

## CLINICAL

# Periodontally compromised dentition and fibre-reinforced composite therapy

Ian E Shuman, DDS, FAGD, presents an innovative technique for restoring the periodontally compromised dentition using fibre-reinforced composite therapy

When presented with a patient who has chronic periodontitis (Armitage GC), the prognosis for tooth retention is guarded and fixed-restorative treatment options are few. This is often due to the following circumstances:

- Loss of adequate bone and associated periodontal structures to support the existing teeth (or future implants)
- Poor prognosis for tooth retention and, therefore, a guarded clinical decision to invest time and finances in the fabrication of indirect, fixed restorative therapy
- Difficulty in deciding whether to maintain the existing teeth through vigilant, aggressive periodontal therapy or to extract the existing diseased dentition.

Despite these obstacles, there are situations in which it is desirable to maintain the existing dentition, if only for a limited period of

time. In order to accomplish this goal and prevent further tooth and/or loss of the periodontal complex, a limited number of treatment options are available.

One of those options involves the use of fibre-reinforced composite (FRC) therapy. FRC therapy has been demonstrated to be a highly valuable materials choice for a wide variety of clinical applications (Levenson MF, 1986; Strassler HE, Serio FG, 1997; Strassler HE, Haeri A, Gultz JP, 1999; Goldberg AJ, Freilich MA, 1999). These include, but are not limited to, periodontal splinting, non-metal direct and indirect restorations, tooth replacement, and post and core fabrication (Kau K, Rudo DN, 1992; Miller TE, Hakimzadeh F, Rudo DN, 1995; Dickerson WG, 1993; Hornbrook DS, Hastings JH, 1995).

The following case report demonstrates an innovative technique using FRC technology to fulfil all of the desirable criteria previously mentioned.

## Case report

A 50-year-old woman presented with the chief complaint of a painful, loose upper right second premolar. She also reported that all of her upper teeth were becoming increasingly sensitive to cold and hot

stimuli, and over time were protruding (Figure 1) and displacing her upper lip. In the past, the patient had non-surgical periodontal scaling and root planning, and extraction of her maxillary left premolars and maxillary molars bilaterally due to chronic periodontal disease.

An examination determined that she had generalised Class III



Figure 2: The radiograph of the upper right second and first premolars at the emergency appointment

periodontal disease with probing depths ranging from 3mm to 10mm, and that all maxillary teeth had a grade 2 mobility or greater. Radiographs revealed that there was a bone loss of 50%, and greater in some areas (Figures 2 and 3). In addition, there was a significant periradicular radiolucency associated with the upper right premolars

Figure 4: The casts are mounted on an articulator (Kavo USA) prior to waxing using a composite material (Triad, Dentsply)

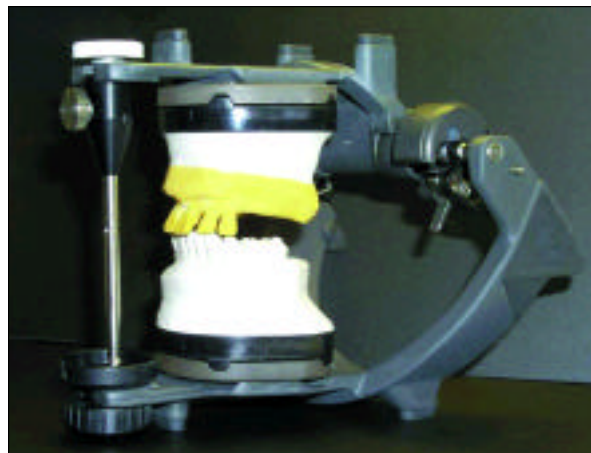


Figure 1: Anterior teeth on presentation. Note the lack of papillae and associated root exposure due to the presence of chronic periodontal disease

