Fibre reinforcements for minimally invasive bridges
everStick®C&B fibre reinforcement for all minimally invasive bridges

The use of everStickC&B fibre reinforcement offers a unique treatment method for replacing missing teeth. With everStickC&B you can prepare composite bridges reinforced with fibres in one single visit using a minimally invasive technique. This evidence-based fibre reinforcement technology provides you with a metal-free, cost-effective treatment method to complement your prosthodontic treatment choice.

In Minimally Invasive Dentistry (MID) the treatment methods should always fit into the patient’s stages of life. This is possible with everStickC&B which does not rule out other treatment solutions at a later date. It enables you to prepare reversible, minimally invasive solutions where healthy tooth structure can be saved for as long as it is clinically possible.

Properties of everStick®C&B

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<th>everStickC&amp;B</th>
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<td>Form:</td>
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<td>Diameter:</td>
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<td>Fibre type:</td>
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Bridge over daily challenges

everStick fibre reinforcements enable you to solve unexpected and previously unmet treatment needs in many cases. Sometimes clinical contraindications or patient’s economic situation determine the treatment choice. Often these everyday situations can be easily solved with everStickC&B, for instance in the following situations:

• when you want to preserve healthy tooth tissue
• in cases requiring immediate bridges after extractions
• when treating trauma cases
• before or during implant treatment
• when replacing congenitally missing teeth for young patients
• when there is a need for provisional bridges
• when the patient wants an economical solution
• When the patient wants an aesthetic solution
everStick®C&B provides an ideal solution for fabricating high-end aesthetic bridgework. Direct fibre reinforced bridges are a reliable and aesthetic way to replace missing teeth during one visit. They are suitable for every indication to replace missing teeth either temporarily, transitionally or for a long-term.

The reversibility of surface retained everStick®C&B bridges offers a perfect choice for transitional bridges, like before implant treatment and during the healing phase. In urgent situations and in trauma cases everStick®C&B provides an immediate solution to replace missing teeth.

Reliable aesthetics for temporary, transitional and long-term solutions

From full cover crown bridges to surface retained bridges

everStick®C&B enables the use of many different retainer types – even in the same restoration to create a hybrid bridge. It is possible to make completely surface retained restorations or create space for the retainer by removing existing fillings.

Anterior and posterior applications

Directly fabricated everStick®C&B bridges can be used both anteriorly and posteriorly. According to research data and clinical experience, the bridge frame structure can be optimised for both regions in order to achieve the strongest possible construction.

everStick®C&B fibre reinforced composite bridge types:

- Surface retained bridges
- Inlay and onlay bridges
- Hybrid bridges
- Full cover crown bridges
- Implant-supported bridges
- Temporary bridges
- Immediate bridges

All these bridges can also be ordered from the dental laboratory.
The everStickC&B fibre frame can be surface retained on the bridge’s abutment teeth and/or embedded within prepared cavities. A bridge in the anterior region is made using one everStickC&B fibre per pontic. The use of a rubber dam is highly recommended to keep the working area dry.

1. **Check occlusion and measure**

   Use articulating paper to ensure that there is enough space in the occlusion for making a surface-retained bridge.

   Measure the length of the fibre required to prepare an everStickC&B fibre frame using, for example, a periodontal probe or dental floss. The fibre should cover approximately two-thirds of the width of the supporting tooth’s crown.

2. **Cut the fibre**

   Cut the required amount of fibre together with its silicone bedding. Shield the piece of fibre from light by placing it under a cover during preparation of the teeth to be bonded.

3. **Clean the teeth**

   Clean the area to be bonded using a pumice and water mix, rinse with water, and air-dry the area.

4. **Etch**

   Etch the surfaces of the teeth in the bonding areas with ortho-phosphoric acid.

5. **Bond**

   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. Light-cure the bonding agent as described by the manufacturer.

6. **Apply flowable composite**

   Apply a thin layer of flowable composite (for example, StickFLOW) to the bonded teeth surfaces. Do not light-cure the flowable composite yet.

7. **Place and cure the fibre**

   Place the fibre on the tooth on top of the uncured, flowable composite. Press one end of the fibre or the entire fibre tightly onto the surface of the tooth using a StickREFIX D silicone instrument or a StickSTEPPER hand instrument. Light-cure for 5 to 10 seconds, but at the same time, protect the rest of the fibre from light-curing using a wide StickSTEPPER instrument. Place and light-cure the rest of the fibre one tooth / pontic area at a time, as above.

