

# SCIENTIFIC REPORT

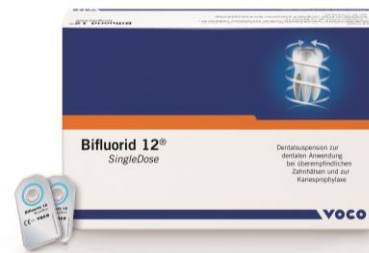
## Bifluorid 12 – Bracket removal

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Orthodontic brackets leave adhesive residue on the tooth surface when removed which must be removed with a rotating instrument. This and the demineralised surface caused by etching make the subsequent application of remineralising agents a particularly wise step. A research project at the University of Manila specifically addressed the interaction of mechanical debonding, rotating abrasive devices and prophylactic preparations in vitro.

### Adhesive removal

The brackets were pried off of 56 teeth with two different forceps (28 each). No significant differences were noted between the Ormco bracket removing plier and the Lift Off debracketing instrument in this context. 48 test teeth were subsequently divided into 3 groups of 16 teeth. In each of the three groups a different abrading device (15 s) was used to remove the utilised composite cement.

- Group A: Wolfram-Carbid cutter (20,000 rpm, CB 700, 010, tapered, no name, Germany)
- Group B: Soflex disc (10,000 rpm, medium grade, 3M ESPE, USA)
- Group C: Dura-white (120,000 rpm, 125A, flame, Shofu, USA)

The enamel surfaces were sprayed with water and dried with air for 5 s afterwards. The examination of the surfaces was conducted with a scanning electron microscope (SEM).

| Abrasive | Residual adhesive |       |       |        |
|----------|-------------------|-------|-------|--------|
|          | ~ 0%              | < 50% | > 50% | ~ 100% |
| Group A  | 5                 | 10    | 1     | 0      |
| Group B  | 0                 | 0     | 0     | 16     |
| Group C  | 3                 | 5     | 4     | 4      |

**Table 1:** Shear bond strength of various luting materials (24 h, 37 °C water storage, then thermocycling 6/60 °C, 1000

Table 1 shows that not all of the used abrading devices removed the cement with the same success. Residual composite cement restricted the efficacy of subsequent remineralisation.

### Remineralisation

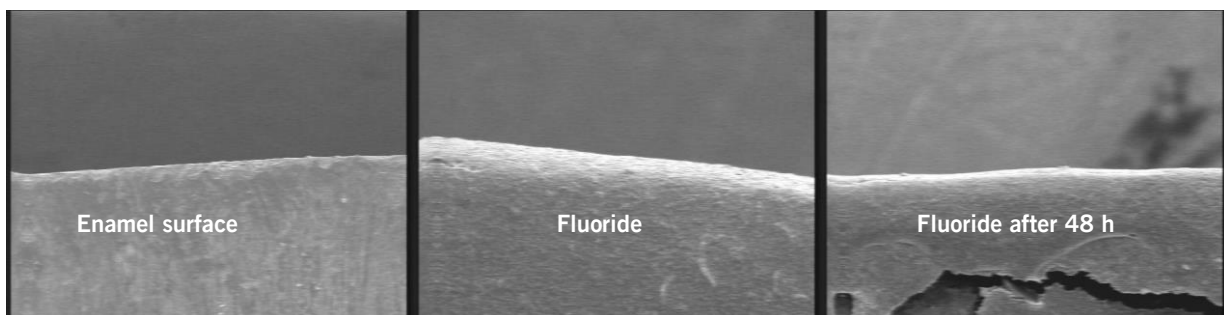
Tooth Mousse (GC) and Bifluorid 12 (VOCO) were further analysed regarding remineralisation and protection of the enamel surfaces after bracket removal in the study. Since Tooth Mousse does not contain fluoride, the remineralisation here had to be

determined by the increase in calcium in the tooth. The percentage of fluoride could be directly determined in the tooth substance with Bifluorid 12 (see Table 2).

| Abrasive | X-ray fluorescence measurements (EDX), Mean values (n=4) |                                  |                                     |                                   |
|----------|--|----------------------------------|-------------------------------------|-----------------------------------|
|          | Tooth Mousse (GC)  |                                  | Bifluorid 12 (VOCO)                 |                                   |
|          | Calcium content before application                       | Calcium content 48 h after appl. | Fluoride content before application | Fluoride content 48 h after appl. |
| Group A  | 22,8%  | 25,5%                            | 0%                                  | 11,2%                             |
| Group B  | 11,8%  | 20,6%                            | 0%                                  | 6,2%                              |
| Group C  | 24,3%  | 25,3%                            | 0%                                  | 9,9%                              |

**Table 2:** Fluoride and calcium content before and after application, 48 h water storage.

The values were measured after 48 h water storage in order to eliminate the influence of the only short-term effective water soluble sodium fluoride. Immediately after application, Bifluorid 12 exhibited fluoride values that were twice as high as expected. This immediate effect, however, disappeared after ca. 24 h. What is left is the remaining deposit mineralization measured here through the water insoluble calcium fluoride, which is detected as structurally bound fluoride. This is also seen in the SEM image (Fig. 1).



**Figure 1:** SEM images from group C mit Bifluorid 12, (x 200), longitudinal section, before application of Bifluorid 12 (left), immediately after (middle) and after 48 h water storage (right). The areas of remineralisation appear lighter.

Noteworthy is the fact that the remaining adhesive residue blocked the surface and thus prevented optimal remineralisation in group B (surface cleaning with Soflex Disc).

**Conclusion: With use of Bifluorid 12, the attacked enamel surfaces after bracket removal were water-insoluble fluoridated. Complete removal of composite cement residue is decisive for successful remineralisation.**

[1] V. Vahdani, S. C. Hernandez, University of the Philippines, Manila (PH), 2007, data on file.