

Using injectable resin composite: part one

Douglas Terry¹ and John Powers²

The injectable resin composite technique is a novel indirect/direct process of predictably translating a diagnostic wax-up into composite restorations.

There are a myriad of applications for this technique using a highly filled flowable resin composite. The clinical applications include emergency repair of fractured teeth and restorations, fabricating provisional restorations (Terry, 2012), transitional composite restorations (class III, IV, veneers) and paediatric composite crowns, resurfacing occlusal wear on posterior composite restorations, establishing incisal edge length prior to aesthetic crown lengthening, and developing composite prototypes for copy milling.

In addition, this technique can be used to establish vertical dimension and for altering occlusal schemes (anterior guidance and posterior disclusion) prior to restoring with final restorations. Furthermore, this non-invasive technique is an integral tool for enhancing communication between the patient and restorative team during treatment planning.

This article presents a case report involving the use of the injectable resin composite technique to develop transitional resin composite restorations.

Prototypes

Developing transitional resin composite restorations using the injectable technique is an excellent method to increase the patient's understanding of the planned clinical procedure and anticipated final result (Terry, Leinfelder, Geller, 2009).

¹ Douglas Terry, DDS.
Assistant Professor, Department
of Restorative Dentistry and
Biomaterials, University of Texas
School of Dentistry, Houston,
Texas, USA. Private Practice,
Houston, Texas, USA

² John Powers, PhD.
Clinical Professor of Oral
Biomaterials, University of Texas
School of Dentistry, Houston,
Texas, USA



Figure 1: Preoperative view of the maxillary anterior segment in a 63-year-old. Patient with incisal wear and fracture requested a conservative aesthetic enhancement without orthodontic treatment.

Transitional composite prototypes allow the patient and restorative team to establish parameters for:

- Occlusal function (Heymann, 1987)
- Tooth position and alignment (Gürel, 2003)
- Restoration shape and physiologic contour (Baratieri, 1998)
- Restorative material colour and texture
- Lip profile
- Phonetics
- Incisal edge position
- Gingival orientation.

In addition, this process helps to eliminate confusion and misunderstanding between the patient and the team during the treatment planning stage. This technique can also be used in the development and management of soft tissue profiles and in the design of the definitive restoration (Donovan, Cho, 1999; Preston, 1976; Yuodelis, Faucher 1980; Saba, 1997).

The clinician and technician can use this reversible and preparation-less technique as a guide for developing a pre-approved functional and aesthetic final restoration. This process aids them during the design and fabrication of the definitive restoration, by providing a visualisation for the patient and the team as well as communicating extensive details concerning the treatment plan and the fabrication of final restorations (Terry, Geller, 2013). In some cases, these transitional restorations can be worn for months or even years by patients during long-term interdisciplinary rehabilitation (Terry, 2012).

This technique can be performed without anaesthesia. A clear vinyl polysiloxane impression material is used to replicate the diagnostic wax-up. The clear matrix can be placed over the unprepared teeth and used as a transfer vehicle for the flowable composite resin to be injected and cured.

Once adjustment and polishing have been completed, the transitional composite restorations can be further modified to satisfy the functional and aesthetic needs of the patient. This procedure can reduce the potential for patient



Figures 2a, b and c: Clinical evaluation revealed multiple diastemas and cervical corrosion on the central incisors.

dissatisfaction and litigation since the process is reversible, can be performed without preparation and allows the patient to accept the visual and functional result before the definitive restorations are fabricated.

In addition, this simple procedure helps to regulate the dimensions of the preparation design, ensures uniform spatial parameters for the restorative material, and increases the potential for a more conservative preparation design (Terry, 2012).



Figure 3a: Development of a diagnostic wax-up for the final restorations.



Figure 3b: A clear vinyl polysiloxane matrix replicates the diagnostic wax-up.

Case report

A 63-year-old male patient presented with concerns regarding incisal wear and fracture of his maxillary anterior teeth (Figure 1).

Clinical evaluation revealed multiple diastemas and

cervical corrosion on the central incisors from lemon sucking (Figures 2a and 2b). Additional occlusal findings indicated insufficient canine guidance and posterior disclusion. After occlusal evaluation, a new occlusal scheme was developed with a diagnostic wax-up (Figure 3a). A clear vinyl



Figure 4: A hybrid resin composite placed in the clear matrix and positioned on the maxillary right central and light-cured.



Figure 5a: Before the adhesive surface preparation, each tooth is separated by applying Teflon tape on the adjacent teeth.



Figure 5b: A 37.5% phosphoric acid semi-gel was applied to the enamel surface for 30 seconds, rinsed and air-dried.



Figure 5c: A single component adhesive was applied to the enamel surface and allowed to dwell for 10 seconds.



Figure 5d: The adhesive is air-dried for five seconds.



