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## SEM study on dentin/resin interface in primary teeth

**Language:** English

### Authors:

Dr. Emaan Yoonis, Prof. Dr. Martina Kukletová,  
Masaryk University, Medical Faculty, Stomatological Clinic, Brno, Czech Republic  
Ing. Ale Matouek,  
University of Technology, Institute of Materials Science and Engineering, Brno, Czech Republic

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### Introduction

The aim of the present paper was to study the character of connection between dentine adhesives and dentine in primary teeth, and to compare the structural pattern of selected adhesions in total etch technique and self-etching technique.

### Objectives

Dentin hybridization in primary teeth.

### Material and Methods

Dentinal adhesives Excite, Prime bond, Single bond, Xeno III, AdheSe and Prompt-L-pop Adper were used. The former three belong to the total etch technique, the latter three to the self-etching technique. Thirty extracted intact primary teeth were used for the study, each adhesive was applied into 5 teeth and the class I cavity was filled with EvoCeram. Struers Accutom 50 was used to halve the teeth previously embedded into epoxy resin using Epovac, and the obtained samples were embedded into methacrylate resin. The cut surfaces were polished with the Struers Tegra system. The polished surfaces were etched for 20 seconds with 37% phosphoric acid and for 5 minutes in 5% sodium hypochlorite to remove the debris. The samples were photographed in Tescan Vega TS 5136 XM scanning electron microscope.

### Results

#### Total-etch technique

The acid-etched dentine surface was covered continuously by dentine adhesives Excite, Prime bond and Single bond. Dentine adhesives penetrated into dentinal tubules in the form of tags and formed the hybrid layer in the demineralized surface dentine. The resin tags obturated totally dentinal tubules and sent very fine processes into anastomosing tubules.

#### Self-etching technique

Self-etching adhesives Xeno III, AdheSe and Prompt-L-Pop Adper formed the hybrid layer and penetrated into dentinal tubules obturing them in the same way as the adhesives of total etched technique, however, best results were obtained after AdheSe and Xeno III application. Co-polymerization of dentinal adhesives with the composite resin material was found to be good and without voids.

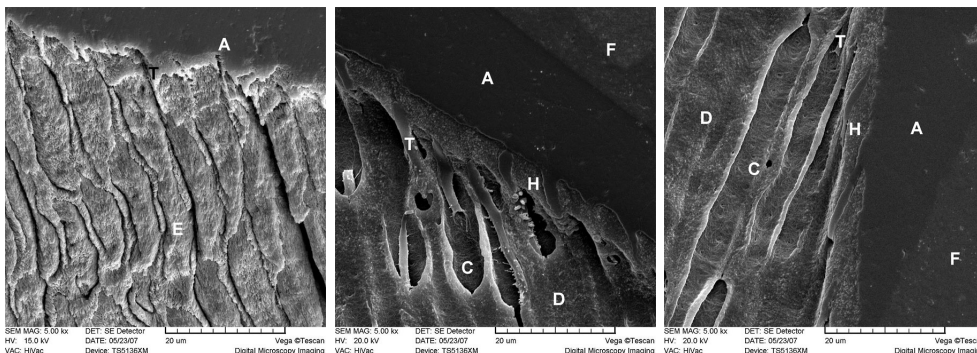


Fig. 1a: Excite. Enamel. Tags of dental adhesives in the etched enamel

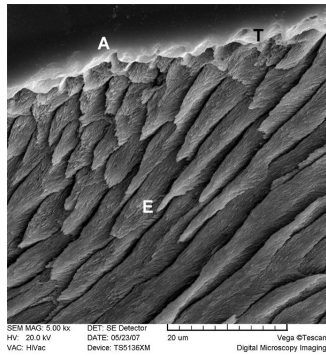


Fig. 1b: Excite. Dentine. Dental adhesives forms the hybrid layer and penetrates into dentinal tubules. (2-4004)

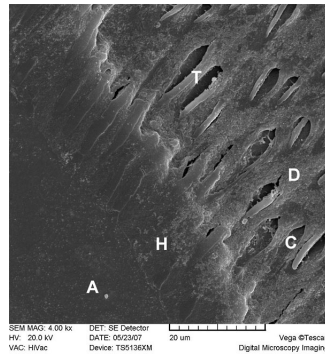


Fig. 1c: Excite. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (1-4004)

