

## Futurabond U – Universal adhesion

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**The latest generation of dental adhesives can be used universally. On the one hand, this frees the dentist to decide whether to additionally etch the dental hard tissue or not. On the other hand, their universal nature means these adhesives are compatible with all materials used in dentistry. In addition to composites, these include metals, metal alloys and various types of ceramics. Prof. Torres at the university of São Paulo in Brazil <sup>[1]</sup> set out to examine the extent to which Futurabond U, the universal adhesive from VOCO, is able to guarantee reliable adhesion to all materials.**

Today a huge variety of materials is used in dentistry. Highly developed methacrylate-based composites within the framework of the adhesive technique are the first choice for the direct restoration of all cavity classes. However, for permanent indirect restorations, dentists tend, for the most part, to use other materials which, compared to the adhesive technique, require different auxiliary materials to ensure safe application. Indirect restoration materials include metals, metal alloys and various ceramics. In addition to roughening by sandblasting or etching with hydrofluoric acid, another bonding agent must be applied between the indirect restoration and luting cement for successful use of these materials.

In the past, the necessary retention of an indirect restoration was often achieved through the use of so-called coupling silanes. Thanks to the recent introduction of universal bonding systems, it is now also possible for practitioners to use this innovative material as a conditioner or so-called primer for all the dental materials named above. Yet to guarantee a successful and safe restoration result, the practitioner must be sure that these new and previously unknown indications for bonding systems are reliably covered. In this study the extent to which Futurabond U, the universal adhesive from VOCO, achieves reliable adhesion on all dental materials was examined on the basis of the cementation of a zirconium dioxide crown on dentine, enamel, composite, metal and ceramic.

### Study design

72 e.max crowns made from zirconium dioxide (2.2 x 2.0 mm) which had been sintered and sandblasted prior to cementation were used for this *in-vitro* study. The luting of the crown to enamel and dentine, i.e., to dental hard tissue, for which bonding systems were originally developed, served as the reference in this study. Freshly extracted and prepared bovine teeth were used as the test specimens. The dental hard tissue was not etched prior to application of the bonding (self-etch mode).

In addition, adhesion to metal (silver/tin/copper or a copper/nickel/zinc/aluminium alloy), to a composite (Rebilda DC, VOCO) and to zirconium dioxide (e.max) was tested. The number of test specimens in each of the six groups was n = 12. Alongside the actual bonding agent Futurabond U (VOCO), Bifix QM (VOCO) was also used as a luting composite. Table 1 provides an overview of the materials used and the various combinations. All the materials were prepared in accordance with the manufacturers' instructions. The stability of the final restorations was determined based on shear bond strength as per ISO 11405.

Table 1: Overview of the materials used and versions

Available material	Bonding agent*	Luting composite	Indirect restoration
Dentine (reference I)	Futurabond U (VOCO)	Bifix QM (VOCO)	Zirconium dioxide (individual crown, e.max, Ivoclar)
Enamel (reference II)			
Rebilda DC (core build-up, VOCO)			
Metal alloy (Cu/Ni/Zn/Al)			
Metal alloy (Ag/Sn/Cu)			
Zirconium dioxide (e.max, Ivoclar)			

\*The bonding agent Futurabond U was used both as the bond between the luting composite and the respective material and between the luting composite and the zirconium dioxide crown.

