

FactFile

Calibra[®] Cements

Calibra[®] Ceram and **Calibra[®] Universal** are the new adhesive and self-adhesive resin cements from Dentsply Sirona, which can be used in both self-cure and dual-cure mode. They complement the light-curing resin cement **Calibra[®] Veneer**, which has been clinically proven since more than 12 years for adhesive luting of veneers.

Shade stability

Common to all three resin cements is a Shade Stable technology that contains no typical benzoyl peroxide (BPO)/amine initiating system causing yellowing over time. This virtually eliminates color shifts of the five available cement shades (translucent, light, medium, bleach, and opaque) on aging (Figure 1).

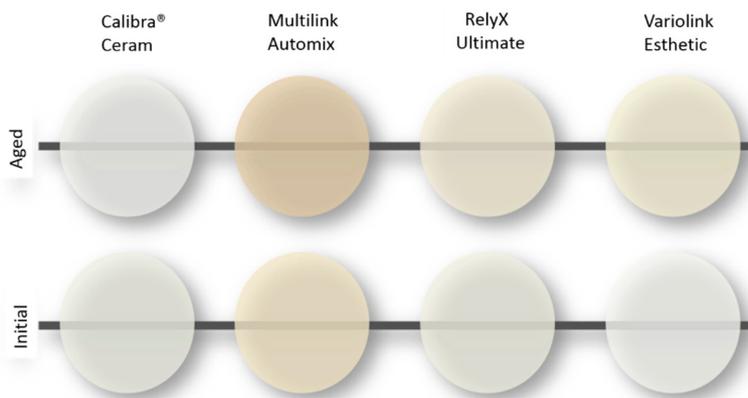


Fig. 1 All resin cements were light-cured. Samples were stored in 37°C distilled water for 24 h (initial) as well as aged in 60°C distilled water for eight weeks (R&D Dentsply Sirona, 2015).

Wide window of gel phase

Self- and dual-curing resin cements can be used for most clinical applications including metal, zirconia, and glass-ceramic restorations. When choosing the dual-cure mode, excess cement at the margins can be removed immediately after a brief exposure with the curing light, a technique known as tack-curing. However, some existing dual-curing resin cements have a very small window for tack-curing, allowing the dentist only 1 to 2 s of light-curing before the cement becomes too hard. Due to an additional three-component photoinitiating system in the base paste containing camphorquinone, acylphosphine oxide, and an accelerator **Calibra® Ceram** and **Calibra® Universal** have a longer tack-curing time of up to 10 s, i.e. 5 s per buccal and oral margin. Within this time, the cement acquires a gel-like consistency for approximately 45 s, allowing the dentist the time needed to clean up the marginal excess and interproximal areas.

Calibra® Ceram

In combination with the universal adhesive Prime&Bond elect^{®1}, **Calibra® Ceram** can be used in all etching modes (etch&rinse, self-etch, and selective enamel etching) ensuring high initial bond strengths of the luting system after cementation as well as durable adhesion of the restoration to non-retentive preparations. This has been confirmed in internal and external studies (Figures 2 and 3).

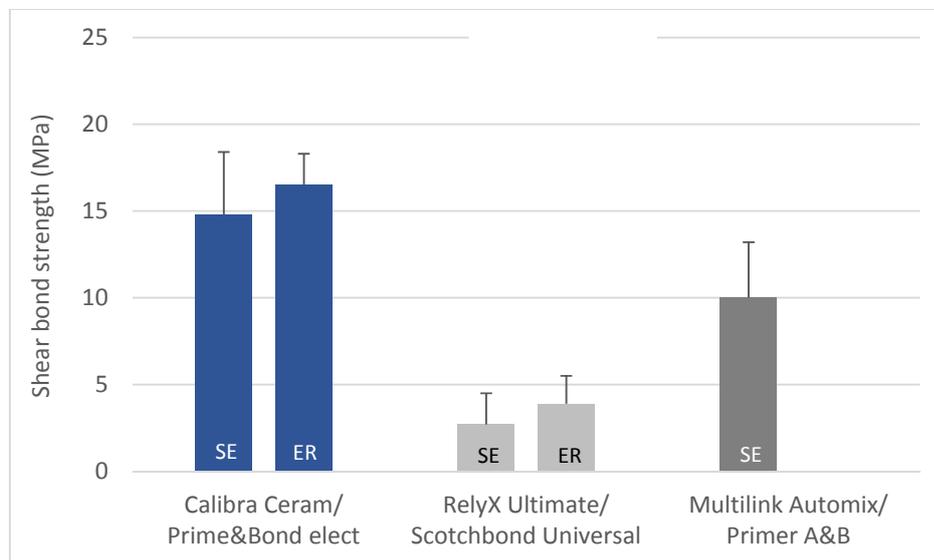


Fig. 2 Shear bond strength to dentin immediately (6 min) after application of the luting systems. Prime&Bond elect[®] was light-cured, Scotchbond Universal and Multilink Primer A&B were not light-cured per their directions for use. All cements were self-cured. SE = self-etch, ER = etch&rinse (R&D Dentsply Sirona, 2015).

