Report on the study conducted by:
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On behalf of ITENA

Comparative evaluation of the sealing ability of 4 materials used for sealing pits and fissures

Materials and methods

Forty recently-extracted human molars, free from decay, were included in the study. After extraction and root cleaning, the teeth were stored in a 1% chloramine solution for a period not exceeding 3 months.

The teeth were randomly divided into groups as follows: ten teeth were treated with the light-curing resin Helioseal® (Ivoclar Vivadent) (Hel), 10 with the light-curing resin Clin Pro (3M-ESPE) (Cpro), 10 with the light-curing resin Embrace WetBond™ (Emb) (Pulpdent, distributed in France by GABA) and 10 with the new self-adhesive experimental material (Exp) (Itena)

The occlusal surfaces of the teeth were brushed with a low-speed rotating brush. Teeth from the Hel, Cpro and Emb groups were etched with 35% phosphoric acid gel for 20 seconds then rinsed for 10 seconds.

All materials were used according to the manufacturer's instructions.

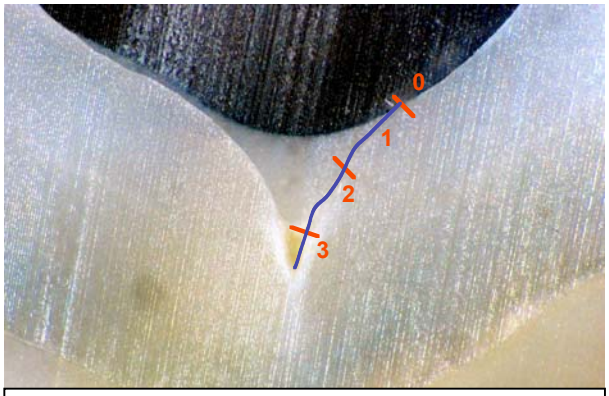
Following sealant application, the teeth were subjected to thermal cycling for 1,500 cycles alternating between 5°C and 55°C (10 secs immersion in each bath).

The apex of each tooth was sealed using Scotch bond Multipurpose Plus and Z100 (3M-ESPE) then 2 layers of nail polish were applied to within 1 mm of the sealant margin.

The teeth were then immersed for 24 hours in a 1% methylene-blue solution, buffered at pH 7. They were then rinsed under running water for 10 minutes and cleaned.

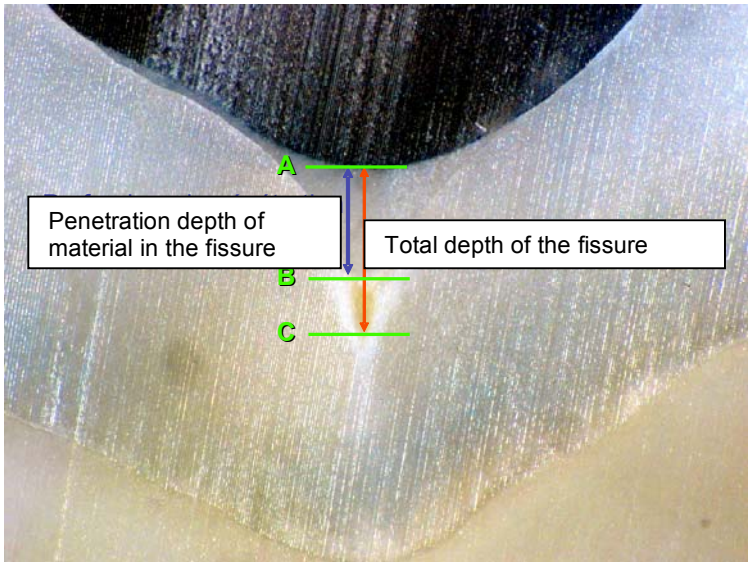
After embedding in a self-polymerizing resin (Sody 33-Escil®, Chassieu, France), a series of 500µm-thick axial sections were obtained from each tooth using a water-cooled diamond disc mounted on a saw at low-speed (Isomet™-Buehler, Evanston, Illinois, USA). Three sections were obtained from each tooth (6 interfaces examined). Dye penetration was examined under a binocular microscope at x 25 magnification. Each section was photographed and then evaluated using the method described by Övrebö and Raadal according to the following criteria:

- Score 0: no penetration of the dye seen in the section
- Score 1: penetration into the part around the sealant
- Score 2: penetration into the part below the sealant
- Score 3: penetration at the base of the fissure.



