

# Effect of Setting Times on Shear Bond Strength Between Biodentin and Resin Composite

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## Background

The aim of this *in-vitro* study was to evaluate the effect of different setting times (24h, 1wk, and 2wks comparing to the 12 min immediate restoration placement) on the shear bond strength (SBS) of Biodentine to resin-composite restoration, using universal adhesive bonded.

## Materials and Methods

Materials used in this study are presented in table1.

Materials	Compositions	Steps of application
Biodentine® Lot B25581 (Septodont, Saint-Maur-des-Fossés Cedex, France)	Powder: tricalcium silicate, dicalcium silicate, calcium carbonate and oxide, iron oxide, and zirconium oxide Liquid: calcium chloride and hydrosoluble polymer	Five doses liquid and powder mixed for 30 s with amalgamator
Filtek Z350 XT Lot NA60303 (3M ESPE, St. Paul, MN, USA)	Organic matrix: Bis-GMA, UDMA, Bis-EMA 6, and small quantities of TEGDMA Inorganic particle: Non-agglomerated nanoparticles of silica 20 nm in size and nanoagglomerates formed of zirconium/silica particles ranging from 0.6 to 1.4 mm in size	Light cured for 20 s
Single Bond Universal Lot 00131B (3M ESPE, St. Paul, MN, USA)	MDP Phosphate Monomer, Dimethacrylate resins, Vitrebond™ Copolymer, Filler, Ethanol, Water, Initiators, Silane pH : 2.7	1. Apply the adhesive to the Biodentin surface and rub it in for 20 seconds. 2. Gently air dry the for5 seconds 3. Light cure for 10 seconds.

Table 1 Materials used in this study

Sixty cylindrical blocks with a uniform cavity (4mm diameter x 2mm height) were prepared from self-cure acrylic. Biodentine was mixed and loaded into the cavity (figure 1). The prepared specimens were randomly assigned into four groups (n=15) based on the timeframe of composite restoration placement;

Group 1) 12 min. Group 2) 24 h.

Group 3) 1 wk Group 4) 2 wks.

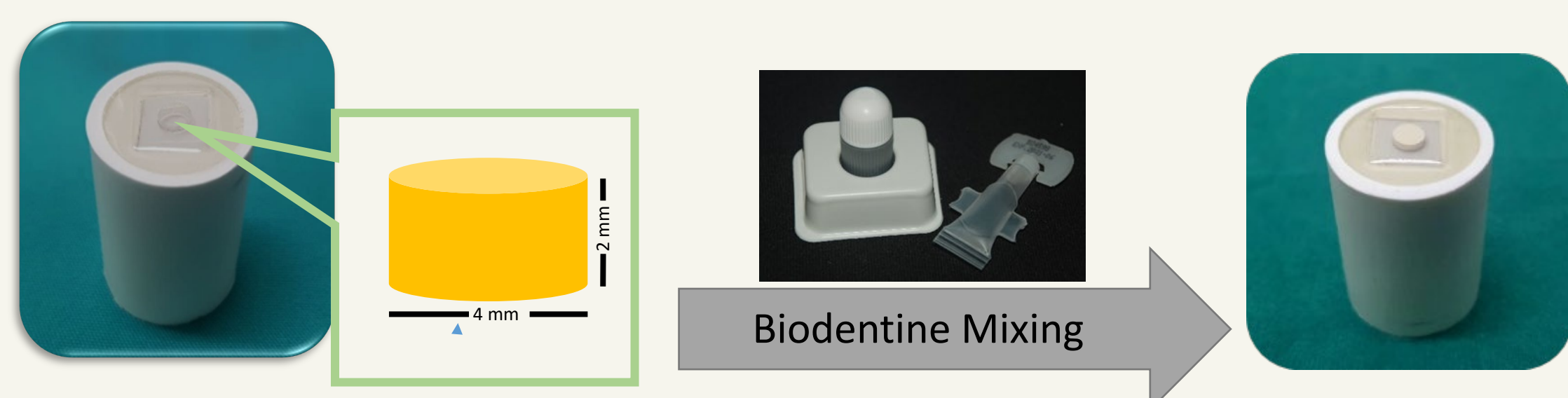


Figure 1 Biodentine specimen preparation

All Biodentine specimens were stored in 37°C, 100% humidity according the setting time assigned. Upon the setting time, Adhesive (Single Bond Universal) was applied on the Biodentine surface (self-etch mode, following manufacturer's instruction, table 1).

Composite resin was applied in a cylinder plastic tube (2mm diameter x 2mm height), then restored on the bonded surface. Light cured with light-emitting diode (Demi Plus, Kerr, USA, 1200 mW/cm<sup>2</sup>) for 20s (figure 2A).

Specimens were kept (37°C, 100% humidity) for 24 h before SBS testing.

SBS was measured using a universal testing machine with a cross head speed of 1mm/min (figure 2B).

The results were statistically analyzed using 1-way ANOVA and post hoc Bonferroni test at a 95% confidence interval.

Mode of failure of fractured specimens were observed under 30X stereomicroscope.



Figure 2 Composite resin restoration (A) and SBS test (B)

## Results

When SBS were compared, a statistically significant difference was found between group 1 and the other groups ( $p < 0.05$ ). No significant difference was observed among groups 2, 3, and 4 (figure 3).

Cohesive failure in Biodentine was most observed for all groups. No cohesive failure within composite resin specimens was found.