Figure 5e: The adhesive is then light-cured for 10 seconds.



Figure 6a: A clear silicone matrix placed over the arch and an opacious A2-shaded flowable resin composite injected above each tooth.

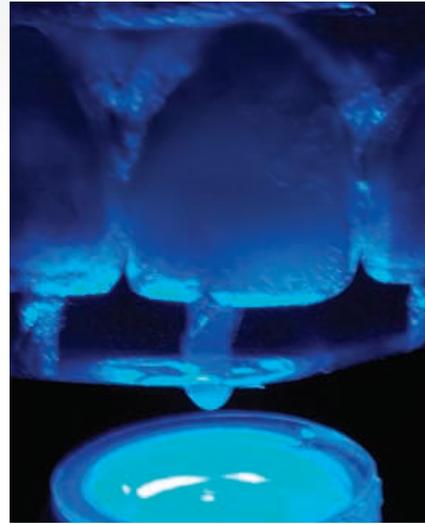


Figure 6b: Resin composite cured through the clear resin matrix.

polysiloxane matrix was used to replicate the diagnostic wax-up. The impression was taken in a non-perforated plastic tray (Figure 3b).

Each tooth was pumiced and cleaned with 2% chlorhexidine. Prior to the restorative procedure, a hybrid resin composite was placed in the clear matrix, positioned on the maxillary right central, and light-cured. This technique allowed the spatial dimension of a large diastema to be controlled during the composite injection procedure (Figure 4).

Each tooth was then separated by applying Teflon or a small amount of glycerin to the adjacent teeth (Figure 5a). This proximal adaptation technique allowed for optimal integration of flowable resin composite in the interproximal region while preventing adhesion of the material to adjacent tooth surfaces (Terry, Leinfelder, 2004; Terry, 2004; Terry, 2005).

Depending on the duration of treatment, the method for bonding requires selective spot etching or complete etching of the tooth surfaces to be restored. A 37.5% phosphoric



Figure 7a: The excess polymerised composite resin is removed.



Figure 7b: The incisal composite sprue was removed with a 30-fluted tapered finishing bur.

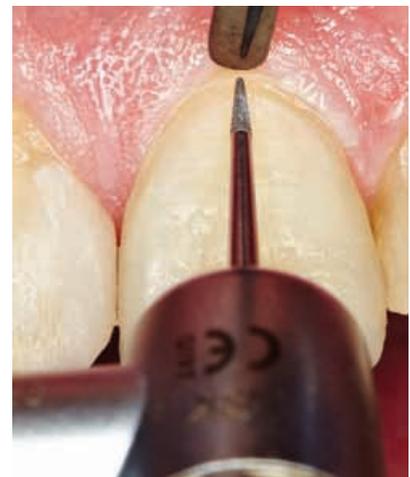


Figure 7c: Using a tapered finishing diamond, the tooth composite resin interface was finished.



Figure 8: The initial hybrid composite mock-up was removed with a scalpel.



Figures 9a and 9b: The proximal surfaces and contours were smoothed with tapered finishing diamond and finishing strips.



acid semi-gel was applied to the enamel surface for 30 seconds, rinsed for five seconds, and gently air-dried (Figure 5b). A single-component adhesive was applied to the enamel surface, allowed to dwell for 10 seconds (Figure 5c), air-dried for five seconds (Figure 5d), and light-cured for 10 seconds (Figure 5e).

The clear silicone matrix was placed over the arch and an opacious A2-shaded flowable resin composite was

initially injected through a small opening above each tooth, followed by a translucent B1 flowable resin composite (Figure 6a). The resin composite was cured through the clear resin matrix for 40 seconds (Figure 6b) and the



Figure 10a: Adhesive surface preparation completed using total-etch technique.

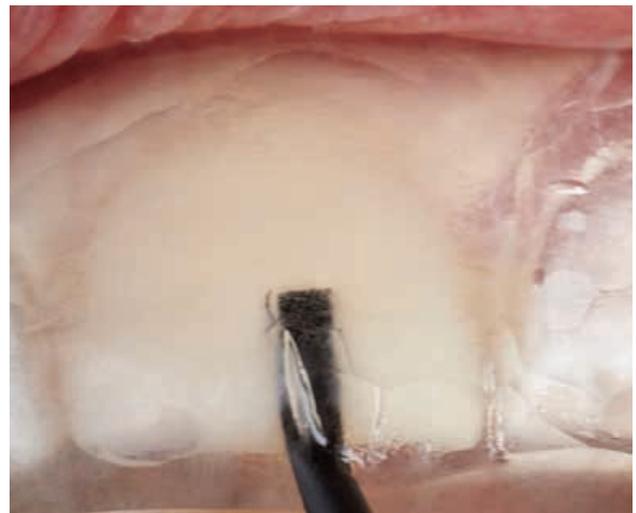


Figure 10b: Flowable composite material is injected through an opening in the matrix.