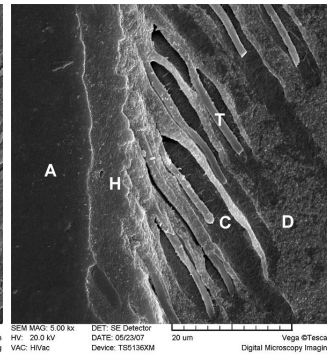


Fig. 2a: Prime bond. Enamel. Tags of dental adhesives in the etched enamel

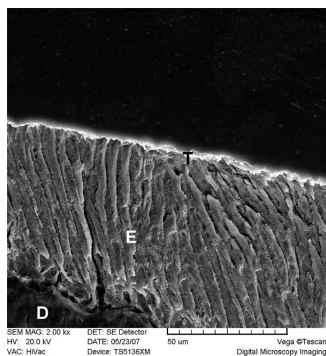


Fig. 2b: Prime bond. Dentine. Dental adhesives forms the hybrid layer and penetrates into dentinal tubules. (2-2002)

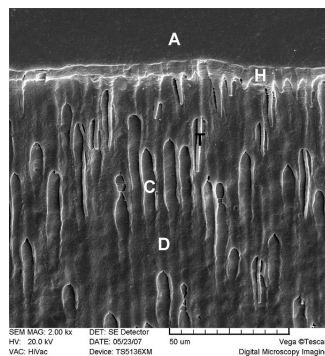


Fig. 2c: Prime bond. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (1-2004)

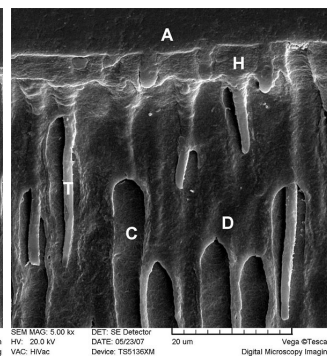


Fig. 3a: Single bond. Enamel. Tags of dental adhesives in the etched enamel

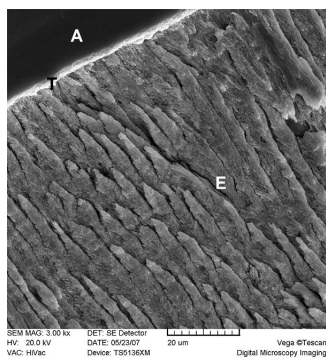


Fig. 3b: Single bond. Dentine. Dental adhesives forms the hybrid layer and penetrates into dentinal tubules

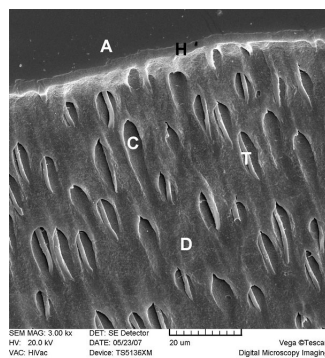


Fig. 3c: Single bond. Dentine. Higher magnification of the previous picture

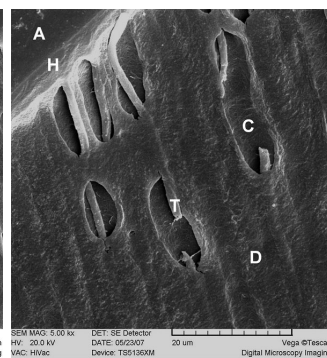


Fig. 4a: Xeno III. Enamel. Tags of dental adhesives in the etched enamel

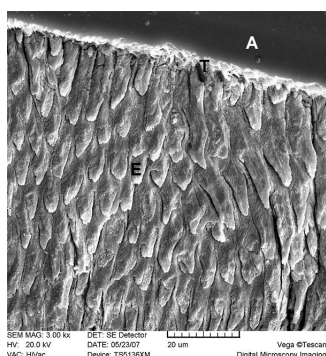


Fig. 4b: Xeno III. Dentine. Dental adhesives forms the hybrid layer and penetrates into dentinal tubules

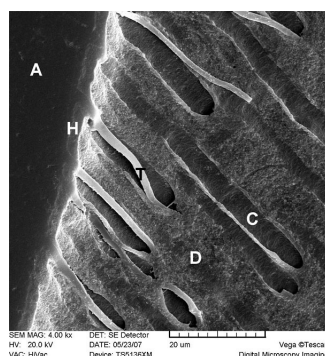


Fig. 4c: Xeno III. Dentine. Higher magnification of the previous picture

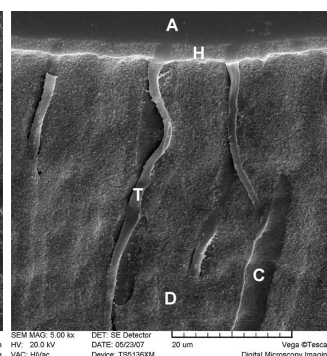


Fig. 5a: AdheSe. Enamel. Tags of dental adhesives in the etched enamel



Fig. 5b: AdheSe. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (1-4005)



