Maintenance of periodontally compromised teeth with direct splinting: current materials and options

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Periodontal disease is initiated in the main as gingivitis, which in a smaller subset of individuals progresses to the more advanced form referred to as periodontitis. Gingivitis is restricted to the marginal gingival area and does not lead to destruction of osseous tissue.

Gingivitis is the progression to periodontitis, which encompasses extensive loss of bone surrounding the tooth. Modern-day therapy can generally ensure the arrest of the progression of periodontal destruction and, in favourable situations, even the regeneration of all the components of the periodontal apparatus, albeit to a much lesser extent than the original. Of the periodontal structures, the loss of soft tissue makes the process of complete regeneration much more difficult.

In such circumstances, wherein the inflammation and infection has been controlled and the disease activity has been curbed, it becomes imperative that the dentition, which is definitely compromised owing to the pre-existing damage, be supported and additional aids provided to create the optimum function, coupled with aesthetics.

One of the key issues in such dentitions is the mobility of the teeth. Such mobility may be localised to certain teeth and in a specific path of motion or may be much more generalised and affect many teeth. In either case, the benefits of immobilisation are multiple. The comfort level of the patient is sufficient reason to use this treatment option for mobile teeth.

Additionally, this also leads to tremendous patient motivation and compliance in maintaining oral hygiene, which directly translates into better periodontal health. Furthermore, an immobile tooth will heal much faster and better than a mobile one. Any regenerative therapy carried out around afflicted mobile teeth will have better results than would have been the case had the teeth been immobilised (Figs. 1-4).

Another critical manifestation of periodontal disease, when coupled with imbalanced occlusal loads, is the sequel of migration that results from such a clinical situation. Migration, an extremely slowly developing phenomenon, leads to drastic consequences that can usually be optimally corrected only by using orthodontic appliances.

But even this correction requires a permanent splinting procedure to ensure that the concerned teeth remain in place and do not migrate away once again. This same technique can be used routinely by orthodontists to place permanent non-invasive quartz splints.

Another possible use of quartz glass fibre splints is in cases of alveolar fractures. The advent of bonding dentistry and the easy-to-use quartz splint fibre make it a very strong contender for the stabilisation and immobilisation of anterior alveolar fractures.

A key factor towards achieving the end point of a good and long-lasting splint is the base material used in conjunction with the composite restorative material for building and applying the splint. It is very important that the splint functions like a monobloc and bonds optimally to the enamel and dentine. In order to provide this monobloc effect, the substructure has to chemically bond and be in unison with composite restorative material.

In order to provide near-optimum bonding, the substructure and the entire monobloc, which has to be built up, have to be very closely adapted to the teeth around all the curves, right into the interproximal spaces. This means that the fibre material should have physical properties that allow curve and very easy manipulation into any shape (Figs. 5, 6).

The required materials for achieving a high quality functional and aesthetic splint are:

- a pre-impregnated glass fibre-
based splinting material;  
• a restorative micro/nano- 
filling composite material;  
• a flowable composite mate- 
rial; and  
• a bonding agent.

The above only highlights the materials required and does not list the armamentarium, which would consist of a number of spe- 
cial hand instruments to achieve a high quality result and fin- 
ish. Amongst the materials, the bonding agent and the composite 
restorative material are depen- 
dent on the clinician’s preference.

The micro- or nano-filled range 
of products from any of the indus- 
try leaders in restorative materials 
are most appropriate. A good flow- 
able material is also required to 
create a close fit of the splint mate- 
rial to the tooth surface, while a 
sixth or seventh generation bond- 
ing agent would be able to achieve 
the desired bond strength.

The most critical aspect in 
achieving the ideal splint outcome 
is the selection of the fibre used 
as the substructure. There are a 
number of options available on 
the market. I have tested differ- 
ent splinting fibres throughout my 
career and quite a number of them 
have given very good results and 
lasted for years.

Available materials have some 
favourable properties at the cost 
of some other undesirable ele- 
ments and at times the clinician 
has to choose between sacrificing 
several of the desired elements in 
order to gain the others. The ideal 
substructure fibre material has the 
following properties:  
• high strength subsequent to 
polymerisation;  
• chemically bondable with 
composite resin material;  
• available in a pre-impregnat- 
ed state;  
• no thicker than 0.2 mm;  
• available in varying widths;  
• easy to trim and cut; and  
• no memory as regards its 
form.

Of the above, the last property 
is the selection of the fibre used 
around curves, especially curves 
that double-back, for example the 
interproximal areas around the 
linguals of lower anterior teeth or 
around curves, especially curves 
that double-back, for example the 
interproximal areas around the 
linguals of lower anterior teeth or 
around the curvature of a maxil- 
lar premolar. 

If the material can be fabri- 
cated in such a way that it bends 
and adapts around curves without 
bouncing back, it makes adapt- 
ing and placing the splint in the 
oral cavity a far simpler and more 
accurate task.

