

# BRACKET BONDING WITHOUT PRIMER: ADHESIVE PROPERTIES OF A NEW 'ONE-STEP' MATERIAL

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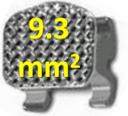
## OBJECTIVE OF THE STUDY

- To verify whether brackets bonded with a **new composite resin that does not require the application of a primer** after enamel etching resist similar **debonding forces** and exhibit comparable **failure patterns** to those of brackets bonded with an **etch-and-rinse adhesive systems** that has been routinely used for orthodontic bracket bonding.

## MATERIALS AND METHODS



- Sample: 24 freshly extracted human premolars free from caries, previous restorations, and visible cracks from the extraction forceps.
- Teeth cleansed of tissue and debris and stored in 1% T-chloramine until use in the experiment.
- Teeth embedded in fast setting acrylic and stored in water at 37°C until bonding of premolar stainless steel brackets (Victory Series, 3M Unitek, Monrovia, CA, USA, mean area of bracket base = 9.3 mm<sup>2</sup>).



- Buccal surfaces cleansed for 10 seconds with a mixture of water and fluoride-free pumice in a rubber polishing cup on a low-speed handpiece.

# Materials and Methods

2 randomly formed groups of teeth based on the adhesive system for bracket bonding

## Group 1 (n=12)

- Scotchbond Universal Etchant (37% phosphoric acid etching gel)
- Transbond XT Primer
- Transbond XT Paste

*(3M Unitek, Monrovia, CA, USA)*



## Group 2 (n=12)

- GC Ortho Etching gel
- GC Ortho Connect

*(GC, Tokyo, Japan)*



# Materials and Methods

## Group 1

### Scotchbond Universal Etchant / Transbond XT Primer / Transbond XT Paste

(3M Unitek)

- Etch for 15 s, rinse with water spray for 5 s, dry with oil-free air spray
- Apply a layer of Transbond XT Primer with a brush, air-thin with a gentle air blow
- Apply a small amount of Transbond XT Paste onto the bracket base
- Seat the bracket and remove excess resin composite with a scaler, light-cure for 6 s mesially and 6 s distally (Ortholux Luminous LED Light, 1600 mW/cm<sup>2</sup>)



## Materials and Methods

### Group 2

#### GC Ortho Etching gel / GC Ortho Connect (GC)

- Etch for 30 s, rinse with water spray, dry with oil-free air spray
- Apply a small amount of GC Ortho Connect onto the bracket base
- Seat the bracket and remove excess resin composite with a scaler, light-cure for 12 s mesially and 12 s distally (Ortholux Luminous LED Light, 1600 mW/cm<sup>2</sup>)



## Materials and Methods

- Shear bond strength test within 30 minutes from the time of bonding
- Debonding force recorded in Newtons and divided by bracket surface area in mm<sup>2</sup> to express bond strength in MegaPascals.
- Bracket bases and the enamel surfaces examined under an optical microscope at 20X magnification.



- Modified Adhesive Remnant Index (ARI) by Ostby et al.\* to assess the amount of adhesive left on the enamel surfaces.

\*Ostby et al. *Am J Orthod Dentofacial Orthop* 2008.

## Materials and Methods

### Modified Adhesive Remnant Index (ARI)\*

- Score 1: all adhesive remained on the tooth
- Score 2: more than 90% of the adhesive remained on the tooth
- Score 3: 10%-90% of the adhesive remained on the tooth
- Score 4: less than 10% of the adhesive remained on the tooth
- Score 5: no adhesive remained on the tooth

\*Ostby et al. Am J Orthod Dentofacial Orthop 2008



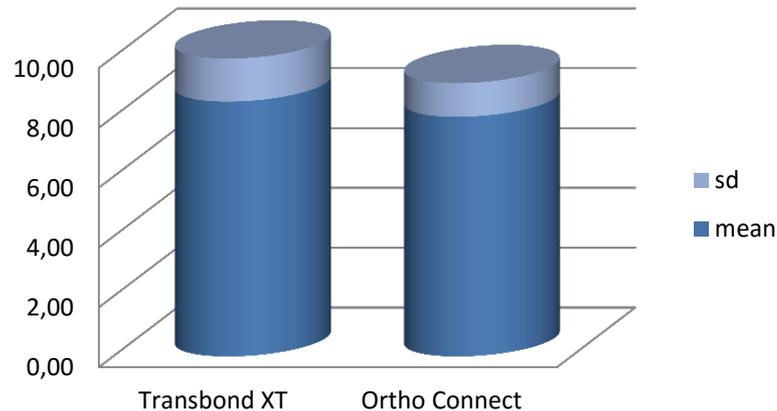
# RESULTS

## Shear bond strength

Shear bond strength (MPa)	N	Mean	Standard deviation
Transbond XT	12	8.52	1.44
Ortho Connect	12	8.01	1.13

- t-test ;  $p = 0.34$

**NO STATISTICALLY SIGNIFICANT DIFFERENCES IN BRACKET SHEAR BOND STRENGTH BETWEEN THE TWO MATERIALS**



## Results

## Modified ARI

Modified ARI scores	N	Median	Interquartile range (25%-75%)	Significance $p < 0.05$
Transbond XT	12	3	2-3	A
OrthoConnect	12	2	2-2	B

- Mann-Whitney U test;  $p = 0.031$

**WHEN ORTHO CONNECT WAS USED, SIGNIFICANTLY MORE BONDING MATERIAL TENDED TO REMAIN ON THE ENAMEL SURFACE.**



**Figure 1.** Example of score 2 (more than 90% of the adhesive remained on the tooth), the most frequent observation in Ortho Connect group.

## CONCLUSIONS

- A new **'one-step'** resin composite for orthodontic bracket bonding that **does not need the application of a primer** after enamel etching achieved **early bond strengths similar to those of a conventional etch-and-rinse adhesive system.**
- When the **one-step** system was used **without primer** as per manufacturer's recommendations, **more bonding material remained on the tooth surface** after debonding than when utilizing the conventional etch-and-rinse adhesive system.