Fig. 5c: AdheSe. Dentine. Higher magnification of the hybrid layer. (1-4005)



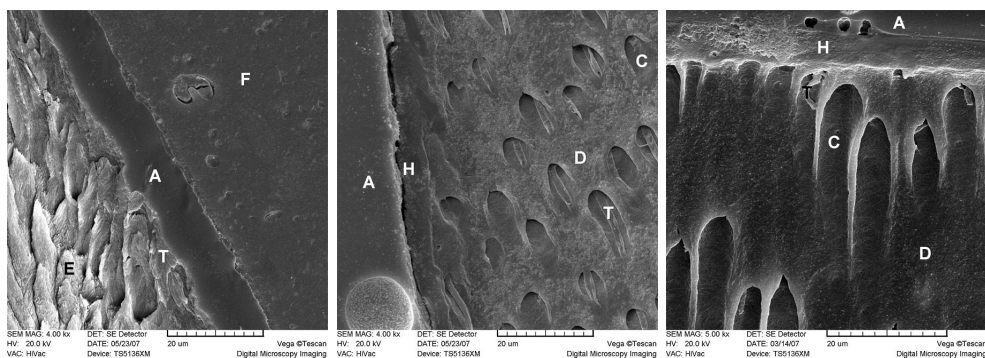


Fig. 6a: Prompt-L-pop. Enamel. Tags of dental adhesives in the etched enamel

Fig. 6b: Prompt-L-pop. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (1-4003)

Fig. 6c: Prompt-L-pop. Dentine. Higher magnification of the hybrid layer. (1-2003)

## Conclusions

There was no substantial difference in morphology of the dentine/resin interface between the adhesives studied. The findings have suggested that the hybrid layer function of all adhesives studied might be of the same quality. This fact that there is no substantial morphological difference in the dentine hybridization between total-etch and self-etching adhesives may be of importance in the restoration of primary teeth because the number of steps and the procedure duration can be significantly reduced.

## Acknowledgements

The study was supported by the Project 1M0528 from the Czech Ministry of Education and by Czech Science Foundation project No. 106/09/H35.

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## Abbreviations

SEM = Scanning Electron Microscopy

E = enamel

D = dentine

C = dentine tubule

T = tag

H = hybrid layer

A = dentinal adhesives

F = composite filling

*This Poster was submitted by MUDr. Emaan Yoonis.*

## Correspondence address:

Dr. Emaan Yoonis

Masaryk University

Medical Faculty, Stomatological Clinic

Pekarska 53

656 91 Brno

Czech Republic



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\*Yoonis E.<sup>1)</sup>, Matoušek A.<sup>2)</sup>, Kukletová M.<sup>1)</sup>

<sup>1)</sup>Stomatological Clinic, Medical Faculty, Masaryk University, Brno, Czech Republic  
<sup>2)</sup>Institute of Materials Science and Engineering1, University of Technology, Brno

**Abstract:**

Dentinal adhesives Excite, Single bond, Prime bond, Prompt-L-pop Adper, Xeno III and AdheSe were applied into class I cavities prepared into extracted primary teeth and they were restored with EvoCeram. The teeth were prepared for investigation under scanning electron microscope using Epowac and Struers Tegra polishing system. There was no substantial difference in morphology of the dentine/resin interface between the techniques studied. This fact may be of importance in the restoration of primary teeth because the number of steps and the procedure duration can be significantly reduced.

**Introduction:**

The aim of the present paper was to study the character of connection between dentine adhesives and dentine in primary teeth, and to compare the structural pattern of selected adhesives in total etch technique and self-etching technique.

**Materials and Methods:**

Dentinal adhesives Excite, Prime bond, Single bond, Xeno III, AdheSe and Prompt-L-pop Adper were used. The former three belong to the total etch technique, the latter three to the self-etching technique. Thirty extracted intact primary teeth were used for the study, each adhesive was applied into 5 teeth and the class I cavity was filled with EvoCeram. Struers Accutom 50 was used to halve the teeth previously embedded into epoxy resin using Epowac, and the obtained samples were embedded into methacrylate resin. The cut surfaces were polished with the Struers Tegra system. The polished surfaces were etched for 20 seconds with 37% phosphoric acid and for 5 minutes in 5% sodium hypochlorite to remove the debris. The samples were photographed in Tescan Vega TS 5136 XM scanning electron microscope.