Glass-based fibres have an 
inherent tendency to maintain 
their longitudinal direction. This 
can easily be observed in any uni- 
directional fibre splint material. 
The only way to negate this prop- 
erty of the fibre is to interweave 
the fibres in a cross-stitch pattern. 
This creates a kind of mesh frame- 
work, thereby making the mate- 
rial almost free of memory. The 
term zero memory can then be 
applied to such a material, which 
will only minimally maintain any 
form to which it is subjected (Figs. 
7–10).

Although the material does pos- 
sess a certain amount of memory, 
it becomes practically insignifi- 
cant as regards clinical applica- 
tion. For all practical purposes, 
the material would then have zero 
memory. 

My best experience thus far 
has been with a very new entry in 
the splinting fibre market: Quartz 
Splint (Recherches Techniques 
Dentaires). The basic raw mate- 
rial used in this product is quartz 
glass, unlike regular glass fibre. 
This is the same quartz used to 
develop endodontic posts, which 
demonstrate cyclic fatigue resis- 
tance values that are much higher 
than desired in the oral cavity. 
Quartz glass is also homog- 
enous with the Bis-GMA range 
of unfilled resin, which makes it 
ideal for use with restorative 
composite material, allowing it
to become a monobloc with the composite. The quartz splint is developed as a woven fibre using extremely thin strands of glass fibres.

The weave pattern imbibes certain physical attributes to the material. It allows force distribution in such a manner that it creates the previously mentioned clinical zero memory effect and not resist and inhibit crack propagation.

All of the above-mentioned effects are achieved without any compromise to the strength of the material. In fact, the quartz fibre will enhance and strengthen the monobloc that is created with the amalgamation of the unfilled resin, quartz fibre, flowable composite, and micro-/nano-filled composite material.

Since the material is available pre-impregnated and is soaked in unfilled resin, it becomes all the more easier to use the splint right out of the box. The zero memory allows it to be adapted extremely easily around a curved arch without polymerisation. Once ideal adaptation has been achieved, it can be polymerised in that position and then layered with micro- or nano-filled composite material.

Another critical factor in the variety of situations for which a splint is indicated is the width and thickness of the material. Too thick a material can be an encumbrance for placement and final positioning. An ideal thickness is between 0.1 and 0.25 mm.

Thinner the material becomes, the lower its ability to reinforce and strengthen will be. The quartz splint is in the 0.2 mm thickness range, making it useful in almost all clinical situations.

The quartz splint is available in a variety of patterns and widths. The recommended pattern for intra-oral splinting is the woven pattern. This is available in widths of 1.5 mm, 2.5 mm and 4 mm. Of these three, the 1 mm design is most suited for use as a retention splint in post-orthodontic cases in which the teeth are neither extremely mobile nor do they exhibit gingival recession and loss of the supporting structures.

The 2 mm fibres are most ideally suited for teeth afflicted with previous periodontal disease. When the teeth are large in size and exhibit clinical crowns larger than the anatomical crowns, the 5 mm fibre may be used in lieu of the 2 mm fibre.

The quartz splint has a unique design — much like a braided rope — giving it extremely high flexural strength values after complete polymerisation. The design of the material requires it to be between 1 and 2 mm in diameter.

A deep groove has to be cut into the teeth where the splint is being placed to enable it to be adapted optimally. This design can be utilised when in cases in which an occlusal splint design is used to stabilise maxillary or mandibular premolars.

Other than the woven and rope patterns, the quartz splint is available as a unidirectional fibre. This is not to be applied in clinical situations, but rather as a laboratory reinforcement material used to develop poly-ceramic prostheses. The quartz splint also has a 4 cm x 4 cm mesh that can be applied in denture repairs, for example.

With material benefits aiding and improving the functional aspect of splints, there has been a new approach possible owing to the enhancement of bonding dentistry technology. Shade matching, polishability, enhanced bond strength and much longer-lasting composites have all contributed to a much greater usage of direct bonding procedures in everyday dentistry.

The emphasis this has given to aesthetic procedures has been tremendous. Similarly, the quartz fibre-based composite splint in a dentition with pre-existing periodontal damage can be enhanced to achieve a much better aesthetic result (Figs. 15–19).

Although function has been the paramount and most critical issue when placing a periodontal splint, aesthetics now also play an important role. The patient and the clinician may not be completely satisfied with function. It is quite easy to apply standard bonding principles of a diastema closure to ensure that the basic substructure is appropriately located and thereby enable an excellent aesthetic outcome with longevity.

This modification of a functional splint to an aesthetic splint can be easily applied for anterior teeth exhibiting extensive mobility or migration. Several of these cases can be seen in Figures 15–24, in which the maxillary anterior teeth presented with diastemas and proclinations coupled with mobility. The results have been very satisfactory.

This article has only touched on the fundamental concepts of splints and the new improvisations available in terms of material technology.

**About the author**

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