## Results

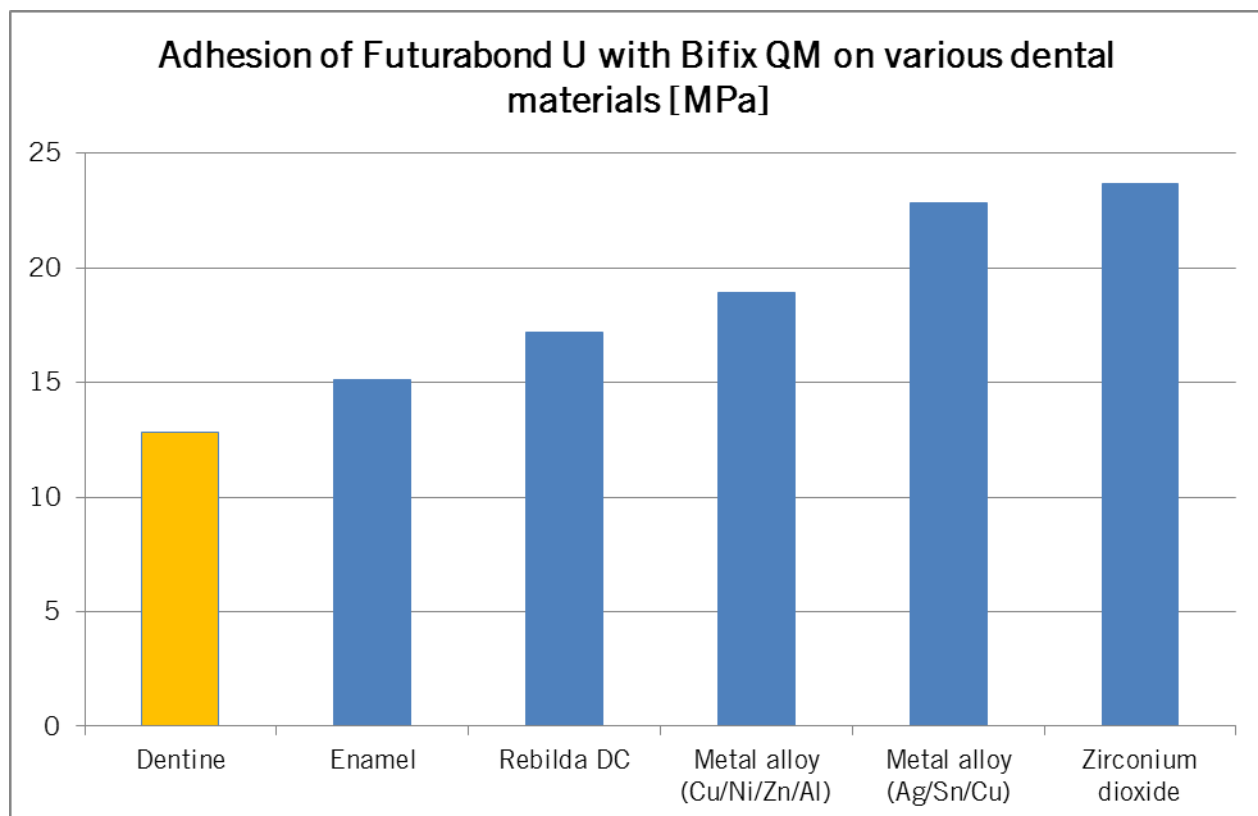


Fig. 1: Shear bond strength of Futurabond U in conjunction with Bifix QM on various dental materials

The dental hard tissue (dentine and enamel) which served as a reference achieved shear bond values of between 13 and 15 MPa. The results recorded for the enamel were slightly better. Futurabond U's pronounced universal nature becomes evident on taking a look at the other results. With values of between 17 and 23 MPa, adhesion on both the core build-up material Rebilda DC and on the metal alloys is significantly greater than on the dental hard tissue. In this study Futurabond U achieved the best adhesion results on zirconium dioxide. On ceramic a shear bond strength of around 24 MPa was recorded, i.e., a value which was almost twice that of adhesion on dentine. The results of this study clear up any doubts as regards Futurabond U's adhesion to and compatibility with all restoration materials used in day-to-day practice.

**Conclusion: Futurabond U can be used safely and reliably by dentists on all dental materials. It can be used both as a conventional bonding system on dental hard tissue or as a conditioner for metals and alloys – it makes no difference whatsoever! Futurabond U has thus once again demonstrated to practitioners that it really is a bond for all cases!**

[1] Torres CRG, *Bond strength of zirconia to core materials*, Report to VOCO, Universidade Estadual Paulista Júlio de Mesquita Filho, São Paulo, 2013.