Clinical Guide

Fibre reinforcements for splinting

- periodontal splints
- splinting of traumatised teeth
everStick® fibre reinforcements for periodontally compromised patients and for traumatised teeth

Traditional methods are considered expensive or time-consuming, leaving patient comfort in second place. As for fibres available, considerable differences exist between them. Pre-impregnated everStick glass fibre splints are gaining more and more popularity due to their minimal invasiveness, reliable bonding, optimised handling properties and aesthetics. They offer a dynamic and cost effective alternative for stabilizing and replacing teeth.

Periodontal splinting with everStickPERIO can be successfully used as a part of periodontal treatment. It has been shown that teeth with healthy, but severely reduced periodontium can be maintained with the aid of splints or fixed bridges.

When splinting traumatized teeth, reliability, aesthetics and patient comfort are the decisive factors. The extremely thin and aesthetic everStickNET is the optimal choice for labial splints in trauma cases.

Depending on the trauma case, you can easily choose between a rigid or a more flexible splint. If the splint is bonded interdentally you will get a more rigid splint, which is the case for example when the root is fractured. When the splint is no longer needed it can be easily removed.

The ideal splint

• supports teeth effectively
• has superior durability (excellent bonding, fatigue and flexural strength)
• is aesthetically pleasing
• is minimally invasive
• does not cause torsional stresses or act as an unintended orthodontic appliance
• is comfortable for the patient
• can be designed to be self-cleansing
• does not interfere with masticatory function
• is easy to remove when necessary

Unique product characteristics together with extensive research background and long clinical experience ensure that everStickPERIO and everStickNET are unparalleled in creating strong and functionally reliable splinting solutions.
Liberate smiles!

Improve quality of life
You can immobilize periodontally compromised teeth effectively. Because of this fixed solution, the patient can eat and smile without difficulties. Quality of life improves considerably.

Quick and easy
Compared to many other fibres, the everStick fibre reinforcements are easy to handle and position, because there is no fraying of fibres. Just follow the simple placement steps.

Change of treatment plan – no problem!
Splints can be re-activated and are easy to remodel or repair. If the splint needs to be extended or if an extracted tooth needs to be replaced, there is no need to remove the whole splint. Instead, due to the unique IPN structure the splint can be remodelled.

2 in 1 – only in everStick® fibre reinforcements
The patented IPN structure ensures both an excellent micromechanical and a chemical bonding to composites.

Create happy smiles
everStickPERIO and everStickNET splints are totally metal free. Being transparent, high aesthetics is easy to achieve with them.

The splint the patient can forget
everStick fibre reinforcements can be flattened to create thin splints with smooth surfaces. This results in high patient acceptance because the splint is easy to clean and very comfortable to wear.

Indications
- Surface-retained or intra-coronal splinting (everStickPERIO)
- Combined periodontal splints and surface-retained bridges (everStickPERIO or everStickC&B)
- Periodontal and post trauma labial splinting (everStickNET)

Properties
everStickPERIO and everStickNET fibre reinforcements are a combination of glass fibres and a polymer-resin gel matrix. The matrix holds the individual glass fibres in a bundle or a sheet and makes it flexible. This makes the handling and use of everStick fibres comfortable and fast.

<table>
<thead>
<tr>
<th></th>
<th>everStickPERIO</th>
<th>everStickNET</th>
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<tbody>
<tr>
<td>Form</td>
<td>Unidirectional fibre bundle</td>
<td>Bi-directional fibre mesh</td>
</tr>
<tr>
<td>Size</td>
<td>Diameter ~ 1.2 mm</td>
<td>Thickness ~ 0.1 mm</td>
</tr>
<tr>
<td>Fibre type</td>
<td>E-glass fibre impregnated with PMMA</td>
<td>E-glass fibre impregnated with PMMA</td>
</tr>
<tr>
<td>Amount of fibres</td>
<td>~ 2000 individual glass fibres in one bundle</td>
<td>Not applicable</td>
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How to make a fibre reinforced, surface-retained splint with everStick®PERIO

1. Measure and cut the fibre

Measure the length of fibre needed by using, for example, a periodontal probe or dental floss. Cut the appropriate amount of the everStickPERIO fibre with the silicone bed using sharp scissors.