The higher of the 2 scores per fissure was selected for each section examined

The median and maximum scores recorded for each tooth were used as the evaluation criterion. Statistical analysis of data was performed using Statview 5.0® (SAS Institute Inc) and Stats direct software programs.
Furthermore the ratio between the penetration depth of the sealant into the fissure and the total depth of the fissure was calculated for each interface examined. The following measurements were calculated for each tooth: the average % of penetration depth into the fissure, the minimum and maximum % observed.



A Kruskall Wallis test was used to compare dye penetration evaluated between the 4 materials. Afterwards, an additional specific test was performed in order to localise any variations highlighted by the Kruskall-Wallis test.

A Chi-square test was used to compare the distribution of the 4 score levels (0, 1, 2 or 3) obtained in the 4 experimental groups.
An analysis of variance was used to compare the % of penetration into the fissure obtained with the 4 sealants tested.
The level of significance chosen for all the tests was p=0.05.

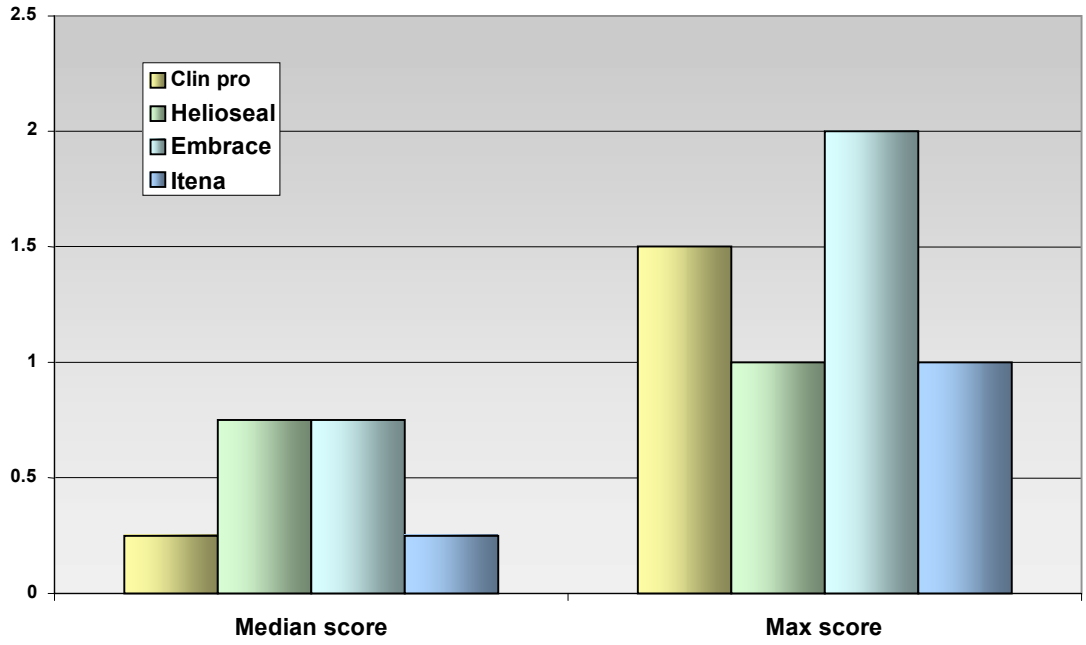
Results

The dye penetration scores (median and maximum) at the tooth/sealant interface are summarised in table 1 and figure 2. There was no statistically significant difference found between the 4 materials tested.

	Median score	Max score
Clin pro	0.25	1,5
Helioseal	0.75	1
Embrace	0.75	2
Itena	0.25	1
	NS	NS

Table 1
Median values of median and maximum scores obtained for each tooth, according to material used to seal fissures.

