymerization, thus reducing the consequent polymerization stress. The poorer adaptation of SFPs to the canal results in a lever arm that is proportional to the thickness of the cement used and transmits any tension to the root walls, thereby increasing the probability of failure.[2,4,5] The fractures in the teeth with IFPs were favorable in 70% of the cases because they were located in the cervical part of the tooth. In the specimens restored with SFPs, the fractures were located in the unfavorable apical part of the root.

Conclusion

Within the limitations of this experimental design, it can be suggested that the use of IFPs warrants longitudinal clinical trials to further analyze the results.

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Literature Abstract

Osteotome sinus floor elevation without grafting material: A 1-year prospective pilot study with ITI implants

The aim of this pilot study was to evaluate: *(1)* the predictability of an osteotome sinus floor elevation procedure with ITI-SLA implants without placing a bone grafting material, and *(2)* the possibility of gaining bone height without filling the created space with a bone grafting material. Seventeen patients received 25 implants protruding in the sinus. Most implants (21/25) were 10 mm long. Eight were inserted in type 2 bone, 12 in type 3, and 5 in type 4. At implant placement, the mean residual bone height (RBH) under the maxillary sinus was 5.4 ± 2.3 mm (5.7 ± 2.6 mm on the mesial side and 5.1 ± 1.9 mm on the distal side). Nineteen implants had less than 6 mm of bone on at least 1 side and 6 implants had less than 6 mm on both sides. A healing period of 3 to 4 months was allowed before abutment tightening at 35 Ncm. The percentage of stable implants at abutment tightening and at the 1-year control was calculated. The endosinus bone gain and crestal bone loss (CBL) at the mesial and distal sides were measured. Abutments were tightened after 3.1 ± 0.4 months. All implants except 1 (96%) resisted the applied 35 Ncm torque. At the 1-year control, all implants were clinically stable and supported the definitive prosthesis. All showed endosinus bone gain (mean, 2.5 ± 1.2 mm). The mean CBL was 1.2 ± 0.7 mm. Endosinus bone gain and RBH showed a strong negative correlation ($r = -0.78$ on the mesial side and -0.80 on the distal side). A good correlation ($r = 0.73$) was found between implant penetration in the sinus and endosinus bone gain. The authors concluded that elevation of the sinus membrane alone without addition of bone grafting material can lead to bone formation beyond the original limits of the sinus floor. Despite a limited RBH at implant placement, a healing period of 3 months was sufficient to resist a torque of 35 N cm and lead to a predictable implant function at the 1-year control.

Nedir R, Bischof M, Vazquez L, Szmukler-Moncler S, Bernard JP. *Clin Oral Implants Res* 2006;17:679–686. **References**: 52. **Reprints:** Dr Rabah Nedir, Swiss Dental Clinics Group, Clinique de Soins Dentaires, Rue du Collège 3, 1800 Vevey, Switzerland. Fax: +41 21 922 2298. E-mail: rabah.nedir@swissdentalclinics.ch—*Tee-Khin Neo, Singapore*