Figure 11a: The incisal composite sprue was removed, and excess composite resin removed with a scalpel.



Figure 11b: The gingival tissue was retracted and the tooth composite resin interface finished using a tapered finishing diamond.



Figure 12: The lingual tooth composite resin interface was finished using a 30-fluted pyramidal-shaped finishing bur.



Figure 13: Proximal surfaces and contours were smoothed with finishing strips.



Figure 14: Incisal and proximal contouring and smoothing accomplished with finishing and polishing discs.



Figure 15: Facial surfaces polished with silicone points.



Figure 16: Gingival region polished with silicone hollow cups.



Figure 17: A goat hair wheel and diamond polishing paste are used to further refine the surface lustre of the composite resin.

excess polymerised resin composite was removed with a scalpel (Figure 7a). The incisal composite sprue was removed with a 30-fluted tapered finishing bur (Figure 7b). The gingival tissue was retracted with a gingival protector, and the tooth-resin composite interface was finished using a tapered finishing diamond (Figure 7c). The initial mock-up on the maxillary right central was removed with a scalpel blade (Figure 8). The proximal surfaces and

contours were smoothed with a tapered finishing diamond and finishing strips.

This restorative procedure was completed for each tooth before restoration of the next tooth (Figures 9a and 9b).

After isolation of the adjacent central, the adhesive surface preparation was completed using total-etch technique (Figure 10a). The same shade combination of flowable composite material was injected through a small opening in the matrix



Figure 18: High surface gloss was achieved with a dry cotton buff applied with an intermittent staccato motion.

above the tooth, allowing the material to completely cover the conditioned enamel surface (Figure 10b). The resin composite was cured through the clear resin matrix for 40 seconds. After the incisal composite sprue was removed, the excess polymerised composite resin was removed (Figure 11a). After each composite injection, the same restorative procedure was completed for each tooth in the anterior segment.

An optimally finished transitional restoration should provide a smooth surface that will prevent plaque accumulation (Terry, 2004; Stewart, Bachman, Hatton, 1991; Berastegui et al, 1992; Yap, Sau, Lye, 1998), and resist staining (Goldstein, 1989). It should also possess proper marginal adaptation and integrity (Yap, Ang, Chong, 1998) with the ideal contours and emergence profile for improved tissue compatibility.

For this patient, the gingival tissue was retracted with a gingival protector to prevent tissue laceration, and the tooth resin composite interface was finished using a tapered finishing diamond (Figure 11b).

The lingual tooth resin composite interface was finished using a 30-fluted pyramidal shaped finishing bur. This bur has an ideal shape that conforms to the appropriate curvature of the tooth surface and restoration (Figure 12).

The interproximal surfaces were smoothed with aluminium oxide finishing strips, which were used sequentially from fine to extra-fine (Figure 13). The incisal edges of the resin composite were contoured with finishing and polishing discs (Figure 14). Pre-polish and high-shine silicone points were used to smooth and polish the resin composite surface (Figure 15).



Figures 19a, b and c: The completed transitional resin composite restorations with optimal anatomical form. The composite injection technique allows the establishment of harmonious proportions of the transitional restorations and the surrounding biologic framework.



Figures 20a, b and c: The transitional resin composite restorations are inspected in centric relation, protrusive and lateral excursions. Notice the improved posterior disclusion and anterior guidance.



Figure 21: The composite transitional restorations establish the optimal aesthetic parameters for a natural smile.

The gingival region was smoothed and polished with pre-polish and high-shine silicone hollow cups, which provide additional flexibility at the cervical curvature of the tooth (Figure 16). The facial surface was polished to a high lustre with synthetic diamond paste using a goat hair wheel, and the final surface gloss was accomplished with a dry cotton buff using an intermittent staccato motion applied at conventional speed (Figures 17 and 18).

The transitional resin composite restorations were completed and inspected in centric relation, protrusive and lateral excursions (Figures 19a-c).

The composite prototype achieved using this non-invasive injectable technique established the optimal aesthetic parameters for a natural smile (Figures 20a-c and Figure 21).

Conclusion

The injectable resin composite technique is a valuable communication tool for increasing the patient's understanding of the clinical procedure and anticipated

final result. This process allows the functional and aesthetic concerns to be resolved by the entire restorative team before final restorative treatment is initiated.

The future clinical applications of this novel technique may provide clinicians and technicians with alternative approaches to various clinical situations while allowing them to deliver improved and predictable dental treatment to their patients.

Although the long-term benefits of this technique remain to be determined, the clinical results achieved in the past seven years by the authors are extremely promising.

Further information

The second part of this series, will describe and illustrate another application of the injectable resin composite technique for use with the primary dentition.

The list of references that accompany this series is available on request.

Published with permission by Private Dentistry November 2014