¹ Prime&Bond elect[®] is available in Canada and the U.S.

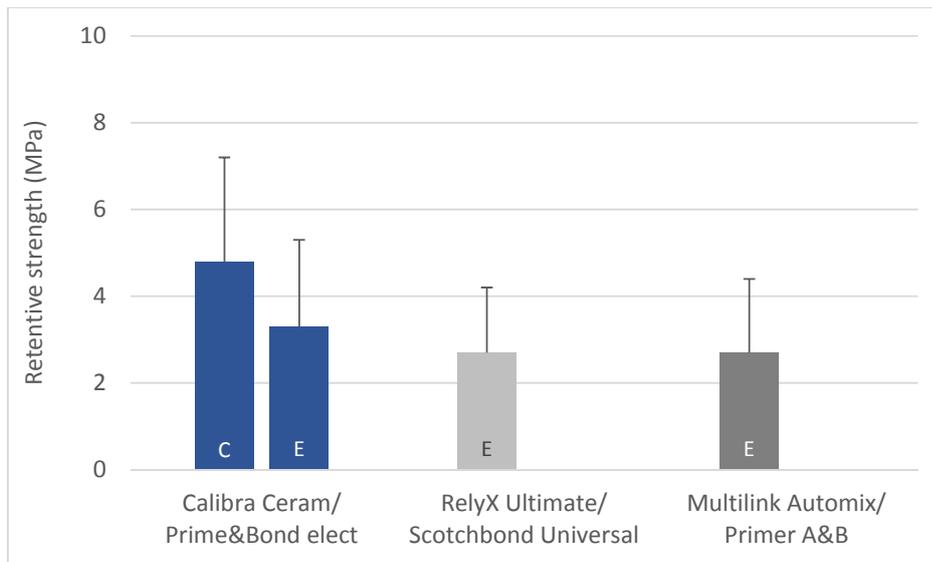


Fig. 3 Retentive strength of glass-ceramic crowns on non-retentive preparations after 10,000 thermocycles. All adhesives were used in self-etch mode. Prime&Bond elect[®] was light-cured, Scotchbond Universal and Multilink Primer A&B were not light-cured per their directions for use. All cements were self-cured. C = Celtra[®] Duo, E = IPS e.max (Burgess J, 2014).

For traditional luting systems based on BPO and amine, a separate dual/self-cure activator may be needed to prevent deactivation of the resin cement's co-initiator amine by acidic monomers from the adhesive. In contrast, **Calibra[®] Ceram** is compatible with the universal adhesive Prime&Bond elect[®] without the use of an activator. The key innovative chemistry lies in the utilization of Dentsply Sirona patented initiator technology. Unlike BPO/amine, a strong acid participates in the radical initiation mechanism involved with the novel self-cure initiating system. Curing of **Calibra[®] Ceram** is accelerated on contact with Prime&Bond elect[®], which can be advantageous in terms of rapid achievement of high initial bond strength (Figure 2). In a prospective clinical trial at the University of Michigan the postoperative sensitivity of glass-ceramic crowns (Celtra[®] Duo) cemented with Prime&Bond elect[®] and **Calibra[®] Ceram** was evaluated. None of the patients experienced severe sensitivity. Of the 50 crowns cemented, six were slightly sensitive at one week and all sensitivities had resolved by the second week (Fasbinder DJ, 2016). Apart from generating high bond strengths to enamel and dentin, the phosphoric acid modified monomers (Dipentaerythritol Pentaacrylate Phosphate, PENTA) in **Calibra[®] Ceram** and Prime&Bond elect[®] are effective for establishing durable bonds to zirconia and metal-based restorations. Investigations also showed the good bonding performance to a number of other restorative materials (Figure 4).