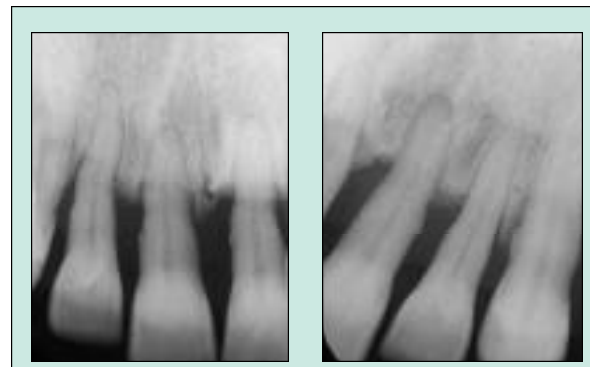


Figure 3: Radiographic appearance of the maxillary anterior teeth

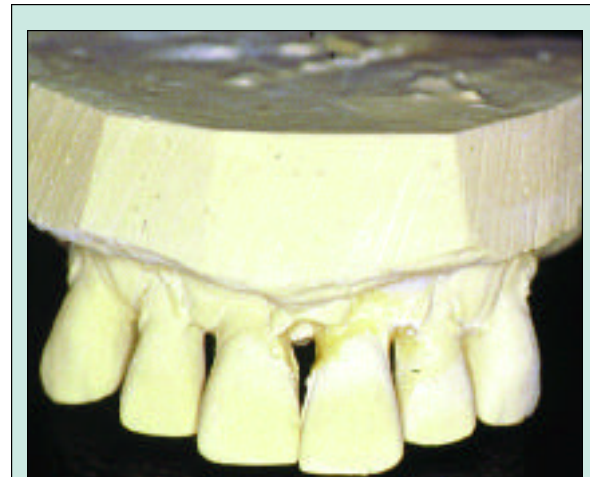


Figure 5: Before and after - model preparation

Dr Ian E Shuman maintains a full-time private practice in Glen Burnie, Maryland, emphasising reconstructive and aesthetic dentistry. He is a product/material evaluator and beta tester for numerous companies that produce dental products and materials. Dr Shuman lectures both nationally and internationally on a wide range of topics. He can be reached at [ishumandds@erols.com](mailto:ishumandds@erols.com)

## CLINICAL



**Figure 6:** Endodontic access is located prior to losing anatomic landmarks following tooth preparation

concurrent with the patient's primary chief complaint. Anterior occlusal contacts were absent in maximum intercuspation and occlusal function was found only on her remaining posterior teeth. The six anterior teeth presented in a labially protrusive position and were not in occlusion.

An extensive examination was conducted and included mounted study models, photographs, radiographs, a comprehensive periodontal examination, intra/extraoral examination and complete medical and dental histories.

The upper study model was duplicated, the upper and lower casts were mounted on an articulator (Protar, Kavo, Lake Zurich, Ill) (Figure 4) and the teeth prepared on the model to evaluate the extent of tooth preparation. (Figure 5).

The diagnosis for the upper right second premolar was primary chronic periodontitis with a secondary complication of occlusal traumatism and deemed hopeless.

Based on the history and

**Bacteria from chronic or aggressive forms of perio can gain access to pulpal tissues through accessory canals or tooth apex and lead to pulpal infection**

present symptoms, the primary diagnosis for the remaining maxillary dentition was 'combined periodontal-endodontic lesions'. This diagnostic nomenclature falls under the new classification for periodontal diseases as established by the American Academy of Periodontology (Meng HX, 1999).

This diagnosis is founded on the basis of signs and symptoms that are caused by endodontic infections that enter the periodontal ligament at the apical foramen or through lateral or accessory canals and proceed coronally. In other instances, bacteria from chronic or aggressive forms of periodontitis can gain access to pulpal tissues through accessory canals or the tooth apex and lead to pulpal infection.

At the emergency appointment, tooth 51 was extracted. Since the only

remaining tooth in occlusal function was the upper right first premolar (tooth 41), the patient was strongly advised to seek immediate care in order to attempt to preserve the remaining dentition and possibly avoid further extraction.