2. Clean the teeth

The entire length of the fibre splint must be bonded to tooth surfaces. Clean the tooth surfaces and approximal areas with a paste of pumice and water, rinse and air-dry the area. Place wedges in the interdental spaces as necessary, so that the spaces to be cleaned are not filled with composite. If you are working without wedges, be careful not to block these spaces with composite.

3. Etch the tooth surfaces

In the area of the splint etch the tooth surfaces and approximal areas thoroughly with ortho-phosphoric acid. Preferably etch a slightly wider area than necessary rather than too little. The recommended enamel etching time for surface-retained areas is 45 to 60 seconds. Rinse with water and air-dry the tooth surfaces after etching. As with all bonded restorations, a dry operating field is absolutely necessary. A rubber dam isolation is highly recommended.

4. Bond the tooth surfaces

Use the adhesive bonding technique for bonding teeth according to the instructions of the bonding agent manufacturer. Apply the bonding agent to the entire area to be bonded. Light-cure the bonding agent as described by the manufacturer.

5. Apply flowable composite

Apply a continuous thin layer of flowable composite (for example, StickFLOW) on the teeth including the approximal areas. Leave enough space for cleaning the interdental spaces. Do not cure the composite during this phase.

6–7. Position and light-cure the fibre

Place the fibre bundle on top of the uncured flowable composite. Aim to place the fibre as incisally as possible in the anterior area. Make sure that it will not be in occlusion. Position one end of the fibre bundle first by pressing it down with the StickSTEEPER instrument. Pre-cure the fibre in place, one tooth at a time, for about five seconds, using a curing light. The wide-tipped StickSTEEPER instrument shields the rest of the fibre from light. As the fibre is made of light-conducting material, it is recommended to direct the light-curer away from the uncured fibre bundle. Press the fibre into the approximal areas as well. Make sure that the interdental spaces are not blocked with fibre and composite.

7. Cover and finish the splint

After pre-curing, cover the entire fibre splint with a thin layer of composite. Note that in surface-retained areas the fibre bundle can be coated with a thin layer (0.5 mm) of flowable composite. Then light cure the whole retainer for 40 seconds, one tooth or coverage area of the light-curer at a time. Be careful not to cut the fibre when finishing/polishing the splint.

8. Intra-coronal periodontal splinting of anterior and posterior teeth

The steps for the intra-coronal splint are the same as for the surface retained splint except for that a mesial-to-distal groove is prepared in the teeth to be splinted.

CLINICAL TIPS:

- Keep the fibre protected from light to avoid premature curing
- Adapt the fibre close to the incisal edge to achieve maximum strength
- While curing tooth-by-tooth, direct the light away from the rest of the fibre and cover the remaining uncured fibre with StickSTEEPER
How to make a surface retained labial splinting with everStick®NET

everStickNET is recommended for use in the following applications:
- Labial periodontal splinting
- Labial splinting of traumatized teeth
- Veneer repairs

1. Measuring and cutting the fibre

For the splint measure and cut 2 to 3 strips of everStickNET fibre with suitable length and width. everStickNET is easier to cut before the protective papers are removed. The fibre strips must be cut so that the bottom strip is the largest and each of the layers to be placed on top of the first strip is slightly smaller than the previous one. This will ensure that the marginal areas of the splint are not formed too steep. Shield the strips of fibre from light by placing them under a cover during the preparation of the teeth to be splinted.

2. Cleaning the teeth

The fibre splint must be bonded to the teeth over an adequately wide area. Clean the area to be bonded using a pumice and water mix, rinse with water and air-dry the area.

3. Etching

Etch the tooth surfaces and approximal areas with care, using ortho-phosphoric acid over the entire proposed area of the splint and overlying composite layer, according to the bonding agent manufacturer’s instructions. The recommended enamel etching time for surface-retained areas is 45 to 60 seconds. Rinse with water and air-dry the tooth surfaces carefully after etching. Keep the working area dry until the fibre splint is entirely covered with composite and has been light-cured.

4. Bonding

Use the composite bonding technique for bonding the teeth according to the instructions of the bonding-agent’s manufacturer. Apply the bonding agent to the entire area to be bonded. Spot bonding will not create a sufficient bond for a permanent fibre splint. The splint must be bonded to the teeth for its entire length, including the approximal areas. Light-cure the bonding agent as described by the manufacturer.

5. Applying flowable composite

Apply a thin layer of flowable composite (for example StickFLOW) to the surface of the teeth. Cover the bonding area carefully, including the approximal areas, but leave sufficient cleaning spaces. Do not light-cure the composite at this stage.