Figure 2: median of median and maximum dye penetration scores at the tooth/sealant interface



The distribution of the 4 score levels obtained for each sealant (0, 1, 2 or 3) is summarised in figures 3 and 4. No difference was observed in the distribution between the 4 experimental groups (Chi-square test non-significant)

Figure 3: Distribution of median scores according to sealant used

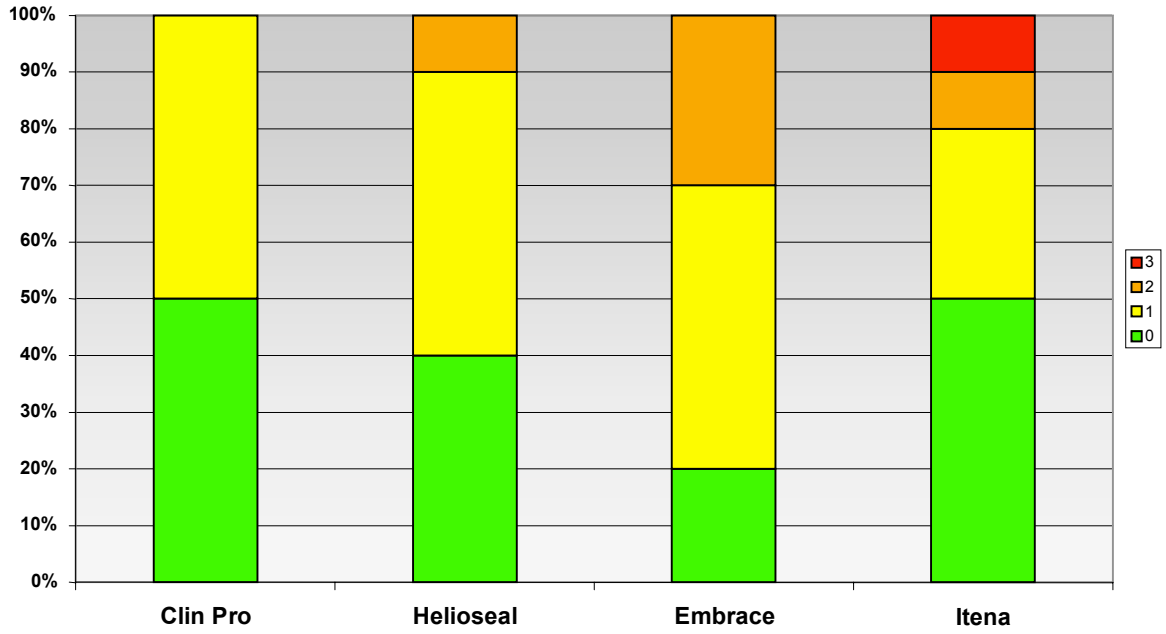
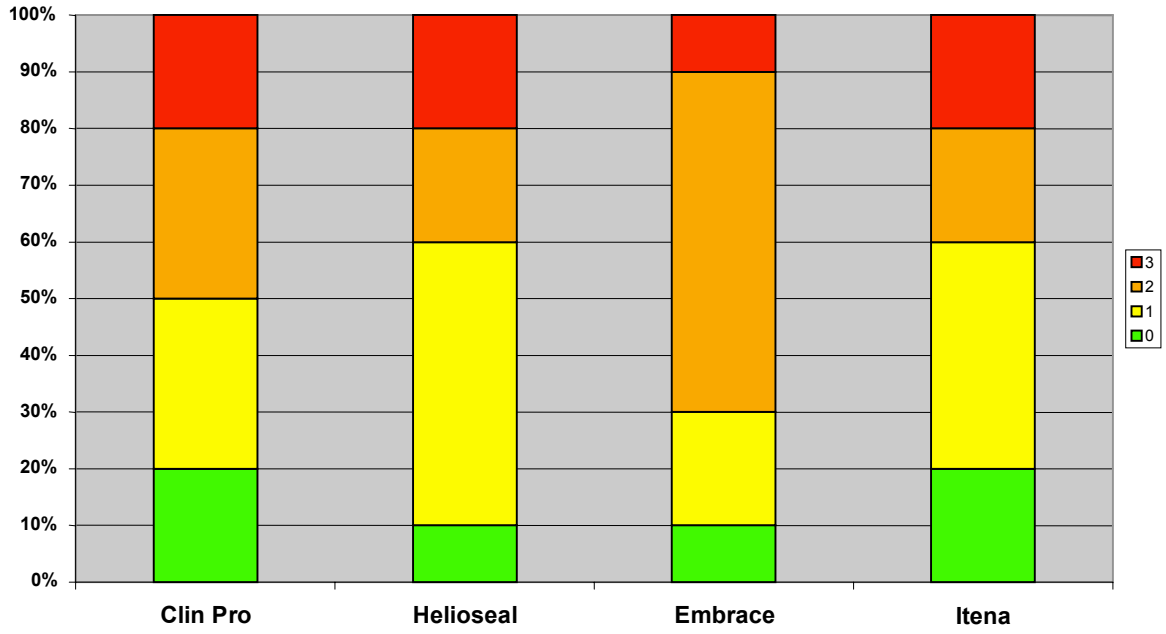