**Fibre-reinforced composite therapy has been demonstrated to be a highly valuable choice for a wide variety of clinical applications**

Unfortunately, the patient did not seek immediate care and, four weeks later, the upper right first premolar had undergone severe occlusal traumatism and, combined with the existing periodontal condition, was deemed hopeless and the tooth was extracted.

At this point, only aggressive intervention could avoid any further tooth loss. However, any further extractions would ideally require a removable prosthesis with full palatal coverage. But this option was not possible as the patient was a severe gagger and, therefore, would not be able to tolerate any type of traditional full palatal coverage.

Consequently, the following treatment plan was devised in order to satisfy the limitations of this particular case.

**Figure 11:** The core is set and the ribbon is readied for placement in the next post space



**Figure 13:** The Ribbon is placed into the facial channel and is bonded to the lingual Ribbon to create proper lamination of the ribbon and gain greater reinforcement strength



A direct fibre-reinforced composite restoration would be fabricated using a polyethylene ribbon (Ribbon, Seattle, WA).

This mode of therapy has been reported to be the best option available when presented with the requirements and limitations of such a case (Strassler HE, Scherer W, LoPresti J et al, 1997; Ramos V Jr, Runyan DA, Christensen LC, 1996; Samazadeh A, Kugel G, Hurley E et al, 1997; Munoz CA, Torres J, Dunn JR et al, 1999).

In addition, because of the presence of combined lesions, the existing maxillary teeth would be treated with conventional root canal therapy using a warm vertical condensation technique.

The teeth would be prepared in such a manner as to alter the plane of occlusion and bring it into a more normal function. Then the teeth would be splinted with FRC therapy. Also, a partial denture relieved in the palatal area (to avoid stimulating the gag reflex) would be fabricated to redistribute occlusal forces properly and restore occlusal harmony.

### Pre-operative preparation

A composite material (Triad, Dentsply) was used to create the following:

- Waxing of the prepared model followed by vacuum-form stent fabrication
- A custom tray for a final impression for the fabrication of the partial upper denture immediately following FRC therapy of the six remaining anterior teeth
- A maxillary transitional stent with composite occlusal rims to maintain a corrected vertical dimension and provide posterior occlusion during partial denture fabrication.

At the first appointment, teeth 3, 2, 11, 2, 3 were



**Figure 7:** The corrected incisal length is marked where appropriate prior to actual reduction. Because the upper left canine is in the correct incisal position, it is also used as a guide for incisal reduction



**Figure 8:** The teeth following incisal reduction



**Figure 9:** The teeth following complete reduction in all spatial aspects. Note that a facial channel was created to accommodate space for the reinforcement ribbon



**Figure 10:** Ribbon reinforcement ribbon (Seattle, WA) is packed into composite core material in the prepared post spaces

anaesthetised, isolated and a pilot preparation was created on the lingual of the teeth in order to locate the ideal access for endodontic therapy (Figure 6).

This was done because endodontic therapy would be performed following complete tooth preparation

and the common anatomic landmarks would be lost.

The teeth were then marked with a disposable skin marker (Figure 7) to indicate the new incisal edge position. The corrected incisal length was pre-determined by preparing the teeth on the study model, hence the

**Figure 12:** The completed placement of Ribbon and core material in all post spaces. Note that the length of Ribbon continues from the distal of the upper left canine and is still long enough to wrap around the facial of the maxillary teeth



**Figure 14:** The completed bonding of the fibre reinforcement ribbon to the maxillary teeth



## CLINICAL

importance of pre-operative preparation. The incisal edges were prepared (Figure 8) with a high-speed handpiece (Kavo) and the diamond burs from the Porcelain Veneer Kit (Brasseler, Savannah, GA). Following endodontic therapy, the teeth were prepared to completion (Figure 9) and post spaces were created.

