The Use of Fibre Reinforced Composites (Frcs) in Periodontal Splinting & the Natural Tooth Pontic (NTP) in the Management of Advanced Periodontal Disease

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ABSTRACT
This article uses a series of case studies to examine the use of fibre reinforced composite splints in the management of advanced gum disease that has led to mobility and imminent exfoliation of teeth. The case studies show the various techniques for producing a durable aesthetic splint and how to use these principles in the production of a natural tooth pontic.

KEYWORDS
Fibre reinforced composites, Periodontal Splints, natural tooth pontics, Mobility.

INTRODUCTION
Knowledge of the anatomy of the root-canal system

The treatment of periodontal disease is one of the mainstays of modern dentistry and has been shown to have a massive impact on patients’ ability to keep their teeth for much longer than they may have done without care. At the heart of periodontal treatment is the understanding of the relationship to the build-up of plaque on a patients tooth and the response of the host periodontium to that plaque. With this in mind periodontal treatment has developed as a two pronged approach that relies on Periodontal Maintenance by the dental team and home care by the patient. The position paper on Periodontal Maintenance, September 2003 states that the patients with periodontal disease show lower tooth loss and disease progression when they adhere to a PM schedule, sadly it also reports that over a ten year period compliance was as low as 45%. It is assumed throughout this article that this essential approach to periodontal treatment if carried out to the full; neither splints nor NTPs offer an alternative to this care, they act merely as adjuncts to it.

Conventional Periodontal Therapy without the opportunity for splinting (Figs 1,2).

Background information on FRC splints and Case Studies examining how Fiber Reinforced Composite (FRC) splints and Natural Tooth Pontic (NTP) can assist in the management of advanced gum disease;

Advanced gum disease is characterised by severe bone loss that can result in increased mobility and drifting of teeth. This increased mobility and drifting can be uncomfortable and unsightly and can limit function and can impede the patient’s ability to clean their teeth effectively. Eventually the bone loss, if severe enough, will result in tooth loss. It is in these advanced stages we see then most need for the use of splints and NTPs. In the author’s opinion mild (grade 1-2) mobility is usually best managed by conventional periodontal treatment only and splints are not normally needed. In fact some would argue that in cases of mild mobility splints are contra-indicated as they can mask the extent of improvement in the natural condition and can hide any early signs of a worsening condition. Where the disease has reached advanced levels, however, and the mobility is at such a
point that cleaning and function is impaired splints can provide an excellent adjunct to conventional therapy and can positively influence retention of teeth to a significant level. Indeed it has been stated by researchers that splints can help retain mobile teeth to an almost limitless level, so long as they are used in combination with conventional treatment. In the author’s experience in cases of severe mobility (Grade 3+) we see the best results where splints are fitted prior to conventional periodontal therapy as they give patient’s the confidence to clean firmly and effectively around the teeth which is clearly an essential part of the treatment.

The use of splinting for mobile teeth is certainly not new in dentistry and there are a bewildering array of splint designs and materials reported in the literature. Whilst there is some evidence to support the use of cast metal splints the majority of splints provided in general practice rely on either metal ligature wire bonded to the teeth or fibre reinforced composite splints.

This article will look at examples of FRC splints as these represent the only aesthetic option and the one that can be developed into NTPs if needed. Probably the two most commonly used FRC materials for this work are the everStick range from StickTech™ Ltd Finland and the Ribbond™ system. The everStick Perio system incorporates a unidirectional e type glass fibre in a PMMA resin that exhibits an InterPenetrating Polymer network that has been shown to dramatically increase its bond strength. Ribbond™ uses polyethylene fibres locked in a cross-link leno weave to encourage multidirectional integrity. The flexural strength of the everStick® fibre (1280MP) is as high as that of cast chromic cobalt metal, whereas glass fibre reinforced structures are not completely stiff as their elastic modulus is very close to that of dentin. The elasticity of the glass fibres may be beneficial to the periodontal tissue because the surrounding supportive tissues are loaded more naturally by different occlusal forces than in the totally rigid construction. Studies have demonstrated that fibre reinforcement increases the flexural strength and flexural modulus of composite resins and do not impact negatively on the bond strengths achieved.