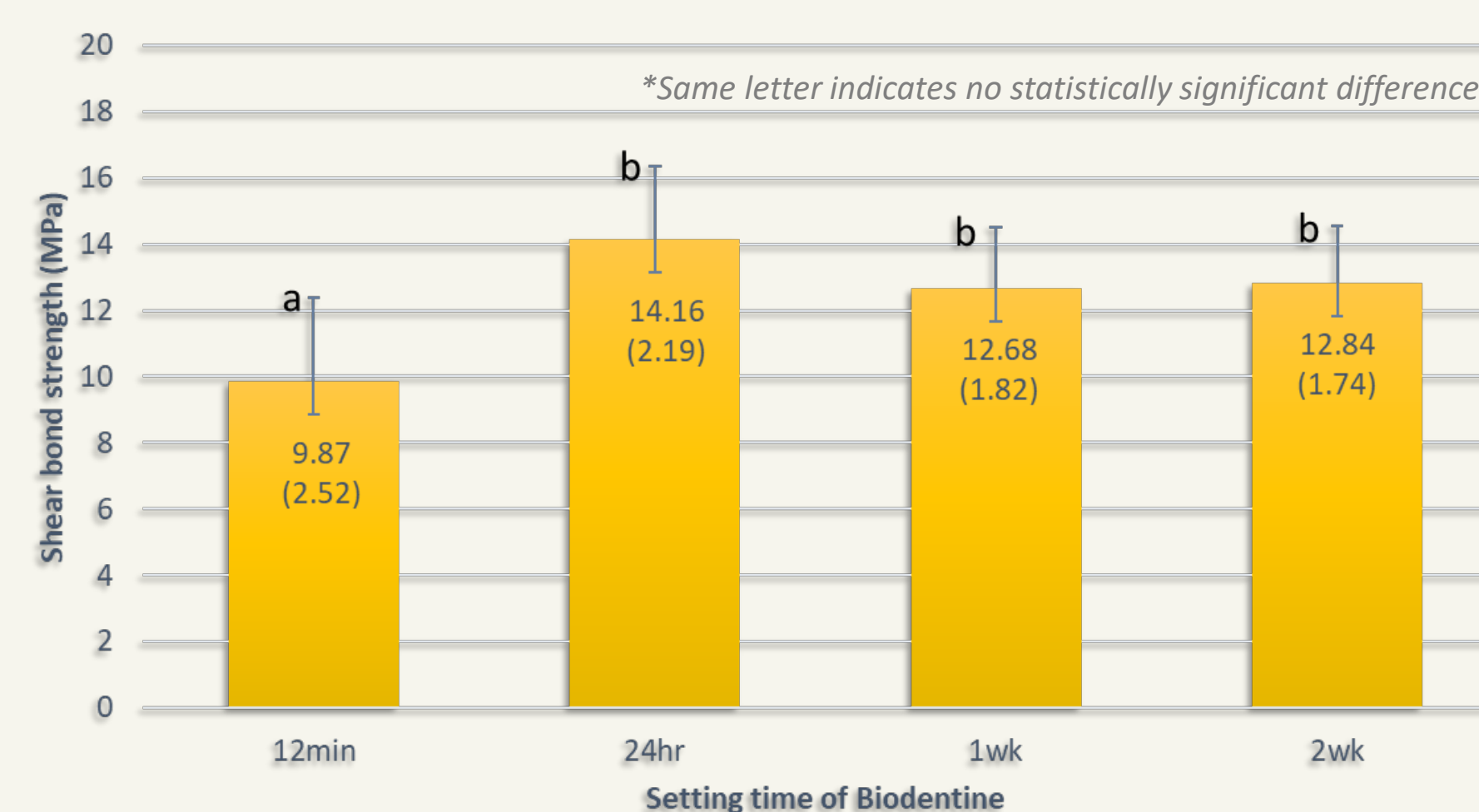


Figure 3 Mean SBS of each group

## Discussion

Biodentine is recommended for use as a dentine substitute under permanent restoration, since a short setting time, good placement, and bioactivity. The bond strength between restorative material and Biodentine is essential for filling quality. The results of this study presented that delaying permanent restoration to 24h, 1wk, and 2wks should be considered. This result was in agreement with previous studies which found that the bond strengths of immediate restoration placement were lower than those of delayed placement of a restoration.

## Conclusion

Based on the results of this study, the final composite restoration should be performed at least twenty-four hours after Biodentine placement to obtain higher SBS.

## References

- Rajasekharan S, Martens L, Cauwels R, Verbeeck R. Biodentine™ material characteristics and clinical applications: a review of the literature. *European archives of pediatric dentistry* 2014; 15(3): 147-58.
- Çolak H, Tokay U, Uzgur R, Uzgur Z, Ercan E, Hamidi MM. The effect of different adhesives and setting times on bond strength between Biodentine and composite. *Journal of applied biomaterials & functional materials* 2016; 14(2): 217-22.
- Odabaş ME, Bani M, Tirali RE. Shear bond strengths of different adhesive systems to biodentine. *The Scientific World Journal* 2013; 13: 38.
- Hashem DF, Foxton R, Manoharan A, Watson TF, Banerjee A. The physical characteristics of resin composite–calcium silicate interface as part of a layered/laminate adhesive restoration. *Dental Materials* 2014; 30(3): 343-9.