6. Positioning the fibres

Position the everStickNET fibre strips on top of the teeth in layers one fibre strip at a time. Remove the white protective papers from both sides of the fibre, and hold the fibre with tweezers. Place the first fibre on top of the uncured flowable composite. Press the other end or the entire fibre strip onto the tooth using a StickREFIX D silicone instrument or a StickSTEPPER instrument. Protect the rest of the fibre strip with a wide StickSTEPPER instrument, so that light does not cure it prematurely, light-cure the other end of the fibre for 5 to 10 seconds. Press the rest of the fibre tightly onto the tooth (including the approximal areas), and continue light-curing the rest of the fibre one tooth at a time.

Apply a thin layer of light-curing resin (for example, StickRESIN) on top of the cured fibre strip. Then place the second fibre layer on top of the first one, and light-cure just as with the first fibre strip. Repeat the procedure with a third fibre, if necessary.

7–8. Finishing

After the initial light-curing, cover the entire everStickNET fibre splint with a thin layer of flowable composite (for example, StickFLOW). Light-cure the entire fibre and composite unit for 40 seconds on each tooth. If necessary, finish and polish the splint. Be careful not to cut the fibres when finishing.

If needed, the splint can be removed by drilling.

Splinting traumatized teeth with everStickNET

Prepare like a surface-retained splint, but do not bond the fibre splint in the interproximal areas. This will allow you to make a more flexible splint that is easier to remove. Use three layers of everStickNET.

- The fibres must always be covered entirely with composite.
- Use a rubber dam to keep the working area dry.
- A small brush can be used to apply a thin layer of flowable composite to cover the fibre.
- During the procedure you can immobilize the teeth labially or lingually with composite or with a support made of putty impression material.
- To achieve a more flexible splinting of traumatized teeth, do not bond the fibre in the interproximal areas.
An orthopantomograph from 1998. The patient was a 69-year old female. She had several fillings on her teeth and many of her teeth had been extracted due to periodontitis or caries. The patient also had an upper partial denture. She was aware of the impaired condition of her periodontium and she had previously been advised to turn to a periodontist in order to have periodontal surgery. Because of the financial situation of the patient, the chosen solution was to build a provisional surface retained periodontal splint using everStick fibre.

About two years ago, the patient’s lower anterior teeth, from 33 to 43, were splinted using a polyethylene fibre (Ribbond®). The Ribbond splint has since broken and become partly loose. In the initial phase, scaling, root planing and curettage of the deep pockets was carried out under local anaesthesia. The response to the treatment was positive, the pocket depths were reduced to a satisfactory level and the patient was clearly more motivated as was shown by her improved oral hygiene.

The broken splint in the lower anterior area was removed and the tooth surfaces were thoroughly cleaned. A suitable length of the everStick fibre was measured with the help of dental floss. Wooden wedges were placed into each of the interdental spaces. This will prevent the flow composite from filling the interproximal spaces and hence good cleaning spaces are maintained. The lingual surfaces of teeth were etched with 35% phosphoric acid (Ultra-Etch®, Ultradent).

After etching, adhesive (StickRESIN, Stick Tech Ltd.) was applied to the tooth surfaces and was light cured for 10 seconds. After light curing, a flowable composite (Tetric®Flow, Vivadent) was applied to the teeth surfaces and the everStick fibre bundle was pressed onto the teeth surfaces. StickSTEPPER (Stick Tech Ltd.) was used to press the fibre bundle onto the teeth and the fibre was light cured for 2–3 seconds on each tooth. When the fibre bundle was in place, it was covered entirely with flow composite and light cured 40 seconds.

The fibre glass cannot be left visible in a permanent splints, but should be covered entirely by the composite. If required, the composite surface of the splint can be polished. Finally, the patient’s occlusion was checked and she was reminded of the use of interproximal brushes. The final result was functionally and aesthetically pleasing to the patient.
Use of everStick®PERIO as a reinforcement in periodontal splint with conjuction of the regeneraritive perio surgery and orthodontic treatment

38 year old healthy female was referred for a periodontal treatment. She was diagnosed having combined endo-perio lesion in region 21. In addition, she was having diastema between the teeth 12–11 t and 31–32. Clinical examination revealed that she was suffering from generalized aggressive periodontitis and had pocketing between 3–12 mm (premolar and molar, and lower incisor: 4–6 mm; upper central incisor 7–12 mm) in her dentition. Her oral hygiene was fair and she had supra- and subgingival calculus on all of her teeth, as well as BOP (Bleeding On Probing) in several sites. She had mobility grade I in the following teeth 11, 31, 41 and her left upper incisor had severe mobility of grade III. Her both diastemas were decided to be closed orthodontically. Overall treatment time was 12 months.