Figure 4: Distribution of max scores according to sealant used



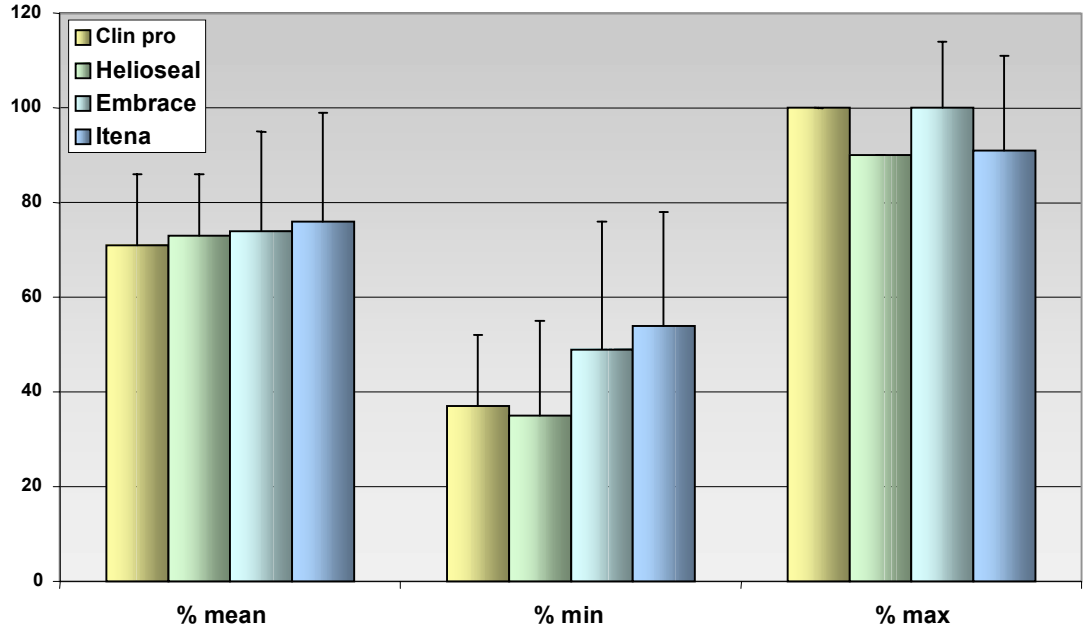
Fissure sealing by the 4 materials tested is summarised in table 2 and figure 5

	% mean		% min		% max	
	mean	SD	mean	SD	mean	SD
Clin pro	71	15	37	15	100	0
Helioseal	73	13	35	20	90	0
Embrace	74	21	49	27	100	14
Itena	76	23	54	24	91	20
	NS		NS		NS	

Table 2
Comparison of the % of fissure sealing by the 4 sealants tested in the study.

No significant difference was observed between the 4 materials tested. Overall, the fissures were correctly sealed by all the materials. However, it is worth noting the extreme variability in fissure shapes and depth, which makes a statistically powerful comparison difficult with only 10 specimens per group. The shape and depth of the pits and fissures should be evaluated in order to select only the teeth that present straight, deep pits and fissures which appear to be more suitable for determining differences between the sealants.

Figure 5: % of sealant penetration into the fissures



The variability of the results is highlighted by the histograms representing standard deviations.

Conclusions:
Under the experimental conditions of this study, Itena's experimental material did not obtain results different to those from the other 3 sealants tested. It is interesting to note that two of these 3 "reference" materials, i.e. Clin Pro and Helioseal are hydrophobic, while Embrace is a more hydrophilic material. It is also interesting to note that only Itena's material does not require prior etching of the enamel with phosphoric acid. However, no significant difference was found between it and the 3 other materials, either in terms of dye penetration at the interface (sealant ability) or regarding its ability penetrate all the sealed fissures.