The preparations were

**Additional light cure composite resin was added incrementally to both the interproximal and the facial aspects of the teeth**

then etched using 40% phosphoric acid, rinsed and dried. A dual cure bonding agent (Syntac, Ivoclar, Amherst, NY) was applied to the tooth and canal preparations using a resin applicator brush (Microbrush, Grafton, WI). Then a dual cure post/core material was placed into the canal of tooth 3].

A long section of 2mm wide fibre reinforcement material (Ribbond) that could be placed into the prepared canal spaces and facial channels was prepared with a coating of liquid resin and then packed into the core material in the canal (Figure 10). Once cured, the canal of tooth 2] had the core material syringed into it and the Ribbond was packed into that canal. This method was continued (Figure 11) until all of the canals had been filled with both core material and Ribbond. (Figure 12).

At this point, a light cured hybrid composite resin (Tetric Ceram, Ivoclar) was placed into the facial channel of teeth 3] and 2], the Ribbond was wound around the facial aspect of tooth 3] and the Ribbond was imbedded into that composite. The interproximal section of resin and Ribbond was held together using cotton forceps (Figure 13) and light cured. This same method was continued until all of the facial and interproximal areas had both composite resin and Ribbond incorporated into their preparation areas (Figure 14). Additional light cure composite resin was added incrementally to both the interproximal and facial aspects of the teeth (Figure 15) until only a 2mm thickness of composite was to be added to the facial.

The vacuum-form stent was then loaded with a microfill composite resin (Heliomolar, Ivoclar) and seated to place on the

**The final clinical result was an FRC restoration for periodontal splinting and aesthetics, and support for a removable partial denture**

prepared teeth (Figure 16). Excess material was removed and each tooth surface was light cured for an additional 60 seconds. The stent was removed, the teeth were finished and polished, and the occlusion adjusted with the prefabricated transitional occlusal stent



Figure 15: Additional composite is added to the interproximal spaces

inserted intraorally.

A final impression was made using the prefabricated custom tray and the prefabricated record base was utilised to capture a final occlusal record. The patient was then given the maxillary transitional stent to serve as an interim partial upper denture. The patient returned for the insertion of the completed cast upper partial denture one week later. For the past three

years, the FRC periodontal splint and partial denture have allowed the patient to retain her existing maxillary dentition and provided excellent occlusal function. (Figures 17, 18, 19 and 20).

### Conclusion

One of the most exciting aspects of current dental care is the myriad of materials and techniques available to us. In treating a severely compromised

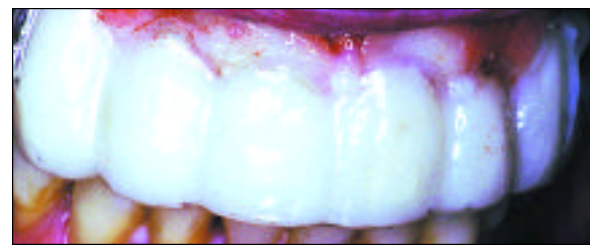


Figure 16: The vacuum-form stent is filled with a microfill composite resin and seated over the prepared teeth (and light cured)

dentition, difficulties abound. However, success can be achieved by implementing a unique and innovative direct technique using a combination of historically successful treatments. Although FRC therapy has a more limited clinical durability than conventional fixed partial dentures, Pollack demonstrated that splinting with a direct composite resin technique could be

successful for a long time (Pollack R, 1999; Shuman IE, Strassler HE, 2000).

