The use of Fiber

Reinforcement to enhance the mechanical properties of an Implant supported provisional restoration – A Clinical report.

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Treatment of the edentulous patient with the aid of dental implants has been a significant challenge for the treating clinician. One of the patient concerns has been the reluctance to wear a denture during the transitional phase. Immediate loading has improved patient acceptance by providing patients with teeth the same day as the implant surgery. One significant issue has been breakage of the implant provisional restoration as a result of the increased forces that are attainable with implant-supported restorations

Solutions to the above problem have often been to

1. Make the restoration thicker – This may cause phonetic problems for the patient.
2. Wire reinforce the restoration – This does not truly reinforce the restoration but rather keeps it together should the restoration break.
3. Heat process the provisional restoration – Although this does result in increased strength the patient is left without teeth for a few days.

Fiber reinforcement has been discussed in the dental literature since the early 1960s, although the more recent availability of commercial products is just now leading to recognition and more generalized clinical use. The literature has reported on either enhanced mechanical properties or descriptions of clinical techniques. The former sometimes demonstrated improved flexural or impact strength depending on the ability of the investigators to achieve good fiber wetting, coupling, and high fiber content.

In the last decades efforts to utilize fiber reinforcement have been attempted to provide long lasting restorations with the aim of improving its mechanical properties and fracture strength. Recently a novel concept was introduced (Fiber Force, Synca, Champlain, New York) in which a combination of unidirectional and braided glass fibers pre-impregnated with light-polymerized methacrylate resin create a "hybrid" compressible fiber. Initial data has been favorable in regards to reinforcement of provisional implant supported restorations.

Since its introduction Fiber Force® has revolutionized the use of fiber reinforcement in dentistry. It has been used successfully for both fixed and removable restorations

The advantages include

1. Innovative compressible hybrid fiber design for optimized physical strength
2. Improved compatibility with the acrylics and composites that are used to complete the final appliances resulting in outstanding resistance to stress forces
3. Affordable cost per arch makes fixed implant solutions more accessible
4. Leverages known engineering concepts and the beneficial physical properties of Fiber Reinforced Composite (FRC)
5. Simple and fast technique allows fabrication of a framework in 30 minutes
6. Requires no CAD/CAM technologies or systems-accessible to all dental professionals

Acrylics have less than ideal physical compatibility with metal wire reinforcement. Wires are rigid - acrylics are flexible. The two materials respond to stress forces in different ways, which can create very small but progressively damaging cracks in the acrylic. Additionally the two materials do not bond together chemically, and the interface between the two materials is prone to separation, wires essentially do not reinforce the provisional but rather hold it together should it break. The dilemma in immediate loading of implant supported restorations until now, has been that acrylic only restorations are not strong enough in many cases to resist long term intra-oral stress forces and result in fracture.

Fiber force® is composed of e-glass and

Figure 1 – Patient requested a long term provisional in order to be able to split financial obligations over time. Wax Try in

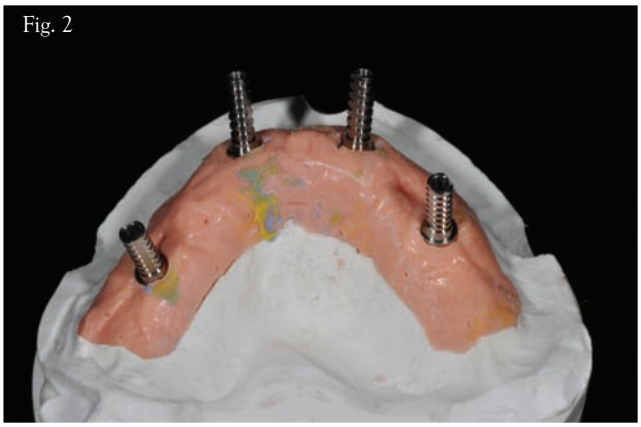

Figure 2 – Position of temporary cylinders

UDMA resin, have elastic properties that are much closer to acrylic than metal. The key term is "visco elastic". Visco elastic materials will deform under stress loads but return to their original shape or form as long as those stress loads don't surpass certain levels. The key benefit of visco elasticity is that it reduces peak stress loads by stretching out the load "period". Like cable stayed bridges and reinforced concrete which themselves take advantage of visco elasticity, the Fiber force® concept results in strong and durable prostheses in part due to the high degree of compatibility between the fibers and the acrylics or composites flowed or "processed" around the framework. The strength of

Figure 3 – Relationship of temporary cylinders to teeth, framework has to support teeth

Figure 4 – Relationship of fibers to teeth set up

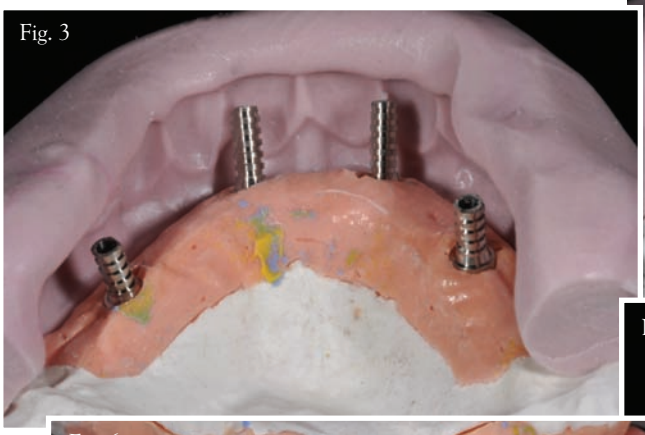

Figure 5 – Long term provisional which is heat processed, cantilever in this instance was provided to satisfy patients esthetic desires. No occlusion was provided on the cantilever.

Figure 6 – Completed maxillary and mandibular provisional restorations

the finished prostheses is also impacted by the chemical compatibility between the fibers and the acrylic - they chemically bond.

The addition of glass fibers has consistently been shown to increase the fracture resistance of the dental acrylics. The use of Fiberforce®, has been shown to increase the fracture strength of implant supported provisionals so greater longevity of the restoration can be achieved.

Incorporation of these fibers within the restoration has several advantages for dentists

1. It truly reinforces the provisional
2. It allows the dentist to break up the financial responsibilities for the patient by providing a long term provisional.
3. There is less breakage and hence saved chair-time
4. It does not require any specialized equipment and the procedure can be done expediently. The framework can be made in approximately 30 minutes and requires no casting, scanning, or milling-making it accessible to any dental technician with a light curing unit. All the usual protocols for fixed-hybrid dentures are followed which means familiar routines and processes are maintained.

Fiber reinforcement of immediate load provisional restorations has set a new standard in patient care when immediate loading of edentulous patients is required. Use of the above techniques allows the clinician to fabricate a long term provisional for patients who do have financial difficulties in affording care. Our focus as clinicians is to be able to help more patients. Often patients want the care but are financially not ready. Use of a long term provisional allows the patient to split up the financial burden so ideal care can be obtained without compromise. SD