1. Pre-operative study models.
2. Root canal therapy of tooth 21 was performed and the filling was done with lateral condensed technique. (Gutta-percha and sealer: AH Plus).
4. Regenerative periodontal surgery was performed in the region 21–22. Bone substitute Bio-Oss was placed in the defect and collagen membrane was placed over the augmented area.
5. Radiographic view after the regenerative surgery.
6. Intra-coronal groove was prepared for the fibre splint (everStickPERIO).
7. Definitive retention with intracoronal FRC splint (everStickPERIO, Tetric Flow, Tetric Ceram).

Materials used:
- Fibre: everStickPERIO, Stick Tech Ltd.
- Etching: Vococid, Voco.
- Adhesive: Clearfil SE Bond – Kuraray Medical Inc.
- Composite: Tetric Flow and Tetric Ceram, Ivoclar Vivadent
In this case study we will describe a classical emergency situation in which a patient requires an immediate, practical and suitably aesthetic result.

The patient attended my office a couple of days prior to a vacation with a loose tooth. Because we didn’t have time for a "classical" treatment with extractions and/or implants, we chose a fibre reinforced composite bridge as an appropriate alternative.

After extraction of the tooth, the tooth was shortened apically and the root canal sealed with composite. We also treated the interproximal lesion. To help ensure the best possible bond strength for the tooth, a slot was cut lingually in the coronal portion.

The adjacent teeth of the extracted tooth were prepared with small slots, using a round bur with a diameter of 1.0 or 1.2 mm, to increase the bonding results in this area and to enhance the thickness of the materials (fibre and flowable composite).

Then we etched and bonded all the teeth and the bridge, and polymerised them with a flowable composite and everStickC&B fibre to the correct position.

In cases when all the teeth are stable and do not have any periodontal problems, the treatment is finished and a long term provisional solution is provided to the patient. But for this patient, I produced a more predictable and better long-term result by stabilizing all teeth in the treated area with a full splint.

In this case there was enough space and I chose to use everStickNET on both sides, labial and lingual, each in a double layer.

Another option would have been a cantilever bridge. However, this depends, for example, on the occlusal and functional situation and the periodontal condition.

**CLINICAL TIP:**

Treatment steps: clean, etch, bond, apply flowable composite and press the everStickNET into the flowable composite. For a proper adaptation and for protecting areas from the polymerization light a spatula or a StickSTEPPER is useful.
Proper bonding between the fibres and composite is the key factor for the successful treatment result. Only everStick products have a unique, patented interpenetrating polymer network* structure (IPN). Clinically this leads to superior bonding enabling reliable surface retained applications and perfect handling properties.

The unique IPN feature ensures both micromechanical and chemical bonding of everStick fibres to composites, adhesives or composite cements. The bond strength is based on the ability of the polymer matrix to partially dissolve in the resin used for bonding. The significance of this is that surfaces can be reactivated even after final polymerisation.

IPN* – The heart of everStick® fibres

**Reactivation is crucial for superior bonding when**

- laboratory-manufactured restorations are cemented to teeth
- everStickPOST root canal posts are cemented
- FRC devices are repaired

everStick fibre products consist of individual, silanated glass fibres. The fibres are locked to each other with linear polymers (PMMA) and cross linking monomers (bis-GMA) to form an IPN structure for polymer matrix that is strong and tougher compared to plain dimethacrylate polymer matrix.

The IPN structure makes the everStick products fundamentally different from any other fibre or composite materials available.

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**Fibre surface can be reactivated**

**Surface retained applications possible**

**Reparation and remodelling possible**

**Reversible**

**Aesthetic, cost effective and fast treatment solutions**
Stick Tech Ltd

Stick Tech Ltd is a Finnish technology focused company dedicated to the advancement of dentistry. We manufacture fibre reinforced composites to meet demanding dental requirements. Stick Tech Ltd has developed a fibre reinforcement technology that enables the use of completely new treatment methods in dentistry. Patented Stick and everStick products are used by dentists and dental technicians worldwide.