

# The Key to “Stress-Free” Restorations

## Flowable Composite Material Provides Reliable Restorations

Since the launch in 1991 of flowable composite materials for direct restorative therapy – or simply “flowables”, they have become one of the most popular and most widely used groups of restoratives. This is hardly surprising, in the light of the high versatility of these dental materials and remarkable improvements in their properties which have resulted in new, practice-oriented application concepts for flowables in the last few years.

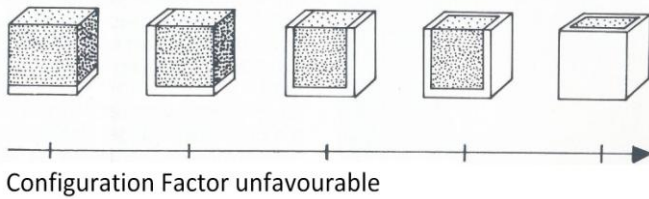
With regard to specific applications of composites with different degrees of flowability, the reputable Japanese manufacturer Shofu Dental has recently made its mark with a very intelligent product line: Beautifil Flow – injectable hybrid composites designed for all types of direct anterior and posterior restorations.

### Advantages of Flowable Composites

Resin-based restoratives whose rheological properties allow them to both easily flow into the cavity during application and, depending on their viscosity-related stackability prior to light-curing, either continue to softly sink into the cavity afterwards or accurately maintain the shape created during dispensing, will have great advantages in practical use.

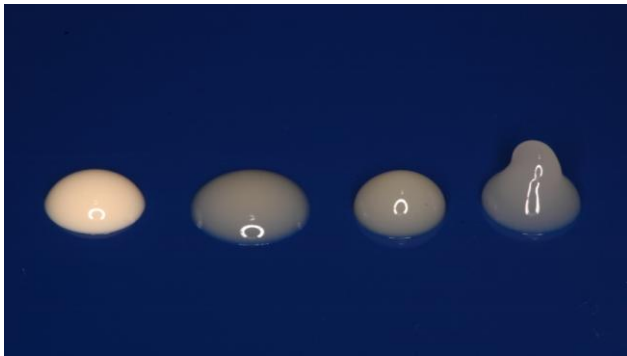
To put it rather simply, without using too many technical terms of materials science, low-viscosity composite restoratives offer the following advantages as compared to conventional resin materials:

- Simplified or less complicated application procedure – with a significantly reduced risk of poor adhesion due to voids or detachment of the material which may occur when using composites with higher viscosities.
- Lower risk of insufficient marginal integrity especially in deep Class II, III and IV cavities which extend to the proximal aspects of the tooth.
- Much better and more thorough wetting of the cavity walls and floor - thanks to the virtually “self-adhering” wettability of self-adapting low-viscosity composite materials.
- Reduction in or substantial “compensation” for the polymerization shrinkage force ensuring good micromechanical/adhesive retention at the interface of composite restorative and the tooth structure, also, unaffected by any polymerization-related tensile stress and a restoration “body” free of any serious internal structural stress after curing (**Fig. 1**).



(1) The cavity type has a great influence on the shrinkage stress developed by a composite during polymerization. The more material is bonded to the tooth structure and the higher its viscosity, the less favorable the "Configuration Factor". Flowable composite restoratives may specifically remedy this problem.

(Illustration by C.L. Davidson, *J Dent Res* 1984; 63: 146-148, from: *Kosmetische Zahnheilkunde mit Hilfe von Komposit.* Joost Roeters and Hein de Kloeit, 1992. Courtesy of Quintessenz Verlag, Berlin.)



(2) The four different degrees of flowability of the Beautifil Flow product line, made by Shofu Dental (photograph of uncured materials, taken 30 seconds after dispensing). From left to right: Opaquer LO, Flow F10, Flow F02 / Flow Plus F03 and Flow Plus 00. These different consistencies allow dentists to restore all cavity classes, from I to V, in a "stress-free" way.

- Improved adaptation of pasty and highly viscous composites to cavity walls pretreated with bonding agents (still slippery after light-curing, due to the "oxygen-inhibited layer"), because a light-cured flowable composite layer (used as a base) facilitates the accurate and homogeneous placement of more viscous composites.

### Allrounders in Direct Restorative Therapy

Although state-of-the-art flowable composites strikingly differ in viscosity from conventional pasty and highly viscous resin

restoratives, their filler load is not as low as their consistency may suggest. A reduction of only 10 percent in the filler load of a composite restorative will lead to remarkable flowability. Therefore, modern flowables do not have any serious detrimental material properties and should not be regarded as composites of inferior quality in contrast to views partly dating from the early days of flowable composite technology.