8. **Cover the fibre**

   After the initial light-curing, cover the entire fibre frame with a thin layer of composite. Light-cure the fibre frame for 40 seconds, one unit at a time. The fibres must be covered entirely with composite, including the interproximal areas. However, there should be enough space to allow the patient to clean the bridge and the approximal areas.

9. **Layer the pontic**

   Layer the pontic using composite according to the composite manufacturer’s instructions. If you do not use a rubber dam, you can use, for example, a rubber dam strip, a sectional matrix, or a plastic strip as a moisture barrier against the gingiva.

   The pontic region next to the gingiva should have a light point contact, and the form should be self-cleaning.

10. **Finish**

    Finish the bridge and adjust it into occlusion.

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**Clinical Tips**

- The fibres must always be covered entirely with composite.
- In anterior bridges attach the fibre frame as incisally as possible. This allows maximum support for the bridge in the anterior region.
- Use powder-free gloves when handling the fibres.
- Use a rubber dam to keep the working area dry.
- During initial curing, protect the other end of the fibre to prevent premature light curing using a StickSTEP instrument.
- Be careful not to cut the fibres in the finishing phase.
- At the occlusal contact, the optimal thickness of the composite layer on top of the fibre frame is 1–2 mm.
**How to prepare everStick®C&B fibre reinforced bridge for posterior region**

**Number of fibres in bridges in posterior region:**

| 1 pontic: | 2 everStick&C&B fibre bundles |
| 2 pontics: | 3 everStick&C&B fibre bundles |
| 3 pontics: | 4 everStick&C&B fibre bundles |

Add one or two short, transverse fibres to the fibre frame to support the composite in the pontic.

A combination structure, containing both a surface retained wing and an inlay support, gives the best strength in structures supporting themselves on molar, premolar or canine teeth.

1. **Check occlusion, measure and cut the fibre**

Use articulating paper to check that there is enough room for the fibre frame and composite in occlusion. Measure the length of fibre required to make a fibre frame using, for example, a periodontal probe or dental floss. Cut the required amount of fibre together with its silicone bedding. Shield the piece of fibre from light by placing it under a cover during preparation of the teeth to be bonded.

2. **Clean the teeth**

Clean the unprepared areas of the teeth to be bonded using pumice and water, rinse with water, and air-dry the area.

3. **Etch**

Etch the surfaces of the teeth in the bonding areas with ortho-phosphoric acid. The recommended enamel etching time for surface-retained areas is 45 to 60 seconds. Preferably etch a slightly wider area than needed rather than too small. Rinse with water and air-dry the tooth surfaces. Keep the working area dry all the time.

4. **Bond**

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. Light-cure the bonding agent as described by the manufacturer.

5. **Apply flowable composite**

Apply a thin layer of flowable composite (for example, StickFLOW) to the teeth’s bonding surfaces and/or the floor of the cavity. Do not cure the composite yet.

6. **Place and cure the fibres**

Place the fibre onto the uncured, flowable composite. Press one end of the fibre or the entire fibre tightly onto the surface of the tooth using a StickREFIX D silicone instrument, a StickSTEPPER instrument, or into the cavity using a StickCARRIER hand instrument. Light-cure for 5 to 10 seconds, but at the same time, protect the rest of the fibre bundle from light-curing using a wide StickSTEPPER instrument.

Position and light-cure the rest of the fibre one tooth or pontic at a time, as before. Only light-cure the fibre for 5 to 10 seconds per tooth at this stage. Spread the fibre wider on the teeth to create a more extensive bonding area. Do not place the fibre too close to the gingiva, so that the cleaning spaces are not covered.

Bend the fibre at the pontic area to a curved form as close as possible to the gingiva, so that maximum reinforcement is achieved. However, leave approximately 5 to 2 mm of space between the fibre and the gingiva for the composite. Do not place the fibre too close to the gingival approximally, so that the cleaning spaces are not covered.

Position and light-cure any additional fibres as described above. Use flowable composite to attach the fibres together.

When necessary, add transverse fibres to support the composite pontic (picture 7).

7. **Cover the fibre**

Cover the entire fibre frame with a thin layer of composite. Light-cure the fibre-frame for 40 seconds, one unit at a time. The fibres must be covered entirely by composite, including the interproximal areas. However, there should be enough space to allow the patient to clean the bridge and the approximal areas.