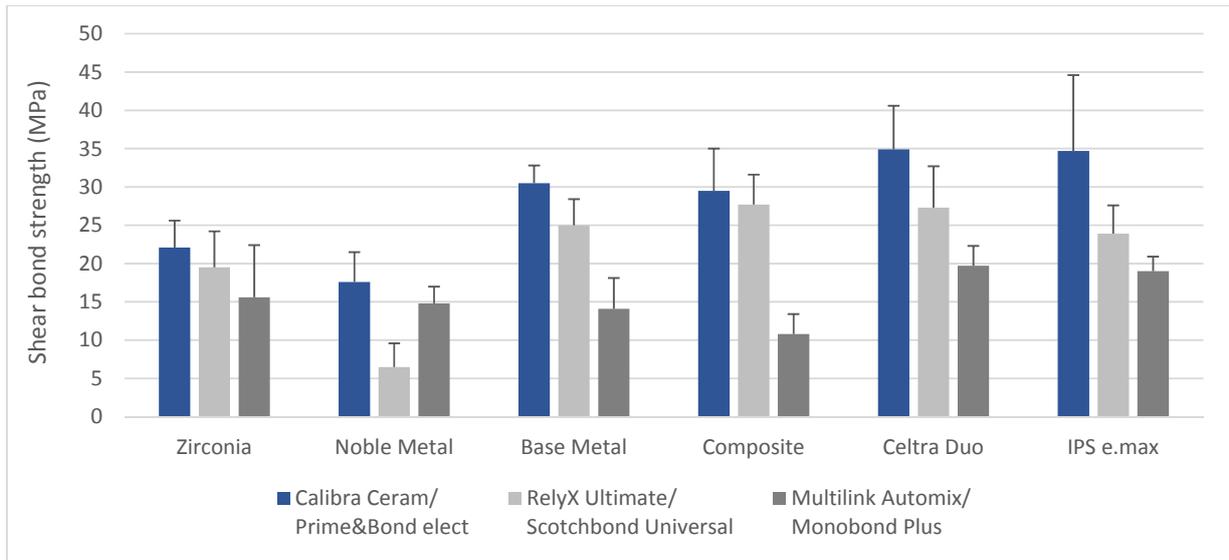


Fig. 4 Shear bond strength to different types of restorative materials after aging through 10,000 thermocycles. Application of the luting systems according to their directions for use. All cements were self-cured (R&D Dentsply Sirona, 2015).

Calibra® Universal

Given its self-adhesive properties, **Calibra® Universal** does not require an additional bonding step with an adhesive and thus simplifies the luting procedure. The bond strength is derived from the phosphoric acid modified monomer PENTA, an adhesion promoter and effective crosslinker that reacts with calcium ions of the tooth structure as well as with metallic oxides of the inner restoration surface. To promote the wetting behavior and to reduce paste viscosity, the resin chemistry also contains mono- and di-functional hydrophilic methacrylates. As with other self-adhesive resin cements, the bond values on dentin and enamel are lower than those obtained with adhesive resin cements used in combination with their respective adhesives. However, compared with some existing self-adhesive cements, **Calibra® Universal** showed significantly higher shear bond strengths on dentin with similar bond strengths to enamel (Figure 5).

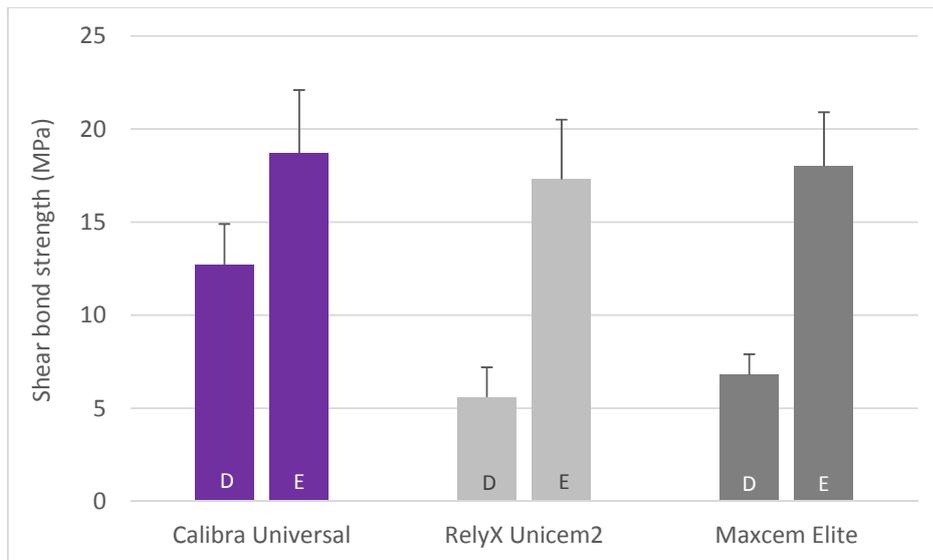


Fig. 5 Shear bond strength to dentin and enamel after 24 h of water storage at 37°C. Application of the self-adhesive cements according to directions for use. All cements were self-cured. D = dentin, E = enamel (R&D Dentsply Sirona, 2015).

As self-adhesive cements have to be sufficiently hydrophilic to self-etch the dentin, water may cause the cement to partially dissolve or to expand. Once the polymer network is formed through polymerization, **Calibra® Universal** becomes essentially hydrophobic to prevent water sorption or water tree development. Both of which can adversely degrade the long-term stability. According to internal data available, the values of **Calibra® Universal** were below the limits of 40 ml/mm³ for water sorption and 7.5 ml/mm³ for water solubility specified by the ISO standard. In a clinical trial carried out by a third party rating agency (Clinicians Report®), 70% of the evaluators (n = 19) stated they would incorporate **Calibra® Universal** into their practice and 79% of them rated it excellent or good and worthy of trial by colleagues.