Flowables now have physical properties comparable to those of conventional composites and are very user-friendly in clinical practice. This is what makes them so indispensable in day-to-day, direct, adhesive restorative therapy in efficiency and quality-oriented dentistry. Flowables are excellent, reliable restoratives for the following indications:

- Tooth structure defects shaped like small gaps or grooves
  - Shallow, trough-like cavities of any size
  - Deep, shaft-like cavities or problematic undercut areas
  - Defective dentin and/or enamel areas in hard-to-reach parts of the dentition
- High-performance materials such as the Beautifil Flow composites (**Fig. 2**) described here as an example are also indicative for all types of direct restorations (Classes I to V) and base fillings. Even surfaces bearing considerable occlusal stress and proximal marginal ridge areas can be reliably restored using this kind of flowable.

## Flowables Comparable to Conventional Composites

The physical/mechanical and visual/aesthetic characteristics of state-of-the-art low-viscosity flowable composites are absolutely comparable to those of most conventional pasty or even highly viscous materials. Their flexural and compressive strength, wear resistance, shade match (before and after light-curing) and, last but not least, radiopacity leave nothing to be desired in comparison with the values of conventional composites with a more viscous consistency.

### Clinical Case 1

Bucco-cervical defects in teeth 42, 43 and 44 of a 36-year-old patient had to be treated (**Fig. 3**). Tooth 44 showed an old, insufficient composite restoration. Tooth 43 showed a non-carious defect, presumably a cavity that had once been filled and then flattened in the course of time by toothbrush abrasion and concurrent erosive influences. The defect at the dentin-enamel junction of tooth 42 may have been caused by abfraction of the enamel prisms extending apically which led to an incipient, superficial carious lesion in the tooth structure of the affected area. It was decided to adhesively fill the defects using flowable composites. In the author's view, state-of-the-art low-viscosity composites of high mechanical and aesthetic quality such as the Beautifil Flow product line are now the restoratives of choice for such defects thus allowing the operator to work in an effective, time-saving and largely "stress-free" way and offering the patient successful, long-lasting restorations.

After excavation of the defect sites and pre-restorative tissue management (to check the bleeding) in the gingival margin area of tooth 42 (**Fig. 4**), the bucco-cervical cavities were successively filled. Beautifil Flow Plus F03 and F00 were used in a layering technique due to the author's (operator's) personal preference for these excellent flowing and nevertheless well-stackable composites and his good clinical experience using Shofu flowables of different viscosities. First, a layer of Beautifil Flow Plus F03, Shade "A3" fully covering the cavity base was applied to tooth 43. In tooth 44, only the apical two-thirds of the cavity were filled with this composite (**Fig. 5**). Tooth 42 did not receive a composite layer of this shade. The material used is excellent to apply, without any voids, adapts well to the cavity surfaces, and still remains stable after placement until light-cured.

The next and final step of the application procedure was to fill all the cavities with a second layer, this time using Beautifil Flow Plus F00, Shade "A2". The very small and shallow cavity in tooth 42 was completely filled with this composite. Tooth 43 received a superficial layer covering the entire cavity. In tooth 44, this brighter shade was used to selectively fill the coronal two-thirds of the cavity (**Fig. 6**). Thanks to their superior handling properties, these flowable composites allow dentists to use such a delicate procedure without any "operator stress" during placement. They are easy to apply and perfectly maintain their shape until polymerized.

**Fig. 7** shows the buccal composite fillings adhesively retained with the aid of the bonding system FL-Bond (also by Shofu Dental), directly after completion of the entire restorative procedure. The aesthetic

quality of the finished restorations is excellent. The photo-optical “chameleon effect” of the Beautifil Flow products is shown to its best advantage.





## Clinical Case 2

The upper right first molar of a 44-year-old patient had to be durably restored after caries-related root canal treatment. The original, deep mesio-proximal defect causing the pulpal infection had already been adhesively filled in the course of endodontic therapy (**Fig. 8**).

Since a crown was not desired for the time being, it was decided to use an adhesive, direct composite restoration exclusively made of flowable materials. The operator chose the flowables of the Beautifil product line. Thanks to the four different consistencies, a wide variety of shades, excellent handling properties and, above all, suitability for large, occlusal stress bearing restorations proven by the manufacturer, the Beautifil Flow Plus products made material selection relatively easy in this case.

A first layer of Beautifil Flow F10 was applied to adhesively seal the root canal filling, and reliably and homogeneously line the prepared cavity floor and fill any undercuts (**Fig. 9**).

To clearly mark the cavity floor and to create a reliable adhesive seal, a second flowable composite layer was placed, using Beautifil LO. This ochre-coloured and highly opaque material was not used to mask any visually undesirable shade defects in the tooth structure, but mainly as a precautionary measure to clearly mark the deepest cavity areas in case the tooth had to be prepared once again in the future (for a crown or any other type of restoration) (**Fig. 10**).