It is beyond the scope of this article to contrast clinical outcomes of either product but I would encourage readers to try each product and find which they find more manageable as ultimately this is likely to have a profound impact on the outcome of the splints (Figs 3-13).
The great advantage that FRC splints have over their metal counterparts is aesthetics. This can be of particular importance when teeth have started to drift and spacing has developed. The example below shows how the above technique can be used to extend the splint across interproximal spaces in an aesthetically acceptable manner.

Example of splint placement technique using everStick Perio fibres: (Figs 14,15)

We also have the option to incorporate our splinting into direct composites on the buccal facing of upper anterior teeth which has the obvious advantage of avoiding any potential occlusal interferences that can occur when splinting on the palatal surfaces of upper incisors. In this case the upper left lateral incisor had become mobile and the patient was unhappy with the appearance of her upper left central and lateral incisor compared to the ceramic crown on the upper right central incisor, which she was very fond of. She did not want to make any changes to the appearance of her teeth on the right hand side of her smile. A decision was made to splint the upper left central and lateral incisor together with the upper left canine using a direct everStick splint and direct composite “veneering” (Figs 16-18).

Traditional wire splints are on occasions not well tolerated when used to help stabilise posterior teeth. Here again FRC splints can be of value as they can be incorporated into the restoration so generating much less bulk. In the case below, the lower right second molar was showing grade 3 mobility despite excellent specialist periodontal care and home maintenance. The decision was made to splint the tooth to the firm and much less affected lower right first molar. The splint was replaced at 5 years due to decay in the second molar; it has remained in function for the past 18 months since the splint was replaced (Figs 19-23).
A similar approach was used in these premolars as part of a strategy to delay the loss of the upper posterior teeth for as long as possible. This was a strategy that lasted for almost 12 years until all posterior teeth were electively removed at a time that suited the patient to do so (Figs 24-26).

The timing of the loss of teeth is a very important consideration when managing patient’s advanced periodontal disease. It is a decision that often reflects a far greater emotional attachment to the teeth than any physical one. The loss of confidence that goes along with a worsening state of edentulosity cannot be overestimated and it is important that we are able to offer simple non-invasive, cost effective ways of delaying the loss of teeth for patients so they can plan for replacement options at a time of life that is most acceptable to them.

As previously stated one of the concerns regarding the use of splints is that they can mask symptoms such as worsening mobility which can fool both patients and clinicians in to believing the periodontitis is under control. In patients with poor compliance and contributing health problems the rate of bone loss under splints can be alarming. The case below shows a splint over a four year period in a patient who was a heavy (20 or more per day) smoker and poorly controlled insulin dependent diabetic. The home care was intermittent and professional cleaning kept to a minimum at the patient’s request (Figs 27,28).

Where bone loss has reached a point where infection can no longer be controlled then the loss of the tooth is almost inevitable. If the tooth is extracted then we are left facing the usual decisions regarding replacement options and none of them are ideal in patients with advanced bone loss and adjacent mobile teeth. If the teeth are splinted then the natural tooth pontic can be utilised. This approach offers us an immediate solution that is cost effective, minimally invasive and aesthetically very pleasing (Figs 29-35).
An alternative technique for the natural tooth pontic can be used where an existing splint is functioning adequately. In this case there was an existing lingual splint but recurrent infection associated with the lower right central incisor. The decision was taken to place an additional reinforcing buccal splint using everStick Net fibres and to remove the root tip whilst the rest of the tooth remained secure within the splint (Figs 36-41).

CONCLUSION

The aesthetic periodontal splint has been shown to enhance outcome in tooth retention and can improve patients’ confidence along with their ability to chew and to clean their teeth. The natural tooth pontic offers an immediate, cost effective way of restoring a smile in such a way that the patient may not feel that they have really lost a tooth. The techniques involved are easily mastered and are simple to learn via hands on training course; they can form a regular and productive part of any general dental practice.

REFERENCES