8. **Layer the pontic and finish**

Layer the pontic using composite according to the composite manufacturer’s instructions. If you do not use a rubber dam, you can use, for example, a rubber dam strip, a sectional matrix, or a plastic strip as a moisture barrier against the gingiva.

The pontic region next to the gingiva should have a light point contact, and the form should be self-cleaning.

At the location of the occlusal contact, the optimal thickness of composite to be layered on top of the fibre frame is 1–2 mm, so that it will not fracture from the fibre. Remember to preserve the cleaning spaces.

- **If, after placing the fibre, you notice that the fibre is too long, shorten it using a diamond bur during the finishing phase of the bridge. Apply some enamel adhesive (e.g. StickRESIN) to the exposed fibre surface and thin with air. Light cure and carefully cover the fibre again with composite.**
- **In posterior bridges bend the fibre at the pontic area to a curved form as close as possible to the gingiva, so that maximum reinforcement is achieved.**
- **By removing old restorations, you can obtain space for the fibre frame without additional preparation of the teeth.**
- **In premolars use one and in molars two transverse fibres to support the composite pontic.**
Patient was a 16 year old girl with congenitally missing lateral maxillary incisors. She was too young for implants. It was decided to build two everStickC&B fibre reinforced composite bridges using direct technique after orthodontic treatment was finished. Treatment was planned as an intermediate solution until she would be 18 years and it would be possible to carry out implant treatment. But at the time she was 18 she didn’t want implants anymore, because the bridges worked very well and the aesthetics was satisfying.

1-2. Initial situation after orthodontic treatment with both maxillary lateral incisors missing.

3. Length of the fibre frame was measured using Wedjets (Hygienic, USA-Akron) dental dam stabilizing cord. Surfaces of the teeth were cleaned with Sodium Bicarbonate (Prophyflex, KaVo) and etched 45 seconds with 38% orthophosphoric acid. Bonding agent Optibond FL (Kerr Hawe, USA-Oregon) was applied on the teeth surfaces and light cured according to manufacturer’s instruction. A cut piece of everStickC&B fibre was attached to the bonded teeth surfaces using Tetric Flow (Ivoclar Vivadent, Liechtenstein) flowable composite and light cured.

4. A piece cut from the labial side of Frasacostrip® (Frasaco, Germany) anterior tooth crown former was placed under the fibre frame to help contouring the base of the pontic.

5. A special opaque dentin composite (BioStyle OD2, Dreve, Germany) was applied. Dentin composites (Enamel plus HFO UD 3,5, UD 3 and UD 2 and effect material HFO OBN and stain white, Micerium, Italy)) applied.

6. Finished pontic after application of enamel composite (Enamel plus HFO GE 1, Micerium, Italy), finishing and polishing.

7. Intraoral view of both bridges at 5 year follow-up.

8. Extraoral view of at 5 year follow-up.

In my opinion modern restorative dentistry means to be noninvasive, adhesive and aesthetic. For me fibre reinforced composite restorations are since 9 years indispensable in my daily life as a dentist. Direct metal-free restorations are excellent alternatives with high aesthetic results, less treatment time and low costs. Patients can save a lot of money and time and they are very satisfied with the aesthetic and the function.

By courtesy of Dr Carmen Anding, Switzerland

Aesthetic replacement of congenitally missing lateral incisors with two everStick®C&B bridges using direct technique.
The patient is a 33-year-old woman who has lost the first premolar. The loss of the tooth was probably caused by bruxism and precontact in retrusion position and during lateral movements which has led to vertical fracture of the tooth. The fabrication of traditional bridge was contraindicated due to the patient’s young age and intact neighbouring teeth. The missing tooth will possibly be replaced with an implanted crown later on.

As replacing the missing tooth quickly is important for the patient’s appearance, we made a micro-invasive bridge with direct technique, using everStickC&B fibres and plastic composite. The adjacent teeth were not prepared at all and the treatment is reversible, in other words, it will be possible to use other treatment methods later, if necessary. The treatment was completed during one visit to the dentist. Prior to the treatment, the occlusion will be balanced.

1. Lateral view of the missing tooth. Note the vertical space in intercuspidation at the buccal cusp of tooth 25. The space makes it possible to obtain vertical support for the bridge without preparation of the cavity. The enamel is etched on a wide margin in the area to be reached by the fibres. Prior to etching, the enamel surface is cleaned by using a mixture of pumice stone and water.