This article presented a creative solution to a case where the patient had chief complaints of tooth pain and cold sensitivity, and an unaesthetic dentition because of periodontal disease. The patient was presented with many conventional and traditional treatment options, which she

Figure 17: The patient before and after. Note that the after image shows the patient with the FRC periodontal splint and a removable partial denture. This has corrected her lip position and filled out the buccal corridor

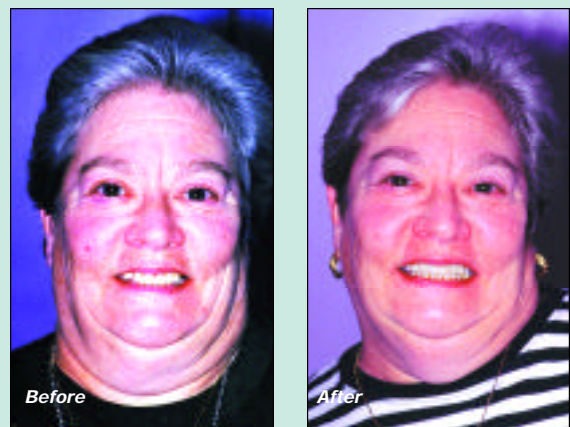


Figure 18: Before and after - the patient in profile



## CLINICAL

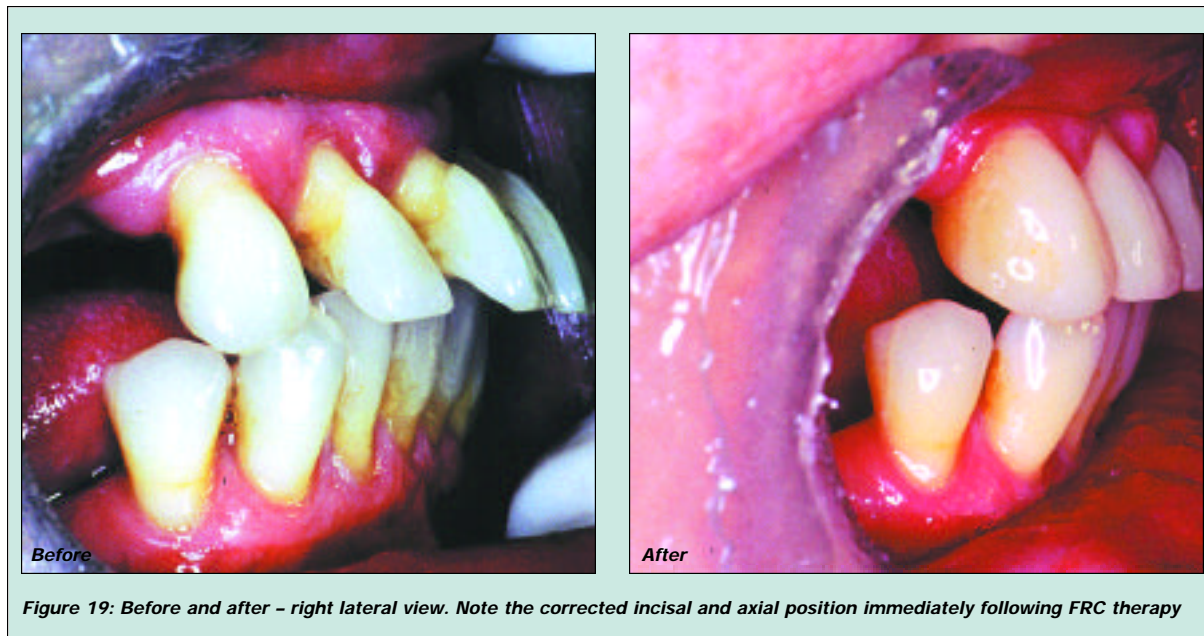


Figure 19: Before and after - right lateral view. Note the corrected incisal and axial position immediately following FRC therapy

rejected, before accepting a plan using FRC, even though the clinical durability of the restorations would have a

shorter life expectancy and need to be repaired often (Shuman IE, Strassler HE, 2000).

The final clinical result was the placement of a successful fibre-reinforced composite restoration for

periodontal splinting and aesthetics, as well as support for a removable partial denture. ■



Figure 20: Occlusal view of the completed fixed/removable case. The partial denture is a combination cast frame with Valplast base and clasps

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Mr Julian English  
Executive Editor  
Dentistry  
524 Watford Way  
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E-mail:  
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Fax: 020 8906 8808