**Results:**

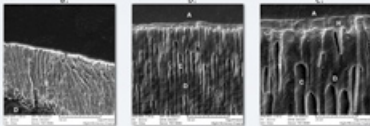
**Total-etch technique**

The acid-etched dentine surface was covered continuously by dentine adhesives Excite, Prime bond and Single bond. Dentine adhesives penetrated into dentinal tubules in the form of tags and formed the hybrid layer in the demineralized surface dentine. The resin tags obturated totally dentinal tubules and sent very fine processes into anastomosing tubules.

**Self-etching technique**

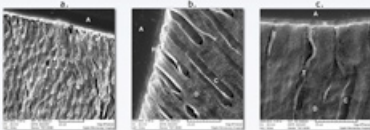
Self-etching adhesives Xeno III, AdheSe and Prompt-L-Pop Adper formed the hybrid layer and penetrated into dentinal tubules distorting them in the same way as the adhesives of total etched technique, however, the best results were obtained after AdheSe and Xeno III application. Co-polymerization of dentinal adhesives with the composite resin material was found to be good and without voids.

**Single bond**



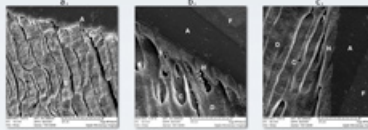
**Fig. 3 Single bond**  
 a. Enamel. Tags of dentinal adhesives in the etched enamel.  
 b. Dentine. Dentine adhesives forms the hybrid layer and penetrates into dentinal tubules.  
 c. Dentine. Higher magnification of the previous picture.

**AdheSe**



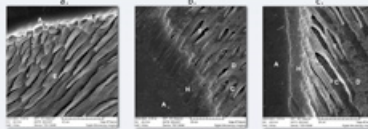
**Fig. 5 AdheSe**  
 a. Enamel. Tags of dentinal adhesives in the etched enamel.  
 b. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (1-400X)  
 c. Dentine. Higher magnification of the hybrid layer (1-400X)

**Excite**



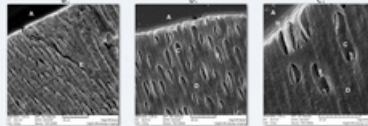
**Fig. 1 Excite**  
 a. Enamel. Tags of dentinal adhesives in the etched enamel.  
 b. Dentine. Dentine adhesives forms the hybrid layer and penetrates into dentinal tubules. (2-400X)  
 c. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (1-400X)

**Prime bond**



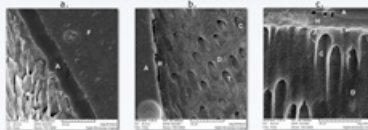
**Fig. 2 Prime bond**  
 a. Enamel. Tags of dentinal adhesives in the etched enamel.  
 b. Dentine. Dentine adhesives forms the hybrid layer and penetrates into dentinal tubules. (2-200X)  
 c. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (2-200X)

**Xeno III**



**Fig. 4 Xeno III**  
 a. Enamel. Tags of dentinal adhesives in the etched enamel.  
 b. Dentine. Dentine adhesives forms the hybrid layer and penetrates into dentinal tubules.  
 c. Dentine. Higher magnification of the previous picture.

**Prompt-L-pop**



**Fig. 6 Prompt-L-pop**  
 a. Enamel. Tags of dentinal adhesives in the etched enamel.  
 b. Dentine. Hybrid layer along the cavity wall, penetration of adhesives into dentinal tubules (1-400X)  
 c. Dentine. Higher magnification of the hybrid layer (1-300X)

**Explanation to abbreviations**

- E = enamel
- D = dentine
- C = dentine tubule
- T = tag
- H = hybrid layer
- A = dentinal adhesives
- F = composite filling

**Conclusion:**

There was no substantial difference in morphology of the dentine/resin interface between the adhesives studied. The findings have suggested that the hybrid layer function of all adhesives studied might be of the same quality. This fact that there is no substantial morphological difference in the dentine hybridization between total-etch and self-etching adhesives may be of importance in the restoration of primary teeth because the number of steps and the procedure duration can be significantly reduced.

The study was supported by the Project J05/28 from the Czech Ministry of Education and by Czech Science Foundation project No. 156/06/0423