2. The ends of the everStickC&B fibres are spread to obtain a wider bonding surface and to make the fibre frame sufficiently thin on the surface of the supporting teeth. The fibre bundle is placed so that the buccal cusp of premolaris encapsulated by fibre.

3. The everStickC&B fibres are pressed tightly against the surface of the tooth by using a transparent silicone instrument (StickREFIX), through which the fibre frame is preliminarily light cured. Please note that a thin layer of flowable plastic composite is spread between the fibres and bonding agents. The composite is not light cured before pressing on the fibres. The purpose of flowable plastic composite is to tighten the space between the fibre frame and the enamel surface.

4. The first fibre bundle of the bridge frame has been applied (the picture was taken through a mirror).

5. Another fibre bundle is placed on the buccal surface of the canine and pressed tightly against the fibre applied first.

6. The bridge frame is characterised at the approximal spaces and occlusal surface by using light cured colours (for example, Tetric Color, Vivadent), and the premolar tooth is laminated with composite plastic. When finishing the bridge we must take care not to break the reinforcing fibres particularly in the approximal spaces, because the reinforcing effect is only obtained for the bridge with intact, continuous fibres.

7. Lateral view of the finished bridge. Please note the reasonably little cosmetic drawback caused by the buccal fastening wings of the bridge.

8. 10-year follow-up.
A healthy 31 years old female came to the periodontal clinic because her lower incisor was very loose. Implant treatment was not possible for the patient due to the severe bone loss caused by her periodontal disease (periodontitis).

1. Pre-operative radiograph (Fig 1). Note the complete bone loss around the incisor; the deepest pocket was 7 mm. The conventional treatment options were considered, but rejected because the neighbouring teeth on both sides were intact and the patient did not want any heavy preparations. Therefore it was decided to make a laboratory made everStick®C&B (Stick Tech Ltd, Finland) fibre reinforced composite bridge because of its many advantages – a minimally invasive technique without losing any enamel can be used, a large bonding area between the fibre frame and tooth can be obtained by spreading the fibre bundle and the fibre reinforced bridge looks more natural than the corresponding metal reinforced bridge would.

2. At the first visit, the lower right incisor was extracted and the pontic site allowed to heal and recontour for a period of three months. The situation after 3 months (Fig 2). The picture shows the situation before beginning the FRC bridgework. Both neighbouring teeth, 41 and 43, were intact. An impression of the abutment teeth was taken for making a working model for constructing the bridge.

3. Attachment surfaces (wings) should be made as large as possible and, at the same time, the interproximal spaces kept open in order to obtain good cleaning spaces. Once the fibre frame is cut to the right length and attached to an isolated model, veneering of the pontic with a composite (Epricord, Kuraray Co, Japan) can start.

4. The laboratory made fibre frame after polymerisation in a light curing oven. Although the wings are covered with a composite layer, the bonding surfaces of the wings should only be fibres. This facilitates the use of everStickC&B fibres’ unique IPN-structure giving a good adhesion/bonding. On the canine, a small attachment wing was applied on the labial side too. The attachment wings should be covered with a layer of composite.

5. Before cementing the bridge, the bonding surfaces were roughened lightly and resin applied for 5 minutes. The resin layer dissolves the PMMA matrix, thus making the space for the composite cement to enter between the fibres. This creates not only a chemical, but a micro-mechanical bond between the cement and the fibre frame. The situation after cementing the bridge from the lingual side. The bridge was cemented with Super Bond, adhesive cement (Sun Medical, Japan). The clear composite colour was chosen in order to create an aesthetic result.

6. Labial view of the final situation.

CONCLUSION:

7–8. In this particular case, the main advantages for using a fibre reinforced bridge were saving the intact enamel and achieving a good bond between the materials and etched enamel surface. The fibre reinforced composite material has a similar elasticity to dentine. The fibre reinforcement ‘shares’ and distributes the mechanical stress concentrated within the connector to a wider area thus diminishing the risk of failure (Fig 7). It also takes away the biggest stress from the important bonding area. In comparison, dental alloy is a low elasticity material and the stress concentrates in the area between the connector and bonding layer (Fig. 8). Therefore the structural stability is weakened and debonding can be expected. In the finite element model (FEM) images red colour indicates the highest stress areas.
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
- everStick®POST root canal posts are cemented using indirect technique
- 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.

A cross sectional view of everStick fibre. Silanated glass fibres are impregnated with PMMA and bis-GMA.

The view inside the everStick fibre. Individual fibres, bis-GMA and PMMA form the unique IPN structure.
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.