To fill the bulk of the cavity, Shade “A2” (relatively bright in this case) of Beautifil Flow Plus F03, suitable for restorations bearing high occlusal stress, was applied in one layer and light-cured. Beautifil Flow layers up to approx. 5mm in thickness can be completely light-cured without any problems, according to the manufacturer (clinically confirmed in the author’s practice). As already mentioned, a very bright flowable with good light transmission was selected, to be on the safe side, when light-curing this bulk filling (**Fig. 11**).





The palatal part of the occlusal surface and the mesial marginal ridge were restored using Beautifil Flow Plus F00, Shade “Inc”, which was excellently stable after placement (**Fig. 12**). The use of such a flowable composite, which is precisely applicable and maintains its shape in situ until light-cured, ensures a step-by-step, quality-oriented and absolutely stress-free filling procedure. Since this flowable remains stable in any shape created during application despite its low viscosity, it can even be used to easily build up all the cusps of the occlusal surface to be reconstructed in one step (**Fig. 13**). The manufacturer describes this pre-sculpting application of cone-shaped composite increments for cusp restoration as a “resin cone technique”.

To restore the rest of the occlusal surface, Beautifil Flow Plus F03, Shade “A3”, which flows more easily during application, was used once more. The completed Class II restoration and the remaining occlusal tooth structure (in an absolutely dry condition) functionally harmonize after finishing with diamond burs and high-luster polishing of the occlusal surface (**Fig. 14**).



State-of-the-art, low-viscosity, resin-based restoratives with different degrees of flowability, such as the Beautifil Flow composites described here, will literally “de-stress” not only the restoration itself, mainly by reducing the shrinkage force generated in the composite matrix by light-curing, but also the application of the materials, always in the optimal viscosity, to any type of cavity. As a result, the filling procedure will be much more “relaxed”, for both the dentist and the patient. The trend towards increased use of flowables for the restoration of all cavity types (Classes I to V) will therefore definitely continue.

**Dr. Markus T. Firla**  
**Hasbergen-Gaste**  
**Germany**

## References

1. Albers H. F.: Tooth-Colored Restorations. Alto Books. Santa Rosa (CA), 1996.
2. Bandel A.: Schöne Zähne in sieben Schritten. Dent Mag 2008; 25 (4): 22-24.
3. Burgess J., Cakir D.: Selected Mechanical Properties of a Flowable Composite Resin. School of Dentistry, University of Alabama in Birmingham 2009; unpublished information, Shofu Dental Corporation, USA: 1-6.
4. Diedrichs U.: Adhäsivrestaurationen von minimalinvasiv bis rekonstruktiv. Dentalzeitung 2010; 11 (2):38-40.
5. Ernst C.-P.: Update Komposite Teil 1 – Eine Einteilung der Kompositmaterialien. ZMK 2010; 26 (4): 198-206.
6. Ernst C.-P.: Update Komposite Teil 2 – Indikation und Anwendung von Kompositmaterialien in der Füllungstherapie. ZMK 2010; 26 (5): 255-275.
7. Ernst C.-P.: Ästhetisch ansprechende Restaurationen mit minimalem Aufwand. ZMK 26; (1/2): 6-14.
8. Ernst C.-P.: Worauf es bei einer individuellen Farbzusammenstellung wirklich ankommt. ZMK 2011; 27 (6) 430-432.
9. Firla M. T.: „Let it flow“ – fließfähige Komposits richtig eingesetzt. DZW 2003; 17 (50): 14-15.
10. Firla M. T.: Eine Komponente, eine Applikation, ein erfolgreiches Ergebnis. DZW 2010; 24 (14): 20-21.
11. Firla M. T.: Direkte „einfache“ biomimetische Frontzahn-Komposit-Restaurationen. Dent Barometer 2010; 5 (6): 38-41.
12. Frankenberger R.: Bonding 2006 – Zeitersparnis versus Langzeiterfolg. Quintessenz 2006; 57 (5): 499-506.
13. Krueger-Janson U.: Die ästhetische, substanzschonende Restauration mit Komposit. ZMK 2008; 24 (6): 442-444.
14. Lowe R. A.: Die Klasse-II-Herausforderung. DZW Spezial 2009; 17 (3): 27-31.
15. Luts kaya I. K., Novak N. V.: Moderne Fotopolymere in der restaurativen Zahnheilkunde. ZMK 2010; 26 (12): 817-820
16. Mahn E.: Die richtige Wahl bei Frontzahnfüllungen. Dentalzeitung 2009; 10 (1):36-38.
17. Ozoglu A. H.: Minimalinvasiv restauriert. Dent Mag 2011; 28 (1): 44-46.
18. Roeters J., de Kloet H.: Kosmetische Zahnheilkunde mit Hilfe von Komposit. Quintessenz Verlag. Berlin, 1992.

First published in: “DZW – Die Zahnarzt Woche”, No. 41/2011, P. 20-22, Zahnärztlicher Fach-Verlag GmbH, Herne, Germany